Investigating designers' and users' perception gap in product values and experience: Through the mental-modelling and role-based scenario approaches

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ABSTRACT

The research aims at understanding the perception of product values and experience, and investigating the possible differences between designers' and users' perceptions. The role of designers is supposed to bridge the gaps between businesses and users by designing products with affordances valued by the potential users. However, cases of unsatisfactory market and product performance yielded from "well-designed" products imply that the users may not perceive, interact with, or value the product as the designer does. Some past studies have looked at the designer/user differences[1] from angles such as differed adoption stages and product expertise, and product communication and semantics issues. The current study explored the possible designer/user gaps from less attended prospects of value perception, individual's characteristics (such as personality traits), and role-based variations.

The research aims are fulfilled through mental modelling and survey with role-based scenario questions. Findings from the survey with 791 respondents show support for the conceptual framework proposed along the "perceived values – satisfaction – behavioural intention" model, enhanced with inter-value interventions (between extrinsic and intrinsic values) and updated with the "perceived innovative value". Key differences identified between real-world designers and nondesigners include their abstraction and tangibility levels, and their perceived innovative and hedonic values which may relate to their varied individual traits of innovativeness and openness to experience. Significant gaps have been recognised between role-taking designers and users in their need projection. Role-taking designers tend to project greater needs (often over-estimated with stereotyping tendencies) for their target user groups than their own self.

The research has contributed in three key aspects. Firstly, the study enhanced and updated the conceptual framework for the "perceived values – satisfaction – behavioural intention" model, suggesting and validating in a product context

[1] Throughout the thesis, the term "designer/user differences" is used (instead of "designer-user differences") to denote the differences between designers and users, since the term "designer-user" has been designated in this thesis to represent "a real-world designer who plays a user role in response to particular question(s) / task(s) in the research (Notes in Section 3.1 and Section 5.5.8.3). The same logic applies to other similar expressions, such as designer/nondesigner gaps, and user/designer discrepancies, etc.

the mediation role of the intrinsic values (hedonic and social) between the extrinsic values (utilitarian and innovative) and satisfaction / behavioural intention. It also tested individual's characteristics as antecedents / moderators in terms of designer/nondesigner, individual innovativeness and personality traits, beyond the commonly tested demographic and user experience factors. Secondly, it developed and tested the exploratory empirical research methods of (a) mental modelling with semi-structured framework of laddered abstraction and (b) role-switching between user and designer triggered by scenario-type questions designed into the survey, enabling the comparison of role-based differences between users and designers. Thirdly, the study has recognised designer/user differences / gaps with the potential underpinning factors: the differences in identified innate individual characteristics contributing to value perception differences; the difference in abstraction and tangibility levels contributing to the designer/user communication gap; and the potential imbalance of designer and user self-efficacies contributing to the need projection discrepancy. The identification of gaps and their prospective underlying factors hinted the potential directions to bridge the gaps, improve designer-product-user interaction, and ultimately enhance user experience.

DECLARATIONS

Declaration 1

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed: Circula Sau Lin Chan Date: 31 January 2023

Declaration 2

This thesis is the result of my own investigations, except where otherwise stated. If and where correction services have been used, the extent and nature of the corrections would be clearly marked in a footnote(s). Other sources are cited with the reference information listed in the appended bibliography.

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CHAPTER 1: INTRODUCTION

1.1 Background and context

The research aims at understanding the perception of product values and experience, and investigating the possible differences between designers' and users' perceptions. In eliciting the mental model / conceptual model of designers and users[2] for comparison, product exemplars such as the smart communication products (e.g. smartphone) are referred to in the mental modelling activities and surveys. An enhanced and updated conceptual framework is proposed to adequately reflect the values involved in the user experience with contemporary products and to facilitate the systemic comparison between the designers' and users' perceptions.

Humans have been using tools / products since ancient times to make life easier or more enjoyable. Products give users values and experiences, good or bad. Positive product values and user experiences are appreciated by individuals, and cherished by business because they are believed to create customer satisfaction and continuous use of the product, contributing to customer loyalty and business sustainability. In what ways can businesses invest their efforts in satisfying user needs, building positive product values and user experiences? What values of the products are "valued" by the consumers and users, not only by the enterprises and designers?

[2] "Users", unless otherwise specified, refer to the general people who adopt the product after its launch into market. As such defined, users of a specific product are nondesigners in respect to the product, and the nondesigners include users and potential users of the concerned product. The "user" and "nondesigner" groups in fact overlap, and the two terms are interchangeably used in the current thesis in respect to the context / point of concern. (Detailed definitions in Section 3.1)

When people made their own tools in ancient times, producers were users who well understood their own needs and the values of the tools they made for themselves. When pre-industrial revolution craftsmen tailor-made tools and products for customers in older times, the producers communicated with users through close contacts. Since the First Industrial Revolution in the 18th century brought about the factory system and mass production (Britannica, 2018), the distance between producers and users has widened resulting in potential gulfs of understanding (Norman, 1988, 2013). The emergence of the profession of "designers" in the 20th century was supposed to bridge the gaps, facilitating businesses to produce products which satisfy users' needs and are valued by the users. The designers are believed to be able to understand users' divergent needs (physical, psychological and more……) and design products which communicate their values and uses, or affordances, to users, thus affirming users' experience.

But this is not always the case as reflected in reality. "Well-designed" award winning products may not perform as well in the market or in the users' hands. In terms of marketing, the problem may lie with one or more aspects of the Ps: product, price, place, promotion, people, and more (Kotler & Keller, 2012). There have been numerous studies on sales and marketing and pre-purchase consumer behaviours, hence paying more attention to the selling rather than the actual use experience of the products. This current research study was proposed to focus the investigation on use experience with two important groups of the "people" involved: the designers and the users who interact and communicate through the products and their use. Unsatisfactory market and

product performance and experience yielded from “well-designed” products imply that the majority of the potential customers / users may not perceive the product values and / or interact with the product as the designer does; or in other words, the designer has designed the product to satisfy needs projected for the users from the designer’s rather than the users’ perception. In such case, it is worth looking into the root of their different perceptions – the possible different mental models which are the conceptual models in people’s minds of what things do and how things work (Norman, 1988, 2013):

“In interacting with the environment, with others, and with the artefacts of technology, people form internal, mental models of themselves and of the things with which they are interacting. These models provide predictive and explanatory power for understanding the interaction.” (Norman, 1983, p. 7)

Previous studies in the literature have applied various models and theories when investigating the perception and adoption of technologies, products and services. The attributes / values – satisfaction – behavioural intention school of models / theories take into consideration the influence of attributes / values from the technology/product/service on perceived satisfaction and/or intended (continuous) adoption of the technology / product / service. These include: the Technology Acceptance Model (TAM) (Davis, 1985) focusing on the utilitarian attributes (usefulness and ease of use) and the ultimate user decision of use or not-use of the product; the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) and Theory of Planned Behaviour (TPB) (Ajzen, 1985, 1991) adding the consideration of the subjective norm (social concern); the Means-End Chain (MEC) model (Gutman, 1982; Zeithaml, 1988) and the Theory of Consumption

Values (Sheth et al., 1991b; Kim & Han, 2009; Rivas et al., 2022) investigating consumers' perceived product values which could consist of functional / utilitarian, emotional / hedonic, social, and epistemic values; and the Innovation Diffusion Theory (IDT) (Rogers, 1983) examining the concerned technology's relative advantage and situational factors such as consumers' readiness. While the above models / theories bring out / emphasise certain perspectives, they do not integratively or interactively address the inter-relationship across the different product values and the corresponding user experience, satisfaction, and adoption. Most importantly, the user factor is seldom an integral part of these models. The United Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) based on eight prior models including TAM and TPB was an amalgamative attempt which also suggested the inclusion of user characteristics (such as gender, age, experience, and voluntariness of use) as moderators for use intention and behaviour.

Other studies looked at user experience from more user-oriented perspectives employing theories such as Uses and Gratifications Theory (UGT) (Blumler & Katz, 1974; Williams et al., 1985), and Social Cognitive Theory (SCT) (Bandura, 1977a, 1986), both of which recognise that user behaviours are motivated by users' goals and expected outcomes of the behaviours. In the wide range of studies with UGT, scholars have defined the gratifications under the "instrumental" (extrinsic) and "ritualistic" (intrinsic) domains (e.g., Rubin, 1984; Leung & Wei, 2000; Ozcan & Kocak, 2003; Grellhesl & Punyanunt-Carter, 2012; Joo & Sang, 2013). In the examples of their studies on mobile phone user experience, instrumental gratifications cover practical task-oriented motives such as mobility, immediate accessibility, information seeking, and surveillance

while ritualistic gratifications cover more affective and social motives such as enjoyment, entertainment, self-reactiveness, reassurance, security, social identity, and maintaining relationships with family and friends. The UGT posits that individual differences motivate people to use a media / product differently to satisfy underlying needs (Katz & Blumler, 1974; Leung & Wei, 2000; Guo et al., 2021). Individual differences studied to have association with mobile phone user experience include personal characteristics in demography, occupation, individual innovativeness and personality (Leung & Wei, 2000; Pagani, 2007; Stachl et al., 2017; Stachl et al., 2020).

The current study integrates the paradigms of interpretivism (inductive approach) and positivism (deductive approach) at different stages. The research flows from “inductive” in the first part (mental modelling) to “deductive” in the second part (survey), which coincides with the “exploratory sequential design” defined by Creswell (2013).

The mental models constructed by participants (via an online mindmapping platform) in Part One illustrating how the participants used their smartphones to satisfy needs and achieve goals were consolidated into the designers’ and nondesigners’ group models for comparison and further analyses in reference to the theories reviewed in the literature including the Theory of Consumption Values (Sheth et al., 1991b; Kalafatis et al., 2010; Rivas et al., 2022) and the Uses and Gratifications Theory (Rubin, 1984; Williams et al., 1985; Leung & Wei, 2000; Moon et al., 2022).

The conceptual framework for testing in the Part Two Survey was initially drawn

up (**Figure 23**) referencing prior studies' "perceived values – satisfaction – behavioural intention" models. After taking into consideration the observations and findings from the Part One (Mental Modelling) and the Pilot 1 test of Part Two (Survey), the framework has further incorporated the intervening relations between the user perceived values for verification in the Survey (**Figure 25**). The emerging inter-value interventions aligned with research studies (Davis, 2013; Kalafatis et al., 2010) which acknowledged the existence of interrelationships between the value constructs, challenging Sheth's Consumption Values model (Sheth et al., 1991b) that illustrated the values as independent of each other. The current study also investigated the designer/nondesigner differences and the potential underlying factors for the differences.

The research conducted through mental modelling and survey (791 respondents) with role-based scenario questions show support for the conceptual framework proposed along the "perceived values – satisfaction – behavioural intention" model, enhanced with inter-value interventions (between extrinsic and intrinsic values) and updated with the "perceived innovative value". Key differences identified between real-world designers and nondesigners include their abstraction and tangibility levels, and their perceived innovative and hedonic values which may relate to their varied individual traits of innovativeness and openness to experience. Significant gaps have been recognised between role-taking designers and users in their need projection. Role-taking designers tend to project greater needs (often over-estimated with stereotyping tendencies) for their target user groups than their own self.

In summary, the research has contributed in three key aspects. Firstly, the study enhanced and updated the conceptual framework for the "perceived values – satisfaction – behavioural intention" model, suggesting and validating in a product context the mediation role of the intrinsic values (hedonic and social) between the extrinsic values (utilitarian and innovative) and satisfaction / behavioural intention. It also tested individual's characteristics as antecedents / moderators in terms of designer/nondesigner, individual innovativeness and personality traits, beyond the commonly tested demographic and user experience factors. Secondly, it developed and tested the exploratory empirical research methods of (a) mental modelling with semi-structured framework of laddered abstraction and (b) role-switching between user and designer triggered by scenario-type questions designed into the survey, enabling the comparison of role-based differences between users and designers. Thirdly, the study has identified designer/user differences / gaps with the potential underpinning factors: the differences in individual innovativeness and personality traits (such as designers with greater openness to experience) contributing to value perception differences (such as designers perceiving higher innovative and hedonic values); the difference in abstraction and tangibility levels contributing to the designer/user communication gap; and the potential imbalance of designer and user self-efficacies contributing to the need projection discrepancy. The identification of gaps and their prospective underlying factors hinted the potential directions to bridge the gaps, improve designer-product-user interaction, and ultimately enhance user expereince.

The following chapters will unfold with more details the aims, methodologies, research results and findings, discussions, conclusions, recommendations, limitations and future research opportunities.

1.2 Aims and objectives

As discussed above, the research aims at understanding the perception of product values and experience, and investigating the possible differences between designers' and users' perceptions. The flow of research for this study, from planning and proposal to the Part One and Part Two field research, denoted with the corresponding evolving frameworks, is illustrated in **Figure 1**.

As mental models are believed to "provide predictive and explanatory power for understanding the interaction" of users with products (Norman, 1983), the mental models of designers' and users' product value and use perception are elicited and compared to provide scenarios of why users fail to interact with a product the same way as a designer expects, or the other way round, why the designer fails to predict how the users interact with the products. In the business sense, such understanding may enable the designers and producers to grasp why "well-designed" award-winning products do not perform well in the market, and how the situation could be turned around.

Previous studies have indicated the existence of a perception gap between designers / products and users, which was found associated with the not so well as expected product acceptance. For instance, Norman (1988, 2013) discussed the "gulf of execution" and "gulf of evaluation" in his book "Psychology of Everyday Things" which was later updated as "Design of Everyday Things". The findings from an empirical study by Cata and Martz (2015) identified differences in the usability of mobile phone apps perceived by designers and nondesigners. An experimental study by Chamorro-Koc and

Popovic (2008) demonstrated the differences between designers and nondesigners in their approaches and concepts when they were asked to illustrate their ideal models of specified “everyday” products. That study identified a correlation between the different approaches / concepts and the creators’ prior experiences.

The current study is expected to provide answers to the following research questions:

(1) What is the perception model like for product values and user experience regarding a mobile communication product such as the smartphone?
(2) Do designers and users have different perceptions regarding the values and user experience of a product, and if yes, what are the differences?
(3) What are the underlying factors contributing to the differences?

To answer question (1), in Part One of the current research, a mental modelling framework was created for eliciting and interpreting participants’ perceptions and user experiences along the four domains of utilitarian, hedonic, social, and innovative values adapted from the consumption value perception studies (Sheth et al., 1991b; Brown & Venkatesh, 2005; Kim & Han, 2009; Kalafatis et al., 2010; Rivas et al., 2022), and with a goal-oriented hierarchical structure of laddered abstraction developed taking reference from the Uses and Gratification (Rubin, 1984; Leung & Wei, 2000; Moon et al., 2022) and Mean-End Chain approaches (Reynolds & Olson, 2001; Jung, 2014). Valued goals and anticipations (together with potential designer/user gaps) identified in Part One have been incorporated into the Part Two questionnaire for further testing. In Part Two of the research, an enhanced and updated conceptual framework

along the same line was proposed for testing the “perceived values – satisfaction – behavioural intention” associations in reference to previous studies from the literature.

To answer question (2), the mental models constructed by participants in Part One illustrating how the participants used their smartphones to satisfy needs and achieve goals were consolidated into the designers’ and nondesigners’ group models, compared and analysed. Designer/nondesigner differences identified from Part One were further checked in Part Two. In Part Two, causal relations would be examined and t-tests would be conducted to identify any significant designer/nondesigner group differences among the key variables in the framework.

Apart from finding difference between real-world designers and nondesigners, the study tried to explore possible situational-based or role-based differences. In one section of the questionnaire, the respondents were requested to weigh a series of design enhancements for smartphones for themselves, from a user’s perspective, and for a specific target user group (a, b, c or d), from a designer’s perspective. T-tests were then conducted between the weightings given by the user group (x) and the weightings projected by the situational role-taking designers for user group (x). The test results indicated some meaningful and noteworthy tendencies.

To answer question (3), relevant individuals’ characteristics were collected from the Part Two questionnaire, and their possible influences on value perception as well as moderating effects on the causal relations were tested. Previous

studies (e.g. Leung and Wei, 2000; Venkatesh et al., 2003, 2012) have acknowledged the moderating effects of individual characteristics such as age, gender, experience, occupation and product expertise on value perception, product adoption or product use. Moderating factors like occupation and product expertise (which is also associated with occupation) seem relevant for the designer vs nondesigner comparison. But what are the factors behind the occupation facade which might have contributed to the difference between designers and nondesigners? Certain psychological studies suggested that individuals with particular personality traits would tend to opt for or succeed in corresponding career types (Holland, 1985; Hammond, 1991; Hannah, 1994; Caprara et al., 2003; Nettle, 2005, 2006; Hu et al., 2017). Apart from the personality-career-inclination perspective, the potential relevance of individual personality as among the underlying factors for the designer/nondesigner differences could also stem from the consumer perception perspective (e.g. Varnali, 2013; Zu et al., 2016; Stachl et al., 2017, 2020). Previous research found the personality traits either influencing relationships as moderators, or directly affecting user perceptions, both of which may subsequently contribute to the perception differences between groups. Considering the above, differences in personality might be among the underpinning factors contributing to potential designer/user gaps, hence the possible influences on value perception as well as moderating effects of personal innate characters of individual innovativeness and personality traits (吴琼 & 谷丽萍, 2020) on the causal relations were tested.

Ultimately, the study is expected to contribute to the academic and professional arena. The study has enhanced and updated the conceptual framework for the

conventional “perceived values – satisfaction – behavioural intention” model(s). It has demonstrated an applicable methodology in eliciting mental models of target groups, enhancing the communication and understanding of their perceptions and underpinning needs which may not be easily discovered through other means of research like observation and interviews. The situational setup with scenario questions in the survey has further enabled role-based compaisons between designers and users. The identification of potential designer/user gaps is expected to provide hints for bridging the gaps and improving designer-product-user interaction, empowering the design of products with better user values. The study may also inspire the researchers and tool developers to design better research and / or product development tools so as to foster product R&D and enhance the ultimate user experience.

In summary, the study is expected to contribute academically by adding to the knowledge on:

- Enhanced and updated conceptual framework for the “perceived values – satisfaction – behavioural intention” model
- Empirical mental modelling approach with semi-structured framework of laddered abstraction for eliciting mental models regarding the participants’ perception and anticipation for products / services
- Empirical scenario-question approach for inducing the user/designer role-switching in the survey
- Differences / gaps between designers’ and users’ mental models and perceptions
- Possible contributive factors underpinning the differences / gaps

The findings of the study will provide hints for designers and businesses on:

- Practical methods and tools for understanding users' perceptions through the elicitation of mental models regarding the goals, values, affordances, uses and anticipation for products / services
- Possible directions for product development taking reference of users' perceptions and anticipations reflected in their mental models
- Understanding of potential differences / gaps between designers' and users' perceptions, and taking such differences / gaps into consideration in the design and communication processes
- Considerations for long-term strategies in addressing critical designer-product-user gaps and their contributive factors to minimise their potential hindrance on designer-product-user interaction, product adoption, and user experience

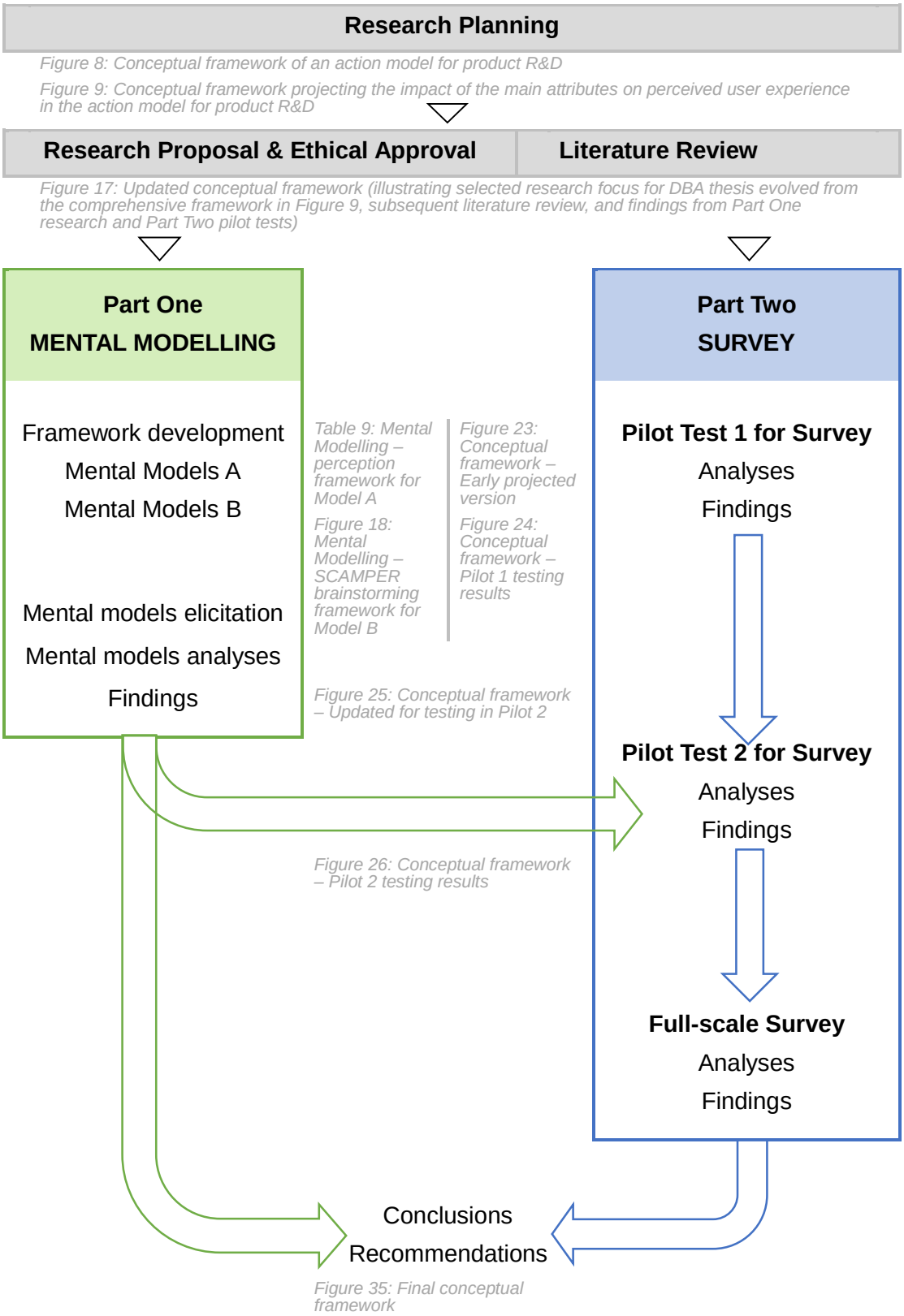


Figure 1: Flow of research and corresponding evolving frameworks

Note: Grey italic texts denote respective frameworks.

CHAPTER 2: LITERATURE REVIEW

"User experience" is now a core concern for businesses and seen as a key factor for business success. The review of prior researches in this chapter began with the development of the concept of "user experience", the discussed gaps (such as those between designers and users, and those between physical and psychological focuses), and efforts attempted to bridge those gaps. A series of theoretical models / concepts examining the relations across attributes in the user experience scenes including user motivations, perceived values, behavioural intentions, and individual's characteristics (which are potential antecedental / moderating factors for motivations, values and behaviours) are also reviewed.

A framework has been outlined (**Section 2.3**) for an action model integrating Norman's user action cycle and recommended design principals (Norman, 1988, 2013) with the utilitarian-hedonic value perception approach (Batra and Ahtola, 1991; Zaichkowsky, 1994; Voss et al., 2003; Mouri, 2005) aiming at narrowing those identified gaps (designer/user, psychological/physical) with an actionable model accompanied by a set of application tools (**Figures 8, 9 and 11**). Such inclusive model and tools have been long anticipated and require the investment of persistent efforts and time for developing and verifying the theoretical grounding, the empirical applications, and repeating tests in honing the model and range of tools. The framework would be a good reference for planning future studies to work towards the goals probably in phases. For this DBA thesis, attention is pinpointed at "good conceptual model" (an important psychological-physical consideration in the action model) and user experience

in addressing the designer/user gaps (as highlighted in **Figure 10**). Since the conceptual models, also known as mental models, represent what products do and how products work in people's minds (Norman, 1988, 2013), investigating the designer's and user's mental / conceptual models on product perception would help understand the potential designer/user gaps.

The topics reviewed in this chapter and their relevance to the current research study are summarised below:

2.1	User experience and identified gaps	This section reviewed literature concerning the development of the concept of "user experience", the gaps recognised (such as those between designers and users), and efforts attempted to bridge those gaps.
2.2	Designer-product-user communication gap	The designer-product-user communication issue, one of the recognised designer/user gaps, was reviewed with some literature deliberating on the problem or suggesting certain ideal communication models, but few has proposed the problem's underlying factors or demonstrated applicable methodologies for the solutions.
2.3	Action model framework outlined for bridging the designer-product-user and psychological-physical gaps	This is the framework outlined by the researcher at the early planning stage, from which the current research focus branched out. It also provides reference for future research planning on the related domains.
2.4	User behaviour studies on attributes / values – satisfaction – behavioural intention	The user behaviour models / theories along the line of "attributes / values – satisfaction – behavioural intention" were made reference of when proposing the conceptual framework for the current research study. Theories referred to included: Technology Acceptance Model (TAM 1, 2 & 3) (Davis, 1985; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008); United Theory of Acceptance and Use of Technology (UTAUT 1, 2 & extended versions) (Venkatesh et al., 2003; Venkatesh et al., 2012); Theory of Consumption Values (Sheth et al., 1991b; Hur et al., 2012; Rivas et al., 2022); and Expectation-Confirmation Theory (Bhattacherjee, 2001; Mouri, 2005).

2.5	Uses and Gratifications Theory	The Uses and Gratifications Theory (UGT) was referred to, as it looks at user experience and motivation from user-oriented perspectives (Blumler & Katz, 1974; Williams et al., 1985). The theory's concept concerning "instrumental / extrinsic" and "ritualistic / intrinsic" motives (using mobile services as example) has been consulted in the current study's proposition on the inter-relations between extrinsic and intrinsic perceived values.
2.6	Means-End Chain and hierarchical map	The mean-end chain approach's hierarchical levels of abstraction (along attributes, consequences and values) have been made reference to when designing the mapping process for eliciting the mental models of designers and nondesigners in the Part One field research.
2.7	Measuring consumer / user innovativeness	Consumer / user innovativeness has been among the individual characteristics which were proposed as potential antecedents for the perceived values or moderators along the "values – satisfaction – behavioural intention" chain. Past studies' attempts to measure consumer innovativeness with different strategies were reviewed and evaluated.
2.8	Personality and consumer / user perceptions	The potential relevance of individual personality as among the underlying factors contributing to the differences / gaps between designers and nondesigners was reviewed, including the personality-career-inclination and consumer / user perception perspectives.
2.9	Designer, product, and user (self-)efficacies	The empirical results (survey responses) of the current study revealed significant discrepancies in the need perception of respondents playing the roles of designer and user, demonstrating a critical gap issue. Since the observed tendencies for the role-taking designers to over-estimate their target user groups' needs are projected as possibly associated with the imbalance of self-efficacy between the "expert" designers and "layman" users, relevant literature was reviewed to better interpret these potential contributive relations.

2.1 User experience and identified gaps

Donald Norman, a respected scholar and professional in user experience and design psychology, was among the first to use the term “user experience” in the 1990s, when he named the group he headed at Apple Computer “the User Experience Architect’s Office” (Norman, 2013; Bard, 2016). As defined (Norman, 2013; Winter, 2015), the broad sense of product user experience involves the user’s interaction with the brand before, during and after purchase (**Figure 2**), including consumers’ reaction to the advertisements, the experience of shopping, unpacking, reading the manual, assembling the parts (if necessary), using the product, evaluating the usability, and contemplating future uses. Norman (1988, 2013) illustrated such experiential stages in the user “action cycle”. The marketing literature and textbooks have largely covered studies on the before- and during- purchase consumer behaviour in topics of marketing and promotion strategies (such as Edell & Burke, 1987; Lee & Mahony, 2004; Dellaert & Stremersch, 2005; Decker & Gnibba-Yukawa, 2010; Nichols & Schumann, 2012), and purchase decision models (such as McFadden, 1986; Ghoshal & Boatwright, 2009; Ghoshal, 2010; Huang & Dubinsky, 2014; Huang et al., 2015), etc. However, the after-purchase user experience is inadequately addressed. Yet, the after-purchase user experience usually lasts for the longest period of time, leaves the deepest impression, and creates a large part of the customer value and satisfaction. The enhancement of after-purchase user experience hence deserves more attention by researchers and businesses, and is the focus of the current study.

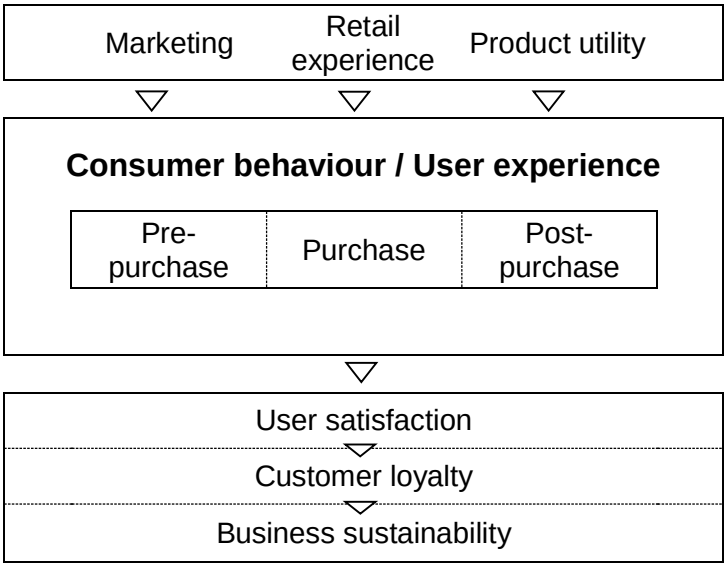


Figure 2: Overview of the consumer-business interfaces in the business environment

Despite “User experience” itself being a relatively young area of study with the term not commonly used before the1990s, the study of the relationship between human beings and the work environment could be dated back to the 19th century including Taylor’s “scientific study of the worker” (Meister, 1999; Salvendy, 2012), often referred to as “ergonomics”. Although the study of ergonomics, in the broad sense, may cover “physical ergonomics”, “cognitive ergonomics”, “organisational ergonomics”, and more (Salvendy, 2012), past studies mostly focus on “physical ergonomics” aiming at the improvement of work efficiency (such as Tilley and Henry Dreyfuss Associates, 1993). The “physical ergonomics” is also what is taught in the ergonomic course of most product / industrial design / engineering programmes. The psychological considerations in “cognitive ergonomics” have been given less attention than they deserve.

On the other hand, certain studies investigating the emotional impacts of user

experience, such as the Kansei model (Lottum et al., 2006; Nagamachi, 2010), tended to approach the emotional and psychological aspects of product development in their own right, separated from the utilitarian and physical aspects. The considerations should not be straight-forward injections of psychological input into the affective aspect, and physical input into the utilitarian aspect, neglecting the intertwining nature of the psychological and physical considerations and their cross-playing roles in creating enjoyable user experiences. For instance, a driver may be delighted with the chic image of his / her new car and would also feel good if the car steers exceptionally smoothly; that is both psychological and physical inputs can lead to emotional responses. On the other hand, if psychological considerations are neglected resulting in the car's controls arranged in a manner totally going against the driver's sensory and mental models, physical utilities would of course be affected leading to emotional dissatisfaction as well. The above are just examples to demonstrate the intertwining nature of the psychological and physical considerations and their cross-playing roles in creating enjoyable user experiences. This interactivity is in line with Peter and Olson's (1999) perspective on the inter-relationship between the human affective and cognitive systems, in which the reaction to stimuli by one system could influence the other system.

Donald Norman (1988, 2013), being among the first to use the term "user experience" in the 1990s, published the book "The Psychology of Everyday Things" in 1988, which was later renamed "The Design of Everyday Things", and renewed in 2013 to keep up with the evolvement of technology and lifestyles. The book discussed about user experience and the underpinning psychological factors although the term "user experience" was not explicitly

used in the 1988 version. Norman's user experience model (**Figure 3**) has comprehensive considerations involving different stages, levels of responses, and recommended design principles (discoverability, feedback, conceptual model, affordances, signifiers, mappings, and constraints). The seven design principles, applied appropriately, were expected to help users bridge the "gulf of execution" and "gulf of evaluation" (**Figure 6**). The "gulf of execution" and "gulf of evaluation" are gaps between users' expectation and the reality on how products operate and reflect their state of operation. Norman's depositions have been among the most comprehensive models conceptualising user experience and most cited by scholars since the publication of the book "The Psychology of Everyday Things". However, it appears more an insightful theoretical model than a practical application model. The book has included quite a number of real life examples of bad user experiences and how they might be made better. Nevertheless, the examples were not used to demonstrate the application of the model in whole.

After the benchmark set by Norman, many researchers and scholars have investigated and written about human-centred design and user experience. Among the somehow digital interface biased focus of most studies, the "Universal Principles of Design" by Lidwell et al. first published in 2003, Susan Weinschenk's "100 Things Every Designer Needs to Know About People" published in 2011 and her "100 More Things Every Designer Needs to Know About People" published in 2016 did provide some useful references on how user experience could be enhanced with a better understanding of the underpinning psychological principles for design.

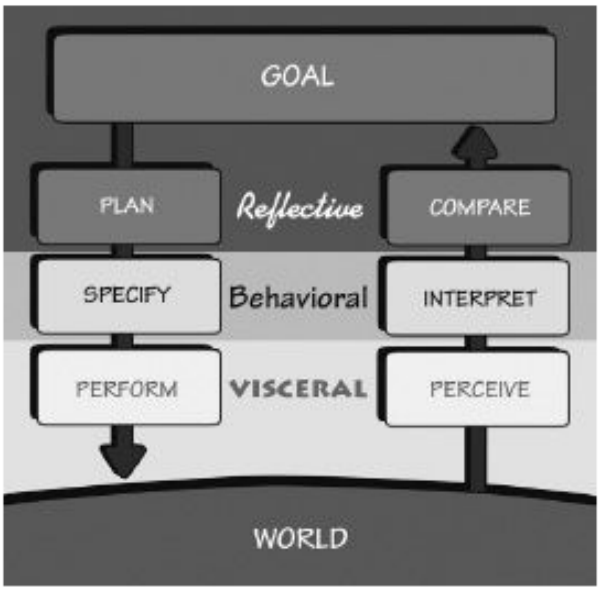


Figure 3: Norman's user experience model showing different levels of user responses and stages of the action cycle (Norman, 1988, 2013)

Lidwell et al. (2010, p. 11) identified in the preface of the book "Universal Principles of Design" that "Courses in psychology and anthropology were glaringly absent from my undergraduate and graduate design education. Indeed, a deeper understanding of human behaviour and a scholarly approach to design were almost entirely overlooked." So the book aimed to "enhance usability, influence perception, increase appeal, make better design decisions, and teach through design". The 2010 edition included 125 principles indexed under the above five aims, illustrated with basic theories and application examples, drawn from products, graphics, computer interfaces, etc (Lidwell et al., 2010).

Weinschenk (2011, 2016) pointed out that "the totality of your audience's experience is profoundly impacted by what you know – or don't know – about them". For users / audience to enjoy the experience, the product / system /

service should address how they thought and decided, and what motivated them to click, purchase, or act as “desired”. The psychological principles / facts / traps covering physio-psychological, cognitive, behavioural and social aspects were illustrated with research studies and / or real life examples of user experiences.

Lidwell et al.’s 125 “Universal Principles of Design”, together with Weinschenk’s “100 Things Every Designer Needs to Know about People” and “100 More Things Every Designer Needs to Know about People”, provided rich collections of design and real life examples, or research studies, on how psychological factors influenced user experiences. Some of Norman’s psychological / design principles were further elaborated in the “Universal Principles” and Weinschenk’s examples. However, Lidwell, Holden, Butler, and Weinschenk’s over 300 “principles” and “things” were only loosely grouped. It is left to the readers to identify the potential association across the psychological principles / facts / traps. It might not be the authors’ intention to draw up a model for the principles, but at least their links could have been more explicitly presented.

Peter Morville (2004) formulated the UX Honeycomb as a tool for product / system managers and developers to better define priorities in developing and managing user experiences. Morville advocated that products / systems had to satisfy users’ needs beyond usability in order to create valuable experiences.

The Honeycomb model weaved together important UX values (**Figure 4**) including: useful, usable, desirable, findable, accessible, credible, and valuable.



Figure 4: Peter Morville's UX Honeycomb (Morville, 2004)

Both models from Morville and Norman examined the affective / hedonic and cognitive / utilitarian aspects of user experience. Morville emphasised on addressing user experience beyond usability, to make the product / system "desirable", and efficiency to go side-by-side with "image, identity, brand, and other elements of emotional design"; which echoed with Norman's three levels of user responses, visceral, behavioural and reflective, associated respectively with the sensory impressions, the product usability, and overall cognitive weighing of the experience. However, while Norman's model might be found too abstract for application, Morville's model only specified the goals and criteria for good user experience providing no hints of the "how" question.

In the current literatures including those reviewed above, there is little discussion on practically how psychological considerations and physical considerations could be integrated in addressing the emotional and utilitarian

aspects of user experience. There were researchers who applied Norman's cognitive action model to investigate specific topics. Aguirre-Urreta and Marakas (2008) employed the "gulfs of execution and evaluation" to distinguish between model creation and model comprehension studies. Poor et al. (2016) applied Norman's seven stages of user interaction to describe how the post-WIMP (Window Icon Menu Pointer) computer interface enhanced users' mental representation and task performance. Wrigley proposed a "visceral hedonic rhetoric framework" and a corresponding tool (**Figure 5**) for designers' reference expanding on Norman's visceral level of cognition (Wrigley, et al, 2009; Wrigley, 2011, 2013). Her "visceral hedonic rhetoric design tool" (Wrigley, 2011) listed fourteen attributes and their relative strengths drawing upon the descriptive "first impressions" of participants on products in an experimental setup. The fourteen attributes ranked from the strongest were: colour, size, shape, intrigue, material, perceived usability, portability, perceived function, novelty, analogy, brand, quality, texture, and gender. The findings were logical, somehow expected, whereas the attributes might alert product developers the areas of concern but give little directional hints. Wrigley's empirical study only focused on the visceral level of user responses, and the behavioural and reflective levels of responses were not addressed or followed up. Here is a potential for further research.



Figure 5: The Visceral Hedonic Rhetoric Design Tool (Wrigley, 2011)

In the search for application models for guiding product research and development (R&D) in enhancing user experience, apart from Wrigley's attempt, related attempts could be found with Cagan and Vogel's style-technology positioning map, the social-economic-technology (SET) framework, and the value opportunity chart for product value analysis and goal planning in the seven aspects of emotion, aesthetics, product identity, impact, ergonomics, core technology, and quality (Cagan & Vogel, 2002, 2012). Although Cagan and Vogel's proposed models apparently address both psychological and physical concerns for product R&D, their proposition of driving product value through superior style and technology had over-simplified the mechanisms and chemistries in the product-user interaction. Also, their SET framework and opportunity chart, orienting more from the producer's than user's point of view, were not that user-experience focused.

2.2 Designer-product-user communication gap

Apart from understanding the users' valued product values, concerns that follow can be: whether the designer can fully perceive the user-cherished values and design the product to fit the user values, whether the product performs like what the designer intends it to do, whether the users understand and use the product as the designer thinks…… Some previous literature has pointed out the designer-product-user communication problem or suggested some ideal communication models, but few has proposed or demonstrated applicable methodologies for the solutions.

Norman's (1986) Theory of Action not only described the stages of user responses, but also illustrated the discrepancies between the mental models of the product / system designed by the designers and the mental models of users as the phenomena of the "gulf of execution" and "gulf of evaluation" (**Figure 6**). It was noted that the gulfs existed because users developed mental models from their perception of the products / systems as presented, combined with perceptions accumulated from past experience, which likely differed from the mental model held in the designer's mind when designing the product / system.

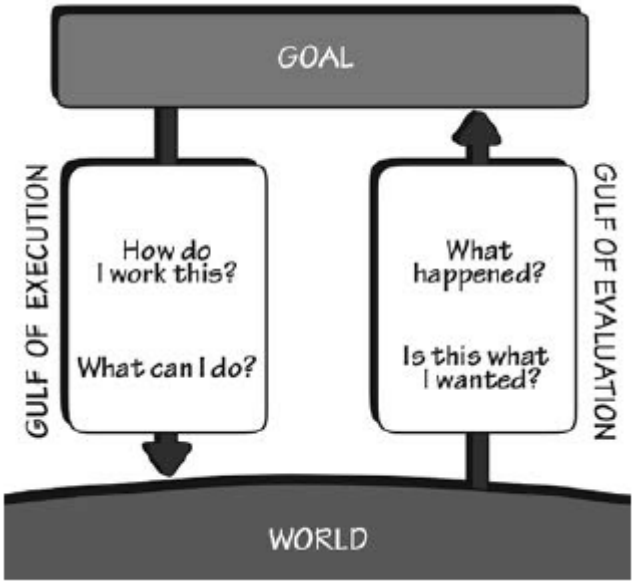


Figure 6: Norman's action model illustrating the "gulf of execution" and "gulf of evaluation" between the product / system and users (Norman, 1988, 2013)

Crilly et al. (2008) proposed an integrated ideal model of the relationship between designer intent and consumer experience. The visceral hedonic rhetoric design dialogue framework was then developed by Wrigley (2013) from Crilly et al.'s design dialogue framework (Crilly et al., 2008) (**Figure 7**).

Product semantics was another concept related to the communication between products and users. Krippendorff (1989, 2006) suggested that the "symbolic qualities" of man-made forms communicated with the users (and the community) in different contexts. However, the early application of semantics in product development projects was often reduced to the application of the Semantic Differential Method (SDM) by defining pairs of antonymous adjectives and drawing up the semantic space (such as in Petiot & Yannou, 2003). More recent studies (such as by Khalaj and Pedgley, 2019) may identify the "semantic discontinuity" comparing designers' and nondesigners' interpretation of products (Guo et al., 2023). These studies help surface the gaps, but seem

lacking further investigation into the underlying factors for the gaps and hence not contributing much to enhance user experience.

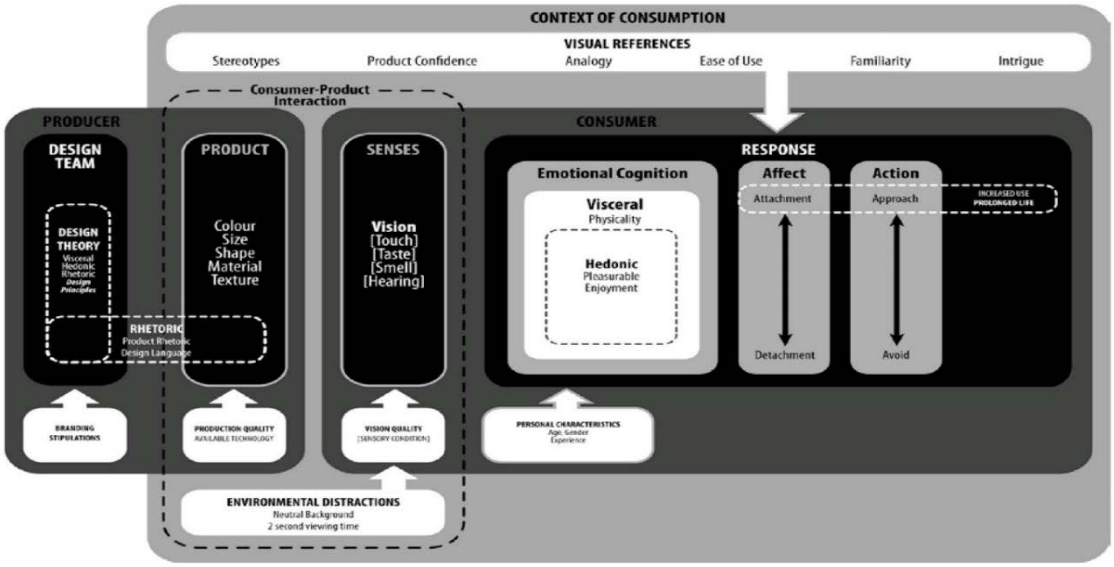


Figure 7: The visceral hedonic rhetoric design dialogue framework (Wrigley, 2013) developed from Crilly et al.'s design dialogue framework (Crilly et al., 2008)

Some researchers did work more empirically in identifying the differences in the perception of designers and users. For examples, Cata and Martz (2015) compared mobile apps' usability characteristics for designers and users through two surveys, and Chamorro-Koc et al. (2009) applied a visual approach asking designers and nondesigners to make suggestions by drawing their ideal designs of products like handheld camera for underwater use and GPS handsets. The studies have yielded some useful information for the concerned product categories, but it is doubtful whether the findings can be generalised for application in other industries and product categories. On the other hand, entrepreneurs may doubt that user-inclusive approaches of participatory design being promoted in recent years may suit more for social innovation, that is designing for the community or social well-being, than for designing commercial products due to the confidentiality issue.

The designer-product-user communication gap has been under sporadic discussions for over half a century from Norman in the 1980s (Norman, 1988) up to recent years without much breakthrough. Recent studies by Beeman (2022) and Guo (2023) are still pointing out the existence of an “information vacuum” or “semantic discontinuity” in the communication between designers and users / customers. As discussed in the literature review, there has been little study on how hedonic, utilitarian and social considerations could be integrated in addressing user experience and user behaviour. In the prior literatures, user experience / behaviour related studies are either theoretical-based and abstract without providing practical guide for implementation, or approaching the hedonic / utilitarian / social aspects of product values separately, or being focused on web and digital, rather than tangible product, user interfaces. Tools for promoting user/designer communication and understanding are also rare.

2.3 Action model framework outlined for bridging the designer-product-user and psychological-physical gaps

As mentioned in the introduction of Chapter 2, the action model framework reviewed in this section was outlined by the researcher at the very early research planning phase, which has subsequently inspired the direction of the current research study and become a reference for future related research.

The gaps identified in the previous sections support the development of a model integrating the psychological and physical considerations into the product design and user experience development processes.

Questions of concern included:

- How can the considerations for product R&D be better managed to systematically integrate the psychological and physical attributes in enhancing user experience?
- What attributes should be included in the action model which aims at systematically integrating the psychological and physical considerations into product R&D?

To draw up a testable hypothetical action model with relevant psychological and physical considerations, references have been made with a number of prior literatures. A list of literatures with related considerations suggested for improving or evaluating user experience is attached in **Appendix 1** for reference.

As the hypothetical action model is formulated for use by the product developers, it starts with the “intended product-user interactions” as manageable entry points (**Figure 8**). With reference to Norman’s “action cycle” (Norman, 1988, 2013) and Lidwell et al.’s categorisation of the “universal principles of design” (Lidwell et al., 2010), the main “intended product-user interactions” are consolidated as:

(1) To attract user

(2) To influence perception

(3) To help learning

(4) To enhance usability

The first two intended product-user interactions correspond to the visceral level of user responses in Norman’s action cycle (Norman, 1988 and 2013), in which the psychological-physical considerations should address the sensory impression and perception of the product users. The third and fourth intended interactions correspond to the behavioural level of user responses in Norman’s action cycle, in which the psychological-physical considerations should address users’ learning and use of the product. Finally, the perceived user experience to be examined in terms of perceived value and satisfaction corresponds to the reflective level of user responses in Norman’s action cycle.

Under the intended product-user interactions, users of the action model, that is the product developers involved in R&D, then look up the relevant main psychological-physical considerations / attributes and sub-attributes mapped to the four intended interactions.

Based on Norman's seven design principles (Norman, 1988, 2013) and the evolvement of user needs and product development trends discussed in recent literatures, the nine main attributes of psychological-physical considerations are projected as:

(1) visibility

(2) sensory appeal

(3) story telling

(4) mapping

(5) feedback

(6) conceptual model

(7) constraint

(8) affordance

(9) ease of use

Attribute (1), and (4) to (8), are adapted from six of Norman's seven design principles. The other one principle of Norman's, which is "signifier", has been subsumed under "affordance" as a sub-attribute in the proposed hypothetical action model, because a signifier can be seen as a tool to achieve affordance. "Sensory appeal" and "story telling" are added to address the growing user inclination towards affective (Crilly et al., 2008; Singh, 2013; Holtzblatt, 2015) and narrative qualities (Parrish, 2006; Brown, 2009; Hamaguchi, 2017) in products and other walks of life. "Ease of use", being a common evaluation criterion for product utility (Burke, 2013), is incorporated as a more direct attribute addressing the actual use issue, although some of the other attributes may contribute to and reflect the easiness to use the product. The projected

main attributes, mapped under the four intended product-user interactions, are presented in **Figure 9** showing their predicted causal relations with the perceived hedonic and utilitarian values and user satisfaction.

As shown in **Figure 9**, some of the main psychological-physical attributes tend to cross over the domains of different “intended product-user interactions” implying that these attributes are applicable for more than one intended product-user interactions. The current mapping of the attributes to the domains only reflects the closest expected association with the respective intended product-user interactions. For example, the attributes of “mapping”, “feedback” and “conceptual model” should be carefully considered if one intends to influence users’ perception of a product, or if one intends to enhance the learning aspect of a product. In fact, there is no definite boundary between the four domains of “intended product-user interactions”. The space under the visceral and behavioural levels of user responses is a continuum, spreading horizontally from psychological-intent on the left to physical-intent on the right, and vertically from psychological-intent at the central level to physical-intent at the top and bottom. In reality all attributes lie somewhere along the continuum with both psychological and physical intents. One can recognise that the interactions of “attracting users” and “influencing perceptions” (and their attributes), being at the visceral level of cognitive responses, have relatively higher psychological instinct than the interactions of “learning to use” and “actually using” the product at the behavioural level of cognitive responses. One can imagine the learning and utilisation processes involving more physical contacts with the product and its functions. However, the psychological-

physical weightings of the interactions would vary depending on the product nature, the product user's personality and culture, and the use context, etc.

In practice, each main attribute and sub-attribute will lead to further guidance of application which may include definitions, theories, methodologies, and examples of applications. The projected hierarchy of the action model with the layers of intended product-user interactions, main psychological-physical attributes, sub-attributes, and application guidance, are outlined in **Figure 11**.

Under the reflective level of user responses, with reference to prior studies, the user / customer perceived values towards products may be conceptualised and measured in two dimensions: the affective or hedonic dimension derived from the sensations of the experience, and the cognitive or utilitarian dimension derived from the functions performed by products (Batra & Ahtola, 1991; Zaichkowsky, 1994; Voss et al., 2003). Previous literature (Mouri, 2005; Deng et al., 2010; Mugge et al., 2010; Lai & Tam, 2011; Amin, 2016) also suggested positive correlations between perceived product / customer value (or perceived product performance) and user satisfaction. Based on the above tested perceptions, the conceptual framework is drawn up with the "perceived user experience" represented by perceived hedonic / utilitarian values and the resulted satisfaction, for evaluating the impact of the main psychological-physical R&D attributes. The framework in **Figure 9** illustrates the projected causal relations between the variables, symbolising the possible hypothetical testing in future research.

As stated at the beginning of the “Literature Review” chapter, realising the projected action model with the series of applicable guidance tools would require persistent efforts over years, likely in phases, to develop the theoretical grounding, the empirical applications, and testing-re-testing with the industry. At the onset, the current study would start with the “good conceptual model” (an important psychological-physical consideration in the action model) investigating its association with the perceived user experience and designer/user gap. Since the conceptual models, also known as mental models, represent what products do and how products work in people’s minds (Norman, 1988, 2013), investigating the designer’s and user’s mental / conceptual models on product perception would help understand the potential designer/user gap. This selected initial scope of research is highlighted (yellow) in **Figure 10**. The following discussion goes along this research direction to further review literature in the related fields. As stated in **Chapter 1**, attempts would be made to better understand and verify the possible designer/user differences and underpinning factors, in order to provide hints for bridging the gaps so identified. To set up an appropriate conceptual framework for the purpose, a series of theoretical models / concepts examining the relations across attributes in the user experience scenes including user motivations, perceived values, behavioural intentions, and individual’s characteristics are reviewed.

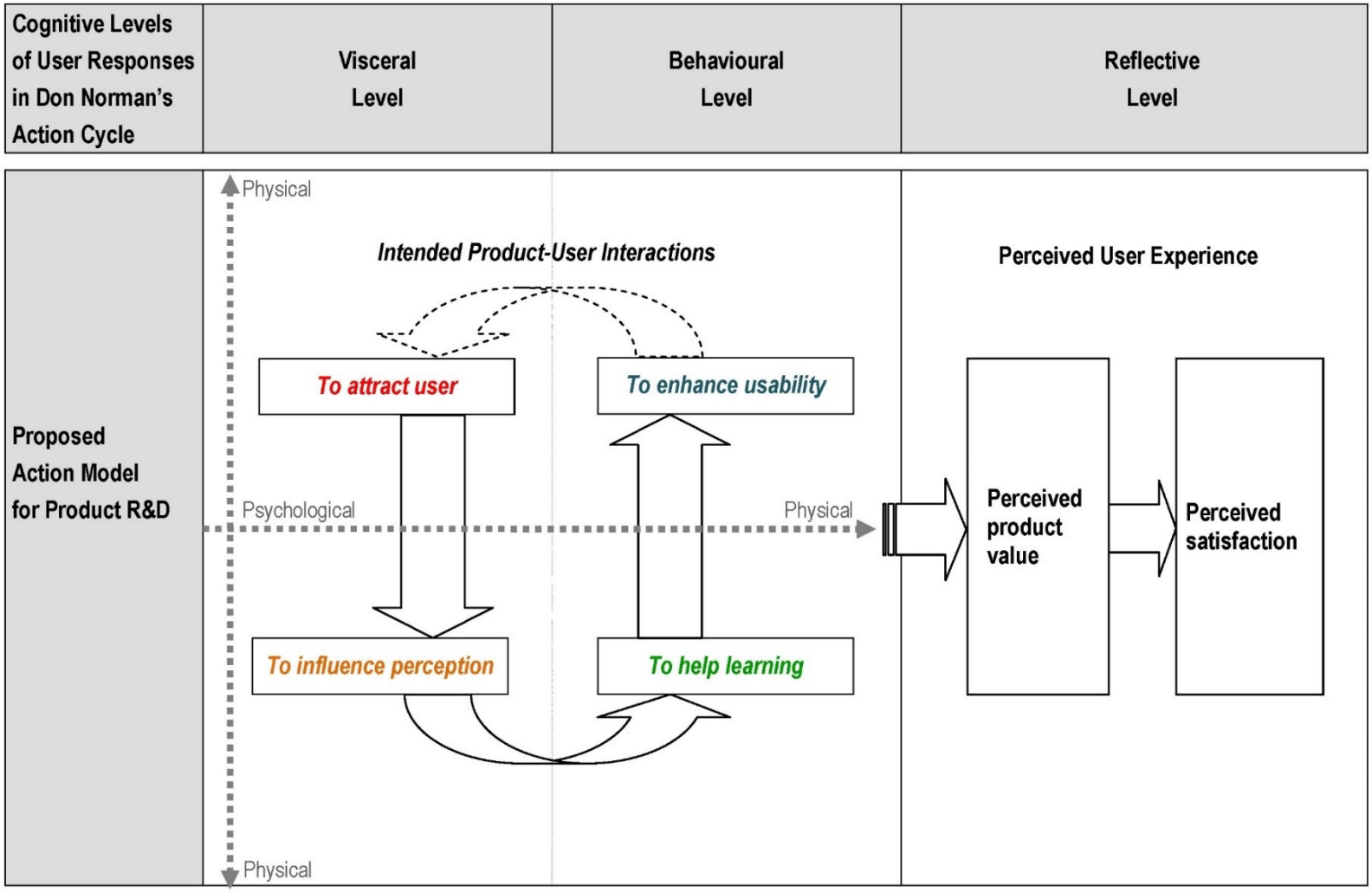


Figure 8: Conceptual framework of an action model for product R&D – aiming at bridging the designer-product-user and psychological-physical gaps (outlined by the researcher)

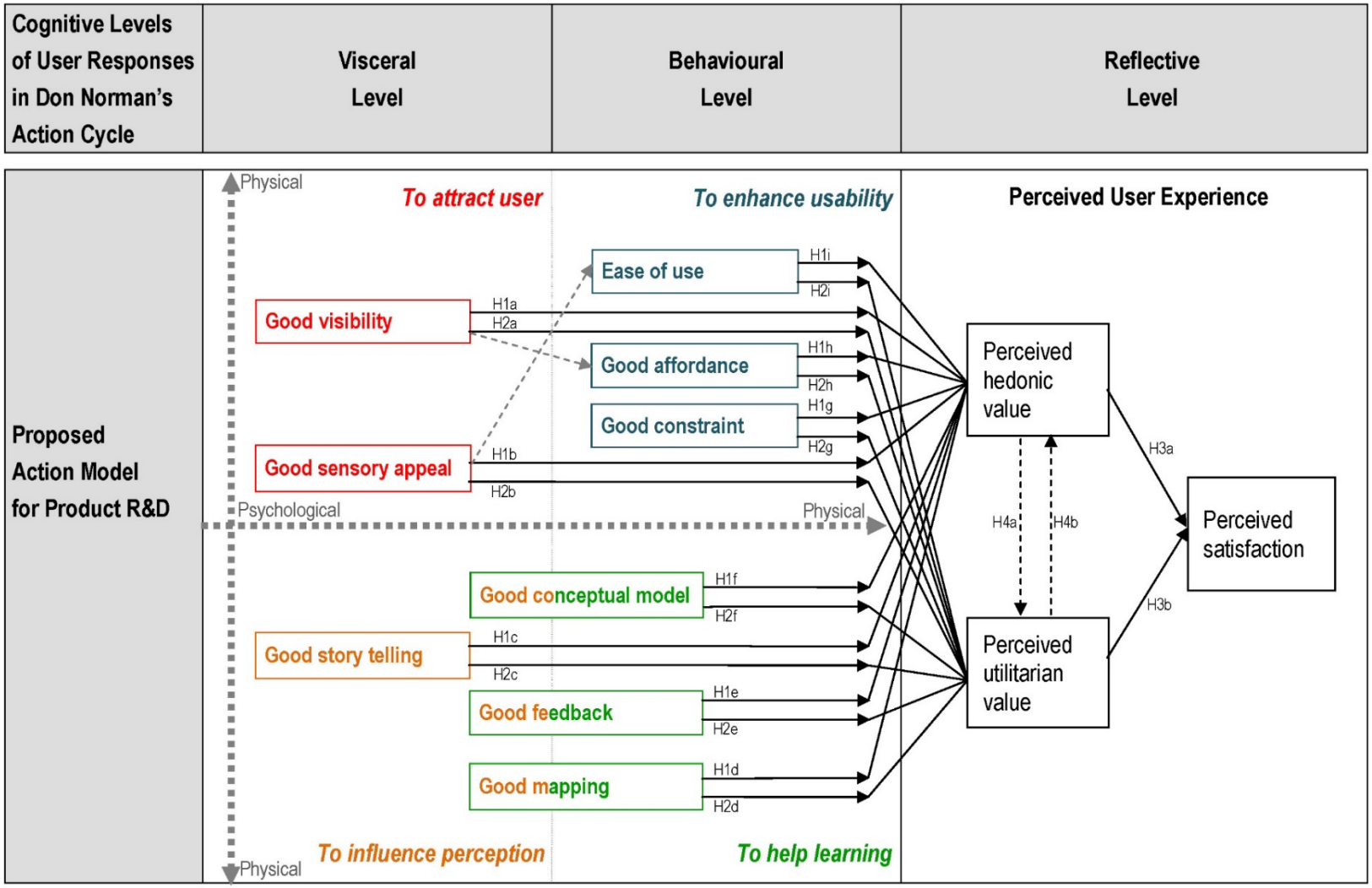


Figure 9: Conceptual framework projecting the impact of the main attributes (at the visceral and behavioural levels) on perceived user experience (at the reflective level) in the action model for product R&D (Norman, 1988, 2013; Batra & Ahtola, 1991; Zaichkowsky, 1994; Voss et al., 2003; Mouri, 2005) (outlined by the researcher)

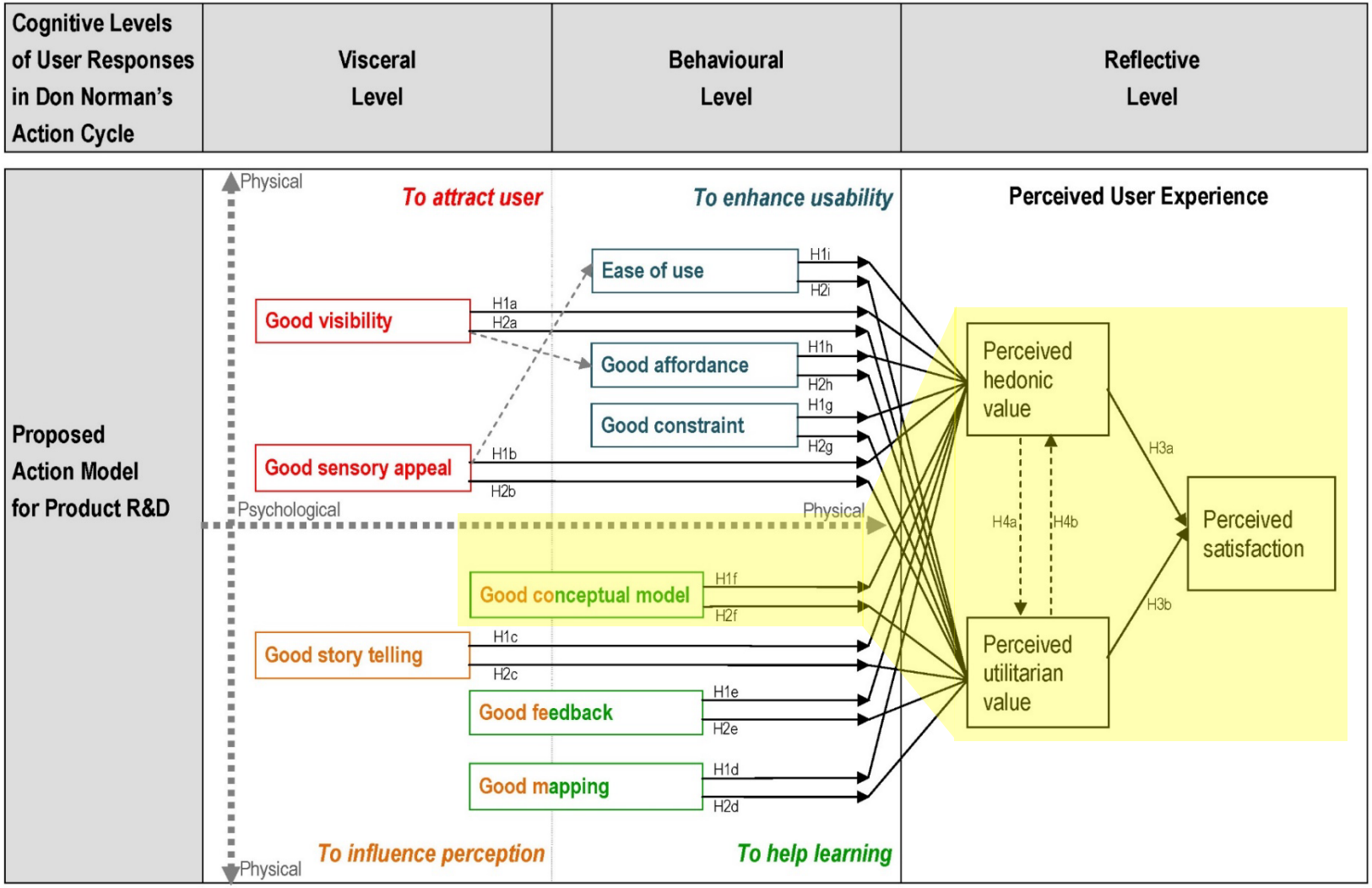


Figure 10: Conceptual framework projecting an action model for product R&D,
with the selected initial focus of research (conceptual model and perceived user experience) highlighted for the DBA thesis.
(Norman, 1988, 2013; Batra & Ahtola, 1991; Zaichkowsky, 1994; Voss et al., 2003; Mouri, 2005) (outlined by the researcher)

Hierarchy of Proposed Action Model for Product R&D									
Cognitive levels of user responses (Norman, 1988 & 2013)	Visceral level			Behavioural level					
Intended product-user interactions	To attract user ····· To influence perception ····· To help learning ····· To enhance usability								
Main psychological-physical attributes	Visibility	Sensory appeal	Story telling	Mapping	Feedback	Conceptual model	Constraint	Affordance	Ease of use
Sub-attributes	▪ Form-function correlation ▪ Legibility-readability ▪ Picture superiority effect ▪ Exposure effect ▪ Highlighting ▪ Iconic Representation ▪ Threat detection ▪ Figure-ground relationship ▪ Signal-to-noise ratio ▪ von Restorff Effect ▪ Inattentional blindness	▪ Aesthetic-usability effect ▪ Kansei ▪ Semantics ▪ Aesthetics (colour, form, size, …) ▪ Haptic impression ▪ Anthromorphic form ▪ Contour bias ▪ Hunter-nurturer fixations ▪ Stickiness ▪ Wabi-Sabi	▪ Empathy ▪ Persona ▪ Self identity ▪ Social proof ▪ Cultural symbolism ▪ Metaphor	▪ Layout (Gestalt principles of perception) ▪ Behaviour ▪ Meaning ▪ Hierarchy	▪ System status ▪ Possible actions ▪ Consequences of action ▪ Operant conditioning ▪ Classical conditioning ▪ Progressive disclosure ▪ Priming	▪ Internal & external consistency ▪ Consistency with users' mental model ▪ Advance organiser ▪ Shaping	▪ Psychological constraints (symbols / conventions / mappings) ▪ Physical constraints (paths / axes / barriers)	▪ Signifiers (intentional / unintentional / desired line) ▪ Form follows function ▪ Mimicry (surface mimicry / behavioural mimicry / functional mimicry)	▪ Performance load (cognitive / kinetic) ▪ Ergonomics ▪ Recognition over recall ▪ Prescriptive vs. descriptive knowledge model ▪ Flexibility-usability tradeoff ▪ 80/20 rule ▪ Hick's Law ▪ Law of simplicity ▪ Fitts' Law (accessibility)
Guidance	Definitions, theories, methodologies, applications, examples								

(Norman, 1988, 2013; Lidwell et al., 2010; Nagamachi, 2010; Lottum et al., 2006; Mochimaru et al., 2012; Parrish, 2006; Tilley & Henry Dreyfuss Associates, 1993; Meister, 1999; Salvendy, 2012; Leech, 2016)

Figure 11: The hierarchy of the projected action model for product R&D, with the layers of intended product-user interactions, main psychological-physical attributes, sub-attributes, and application guidance under the visceral and behavioural levels of user responses (outlined by the researcher in reference to the literature listed above)

2.4 User behaviour studies on attributes / values – satisfaction – behavioural intention

There have been a number of fundamental theories / models commonly applied to explain consumer behaviour and the acceptance of new technology (and with the products or systems using the technology). The "attributes / values – satisfaction – behavioural intention" school of models / theories may take into consideration the influence of attributes and / or values from the technology / product / service on perceived satisfaction and / or intended (continuous) adoption of the technology / product / service.

The Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) stated that "attitude towards behaviour" and "subjective norm" were the main predictors for various human behaviours, where "subjective norm" referred to the perception of how your important ones think you should behave. TRA suggested that an individual's behaviour was initiated by his or her behavioural intention to carry out a specified action. The Theory of Planned Behaviour (TPB) extended TRA in 1985 (Ajzen, 1985, 1991) by adding an additional predictor "perceived behavioural control" which addressed the individual's perception of easiness or difficulty to carry out the planned action (**Figure 12**).

In contrast to the attitude and social focuses of the TRA and TPB models, Davis (1985) developed the Technology Acceptance Model (TAM) stressing the utilitarian benefits of "perceived usefulness (PU)" and "perceived ease of use (PEOU)" as drivers for behavioural intention of using a technological system (**Figure 13**). TAM conceived that users' beliefs determined their attitudes towards the use of a technology, which in turn determined the behavioural intention and ultimately leading to the actual use. Despite TAM has been widely applied by researchers for evaluating technologies and making comparisons between user groups (Farn et al., 2006), it is limited in aspects such as: not addressing the affective / hedonic side of attributes or the antecedent variables influencing PU and PEOU.

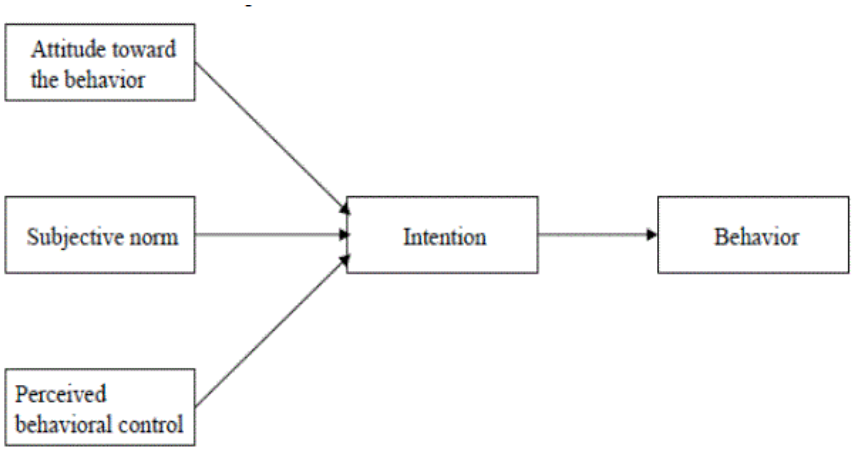


Figure 12: Theory of Planned Behaviour (TPB) 1985 (Ajzen, 1991)

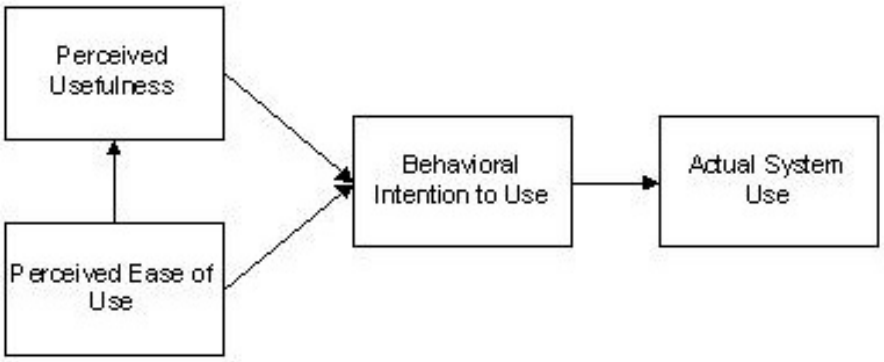


Figure 13: Technology Acceptance Model (TAM) 1985 (Venkatesh et al., 2003)

On the other hand, the affective / hedonic side of attributes have been addressed in studies by Batra and Ahtola (1991), Zaichkowsky (1994) (Personal Involvement Inventory) and Voss et al. (2003) (HED/UT Scale). Their studies suggested and empirically demonstrated that the consumer / user perceived values towards products (and advertisements for Zaichkowsky's study) may be conceptualised and measured in two dimensions: the affective or hedonic dimension derived from the sensations of the experience, and the cognitive or utilitarian dimension derived from the functions performed by products / advertisements. Their study also suggested that product / brand categories differed in the extent to which their overall attitudes were derived from these two components.

Subsequently there have been some integrating efforts (Venkatesh et al., 2003), such as the TAM2 which extended TAM by incorporating the "subjective norm" as an additional predictor, and the United Theory of Acceptance and Use of Technology (UTAUT) based on eight models including TAM and TPB (**Figure 14**). UTAUT also suggested the inclusion of user characteristics (such as gender, age, experience, and voluntariness of use) as moderators for use intention and behaviour. The UTAUT2 (Venkatesh et al., 2012) further extended the UTAUT of 4 predictors ("performance expectancy", "effort expectancy", "social influence" and "facilitating conditions") by incorporating 3 additional predictors of "hedonic motivation", "price value" and "habit" (**Figure 15**). The extensions in UTAUT2 acknowledged a substantial improvement in the variance explained in behavioural intention (from 56 percent to 74 percent) and technology use (from 40 percent to 52 percent). Despite the attempts of more recent studies (Farooq et al., 2017; Dwivedi et al., 2020; Patil et al., 2020; Gopinath et al., 2022) to further extend the UTAUT model by proposing / testing additional influencing factors such as personal innovativeness, self-efficacy, anxiety and trust, etc, and naming the extensions as UTAUT3 (Farooq et al., 2017) or Meta-UTAUT (Dwivedi et al., 2020; Patil et al., 2020), such extended models are not yet widely recognised.

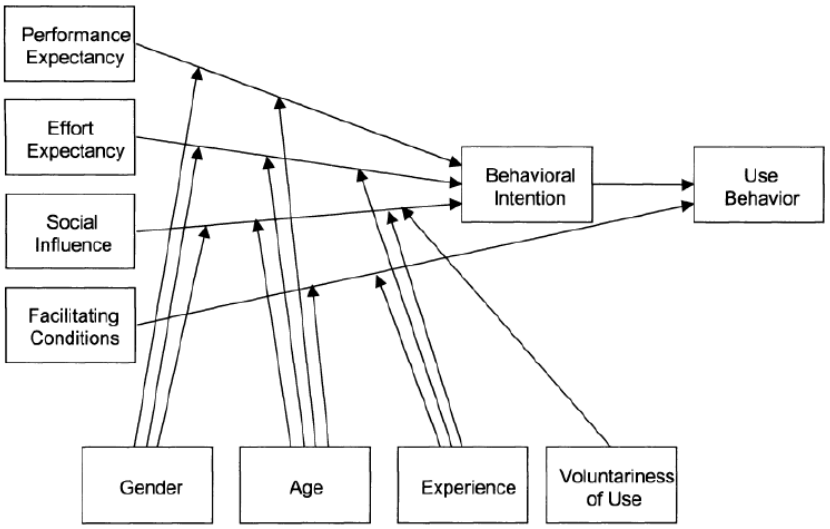


Figure 14: United Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)

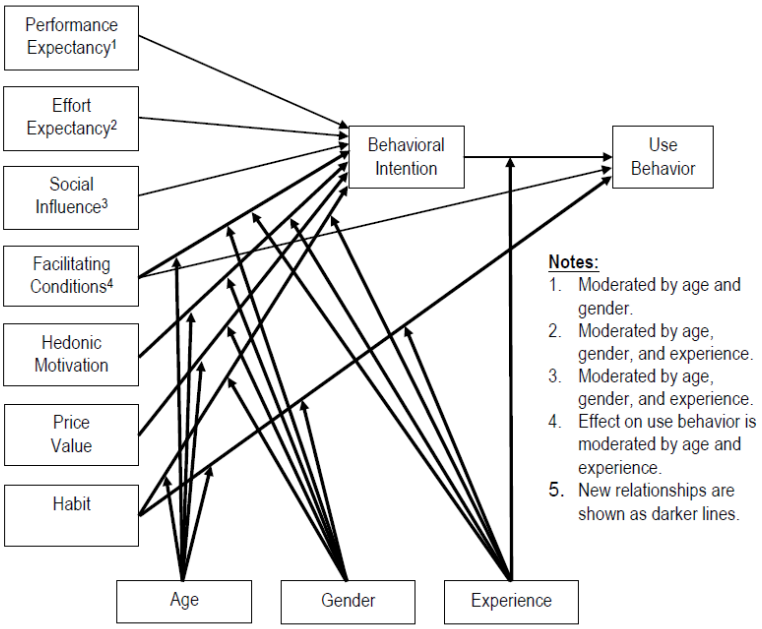


Figure 15: United Theory of Acceptance and Use of Technology – Extended (UTAUT2) (Venkatesh et al., 2012)

On top of the utilitarian / functional, hedonic / emotional, and social values recognised in the above reviewed consumer perception models, the epistemic value and conditional value were further adopted into the Theory of Consumption Values (Sheth et al., 1991b; Hur et al., 2012). While the epistemic value was defined as "the capacity to arouse curiosity, provide novelty, and / or satisfy a desire for knowledge", the conditional value was the perceived value as a result of specific situations (such as the seasonal value of Christmas card).

Apart from the growing comprehensiveness of the value domain with additional members, the literature (Bhattacherjee, 2001; Mouri, 2005; Deng et al., 2010; Mugge et al., 2010; Lai & Tam, 2011; Amin, 2016) also suggested positive correlations between perceived product value and user satisfaction, and between user satisfaction and behavioural intention. In other words, satisfaction was suggested to be a mediator on the causal relation from the perceived values to the behavioural intention. **Figure 16** is such an example of Bhattacherjee's post-acceptance model (in relation to the Expectation-Confirmation Theory) proposing satisfaction as a mediator between perceived usefulness and information system (IS) continuance intention (Bhattacherjee, 2001).

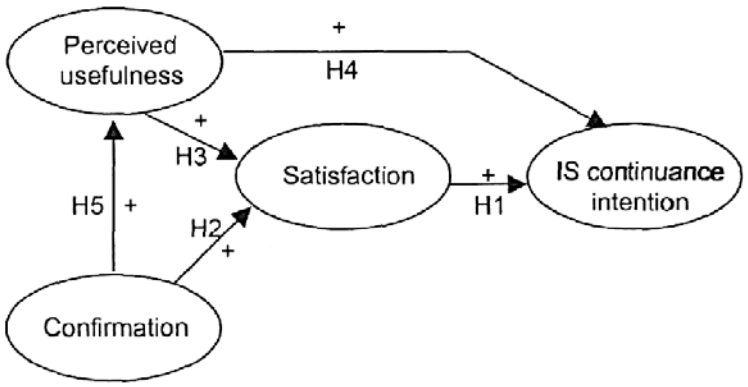


Figure 16: Post-acceptance model relating the Expectation-Confirmation Theory with perceived usefulness, satisfaction and intention of continuous use (Bhattacherjee, 2001)

With all the attempts to incorporate relevant attributes in perfecting the various models, the above models / theories suggest a number of background frameworks, each bringing out certain perspectives, despite that they may not have integratively or interactively addressed the inter-relationship across the different product values and the corresponding user experience, satisfaction, and adoption (initial or continuous), and that the user factor is not adequately addressed in some of the models.

2.5 Uses and Gratifications Theory

Contrary to the “attributes / values – satisfaction – behavioural intention” theories reviewed above, the Uses and Gratifications Theory (UGT) looks at user experience from more user-oriented perspectives (Blumler & Katz, 1974; Williams et al., 1985). The UGT recognises that user behaviours are motivated by users’ goals and expected outcomes of the behaviours, and that individuals have bigger power over their decision than the market’s influence on them. It also assumes that the consumers / users know their needs and gratifications (Kasirye, 2021). These acknowledgements / assumptions have been criticised by certain scholars (e.g. Elliott, 1974) that they may not be always true. It is arguable that their validity may vary with the nature of the product / service or characteristics of individual consumer / user.

In the wide range of studies with UGT, scholars have defined the gratifications under the “instrumental / extrinsic” and “ritualistic / intrinsic” domains (e.g. Rubin, 1984; Leung & Wei, 2000; Ozcan & Kocak, 2003; Grellhesl & Punyanunt-Carter, 2012; Joo & Sang, 2013). While the “instrumental / extrinsic” motives would likely drive more practical and task-oriented behaviours, the “ritualistic / intrinsic” motives would likely drive more affective and social behaviours. Taking the field of mobile services as an example, instrumental / extrinsic gratifications may involve mobility, immediate accessibility, information seeking, and surveillance, whereas intrinsic / ritualistic gratifications may cover enjoyment, entertainment, self-reactiveness, reassurance, security, social identity, and maintaining relationships with family and friends, etc. However, the boundary may be blurred for certain behaviours. For instance, the behaviour of communicating on the phone with colleagues or business “friends” to get jobs done would be fulfilling instrumental and extrinsic gratifications, whereas communicating on the phone with family members to show affection and care would be fulfilling ritualistic and intrinsic gratifications (Leung & Wei, 2000).

The UGT posits that individual differences motivate people to use a media / product differently to satisfy underlying needs (Katz & Blumler, 1974; Leung & Wei, 2000; Guo et al., 2021). Individual differences studied to have association with mobile phone user experience include personal characteristics in demography, occupation,

individual innovativeness and personality (Leung & Wei, 2000; Pagani, 2007; Stachl et al., 2017, 2020).

2.6 Means-End Chain and hierarchical map

The Means-end chain (MEC) approach (Reynolds & Olson, 2001) has been used to discover hierarchical structures of consumption values, hence understanding consumers' preferences toward products or services. The approach assumes that consumer knowledge is hierarchically organised in three levels of abstraction: attributes, consequences and values. Attributes are the means to realise consequences, which are in turn the means to achieve values (Gutman, 1982; Zeithaml, 1988). Attributes are "characteristics / features / perceived qualities of products / services". Consequences are "outcomes or results derived from using the product / service". Values can be "beliefs people hold about themselves" or "desirable goals" which drive consumers' use behaviours.

An "attribute – consequence – value" chain example could be the role-playing attribute of online game – generating the consequence of absorption – leading to the user's psychological state of reality avoidance (attaining the value of escapism) (Jung, 2014). An "attribute – consequence – value" chain could be expressed in a hierarchical map, with nodes denoting the attributes, consequences and values, and links denoting the relationships along and possibly across the nodes. The related laddering interview technique is usually applied for eliciting the target group's perceptions of the mean-end chains. Some studies might adjust the three levels of abstraction, or determine the appropriate level element by element along the abstraction continuum (Jung, 2014).

The mean-end chain approach has been made reference to when designing the mapping process for eliciting the mental / conceptual models of designers and nondesigners in the Part One research.

2.7 Measuring consumer / user innovativeness

Consumer / user innovativeness has been among the personal characteristics which may be treated as potential antecedents for the perceived values or moderators along the “values – satisfaction – behavioural intention” chain. Past studies attempting to measure consumer innovativeness have been using a few different strategies, such as time-of-adoption, cross-sectional method, and self-reporting approach (Goldsmith & Hofacker, 1991).

Following Rogers’ Innovation Diffusion Theory (IDT) (Rogers, 1983) which defined innovativeness as the "degree to which an individual is relatively earlier in adopting an innovation than other members of his system", some researchers took a measure of the time since the product / service introduction until adoption as an indicator of an individual's innovativeness, or use the time-of-adoption to assign consumers to the adopter categories of innovators, early adopters, early majority, late majority, and laggards. This approach has been criticised for equating a time-based concept to the construct of “innovativeness” without a proven relation. There are also methodological doubts with the time-of-adoption approach since it is difficult, if not impossible, to evaluate its reliability and validity, to compare the findings across studies, or to predict future behaviour (Goldsmith & Hofacker, 1991).

The cross-sectional method tried measuring individual innovativeness based on "how many of a pre-specified list of new products a particular individual has purchased at the time of the survey" to reflect the "innate innovativeness" of the individual’s personality. The main problem is the questionable criteria to be used in selecting the “new” products and product categories, hence rendering the resulted measure of questionable values (Goldsmith & Hofacker, 1991).

In view of the drawbacks of the above approaches, researchers such as Goldsmith and Hofacker (1991), Agarwal and Prasad (1998), Pagani (2007), Farooq et al. (2017) and Patil et al. (2020) supported / applied the use of self-report scales in their research studies. They opined that a multi-item self-report scale could be area-specific allowing respondents to sum up their behaviours and attitudes in a specific area of interest. The use of multiple measurement items also enabled the

innovativeness construct to be accessed from a variety of perspectives, enhancing the overall reliability of the scale.

With the above considerations, the current study has taken the approach of multi-item self-report scale in measuring the individual innovativeness with relevant reference to past studies.

2.8 Personality and consumer / user perceptions

The potential relevance of individual personality as among the underlying factors for the differences between designers and nondesigners, from a personality-career-inclination perspective, has been discussed in earlier sections. This section would further look at the relevance of individual personality with consumer / user perceptions found in the literature.

Earlier studies on consumer behaviour in the mobile context (applying models such as TAM, TRA, TPB, IDT, and UGT) has found that content relevance and consumer / user perceptions are among the most influential factors for the acceptance and adoption of mobile services by consumers. However, these studies have provided little explanation for the differences in user perceptions (Varnali, 2013).

Schiffman et al. (2012) defined "perception" as "a subjective process through which an individual selects, organises, and interprets stimuli into a meaningful and coherent picture of the world, …… and is highly vulnerable to biases". Different individuals may form varied perceptions from the same stimuli about the utility and emotional appeal brought by the stimuli. Factors influencing the varied perceptions may include cultural values, beliefs, prior knowledge, stereotypes, cognitive biases, and intrinsic psychological characteristics (Varnali, 2013). Among these influencing factors, the intrinsic psychological characteristics, more generally referred to as personality, are relatively more enduring and hard to change (John & Srivastava, 1999).

Personality, when viewed as a unified entity, has been measured with qualitative techniques. On the other hand, Pervin (1994) pointed out that the trait theory, which posits people along a continuum of a suite of personality traits, would be a more appropriate approach for quantitative measurement of specific individual traits relevant for particular research. As Varnali (2013) has noted, most of the literature that investigates the personality differences as factors influencing a user's product / service experience or behavioural response have adopted the trait theory approach (e.g. Nettle, 2005, 2006; Stachl et al., 2017, 2020; Zu et al., 2016; Roos, 2023).

These studies found the personality traits either influencing relationships as

moderators, or directly affecting user perceptions. It has also been identified that some personality traits (e.g. self-efficacy, sense of control, optimism, Machiavellianism, and risk-aversiveness) related more to one's perception of outcome success, whereas other personality traits (e.g. playfulness, arousal seeking, openness to experience, and novelty seeking) related more to one's perception of process engagement.

As Varnali (2013) pointed out that the mobile phone handset and mobile service contract are typically used by a single individual, the mobile platform could become the ultimate channel of product / service personalisation and one-to-one marketing. As personality traits are found to influence consumer / user perceptions, the inclusion of personality traits in user profiling would be expected to lead to more effective product / service / advertisement targeting and personalisation.

Among different personality assessment scales, the Big Five (BF) Personality Traits (McCrae & John, 1992) are most commonly applied and validated in scientific research. The Big Five's trait-based and scaled item characteristics give it a significant advantage over the other scales like Myers–Briggs Type Indicator (MBTI) and Enneagram which give results in form of personality types (Retorio, 2022). During the 20th and 21st centuries, numerous editions of the Big Five have been developed (along the five main traits of Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience) for self-assessment and observer-rating purposes.

Past studies applying the BF scales have found associations between the personality traits and different professions, user experience of IT, and in particular the mobile experience. Below are some examples.

- Past studies showed that artistic creators such as writers, poets and visual artists tended to be high on the five-factor dimensions of neuroticism and openness to experience (Nettle 2005).
- Xu et al. (2016) also stated that neuroticism was found positively correlated with an individual's level of creativity but negatively correlated with the perceived usefulness and behavioural control, whereas conscientiousness was negatively correlated with creativity.

- The studies of Stachl et al. have both predicted respondents' phone use tendencies from their personality traits (Stachl et al., 2017) and vice versa predicted personality traits from phone use patterns (Stachl et al., 2020).
- The study of Butt and Phillips (2008) recognised that disagreeable people tended to spend more time on their phone as a display; extraverts were more likely to spend time calling and personalise their phones; and neurotic individuals tended to prefer textual communication (e.g. SMS).
- The study by Krey et al. (2019) recognised the moderating role of consumer innovativeness and extraversion along the drive of functional and emotional advertisements on smartwatch adoption.

The Big Five Personality assessments was applied in public surveys in a number of countries, such as the Panel Study of Income Dynamics (PSID) of United States, British Household Panel Survey (BHPS), German Socio-Economic Panel (SOEP), and China Family Panel Studies (CFPS) (中国家庭追踪调查) (吴琼 & 谷丽萍, 2020). The 15-item BF scale tested in these surveys has been adopted in the survey of the current study.

2.9 Designer, product, and user (self-)efficacies

The empirical results (survey responses discussed in **Sections 5.5.8.3, 5.5.8.4** and **5.5.8.5**) of the current study revealed significant discrepancies in the need perception of respondents playing the roles of designer and user, demonstrating a critical gap issue. The observed tendencies for the role-taking designers to over-estimate their target user groups' needs are projected as possibly associated with the difference in self-efficacy between the "expert" designers and "layman" users, and perhaps simultaneously associated with the differentiated evaluation for the self and others (also possibly moderated by self-efficacy). To better interpret these potential causal relations, further review has been conducted with relevant literature.

The concept of self-efficacy originates from "Social Cognitive Theory (SCT)", referring to a person's belief about his / her own ability to accomplish tasks and achieve the desired objectives (Bandura, 1977a, 1986). So, in simpler words, self-efficacy may be understood as self perceived efficacy. Bandura (1977a) suggests that self-efficacy may be built from sources such as performance accomplishments, vicarious experience (observing others' accomplishments), verbal persuasion, and positive physiological and affective states. Bandura and Locke (2003) posit it as "a theory embodying feed-forward self-regulation" that regulates human functioning through cognitive, motivational, affective, and decisional processes. Self-efficacy affects whether a person thinks in "self-enhancing or self-debilitating ways", hence influencing their motivation and persistence when facing difficulties, their emotional well-being, and their decision-making approaches. Bandura and Locke (2003) argue that the self-regulation of efficacy is proactive and thus differentiated from the control theories (such as "perceptual control theory (PCT)") which focuses on "feedback control systems aiming at error correction"

There are many research studies showing evidences of relationship between self-efficacy, human behaviours and performance in different domains such as school learning and training, health improvement programmes, and technology adoption (Bandura, 1977a, 1986; Bandura & Locke, 2003; Travis & Bunde, 2022 – on college student performance; Hilton et al., 2018 – on design engineering education; Rimal et al., 2010 – on breast cancer prevention; Liao et al., 2017 – on exercise promotion;

Susanto et al., 2016 – on smartphone banking; Ainsworth et al., 2017 – on mobile payment). While the SCT group of scholars represented by Bandura emphasise the positive influence of self-efficacy on performance, the other group favouring the PCT like Powers (1973, 1991), Vancouver et al. (2002) and Vancouver (2018) point out the existence of both positive and negative associations between self-efficacy and performance depending on individual and situational differences. Stone (1994) inferred from an experimental study that inducing positive expectations (raising self-efficacy) might produce overconfidence in choice accuracy hence reducing effort, attention and performance, while inducing mildly negative expectations (slightly degrading self-efficacy) increased effort, attention and performance.

Apart from the general personal self-efficacy, researchers also study the perceived efficacy of individuals or groups in more specific functions such as occupational self-efficacy (e.g. Schyns & von Collani, 2002; Rigotti et al., 2008), design (designer) self-efficacy (e.g. Beeftink et al., 2012; Hilton et al., 2018), creative self-efficacy (e.g. Carmeli & Schaubroeck, 2007; Kwon et al., 2014; Zhang et al., 2019; Wu et al., 2022), user self-efficacy in specific domains (e.g. Ainsworth et al., 2017 – mobile payment self-efficacy; Susanto et al., 2016 – smartphone banking self-efficacy), and team self-efficacy (e.g. Lin et al., 2012; Latif et al., 2020). Findings from the current research have suggested the possibility of the designer self-efficacy (or its excess) being contributive to the discrepancies in need perception between the designer and user.

As an appropriate level of self-efficacy is generally believed to support performance (such as in learning, training, and work) or desirable behaviours (such as smoking cessation, lifestyle regulation, and technology adoption), the suggested approaches of performance accomplishments (e.g. formative staged assessments, progress records), vicarious experience (e.g. case sharing, demonstrations), verbal persuasion (e.g. encouragement from teachers / coaches, advertisements), and positive physiological and affective states (e.g. maintaining emotional stability) have been applied in developing individual's self-efficacy in education / training, organisation management, healthcare programmes, and promotion / adoption / implementation of new technology / product / service (Travis & Bunde, 2022; Hilton et al., 2018; Rimal et al., 2010; Liao et al., 2017; Susanto et al., 2016; Ainsworth et al., 2017). While

long-term development of self-efficacy requires longitudinal plans and programmes, researchers have also applied these approaches with techniques like priming and scenario prompting to temporarily boost / trim self-efficacy of participants in research studies for within-subject and / or between-subject comparison purposes (e.g. Stone, 1994; Wang et al., 2017). For instance, Stone's (1994) experimental study manipulated varied levels of positive / negative task outcome expectations for different groups of participants. The study found that "inducing" positive expectations (raising self-efficacy) tended to produce overconfidence in choice accuracy, but without increasing effort, attention, or performance, while "inducing" mildly negative expectations (slightly degrading self-efficacy) increased effort, attention and performance. On the other hand, Wang et al. (2017) conducted a study on the role between self-efficacy and stereotype activation. When "primed" with the stereotype of an occupation requiring high or low mental efforts, the participants in the study unknowingly changed their self-efficacy beliefs and performed better or worse in a given test. The current research has applied scenario questions in the survey questionnaire asking the respondents to assess the importance / need for a set of new product features firstly in the role of a user, and then in the role of a designer designing for a specific user group. The role-taking as designers may possibly induce a designer self-efficacy for the respondents who are nondesigners in real life and boost the designer self-efficacy for the respondents who are designers in real life, which may ultimately cause the tendency of respondents in the designer's role estimating bigger needs for the other users than themselves. The phenomenon is further discussed in **Chapter 6**.

It is believed that creative self-efficacy is an important asset for someone to be able to generate creative designs / solutions (Carmeli & Schaubroeck, 2007; Kwon et al., 2014; Zhang et al., 2019; Wu et al., 2022), and there have been research studies investigating on the topic. For a product design to be good providing valuable experience for its users, it has to match the user's needs besides being creative. Hence the essential efficacies, actual and perceived, for a designer may include creative self-efficacy and efficacy in design management and execution, particularly the efficacies to produce good-efficacy products and to understand and communicate with users, all of which may be grouped as "designer self-efficacy", one sub-domain of occupational self-efficacy as termed by researchers (Beeftink et al., 2012; Schyns

& von Collani, 2002; Rigotti et al., 2008). "Product efficacy" are commonly used in the medical field to refer to "the ability of a product or treatment to provide a beneficial effect" (Mandal, 2021), which is a simple and reasonable description to be applied to other product categories.

Along the designer-product-user chain, user self-efficacy is also recognised to play a part in the interaction. Previous studies show that users with stronger self-efficacy (general / domain-specific) are more proactively involved and contributing in participatory or co-design R&D activities happening inside or outside of a user(-designer) community (Franke et al., 2008; Gabrysiak et al., 2012; Zhou et al., 2014; Soltani et al., 2017; Zhang, 2019). The experiment results of Zhang et al. (2019) suggest that customers' creative self-efficacy moderates the relationship between rewards and customers' participation in e-referral programme. Customers with low creative self-efficacy are more stimulated by cash reward and reward amount than customers with high creative self-efficacy who are more stimulated by gift rewards. These findings signify the need to set up scheme with a variety of rewards to attract and encourage the participation of customers with varied creative self-efficacy.

These studies have demonstrated that such user(-designer) communities and co-creation activities, providing interaction opportunities between users and designers and among peer users, on the one hand benefit the businesses in better understanding users' needs, gaining customer loyalty, and enhancing new adoption and continuous use of products. In return, users may enjoy better future products tailored to their needs, and have their product related efficacy and self-efficacy nourished through participation (online or offline) in the user(-designer) communities and co-creation activities experiencing accomplishments of their own and / or witnessing accomplishments of other participants (vicarious experience in SCT's term) (Bandura 1977a). The interaction in the long-term may help achieving a balance in the perceived and actual efficacies of designers and users, and narrowing the designer/user gaps. The involvement of both users and designers (and other personnel with roles in product R&D) is crucial in working the way out towards a coherent level of (self-)efficacies, and hence possible through-train communication and unconstrained interaction, along the designer-product-user chain.

Concerning the potential association between self-efficacy and need perception, attempts have been made to consult relevant theories. While those need theories focusing on the relations between human needs and motivation (such as Maslow's hierarchy of needs, Herzberg's Motivation-Hygiene Theory, and McClelland's Theory of Three Needs) (Pardee, 1990; Kurt, 2021) do not explain much on discrepancies in the need perception between groups, or between self and others, reference might be made to the risk perception theory. The risk perception theory of "comparative optimism" (Weinstein, 1980; Harris et al., 2008) denotes people's tendency to see others as more vulnerable to risks than the self, and the tendency varies across types of people or events. Persons with higher self-efficacy have been found presuming lower self-risk and higher risk for others. Events with stereotyped victims have also been found associated with greater bias for "comparative optimism" (Harris et al., 2008). Such phenomena are analogous with the respondents' under-estimation of self-needs and / or over-estimation of others' needs, and their stereotyping of gender needs in the current research.

Whether the discrepancies in need perception found from the survey responses are more associated with the "expert" designer and "layman" user roles with self-efficacy difference, or somewhat also associated with the differentiated evaluation for the self and others (which is possibly moderated by self-efficacy as well), will require investigation and verification in future studies.

CHAPTER 3: RESEARCH FRAMEWORKS AND HYPOTHESES

3.1 Main research framework and hypotheses

The research aims at understanding the perception of product values and experience, and investigating the possible differences between designers' and users' perceptions. An enhanced and updated conceptual framework is proposed to adequtely reflect the values involved in the user experience with contemporary products and to facilitate the systemic comparison between the designers' and users' perceptions.

The proposed conceptual framework is developed from the "perceived values – satisfaction – behavioural intention" models / theories proposed / tested in previous literature. As discussed in **Section 2.4** of **Chapter 2** "Literature Review", through the years, consumer behaviour studies have attempted to incorporate different relevant attributes in perfecting the various models along the line. Those models / theories, each bringing out certain perspectives, have provided helpful theoretical backgrounds. However, there seems a need for a model which can more adequately, integratively, and interactively address the inter-relationship across the different values for contemporary products and the corresponding user experience, satisfaction, and adoption (initial or continuous), in aspects such as:

Addressing user satisfaction

The previous models have evolved from dealing with only the utilitarian value (e.g. TAM) to the inclusion of social values (e.g. TAM2, UTAUT1) and hedonic values or both (e.g. TAM3, UTAUT2) (Rondan-Cataluña et al., 2015). But "user satisfaction" has not been addressed in these examples.

As user satisfaction has been recognised in other studies to be a mediator on the causal relation from the perceived values to the behavioural intention (Bhattacherjee, 2001; Mouri, 2005; Deng et al., 2010; Mugge et al., 2010; Lai & Tam, 2011; Amin, 2016; Xu & Du, 2018), the proposed framework projects that "perceived values" of

the product would contribute to “perceived satisfaction” which would further lead to “intention of use / continuous use” of the product.

The possible direct influence of “perceived values” on “intention of continuous use” would also be tested to understand the share of direct and indirect effects. ***(Hypotheses 1-3, & 10 in Table 1)***

While the causal relations across “perceived product values”, “perceived satisfaction”, and “intention of continuous use” are hypothesised in H1-3, the mediating role of “perceived satisfaction” on the causal relation from the perceived values to behavioural intention is also hypothsised in H10 for verification (with the sub-hypotheses detailed in **Table 1**):

H1: ***A product with high perceived values leads to a higher perceived satisfaction for users.***

H2: ***A product with high perceived satisfaction leads to a higher intention of continuous use for the product.***

H3: ***A product with high perceived values leads to a higher intention of continuous use for the product.***

H10: ***The perceived satisfaction mediates the relations between the perceived values and intention of continuous use.***

Addressing appropriate perceived values for contemporary products

As mentioned above, some models have incorporated a wide range of product attributes / values without addressing the variable of “user satisfaction”, while other models / studies addressing the “user satisfaction” variable may not have adequately cover the product values (e.g. Bhattacherjee, 2001; Deng, 2010). They may address only the utilitarian value of usefulness and ease of use, or the utilitarian and hedonic values, or the utilitarian, hedonic and social values, plus some other values / attributes such as conditional value, price and quality, etc.

With the fast developing technologies of nowadays applying to all walks of life, almost every product / service / system is undergoing some sort of innovation, be it simple changes in function, form, materials, style, colour, touch, or more far-reaching

innovations rendering the product more interactive, more customised / personalised, more sustainable, or more invisible. Therefore, the product value set seems incomplete without including the “innovative value”.

Some researchers combined Roger’s Innovation Diffusion Theory (IDT) (Roger, 1983) with models like TAM in their study of consumer behaviour (e.g. Huang, 2012; Tahir, 2015). However, when taking a closer look at the attributes of IDT (high relative advantage, trialability, observability, compatibility, and low complexity), they are values influencing the diffusion speed of innovation instead of indicating the degree of innovativeness of the product, hence not applicable to the current study’s framework.

Sheth’s Theory of Consumption Values (1991b) identified five values influencing consumer choice behaviour (without addressing satisfaction in his model), which were functional, emotional, social, epistemic, and conditional values. The epistemic value was defined by Sheth as the capacity to arouse curiosity, provide novelty, and / or satisfy a desire for knowledge, but the literal meaning of the word (Cambridge English Dictionary, 2022) and the value’s measurement items appear to incline more towards knowledge-seeking, which may not be applicable or may sound misleading for it to cover all innovations. It had better be termed in a more widely understandable way as “innovative value”, and include a balanced set of measurement items to cover the “innovative” aspects. The current study proposes to include the following four perceived values in the conceptual framework to reflect values of contemporary products which contribute to satisfaction and “intention of continuous use”: utilitarian value, hedonic value, social value, and innovative value.

The enhanced set of “perceived product values” and their causal relations with “perceived satisfaction” and “intention of continuous use” would be tested in hypotheses 1-3 projected above. ***(Hypotheses 1-3 in Table 1)***

Addressing the possible interactions between variables

Among the models and past studies investigating the relations across “perceived values – satisfaction – behavioural intention”, there are two varied approaches found

regarding the inter-value interaction. Most earlier models presented the perceived values as independent of each other, such as the TRA, TPB, and UTAUT models. TAM was an exception, as it suggested the influence of "Perceived Ease of Use" on "Perceived Usefulness". More recent studies may or may not have addressed the inter-value interaction. For instance, both Hur (2012) and Kalafatis et al. (2010) have made reference to Sheth's Theory of Consumption Values (Sheth et al., 1991b) to develop their research models. Hur's research model kept the value attributes as independent as in Sheth's model, whereas Kalafatis et al. proposed and validated empirically (in a service context) the mediating effect of the "emotional value" and "social value" on the causal relations from the "functional value" and "epistemic value" to consumer's "satisfaction".

As discussed in previous sections, the researcher supports the existence of inter-value interactions. As recognised in Kalafatis et al.'s 2010 study and other studies investigating the inter-value relations, often the more intrinsic values (hedonic and social values) are found to be mediators between the more extrinsic values (utilitarian and innovative values) and satisfaction. The rationale is that the fulfilment of the extrinsic task-oriented motives does not only give practical benefits, but may also lead to good emotional feelings for the individual or build good impression in one's social groups. For instance, Rogers (1983) states that the desire to gain social status is one of the important objectives for individuals to adopt an innovative product.

Hence the current study proposes a mediating effect of the intrinsic values (perceived hedonic and social values) on the relations between the extrinsic values (perceived utilitarian and innovative values) and "perceived satisfaction". ***(Hypotheses 8 & 9 in Table 1)***

Based on the above propositions, the followings are hypothesised (with the sub-hypotheses detailed in **Table 1**):

H8: ***The perceived intrinsic values (hedonic and social values) mediate the relations between the perceived extrinsic values (utilitarian and innovative values) and perceived satisfaction.***

H9: ***The perceived intrinsic values (hedonic and social values) mediate the relations between the perceived extrinsic values (utilitarian and innovative values) and intention of continuous use.***

Models such as the UTAUT also recognised the moderating effect of individual's characteristics on the causal relations. Among the individual characteristics, the current study proposes to test the moderating effects of: designer vs nondesigner, individual innovativeness, and personality traits (openness to experience, neuroticism, extraversion, agreeableness, and conscientiousness), since individual innovativeness and other personality traits have been recognised by previous studies as influencing factors on user perception and behaviour. The test results may shed light on the designer/nondesigner differences and factors underpinning.
(Hypotheses 11-13 in Table 1)

The followings are hypothesised (with the sub-hypotheses detailed in **Table 1**):

H11: ***The individual characteristics moderate the causal relations between the perceived values and perceived satisfaction.***

H12: ***The individual characteristics moderate the causal relations between the perceived values and intention of continuous use.***

H13: ***The individual characteristics moderate the causal relations between the perceived satisfaction and intention of continuous use.***

Identifying the potential designer/nondesigner differences and projecting the contributing factors for the differences

Some past studies have looked at the designer/user differences from angles such as differed adoption stages and product expertise (Cata & Martz, 2015; Chamorro-Koc & Popovic, 2008), and product communication and semantics issues (Norman, 1988, 2013; Crilly et al., 2008; Krippendorff, 1989, 2006; Khalaj & Pedgley, 2019). The current study explored the possible designer/user gaps from less attended prospects of value perception, individual's characteristics, and role-based variations.

From the scarce empirical studies comparing designers' and nondesigners' product use experience, differences in use and feeling intensities and priorities have been found. For examples, Cata and Martz (2015) identified more intense feelings about mobile app characteristics (including information anonymity and timeliness, aesthetics and fun) in designer-users than general users. The designer-users'

greater commitment in using advanced features of mobile apps implied their higher comfort level with technology and / or more open attitudes. While those findings provide hints for potential designer/nondesigner differences in product perception, the perceived differences were not compared in systematic frameworks. The current study would systematically compare the responses from designers and nondesigners for constructs in the proposed conceptual framework, including the perceived product values, perceived satisfaction, intention of use / continuous use, and individual's characteristics, to identify possible differences. ***(Hypotheses 4-5 in Table 1)***

The followings are hypothesised (with the sub-hypotheses detailed in **Table 1**):

H4: There are differences in the perception of designers and nondesigners towards the product values, user satisfaction, and intention of use / continuous use for the product.

H5: There are differences in the individual characteristics between designers and nondesigners, including individual innovativeness and personality traits.

As reviewed in earlier sections, the potential relevance of individual personality as among the underlying factors for the designer/nondesigner differences could stem from the personality-career-inclination perspective (e.g. (Holland, 1985; Hammond, 1991; Hannah, 1994; Caprara et al., 2003; Nettle, 2005, 2006; Hu et al., 2017), or the consumer perception perspective (e.g. Varnali, 2013; Zu et al., 2016; Stachl et al., 2017, 2020). Previous studies found the personality traits either influencing relationships as moderators, or directly affecting user perceptions, both of which may subsequently contribute to the perception differences between designers and nondesigners. It has also been identified that some personality traits related more to one's perception of outcome success, whereas other personality traits related more to one's perception of process engagement. For instances, neuroticism was found positively correlated with an individual's level of creativity (related to process engagement) but negatively correlated with the perceived usefulness and behavioural control (related to outcome success), whereas conscientiousness was negatively correlated with creativity (Xu et al., 2016). While extraverts were found more likely to spend time calling and personalise their phones, neurotic individuals tended to prefer textual communication and disagreeable people tended to spend time on their phone as a display (Butt and Phillips, 2008). The moderating role of

consumer innovativeness and extraversion was recognised along the drive of functional and emotional advertisements on smartwatch adoption (Krey et al., 2019).

The dual roles of personal characteristics found in previous studies, influencing relationships as moderators and directly affecting user perceptions, are recognised in the current study as both are possibly valid and contributive to the designer/nondesigner differences. As discussed above, in consultation with reference models such as UTAUT and UTAUT2, personal characteristics including "designer/nondesigner" and "individual innovativeness" have been projected at the early stage as moderators influencing the impact of perceived product values on perceived satisfaction and / or intention of use / continuous use. Along the pilot testings and further literature review, the other possibly relevant personal factors of personality traits (openness to experience, neuroticism, extraversion, agreeableness, and conscientiousness) have been projected as moderators as well as potential antecedental factors influencing value perception which may contribute to possible differences in the product perception of designers and nondesigners. ***(Hypotheses 14 in Table 1)***

Based on the above propositions, the following is hypothesised on the direct influence of individual characteristics on value perception (with the sub-hypotheses detailed in **Table 1**), in addition to H11, H12 and H13 which hypothesise the moderating effects of individual characteristics on the conceptual framework's projected causal relations:

H14: The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived values of a product.

Comparing roles

Despite certain differences have been identified in the Part One's Mental Modelling between the designer-users and nondesigner-users in their perception of goals and user experience across the four value domains, there was not much statistically significant distinctiveness found between the groups in the Pilot 1 test questionnaire results. One possible reason, among others, might be that the smartphone has become so much an omnipresent companion product that every young city dweller of

today has come to the same adoption stage with similar user experience and level of expertise. As such, apart from comparing the perceptions of designer-users (see note below) against nondesigner-users, other cross-comparisons across roles would also be made: including perceptions of designer-designers against nondesigner-designers, perceptions of the same respondent as a user against as a designer, perceptions of role-taking users against role-taking designers. To achieve this purpose, scenario questions (Atzmüller & Steiner, 2010; Utomo, 2020) would be employed to elicit the perceptions of the respondents when taking a user role and a designer role, and potential differences would be assessed. ***(Hypotheses 6-7 in Table 1)***

The followings are hypothesised (with the sub-hypotheses detailed in **Table 1**):

H6: ***There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the utilitarian, hedonic, social, innovative, and overall values of a new smartphone.***

H7: ***There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer's role, towards enhancing the utilitarian, hedonic, social, innovative, and overall values of a new smartphone.***

Note:	
Designer-designer (DD):	A real-world designer (self-reported) who played a designer role in response to particular question(s) / task(s) in the research
Designer-user (DU):	A real-world designer (self-reported) who played a user role in response to particular question(s) / task(s) in the research
Nondesigner-designer (NDD):	A real-world nondesigner (self-reported) who played a designer role in response to particular question(s) / task(s) in the research
Nondesigner-user (NDU):	A real-world nondesigner (self-reported) who played a user role in response to particular question(s) / task(s) in the research

While **Table 1** provides a full list of the final hypotheses, **Table 2** summarises and synthesises the development flow of the proposed conceptual framework founding on the supporting theories / models / concepts from previous scholarly research studies as discussed in earlier sections. **Figure 17** illustrates the evolved conceptual framework (version updated after Pilot 2 test) for testing in the full-scale survey. The

hypotheses for the main frame (concerning the causal relations between the perceived values, perceived satisfaction, and intention of continuous use) of the conceptual framework have been drawn up before field works started. As the findings from the Part One Mental Modelling, the Pilot 1 test survey, and further literature review revealed more on the potentials of other analytical perspectives discussed above (including the inter-relations across the product values and potential antecedental and moderating effects from individual's factors such as personality traits), the hypotheses set was adjusted to include assessments for the relevant causal, mediation and moderation effects. Correspondingly, the questionnaire design for Pilot 2 and the full-scale survey evolved to serve the purpose, which would be discussed in further details in **Sections 5.2 to 5.5**.

Table 1: Hypotheses for testing (final version – updated after Pilot tests 1 & 2)

Updated after Pilot 1: H5, H6, H7, H8, H9, H10, H11, H12, H13

Further updated after Pilot 2: H6, H7, H14

Hypotheses for testing	
H1:	**A product with high perceived values leads to a higher perceived satisfaction for users.**
H1a:	A product with high perceived utilitarian value leads to a higher perceived satisfaction for users.
H1b:	A product with high perceived hedonic value leads to a higher perceived satisfaction for users.
H1c:	A product with high perceived social value leads to a higher perceived satisfaction for users.
H1d:	A product with high perceived innovative value leads to a higher perceived satisfaction for users.
H2:	**A product with high perceived satisfaction leads to a higher intention of continuous use for the product.**
H3:	**A product with high perceived values leads to a higher intention of continuous use for the product.**
H3a:	A product with high perceived utilitarian value leads to a higher intention of continuous use for the product.
H3b:	A product with high perceived hedonic value leads to a higher intention of continuous use for the product.
H3c:	A product with high perceived social value leads to a higher intention of continuous use for the product.
H3d:	A product with high perceived innovative value leads to a higher intention of continuous use for the product.
H4:	**There are differences in the perception of designers and nondesigners towards the product values, user satisfaction, and intention of use / continuous use for the product.**
H4a:	There are differences in the perception of designers and nondesigners towards the perceived utilitarian value of a product.
H4b:	There are differences in the perception of designers and nondesigners towards the perceived hedonic value of a product.
H4c:	There are differences in the perception of designers and nondesigners towards the perceived social value of a product.
H4d:	There are differences in the perception of designers and nondesigners towards the perceived innovative value of a product.
H4e:	There are differences in the perception of designers and nondesigners towards the perceived satisfaction from a product.
H4f:	There are differences in the perception of designers and nondesigners towards the intention of use / continuous use for a product.

H5: **There are differences in the individual characteristics between designers and nondesigners, including individual innovativeness and personality traits.**

- H5a: There are differences in the level of individual innovativeness between designers and nondesigners.
- H5b: There are differences in the personality trait of openness to experience between designers and nondesigners.
- H5c: There are differences in the personality trait of neuroticism between designers and nondesigners.
- H5d: There are differences in the personality trait of extraversion between designers and nondesigners.
- H5e: There are differences in the personality trait of agreeableness between designers and nondesigners.
- H5f: There are differences in the personality trait of conscientiousness between designers and nondesigners.

H6: **There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the utilitarian, hedonic, social, innovative, and overall values of a new smartphone.**

- H6a: There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the utilitarian value of a new smartphone.
- H6b: There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the hedonic value of a new smartphone.
- H6c: There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the social value of a new smartphone.
- H6d: There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the innovative value of a new smartphone.
- H6e: There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the overall value of a new smartphone.

H7: **There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer's role, towards enhancing the utilitarian, hedonic, social, innovative, and overall values of a new smartphone.**

- H7a: There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the utilitarian value of a new smartphone.

H7b: There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the hedonic value of a new smartphone.

H7c: There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the social value of a new smartphone.

H7d: There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the innovative value of a new smartphone.

H7e: There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the overall value of a new smartphone.

H8: The perceived intrinsic values (hedonic and social values) mediate the relations between the perceived extrinsic values (utilitarian and innovative values) and perceived satisfaction.

H8a: Perceived hedonic value mediates the relation between perceived utilitarian value and perceived satisfaction.

H8b: Perceived social value mediates the relation between perceived utilitarian value and perceived satisfaction.

H8c: Perceived hedonic value mediates the relation between perceived innovative value and perceived satisfaction.

H8d: Perceived social value mediates the relation between perceived innovative value and perceived satisfaction.

H9: The perceived intrinsic values (hedonic and social values) mediate the relations between the perceived extrinsic values (utilitarian and innovative values) and intention of continuous use.

H9a: Perceived hedonic value mediates the relation between perceived utilitarian value and intention of continuous use.

H9b: Perceived social value mediates the relation between perceived utilitarian value and intention of continuous use.

H9c: Perceived hedonic value mediates the relation between perceived innovative value and intention of continuous use.

H9d: Perceived social value mediates the relation between perceived innovative value and intention of continuous use.

H10: The perceived satisfaction mediates the relations between the perceived values and intention of continuous use.

H10a: Perceived satisfaction mediates the relation between perceived utilitarian value and intention of continuous use.

H10b: Perceived satisfaction mediates the relation between perceived hedonic value and intention of continuous use.

H10c: Perceived satisfaction mediates the relation between perceived social value and intention of continuous use.

H10d: Perceived satisfaction mediates the relation between perceived innovative value and intention of continuous use.

H11: The individual characteristics moderate the causal relations between the perceived values and perceived satisfaction.

H11a: The individual designation of being a designer or not moderates the causal relations between the perceived values and perceived satisfaction.

H11b: The individual innovativeness moderates the causal relations between the perceived values and perceived satisfaction.

H11c: The individual personality trait of openness to experience moderates the causal relations between the perceived values and perceived satisfaction.

H11d: The individual personality trait of neuroticism moderates the causal relations between the perceived values and perceived satisfaction.

H11e: The individual personality trait of extraversion moderates the causal relations between the perceived values and perceived satisfaction.

H11f: The individual personality trait of agreeableness moderates the causal relations between the perceived values and perceived satisfaction.

H11g: The individual personality trait of conscientiousness moderates the causal relations between the perceived values and perceived satisfaction.

H12: The individual characteristics moderate the causal relations between the perceived values and intention of use.

H12a: The individual designation of being a designer or not moderates the causal relations between the perceived values and intention of continuous use.

H12b: The individual innovativeness moderates the causal relations between the perceived values and intention of continuous use.

H12c: The individual personality trait of openness to experience moderates the causal relations between the perceived values and intention of continuous use.

H12d: The individual personality trait of neuroticism moderates the causal relations between the perceived values and intention of continuous use.

H12e: The individual personality trait of extraversion moderates the causal relations between the perceived values and intention of continuous use.

H12f: The individual personality trait of agreeableness moderates the causal relations between the perceived values and intention of continuous use.

H12g: The individual personality trait of conscientiousness moderates the causal relations between the perceived values and intention of continuous use.

H13: The individual characteristics moderate the causal relations between the perceived satisfaction and intention of continuous use.

H13a: The individual designation of being a designer or not moderates the causal relations between the perceived satisfaction and intention of continuous use.

H13b: The individual innovativeness moderates the causal relations between the perceived satisfaction and intention of continuous use.

H13c: The individual personality trait of openness to experience moderates the causal relations between the perceived satisfaction and intention of continuous use.

H13d: The individual personality trait of neuroticism moderates the causal relations between the perceived satisfaction and intention of continuous use.

H13e: The individual personality trait of extraversion moderates the causal relations between the perceived satisfaction and intention of continuous use.

H13f: The individual personality trait of agreeableness moderates the causal relations between the perceived satisfaction and intention of continuous use.

H13g: The individual personality trait of conscientiousness moderates the causal relations between the perceived satisfaction and intention of continuous use.

H14: The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived values of a product.

H14a: The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived utilitarian value of a product.

H14b: The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived hedonic value of a product.

H14c: The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived social value of a product.

H14d: The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived innovative value of a product.

Table 2: Development of the proposed conceptual framework with seminal literature support

Development of proposed conceptual framework :	Literature source:	Supporting theories, models, concepts:
Perceived Product Values (Utilitarian, Hedonic, Social) → Intention of Continuous Use With Individual's factors proposed as moderators (Designer / Non-designer, Individual Innovativeness, Personality Traits)	Rondan-Cataluña et al., 2015; Gopinath et al., 2022	Evolving user behaviour theories / models indicating causal relations between attributes / values (utilitarian, social, hedonic) and use intention: TRA (Fishbein & Ajzen, 1975); TPB (Ajzen, 1985); TAM (Davis, 1985), TAM2 (Venkatesh & Davis, 2000) and TAM3 (Venkatesh & Bala, 2008); UTAUT (Venkatesh et al., 2003) and its extended versions (e.g. UTAUT2, UTAUT3, Meta-UTAUT) (Venkatesh et al., 2012; Farooq et al., 2017; Dwivedi et al., 2020; Patil et al., 2020; Alqudah et al., 2021)
		TAM2, TAM3, UTAUT and extended versions also acknowledged potential moderating effects of individual characteristics (e.g. demographics, personal innovativeness) on the causal relations
	Batra & Ahtola, 1991; Zaichkowsky, 1994; Voss et al., 2003	Utilitarian-hedonic value perception approach
Perceived Product Values (Utilitarian, Hedonic, Social, Innovative) → Intention of Continuous Use	Sheth et al., 1991b; Rivas et al., 2022	Theory of Consumption Values identifying 5 values (functional, emotional, social, epistemic, and conditional) influencing consumer behaviour
Perceived Product Values (Utilitarian, Hedonic, Social, Innovative) → Perceived Satisfaction → Intention of Continuous Use	Bhattacherjee, 2001; Mouri, 2005; Xu & Du, 2018	Mediating role of "user satisfaction" on the causal relation from perceived values to behavioural intention (Expectation-Confirmation Theory; extended TAM)
With perceived intrinsic values (Hedonic and Social Values) proposed as mediators between the perceived extrinsic values (Utilitarian and Innovative Values) and Perceived Satisfaction / Intention of Continuous Use		Inter-value interactions:
	Davis (2013)	TAM / TAM2 / TAM3 recognising the mediating effect of "perceived ease of use" on causal relation from "perceived usefulness" to use intention
	Kalafatis et al. (2010)	With reference to Sheth's (1991b) Theory of Consumption Values, Kalafatis et al. proposed and validated empirically (in a service context) the mediating effect of the "intrinsic values" on the causal relations from the "extrinsic values" to consumer's "satisfaction".
	Katz & Blumler, 1974; Rubin, 1984; Leung & Wei, 2000; Moon et al., 2022	UGT suggesting that the "instrumental / extrinsic" motives would likely drive more practical and task-oriented behaviours; and the "ritualistic / intrinsic" motives would likely drive more affective and social behaviours
With individual's characteristics proposed as antecedents (Individual Innovativeness, Personality Traits), as well as moderators (Designer / Non-designer, Individual Innovativeness, Personality Traits)		UGT positing that individual differences motivate people to use a media / product differently to satisfy underlying needs
	Holland, 1985; Hammond & Edelmann, 1991; Caprara et al., 2003; Nettle, 2005, 2006; Hu et al., 2017	The "personality-career-inclination" perspective portraying distinctive personality traits across professionals in different careers
	Varnali, 2013; Zu et al., 2016; Stachl et al., 2017, 2020; Roos, 2023	The "consumer perception" perspective revealing that individual characteristics and personality traits either influence user perceptions directly or moderate causal relations

Abbreviations:

TRA	Theory of Reasoned Action
TPB	Theory of Planned Behaviour
TAM	Technology Acceptance Model
UTAUT	United Theory of Acceptance and Use of Technology
UGT	Uses and Gratifications Theory

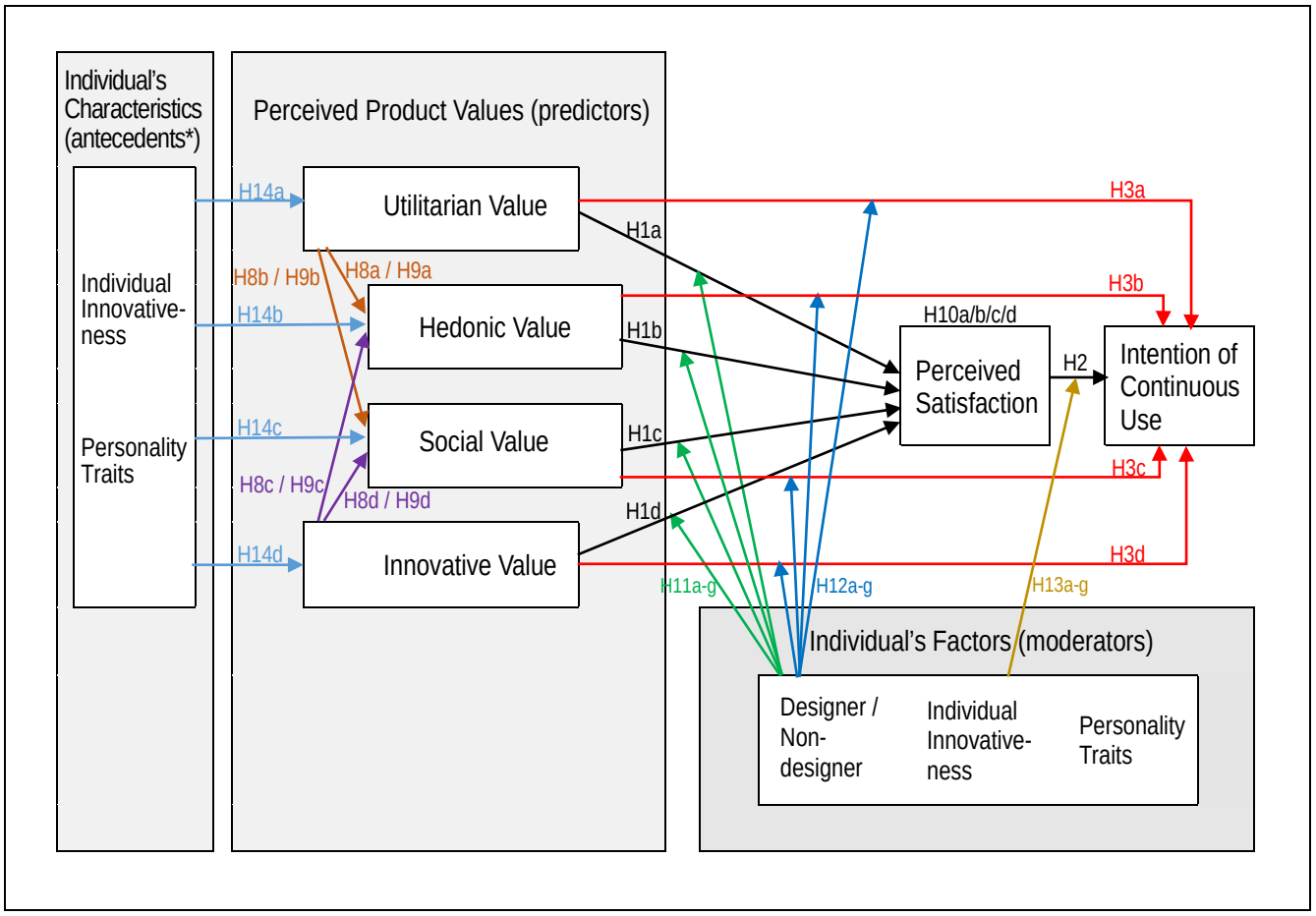


Figure 17: Updated conceptual framework (for testing in full-scale survey) illustrating the user experience, with impact of the inter-related perceived values on users' satisfaction and (continuous) adoption of the product, and the antecedental and moderating effects of individual's factors

The above conceptual framework, in alignment with the final hypotheses in **Table 1**, illustrates the selected research focus for the DBA thesis evolved from the comprehensive framework of **Figure 9** in **Section 2.3**, and has consolidated findings from subsequent literature review, the Part One research, and Part Two pilot tests. More details for the conceptual framework's evolvement are discussed in **Section 5.3** and **5.4**, and illustrated in **Figures 23-26** and **Figure 35**. Verification of the conceptual framework and hypotheses are reviewed and discussed in the respective sections of **Chapter 5**.

* It should be noted that only antecedents relating to individual's characteristics with potential contribution to the designer/nondesigner differences in value perception are included for testing here. Other non-human antecedental factors influencing value perception, such as

product attributes, are not the focus of interest of the current study and hence not covered in the study. For future product-focused research, more comprehensive investigation of different potential factors influencing product value perception should be conducted.

3.2 Summary of key propositions

In the previous sections, an enhanced and updated conceptual framework has been proposed to adequtely reflect the values involved in the user experience with contemporary products and to facilitate the systemic comparison between the designers' and users' perceptions. The current study has outlined and tested a conceptual framework enhancing and updating the conventional "perceived values – satisfaction – behavioural intention" model(s) integrating relevant attributes and interactions in aspects including:

- adding the perceived innovative value to the perceived utilitarian, hedonic and social values of the TAM and UTAUT model series to address the innovative nature of today's fast-advancing products;
- recognising the inter-value relations with intrinsic values mediating the impact of the extrinsic values on perceived satisfaction and intention of continuous use in a product context; and
- proposing potential antecedents / moderators of individual's characteristics embracing the factors of designer / nondesigner, individual's innovativeness and personality traits, beyond the commonly tested factors of demographics and user expertise.

Evidences related to the following propositions would be collected / analysed / verified through Part One (Mental Modelling) and Part Two (Survey) of the research. Most of the propositions have been formulated into the hypotheses (**Table 1**) for verification in the current study, except proposition (d) which is supplemented after reviewing the full-scale survey results and hence requires investigation and verification in future research.

(a) There are differences in the perception of designers and nondesigners towards their product experience, including possibly the perceived product values, satisfaction, and intention of use / continuous use for the product.

(b) Differences in the concerned product perception, including perceived need for specific features / enhancements, exist not only between real-world

designers and nondesigners / users, but also between individuals taking a designer role or a user role.

(c) There are differences in the individual characteristics between designers and nondesigners, including but not limited to individual innovativeness and personality traits, which may contribute to the differences in their product perception (designer/user gaps).

(d) The possible differentiation in individual characteristics contributing to the designer/user gaps may include the potential contrast of self-efficacy levels between designers and users (real-world or role-taking), which would call for more future research.

(e) The perceived values of a product, including perceived utilitarian, hedonic, social, and innovative values, positively influence users' perceived satidfaction, and subsequently their intention to continue using the product.

(f) The perceived intrinsic values (hedonic and social values) mediate the impact of perceived extrinsic values (utilitarian and innovative values) on perceived satisfaction and / or intention of continuous use.

(g) The varied individual characteristics such as the designer / nondesigner role, individual innovativeness and personality traits may moderate the causal relations across the perceived product values, perceived satisfaction, and intention of continuous use.

3.3 Supporting frameworks

Apart from the main conceptual framework proposed for the research as discussed in **Section 3.1**, a number of other related frameworks have been developed and used as reference frames and / or application tools in the research including:

- The action model framework outlined for bridging the designer-product-user and psychological-physical gaps (**Figures 8-11** in **Section 2.3**)
- The Mental Modelling perception framework for Model A – for eliciting and interpreting participants' perceptions and use experiences along an abstraction ladder (**Table 9** in **Section 5.1**)
- The Mental Modelling SCAMPER brainstorming framework for Model B – for brainstorming enhancement ideas resolving pain-points identified in Model A (**Figure 18** in **Section 5.1**)

These frameworks are briefly highlighted below to facilitate an overview of frameworks involved in the current research. They are introduced in more details in the respective Sections.

Action model framework outlined for bridging the designer-product-user and psychological-physical gaps

In the early research planning stage, a framework has been outlined (**Section 2.3**) for an action model integrating Norman's user action cycle and recommended design principals (Norman, 1988, 2013) with the utilitarian-hedonic value perception approach (Batra & Ahtola, 1991; Zaichkowsky, 1994; Voss et al., 2003; Mouri, 2005) aiming at narrowing those identified gaps (designer/user, psychological/physical) with an actionable model accompanied by a set of application tools (**Figures 8, 9 and 11**). The framework aims to be an integration of theoretical and action models providing guidelines and support for product R&D. It has been proposed with the dispositioning of "intended product-user interactions" across the psychological-physical continuum (**Figure 8**), which are further anatomised into "main psychological-physical attributes" (**Figure 9**) supported with relevant actionable "application guidance" (**Figure**

11). A preview of Figures 8, 9 and 11 is shown in this section.

Despite such inclusive model and tools have been long anticipated, their development requires the investment of persistent efforts and time, likely years, for developing and verifying the theoretical grounding, the empirical applications, and repeating tests with the industry in honing the model and range of tools. As such scope and scale would be beyond the timeframe of the University of Wales TSD's DBA programme, the DBA research would pinpoint the "conceptual model / mental model" (an important psychological-physical attribute in the action model) and user experience in addressing the identified issue of designer/user gap. The comprehensive framework would serve as a good reference for planning future studies to work towards the goals probably in phases.

Preview of Figures 8, 9 and 11: Action model framework outlined for bridging the designer-product-user and psychological-physical gaps

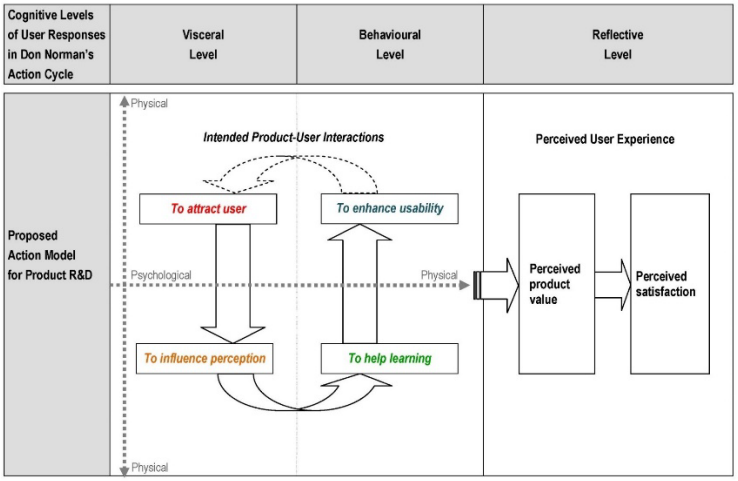


Figure 8: Conceptual framework of an action model for product R&D (outlined by the researcher)

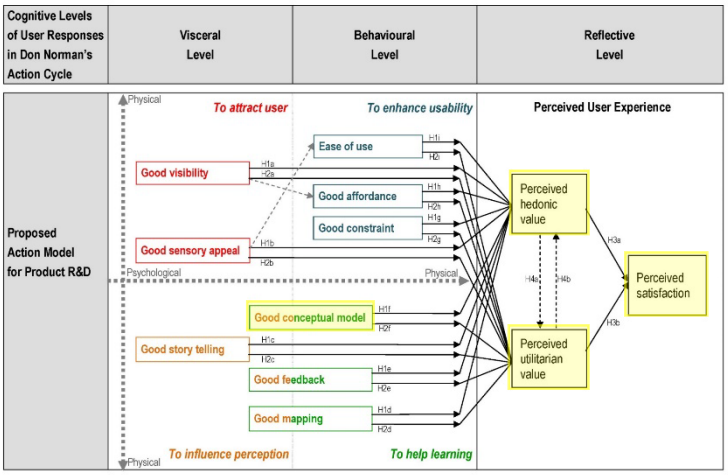
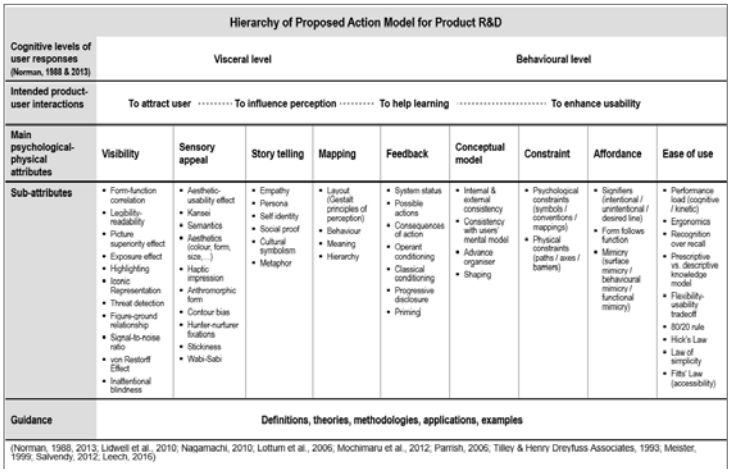


Figure 9: Conceptual framework projecting the impact of the main attributes (at the visceral and behavioural levels) on perceived user experience (at the reflective level) in the action model for product R&D (Norman, 1988, 2013; Batra & Ahtola, 1991; Zaichkowsky, 1994; Voss et al., 2003; Mouri, 2005) (outlined by the researcher)



Hierarchy of Proposed Action Model for Product R&D

Cognitive levels of user responses (Norman, 1988 & 2013)	Visceral level				Behavioural level				
Intended product-user interactions	To attract user ·····		To influence perception ·····		To help learning ·····				To enhance usability
Main psychological-physical attributes	Visibility	Sensory appeal	Story telling	Mapping	Feedback	Conceptual model	Constraint	Affordance	Ease of use
Sub-attributes	• Form-function correlation • Legibility-readability • Picture superiority effect • Exposure effect • Highlighting • Iconic Representation • Threat detection • Figure-ground relationship • Signal-to-noise ratio • von Restorff Effect • Inattentional blindness	• Aesthetic-usability effect • Kansei • Semantics • Aesthetics (colour, form, size, ...) • Haptic impression • Anthromorphic form • Contour bias • Hunter-nurturer fixations • Stickiness • Wabi-Sabi	• Empathy • Persona • Self-identity • Social proof • Cultural symbolism • Metaphor	• Layout (Gestalt principles of perception) • Behaviour • Meaning • Hierarchy	• System status • Possible actions • Consequences of action • Operant conditioning • Classical conditioning • Progressive disclosure • Priming	• Internal & external consistency • Consistency with users' mental model • Advance organiser • Shaping	• Psychological constraints (symbols / conventions / mappings) • Physical constraints (paths / axes / barriers)	• Signifiers (intentional / unintentional / desired line) • Form follows function • Mimicry (surface mimicry / behavioural mimicry / functional mimicry)	• Performance load (cognitive / kinetic) • Ergonomics • Recognition over recall • Prescriptive vs. descriptive knowledge model • Flexibility-usability tradeoff • 80/20 rule • Hick's Law • Law of simplicity • Fitts' Law (accessibility)
Guidance	Definitions, theories, methodologies, applications, examples								

(Norman, 1988, 2013; Lidwell et al., 2010; Nagamachi, 2010; Lottum et al., 2006, Mochimaru et al., 2012; Parrish, 2006; Tilley & Henry Dreyfuss Associates, 1993; Meister, 1999; Salvendy, 2012; Leech, 2016)

Figure 11: The hierarchy of the projected action model for product R&D, with the layers of intended product-user interactions, main psychological-physical attributes, sub-attributes, and application guidance under the visceral and behavioural levels of user responses (outlined by the researcher in reference to the literature listed above)

Mental Modelling perception framework for Model A – for eliciting and interpreting participants' perceptions and use experiences along an abstraction ladder

In Part One of the current research, a mental modelling framework (for Mental Model A) (**Table 9** in **Section 5.1**) is created for eliciting and interpreting participants' perceptions and use experiences along the four domains of utilitarian, hedonic, social, and innovative values adapted from the consumption value perception studies (Sheth et al., 1991b; Brown & Venkatesh, 2005; Kim & Han, 2009; Kalafatis et al., 2010; Rivas et al., 2022). Reference has also been made with the goal-orientation approach of the uses and gratification theory (Rubin, 1984; Leung & Wei, 2000; Moon et al., 2022) (theory reviewed in **Section 2.5**) and hierarchical abstraction framework of the means-end chain model (Jung, 2014) (model reviewed in **Section 2.6**).

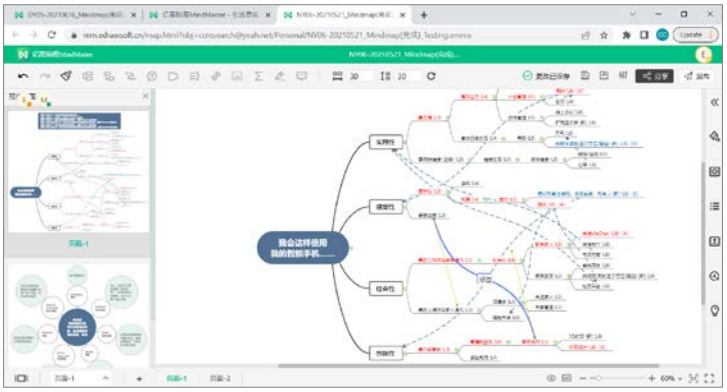
In reference to the hierarchical abstraction framework of the means-end chain model (Jung, 2014), the perception framework (**Table 9** in **Section 5.1**) for Mental Model A (examples in **Appendix 4a**) has been designed to extend from high to low level of abstraction along the theme (Level 1), domains (Level 2), goals (Level 3), values / consequences (Level 4), affordances (Level 5), and product attributes / features (Level 6). This semi-structured framework of laddered abstraction allows the inductive research to be conducted online facilitating participants' thoughts and expressions as well as onward comparison and analysis. To facilitate the expression of participants not familiar with mindmapping, a card pool was provided for all participants where they could pick the desirable card elements to reflect their perception and use experience in the mental model if they wished to, while they could also create their own elements. The framework application has hence integrated the essences of techniques of mindmapping, card sorting and path finding in the elicitation of participants' perceptions on smartphone experience which would be difficult to identify through conventional interviewing methods. The mental modelling process with the laddered framework has enabled the participants to reflect more deeply their perceptions on goals and values, not just use patterns, forming a comprehensive visual-textual representation of their models in mind.

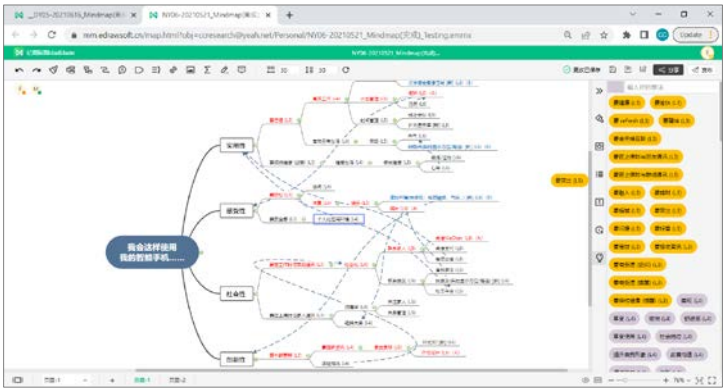
A preview of **Table 9** and Mental Model A on the online modelling platform are shown below.

Preview of Table 9 – Mental Modelling perception framework for Model A – eliciting and interpreting participants' perceptions and use experiences along an abstraction ladder; and the Mental Modelling online platform

Mental Modelling Framework	
L1 – Theme I use my smartphone to ……	***Participant's perception***
L2 – Domains Participants were to extend their perception lines from each of the four domains of utilitarian, hedonic, social, and innovative……along L3-L4-L5-L6	*High level of abstraction*
L3 – Goals e.g. To be uptrend	*motivation anticipation*
L4 – Values / Consequences e.g. individualisation	*perception feeling*
L5 – Affordances e.g. auto information search and management	*experience use*
L6 – Product attributes / features e.g. AI equipped information manager	*Low level of abstraction*

Table 9: Mental Modelling – perception framework for Model A (from Level 1 to 6)





Mental modelling (Model A) with MindMaster online platform – showing card pool on the right

Mental Modelling SCAMPER brainstorming framework for Model B – for brainstorming enhancement ideas resolving pain-points identified in Model A

In the mental modelling process of the Part One research, while Model A calls for the participants' reflection of their perception and use experience with their smartphone in the role of a "user", Model B (**Figure 18** in **Section 5.1**) requests the participants to somehow play a "designer" role in brainstorming for a better smartphone which might resolve the pain-points they have identified. A SCAMPER framework (MindTools, 2022) is adapted for use in the brainstorming for enhancement ideas providing prompts for possible lines of thought along "Substitute", "Combine", "Adapt", "Modify", "Put to another use", "Eliminate" and "Reverse". Participant-constructed samples of Model B can be viewed in **Appendix 4b**.

The mental models elicited through the above two frameworks, Model A eliciting perception and use experience, and Model B eliciting anticipations for a better smartphone, are constructed by participants (through the MindMaster online application) illustrating how the participants use and wish to use their smartphones to satisfy needs and achieve goals. The elicited mental models would be consolidated into the designers' and nondesigners' group models, compared and analysed. Valued goals, anticipations, and differences (between the designer group and nondesigner group) identified in the Part One Mental Modelling would be incorporated into the Part Two Survey for further checking.

A preview of Figure 18 and Mental Model B on the online modelling platform are shown below.

Preview of Figure 18 – Mental Modelling SCAMPER brainstorming framework for Model B – eliciting enhancement ideas resolving pain-points identified in Model A; and the Mental Modelling online platform

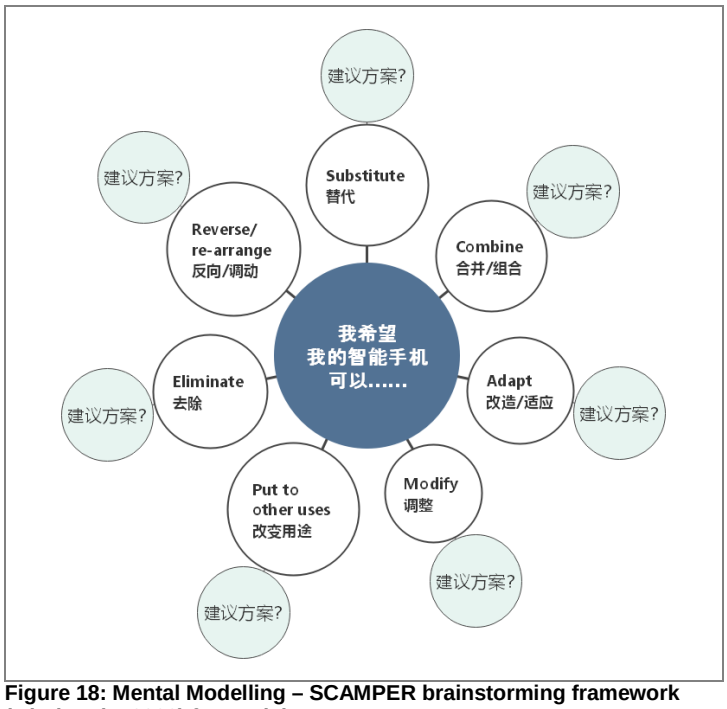
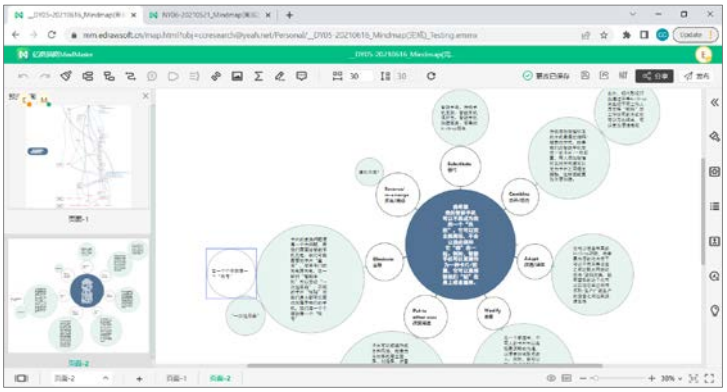


Figure 18: Mental Modelling – SCAMPER brainstorming framework (MindTools, 2022) for Model B



Mental modelling (Model B) with MindMaster online platform

3.4 Conceptual definitions of key variables and terms

This section defines the key variables and terms used in this thesis with reference to relevant conceptual definitions from the literature and the interpretations / applications of the terms in the contexts of the current study. The operational definitions of the key constructs in the proposed conceptual framework would be further summarised in **Section 5.2.1** when the research processes are discussed under **Chapter 5**.

Designer, nondesigner, user

Literally and conceptually, “designer” is defined by the Britannica Dictionary (n.d.-a) as a person who plans the look and making of something new; by the Oxford Learner’s Dictionaries (n.d.-a) as a person whose job is to decide how things look or work by making drawings, plans or patterns; and by the Merriam-Webster Dictionary (n.d.-a) as one who creates a new product style or design, and who may also involve in the manufacturing or execution of projects.

For the term “user”, both the Britannica Dictionary (n.d.-b) and Oxford Learner’s Dictionaries (n.d.-b) define it as “a person or thing that uses something”, while the Merriam-Webster Dictionary (n.d.-b) defines it even simpler as “one that uses”.

In discussions of the current study, product designers / designers in general refer to the practitioners in the industry who design (create) and re-design products; whereas nondesigners refer to people who are not design practitioners in the industry. Users refer to persons who use a concerned product (such as the smartphone exemplar). Despite the designers and producers themselves may use the products they design / produce in product trials or in real life, “users”, unless otherwise specified, refer to the general people who adopt the product after its launch into market. As such defined, users of a specific product are nondesigners in respect to the product, and the nondesigners include users and potential users of the concerned product. The “user” and “nondesigner” groups in fact overlap, and the two terms are

interchangeably used in the current thesis in respect to the context / point of concern.

In the research data collection, designers are represented by participants / respondents who practice design as a student or a professional; whereas nondesigners are represented by participants / respondents who study / work in specialisms other than design. All participants / respondents are required to have at least one year's experience of using smartphones. In the study's role-taking scenarios, the designers and nondesigners are further labelled according to their under-taken roles as below (definitions also given in **Section 3.1**):

Designer-designer (DD):	A real-world designer (self-reported) who played a designer role in response to particular question(s) / task(s) in the research
Designer-user (DU):	A real-world designer (self-reported) who played a user role in response to particular question(s) / task(s) in the research
Nondesigner-designer (NDD):	A real-world nondesigner (self-reported) who played a designer role in response to particular question(s) / task(s) in the research
Nondesigner-user (NDU):	A real-world nondesigner (self-reported) who played a user role in response to particular question(s) / task(s) in the research

Perception

"Perception" is defined by APA Dictionary of Psychology (n.d.-a) as the "process or result of becoming aware of objects, relationships, and events by means of the senses, which includes such activities as recognising, observing, and discriminating". The perception process enables individuals to organise and interpret stimuli into a meaningful picture of the world, possibly involving personal selection and subjectivity (Schiffman & Kanuk, 2007).

In the current study, the perception of user / designer on a product, such as its values and use experience, refers to the user's / designer's interpretation of the product aspects forming their own views / concepts and mental models of

product values and use experience.

Mental model / conceptual model

"Mental model" is defined by APA Dictionary of Psychology (n.d.-b) as the "internal representation of the relations between a set of elements" which may be perceptual or abstract. In the product context, a related mental model could include the product's "various attributes, rules for operation and handling, and expectations regarding use and consequences" which would guide the individual's interactions with the product.

In other words, Norman (1988, 2013) defined "mental models" as the conceptual models in people's minds of what things do and how things work, and such models may be expressed in different media and formats (e.g. descriptive text, hierarchical maps, network maps) to represent individuals' or groups' perceptions of the "thing".

In this thesis, the terms "mental models" and "conceptual models" may be used interchangeably to fit the contexts. In Part One (Mental Modelling) of the current research, the mental models of users / designers are elicited / represented in form of mindmaps*.

Note:

* *A mindmap is "a diagram for representing tasks, words, concepts, or items linked to and arranged around a central concept" using a non-linear layout that facilitates the user constructing "an intuitive framework around a central concept" (MindMapping.com, 2022). British scholar Tony Buzan has promoted the mindmapping technique since the 1970s as a thinking tool that "aligns with the human brain's natural way of doing things". The mindmap was selected as the appropriate thinking and presentation tool for the mental models considering its flexibility and extendibility for laying out the model hierarchy in visual+textual forms ensuring the ease of use by both designers and nondesigners.*

User experience

"User experience (UX)" is the experience of the user interacting with a product, service, system, or more. In the context of this thesis, "user experience" most of the time refers to "experience" involving a product, possibly with accompanying services.

In a broad sense, product related user experience involves the user's interaction with the product before, during and after purchase, including consumers' reaction to the advertisements, the experience of shopping, unpacking and assembling the parts (if necessary), learning to use the product (e.g. reading the manual, trial and error), using the product, maintaining the product, evaluating the usability, reminiscing the enjoyment / satisfaction / dissatisfaction, and contemplating future uses (with reference to Norman, 2013; Winter, 2015). As stated in earlier sections, the current study focuses on investigating "user experience" in the post-purchase part.

"User experience" is sometimes referred to as "consumer experience" when the "user" is a real-life consumer of the product.

Use experience

"Use experience" mainly refers to the post-purchase part of the broad range of user experience, when the product is actually used.

In some situations, "use experience" covers the interacting experience of persons in roles other than the consumer-user, such as a designer or tester who momentarily tries or imagines using the product. (Ideally, the designer or tester is supposed to apply the empathy of role-playing as a real consumer-user.)

Self-efficacy

"Self-efficacy" is defined by APA Dictionary of Psychology (n.d.-c) as "an

individual's subjective perception of his or her capability to perform in a given setting" to attain the desired outcomes. In simpler words, it may be defined as a person's belief about his / her own ability to accomplish tasks and achieve the desired objectives (Bandura, 1977a, 1986). The concept of self-efficacy originates from "Social Cognitive Theory (SCT)", and Bandura (1977a) suggested that self-efficacy might be built from sources such as performance accomplishments, vicarious experience (observing others' accomplishments), verbal persuasion, and positive physiological and affective states.

As discussed in **Section 2.9** "Designer, product, and user (self-)efficacies", the empirical results (survey responses) of the current study revealed significant discrepancies in the need perception of respondents playing the roles of designer and user, and such discrepancies are projected as possibly associated with the difference in self-efficacy between the "expert" designers and "layman" users, and perhaps simultaneously associated with the differentiated evaluation for the self and others (also possibly moderated by self-efficacy). These projected possibilities contributing to the designer/user gap need to be further investigated in future research.

Attributes in the Conceptual Framework:

Perceived product values

In reference to Zeithaml's (1988) definition of "perceived value", "perceived product values" in the current study refer to a user's overall assessment of the benefits of the product based on perceptions of what is (will be) received and what is (will be) given. Every individual uniquely perceives a value based on his / her interaction and experiences with the product (Holbrook, 1999, 2005), which may be actual or expected. As defined above under "perception", the perceived product values, together with other product aspects interpreted by a user, form the user's overall perception on the respective product.

In the current study, the perceived product values are assessed under the four

domains of perceived utilitarian values, perceived hedonic values, perceived social values, and perceived innovative values. As discussed in Section 3.1, the perceived hedonic and social values are recognised as more intrinsic values relative to the perceived utilitarian and innovative values which are recognised as more extrinsic (Leung & Wei, 2000; Kalafatis et al., 2010). The current study projects that the perceived intrinsic values (hedonic and social values) mediate the impact of perceived extrinsic values (utilitarian and innovative values) on perceived satisfaction and / or intention of continuous use.

"Perceived utilitarian value" refers to the perceived benefits acquired from a product's capacity for functional, instrumental performance (Sheth et al., 1991a). Functional / instrumental benefits are often the more obvious, purposeful and expected performance derived from the product's tangible and concrete attributes which a user may directly experience during consumption (Lai, 1995).

"Perceived hedonic value" refers to the perceived benefits acquired from a product's capacity to arouse feelings or affective states, through the sensations derived from interacting with the product (Batra & Ahtola, 1991; Sheth et al., 1991a). Such derived feelings / affective states, like enjoyment, pleasure, or anxiety, are often associated with the users' personal / cultural tastes, meanings and memories (Lai, 1995), and hence tend to vary across individuals.

"Perceived social value" refers to the perceived benefits acquired from a product in relation to specific social / reference groups valued by the user (Sheth et al., 1991a). Such benefits may include the enhancement of social self-concept (Sweeney & Soutar, 2001) or connection with the groups and / or their members.

"Perceived innovative value" refers to the perceived benefits acquired from a product's capacity to arouse curiosity, provide novelty, satisfy desire for new experience, and / or differentiate from the competitors in a meaningful way

(Sheth et al., 1991a; Sethi et al., 2001).

Perceived satisfaction, and Intention of (continuous) use

"Perceived satisfaction" refers to a psychological affective state related to and resulting from a cognitive appraisal of the expected (product) performance, or the "expectation performance confirmation / discrepancy" in the terms of the expectation-confirmation theory (ECT) (Bhattacherjee, 2001). Higher performance and / or lower expectation would result in stronger confirmation, which in turn lead to greater satisfaction and intention of (continuous) use. It has been theorised and validated in ECT and TAM based studies that "satisfaction" is an important predictor of "intention of (continuous) use" (e.g., Oliver & Swan, 1989; Bhattacherjee, 2001; Davis, 1989).

"Intention of continuous use", also termed as "continuance intention" in the literature (Bhattacherjee, 2001), refers specifically to the post-purchase and / or post-use behavioural tendency to continue using the product; whereas "intention of use" may refer to both new and continued adoption of the product and / or its features.

Individual innovativeness

(An individual characteristic proposed as antecedent and moderator for testing)

Individual / personal innovativeness has been defined in prior studies as the willingness of an individual to try out new things in general, or domain-specific entities such as new information technology (Agarwal & Prasad, 1998; Chen, 2015). With reference to the above definition, the current study defines "individual innovativeness" as the willingness of an individual to try out new products / features in the context of smartphone (the exemplar smart communication product used in the study).

The moderating effects of individual innovativeness on the proposed causal relations are tested in the current study. The "willingness" is operationally measured by the self-reported answers to questionnaire items, adapted from

Goldsmith and Hofacker (1991) and Pagani (2007), asking about the respondents' attitude and intention for adopting new smartphones, and perceived comparison within his / her social groups.

Personality traits

(Individual characteristics proposed as moderators for testing)

"Personality trait" is defined by APA Dictionary of Psychology (n.d.-d) as "a relatively stable, consistent, and enduring internal characteristic" inferred from a pattern of "behaviours, attitudes, feelings, and habits" in the individual. Prior studies show that personality traits may predict and explain to some extents an individual's conducts including career choice and consumer behaviours, as reviewed respectively in **Section 1.2** "Aims and objectives" and **Section 2.8** "Personality and consumer / user perceptions". Considering such, differences in personality might be among the underpinning factors contributing to potential gaps between designers' and nondesigners' product perception. Therefore the possible moderating effects of personality traits on the causal relations in the proposed conceptual framework are tested.

Among different personality assessment scales, the Big Five (BF) Personality Traits (McCrae & John, 1992) are most commonly applied and validated in scientific research as well as public surveys (吴琼 & 谷丽萍, 2020). The Chinese version 15-item BF scale tested in the China Family Panel Studies 中国家庭追踪调查 (as cited in 吴琼 & 谷丽萍, 2020) is adopted in the survey of the current study for assessing the respondents' personality traits.

Definitions for the BF main dimensions of Openness to Experience, Neuroticism, Extraversion, Agreeableness, and Conscientiousness are depicted as below (Costa & McCrae, 1985, Eysenck, 1947, Norman, 1963, as cited in Zu, 2016):

Openness to experience is associated with traits showing open-mindedness, active imagination, aesthetic sensitivity and intellectual curiosity such as being creative, adventurous, variety-seeking, and appreciating arts, poetry or

philosophical discussions.

Neuroticism refers to traits showing emotional instability such as being anxious, worried, nervous, insecure, or depressed.

Extraversion is associated with traits showing sociable and outgoing characteristics such as being out-spoken, active, and enjoying parties and talking to people.

Agreeableness refers to traits showing kindness and compatibility such as being courteous, cooperative, tolerant, and trusting.

Conscientiousness represents traits showing industriousness and orderliness such as being diligent, responsible, organised, thorough, and planful.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Research paradigm

Traditional views held that researchers should have clear philosophical stance, and paradigms such as positivism and interpretivism were somehow mutually exclusive (Easterby et al., 1991; Knox, 2004). However, both the philosophical and methodological boundaries are getting more "permeable" (Saunders & Tosey, 2012; Saunders et al., 2012), and views have evolved towards the belief that the choice of research approaches and methods should suit the research question instead of being restricted by the researcher's philosophical stance (Yate, 2004; Saunders et al., 2012). In practice, most social research is recognised to have involved both deductive and inductive reasoning at different stages and methodologies are used in a complementary way (Trochim, 2006).

The current research integrates the paradigms of interpretivism (inductive approach) and positivism (deductive approach) at different stages. The research will flow from "inductive" in the first part to "deductive" in the second part, which coincides with the "exploratory sequential design" defined by Creswell (2013). While the first inductive part (mental modelling) collects and analyses the participants' thoughts in a relatively explorative manner, the findings would be fed into the second deductive part (survey) for further investigation and verification.

The corresponding design of the research methods and processes is explained in the following sections.

4.2 Choice of exemplar product(s) and research region(s)

In the information society of today, the computer and mobile phone are common everyday products in the developed and developing countries. With the advancements of the telecommunication technology and the ever-continuous miniturisation of digital components, accessibility to information is expected to be anytime-anywhere with the worldwide popularity of mobile devices (Kim & Shin, 2015). The penetration rate of mobile phones has surpassed the home computers – 98.7 percent for mobile phones and 53.6 percent for home computers in the developed and developing countries in 2017 according to the International Telecommunications Union's Facts and Figures (Sharwood, 2017). The ubiquity of personal communication is furher promoted by the evolvement of smart wearable devices, which include the smart watches, smart glasses, and smart clothing, etc.

The mobile communication family has presented a wide range of products at different adoption stages involving different research opportunities. When the research was initially planned in 2018, the smartwatch at the early adoptor stage was once considered as an exemplar for elicting the designers' and nondesigners' mental models through focus groups / experiential workshops where the participants would perform tasks with smartwatches provided. The consideration had taken into accout the observation that the category involved award winning models with acclaimed designs, such as the Apple Watch, winner of IF Design Award (Dormehl, 2015) and Red Dot Award in 2015 (Red Dot, 2015), and the Ticwatch, winner of Japan Good Design Award in 2016 and IF Design Award in 2017 (Vane, 2017). However these models did not receive the favourable acceptance as the markets had expected from the consumers – so the smartwatch might be a suitable exemplar to study whether its delayed adoption could be explained to some extent by the possible differences in the mental models of designers and general users.

The plan later adjusted considering the unfavourable environments against conducting face-to-face workshops from mid-2019 up to end 2022. With the intermitten closure of campuses since 2019 under the impact of social

movements in Hong Kong and later the COVID-19 globally, contacts with the early targeted respondents, the local university students, bacame difficult. Even when the campuses were open during certain intervals, extracurricular (face-to-face) group activities were prohibited most of the time. Taking into account of all these factors, the mental modelling activities of the Part One research have gone online and expanded the geographical area to cover China's Mainland. Instead of being provided with product samples for experiencing in onsite workshops, the respondents would respond based on his / her user experience with the smartphone which has a higher penatration rate than the smartwatch (around 67% for the smartphone compared to 24% for the smartwatch in China by January 2022, **Table 3**) (DataReportal, 2022). Since the purpose of the research is to understand and compare users' and designers' mental models, the product is only a media / means instead of the centre of focus, despite the resulted mental models and comparison would deem to be different with varied means. Rounds of studies may be needed with different product categories, such as high and low involvement products, instrumental against ritualistic products, to test if they lead to different or comparable study results. The mobile communication product, like the smartphone or smartwatch, is a good point to start with as a high-involvement, all-rounded, and technology-advanced product which would carry the values in the aspects of utilitarian, hedonic, social and innovative. The smartphone / smartwatch is also sex-free in itself (Wan et al., 2014), although male and female users may have different preferences for styles and uses.

Table 3: IT adoption rates in Mainland China early 2022 (DataReportal, 2022)

China (Mainland)	Population	Internet users	Mobile connection	Smartphone penetration	Smartwatch penetration
Jan 2022	1.45 billion	70.9%	112.6%	67.1%	23.9%

Smartphones are defined as mobile phones that have multiple functions similar to, or more than, those expected of a regular computer (Digital Unite, 2022). They are comparable in size, shape and weight as a normal mobile phone. Apart from making and receiving phone calls and text messages, it can connect the

user to the world via mobile service or wifi connections accessing email, web and social media platforms. It provides tools and memories for music, photographs, videos, information, and more. What makes it omniscient, difficult to depart with, and infinite in growth potential is its ability to run programs known as “apps” providing a wider range of functions from games to word / image processors, different language translators, health monitors, and financial and shopping platforms. With various positioning / sensing capabilities and 5G, the smartphone becomes the user’s companion on the go, and key to the home and Internet of Things (IoT).

4.3 Sampling

In the initial research design, it was proposed to invite students from the faculty of design and other faculties such as business, IT, and languages in universities and higher education institutes as participants / respondents for Part One and Part Two of the research. Students from the design-related specialisms would represent the "designer" group, whereas students from other specialisms would represent the "nondesigner" group. The participants / respondents are required to have at least one year's experience of using smartphones.

The sampling approach is a combination of purposive and convenience sampling with both advantages and compromises (Miles & Huberman, 1994). A major advantage is that the targeted students are of similar age and educational level, which eliminates the possibility of the age and education factors influencing the results. The limitation is that the findings drawn from the study with this particular age and education group may not reflect the situation of the wider population, and further studies with the other demographic groups are needed to verify the broader generality of the findings.

After reviewing the results from the Pilot 1 test for the survey, it was decided to extend the target respondents for the survey to other age groups in design and non-design fields. Upon further testing in Pilot 2 with broadened age groups, the target sample for the full-scale survey was set to be respondents with tertiary education or above at the age of 18 to 40 studying / working in design and non-design fields to facilitate the setup of cross-group comparison in the questionnaire. Further details are explained in the **Chapter 5** "Research Processes, Results and Discussions".

4.3.1 Part One sampling and sample size

For Part One Mental Modelling, 49 students meeting the research requirement were recruited through the faculties and student / graduate coordinators of China's universities, of whom 27 in design related specialisms and 22 in non-design-related specialisms. **Table 4** shows the demographic characteristics of

the participants. These candidates were contacted before the Mental Modelling sessions to ensure that they had experience using a smartphone for at least one year, and had a computer and internet connection capable of online meeting and manoeuvring of the MindMaster online tool for constructing the mental model.

To determine the appropriate sample size for a qualitative research process, the saturation approach (Glaser, 1965; Lincoln & Guba, 1985; Sandelowski, 1995) is commonly recommended, that is to continue including further participants or materials until saturation of information is reached. The reach of saturation may however involve certain subjectivity of judgment, and should consider the study aim, sample specificity, use of established theory, quality of dialogue, and analysis strategy, etc (Malterud, 2015). In practice, samples between 20 and 30 were recommended by scholars for qualitative interviews (Mason, 2010). Boddy (2016) opined that the sample size needed to be enough but not too large, and that more than 30 was regarded too large. Taking into account of the above factors, the target sample size of minimum 40 participants in total, 20 each in the designer group and nondesigner group was set.

Table 4: Part One Mental Modelling – Demographic characteristics of participants

		Designers		Nondesigners		Total	
		Count	%	Count	%	Count	%
Gender：	Male	12	44.4%	9	40.9%	21	42.9%
	Female	15	55.6%	13	59.1%	28	57.1%
Age：	18-20	6	22.2%	4	18.2%	10	20.4%
	21-25	20	74.1%	18	81.8%	38	77.6%
	26-35	1	3.7%	0	0.0%	1	2.0%
Gender：	Tertiary / Technical College	1	3.7%	0	0.0%	1	2.0%
	Undergraduate	22	81.5%	15	68.2%	37	75.5%
	Master or above	4	14.8%	7	31.8%	11	22.4%
Current status：	Student	24	88.9%	21	95.5%	45	91.8%
	Others (e.g. studying + working)	3	11.1%	1	4.5%	4	8.2%
	Total	27	100.0%	22	100.0%	49	100.0%

4.3.2 Part Two sampling and sample size

The Pilot 1 and Pilot 2 tests for the survey of Part Two targeted at a minimum of 40 respondents, ideally a half-and-half split between the design and nondesigner groups. The target was set taking into account the ability of the sample size for testing the reliability and validity of the measurement scales (e.g. Cronbach's Alpha test) and for checking other tendencies.

For the Pilot 1 survey test, a total of 47 students from China's universities, invited through the university faculties and student / graduate coordinators, responded to the Pilot 1 questionnaire. One of the responses was screened out as that respondent was currently studying and living in Hong Kong. To avoid the influence of Hongkong-Mainland cultural and institutional differences on the sample, the Hong Kong case was excluded from the subsequent analysis. Among the remaining 46 respondents, 25 were in design related specialisms and 21 were in non-design-related specialisms. **Table 5** shows the demographic characteristics of the respondents.

Table 5: Part Two – Pilot 1 test for Survey – Demographic characteristics of respondents

		Designers		Nondesigners		Total	
		Count	%	Count	%	Count	%
Gender：	Male	10	40.0%	8	38.1%	18	39.1%
	Female	15	60.0%	13	61.9%	28	60.9%
Age：	18-20	5	20.0%	4	19.0%	9	19.6%
	21-25	19	76.0%	17	81.0%	36	78.3%
	26-35	1	4.0%	0	0.0%	1	2.2%
Gender：	Tertiary / Technical College	1	4.0%	0	0.0%	1	2.2%
	Undergraduate	20	80.0%	15	71.4%	35	76.1%
	Master or above	4	16.0%	6	28.6%	10	21.7%
Current status：	Student	22	88.0%	20	95.2%	42	91.3%
	Others (e.g. studying + working)	3	12.0%	1	4.8%	4	8.7%
	Total	25	100.0%	21	100.0%	46	100.0%

For the Pilot 2 survey test, respondents were invited through the Tencent Survey platform of Mainland China. Out of the 55 responses received, 7 were spotted to have significant problems of "longstring" answers and / or contradictory answers for the reverse-worded questions, signifying doubtful validity for the respective sets of responses. Another 5 outlier cases were identified with the sorting method and Z-score larger than ±3 (Shiffler, 1988; Frost, 2019) in their responses to the key constructs. After screening out the above 12 cases, the remaining 43 responses were used for subsequent analyses. Among the 43 respondents, 17 were in design related specialisms and 26 were in non-design-related specialisms. **Table 6** shows the demographic characteristics of the respondents.

Table 6: Part Two – Pilot 2 test for Survey – Demographic characteristics of respondents

		Designers		Nondesigners		Total	
		Count	%	Count	%	Count	%
Gender：	Male	10	58.8%	4	15.4%	14	32.6%
	Female	7	41.2%	22	84.6%	29	67.4%
Age：	18-20	2	11.8%	5	19.2%	7	16.3%
	21-25	4	23.5%	14	53.8%	18	41.9%
	26-35	7	41.2%	5	19.2%	12	27.9%
	36-45	3	17.6%	1	3.8%	4	9.3%
	46-55	1	5.9%	1	3.8%	2	4.7%
Education：	Tertiary / Technical College	4	23.5%	7	26.9%	11	25.6%
	Undergraduate	11	64.7%	17	65.4%	28	65.1%
	Master or above	2	11.8%	2	7.7%	4	9.3%
Status：	Student	6	35.3%	11	42.3%	17	39.5%
	Working	11	64.7%	13	50.0%	24	55.8%
	Others	0	0.0%	2	7.6%	2	4.6%
	Total	17	100.0%	26	100.0%	43	100.0%

For the full-scale survey, the target sample size was set at around 800, taking into consideration the recommendations from the literature. While it is mostly agreed that the sample size should be large enough to properly detect the statistical inferences with the data, there are a number of approaches recommended for estimating the appropriate sample size for quantitative surveys. Some researchers (e.g. Bentler, 1989; Kline, 2011) recommended the

N:q of 10:1 between the sample size (N) and the number of model parameters (q) as a "rule of thumb". Hair et al. (2010) suggested that the sample size should be at least five times of the number of items in the questionnaire. Kenny (1987) and some others preferred a more rational estimation based on the desired statistical power, considered together with a predetermined Type I error rate (alpha) and the expected effect size (which is the expected difference between the means of the target values between the groups to be compared, divided by the expected standard deviation). While the desired sample size can be calculated through the formulas, he also provided a reference table (**Table 7** below) for checking the sample size required for scenarios in a two-group test.

The full-scale survey in the current study has taken reference of the "power-effect size" approach in determining the target sample size for the approach's rationality and fit with the research condition involving two-group comparisons. Following the norm in social research requiring a statistical power of 0.8, and projecting the effect size to be small (such as 0.2, effect needs to be detected through statistical analyses), the required sample size would be 393 times 2 groups, that is 786 (**Table 7**, Kenny, 1987). Hence a sample size of at least 790 was targeted for the full-scale survey.

Table 7: Sample size required for a two-sample T-test to achieve a given level of power for a given Effect Size and Alpha of .05 (Kenny, 1987)

Power	**Effect Size Cohen's d**		
	0.2	**0.5**	**0.8**
0.25	84	14	6
0.50	193	32	13
0.60	246	40	16
0.70	310	50	20
0.80	393	64	26
0.90	526	85	34
0.95	651	105	42
0.99	920	148	58

The actual number of responses received for the full-scale survey was 1203. Respondents were invited both through faculties of China's universities and the Tencent Survey platform. A stratified sampling technique was employed when

inviting responses from the Tencent Survey platform to strike a better balance between the gender and age groups, so as to facilitate the designer/user role-taking scenarios on the one hand, and to avoid the potential confounding concern arisen from gender and age distribution bias on the other hand. Plausible challenges confronting the sampling control could be: actual recruitment may not fill the quota for all strata, or evenly filled strata become uneven after data cleansing. After the data cleansing process which has screened out 77 outliers and 335 potentially invalid responses according to pre-set criteria, 791 responses (232 designers and 559 nondesigners) were used for subsequent analyses. **Table 8** shows the demographic characteristics of the respondents. More details about the cleansing process can be referred to in **Section 5.5.2** "Data Cleansing".

Table 8: Part Two – Full-scale Survey – Demographic characteristics of respondents

		Designers		Nondesigners		Total	
		Count	%	Count	%	Count	%
Gender：	Male	125	53.9%	275	49.2%	400	50.6%
	Female	107	46.1%	284	50.8%	391	49.4%
Age group：	18-25 male	63	27.2%	125	22.4%	188	23.8%
	18-25 female	78	33.6%	152	27.2%	230	29.1%
	26-40 male	64	27.6%	137	24.5%	201	25.4%
	26-40 female	27	11.6%	145	25.9%	172	21.7%
Education：	Tertiary / Technical College	38	16.4%	136	24.3%	174	22.0%
	Undergraduate	150	64.7%	361	64.6%	511	64.6%
	Master or above	44	19.0%	60	10.7%	104	13.1%
Status：	Student	94	40.5%	133	23.8%	227	28.7%
	Working	132	56.9%	402	71.9%	534	67.5%
	Total	232	100.0%	559	100.0%	791	100.0%

4.4 Ethical considerations

Before and during the research, the ethical requirements (Bouma, 2000) have been considered and observed in respect of the research nature. Basic requirements taken care of include informed consent, confidentiality of data, anonymity of participants' identity (Rotondi,1989), and right for participants to withdraw from the research, etc. Internal guidelines (e.g. UWTSD's codes of practices on research and ethics) and external references (e.g. the related regions' privacy laws, the relevant codes of practices from professional bodies) (**Appendix 2**) have been consulted, and ethical approval has been obtained from the University of Wales Trinity Saint David (UWTSD) before the field research started.

4.4.1 Informed consent

To ensure that the participants (for Part One Mental Modelling) and respondents (for Part Two Survey) fully understand the research purpose, nature and their expected role before they decided to participate, the researcher took all opportunities to convey the information to the potential candidates. Firstly, a brief introduction about the research was included in the invitation messages sent out for both Part One and Part Two. Secondly, the coordinators would explain the Part One Mental Modelling session's arrangement to the would-be-participants when making appointment with them for the session. Thirdly, at the beginning of the online meeting session before the mental modelling activity started, a research brief and consent form (**Appendices 3a & 3b**) was passed to the participant for his / her reading and return with digital signature. The brief and consent form clearly stated the research purpose, nature, participant's expected role and time spent, the required video / audio recording, confidentiality of the collected data, their right to withdraw at any time, contact of the researcher, and access to further information about the research, etc. There was a note to remind that participants for the research should be 18 years of age or above. The participant would confirm on the form that he / she had read and understood the content, and agree to participate in the research. The participant would be debriefed at the end of the session.

Finally, a message similar to the brief used in Part One was included at the beginning of the questionnaire for the Part Two Survey for the respondents' understanding about the survey and their rights. In the case of the online survey, it is commonly recognised that completing and submitting the questionnaire implies consent given by the participants.

4.4.2 Protection of confidentiality and anonymity

The uphold of confidentiality of personal data and anonymity of participants' identity is important, because breach may cause undesirable impact on the participants / respondents and violation of the law. For such purpose, the researcher has avoided the use of any personal identifiers such as individual names and contacts in the research data records and reports which could lead to the human participants being identified.

During the research process, the responses are identified by codes instead of respondents' names; the responses and respondents' data are kept in separate files; all data is securely kept under password protection, and in physically locked places when not in use.

After the completion of the research, the data without personal identification may be kept for academic and professional reference. For example, the final dissertation would be archived in the University's library. The data with personal identification, such as the video / audio records taken at the mental modelling sessions would be stored for three years after the completion of the dissertation. Such data would then be destroyed or have the identifiers removed depending on the type of data.

4.5 Validity and reliability

4.5.1 Part One – Mental Modelling

As the Part One mental modelling approach for eliciting the mental models of designers' and nondesigners' perception, use experience and anticipation of the smartphone has integrated both qualitative and quantitative characteristics in the research processes. In place of the statistical tests for checking the internal and external validity of statistical data, the "trustworthiness" of the data and processes are reviewed in the aspects of credibility, authenticity, transferability, dependability, and confirmability (Lincoln & Guba, 1986; Stahl & King, 2020) where applicable.

Credibility concerns the congruence of the findings with reality. The mental modelling process via a mindmapping tool employed in the Part One research sessions is less subject to interpretative bias than conventional interviews. The participants were requested to construct their own mindmaps via MindMaster's online platform. The process had been pre-tested to make sure that it worked with participants with no mindmapping experience, and that the written briefing on the consent form and verbal briefing given by the researcher were clear enough. During the mental modelling process, other than explaining the purpose and procedure of the research, and the MindMaster application, the researcher would refrain from influencing the participants' construction of their mindmaps. Any observed doubts would be clarified with the participant at the end of the modelling session, or after the session. The online mental modelling sessions were video-recorded so that conversations and happenings if any can be checked. During the consolidation and analysing processes, the consolidated group models were drawn up with elements shortlisted and sorted based on their frequency of occurrence across the group participants' models. Since Part One findings were to be incorporated into the Part Two Survey for further verification as appropriate, the findings are hence triangulated across the two different research methods for testing their validity.

According to Lincoln and Guba (1986), authenticity deals with fairness, and implementability of the research outcomes. The more relevant concern of fairness is reviewed here. To facilitate the expression of participants not familiar with mindmapping, a card pool was provided for all participants where they could pick the desirable card elements to reflect their perception and use experience in the mental model (Model A) if they wished to. They could also create their own elements. The SCAMPER framework (MindTools, 2022) for the anticipation mental model (Model B) also promoted fairness between the designer and nondesigner participants in the brainstorming for enhancement ideas by providing prompts for possible lines of thought along “Substitute”, “Combine”, “Adapt”, “Modify”, “Put to another use”, “Eliminate” and “Reverse”. Equity is further ensured by labelling the individual mental models with codes keeping the anonymity of the participants during the analysing process.

Transferability concerns the replicability of the research process or findings to another context. A general review reveals high potential of applying the process at another time, for another product, or in another region of the world, with corresponding adjustment in the contexts and language of the research tools. The replicability of the process with another target participant group may require the group to be at least computer-able in order to use the mindmapping software. The transferability of the findings would require further checking of the “degree of fit or similarity” between the different categories of product / service, people, or place. Detailed instructions and records have been kept so that necessary comparison and judgment can be made.

Dependability and confirmability call for objectivity in the process, data and findings. As the researcher’s involvement inevitably induces subjectivity in qualitative researches, the involvement of a second researcher, peer review, and least involvement of the researcher are recommended. This study has chosen to apply direct elicitation in the mental modelling to avoid the interpretation / researcher bias possibly found in indirect elicitation (LaMere et al., 2020; Doyle et al., 2022). It has minimised the involvement of the researcher by administering a self-constructing mental modelling process (through a mindmapping tool manoeuvrable by the participants) instead of the

conventional interview in eliciting the participants' perceptions. Observations and analytical interpretations have also been separately recorded and kept (away from the mental models) to maintain objectivity for the observations.

4.5.2 Part Two – Survey

Validity

Validity concerns whether a study tests what it aims to test, and whether an instrument measures what it was designed to measure (Field, 2009). In general, “internal validity” cares about the internal control of a study, whereas “external validity” cares about the generalisation of the study results to the population. Specifically, common validity dimensions to be addressed may include: face validity, content validity, criterion validity, and construct validity (Burns & Burns, 2008).

Face Validity

Face validity addresses whether the content of the test appears to be suitable for its aims, which to some extents has to depend on the judgment of experts and professionals in the respective fields (Burns & Burns, 2008). In this research, local and Chinese design and non-design academia / professionals have been consulted during the development and pilot tests of the instruments. Feedback was also collected from the students / graduates who assisted in the early testing of the instruments for subsequent enhancement.

Criterion validity

Criterion validity compares the current test results to those from another more well-established survey to see how well the results approximate that “criterion” (Fink, 2010). The comparison could be concurrent or predictive. At the moment, there is not one conducted survey that can represent the gold standard of the current study which has made reference to a number of past studies and incorporated new exploratory aspects in its design. The results would be compared to the respective reference studies to look for convergence or divergence (related discussions in **Chapter 6** Discussions and Conclusion).

Content Validity

Content validity assesses whether the test content comprehensively reflects the intended content to be tested (Burns & Burns, 2008). Efforts have been made to ensure the content validity of the current study by making reference to past validated measurement scales, consultation with the experts, and checking through the pilot tests.

Construct Validity

Convergent validity and discriminant validity

Construct validity is the accrual of evidences to support the interpretation of what a measure intends to reflect (Cronbach & Meehl, 1995). Scholars regard it as the overarching concern of validity in research (Messick, 1995). Convergent validity (degree of association among related measurements) and discriminant validity (degree of non-association across unrelated measurements) are two of the important evidences for proving construct validity. The convergent and discriminant validity of the measurements may be checked by examining the item associations in the correlation matrix and factor loading matrix (e.g. rotated component matrix in Principal Component Analysis) generated in factor analysis. The factor analysis results and construct validity checking for the current study can be referred to in **Section 5.5.6**.

Causal relations and confounding

Notwithstanding the testing technique used, be it multivariate regression analysis or structural equation modelling, suggesting / establishing a "sensible" causal relationship requires the fulfilment of specific criteria. The classic formula of John Stuart Mill (Duckworth et al., 2010) specifies three criteria to be met: firstly, "temporal precedence", that is the cause precedes the effect; secondly, "covariance", that is the cause and effect are related; and thirdly, "disqualification of alternative explanations", that is all variables accounted for the relationship are taken care of. Other scholars suggest the fourth criteria that

the proposed causal relation should be derived from / backed up by theories and prior research (Wunsch et al., 2006; Gelman & Hill, 2006; Gelman et al., 2020).

Mill's third criteria relates to the risk of "omitted variable bias" when influencing variables are not accounted for, and the existence of "confounding" variables which may affect the parameter and regression coefficient estimation. Duckworth et al. (2010) points out that while confounding variables should be identified, measured, and controlled, it is theoretically impossible to be sure that all potential confounders have been measured as certain confounders might not be practically measurable. Statistical techniques available for dealing with / adjusting such potential bias and confounders include: random sampling, matching, stratification, multivariable adjustment, propensity scores, and instrumental variables (randomisation, matching, propensity scores more applicable for experimental than observational research design) (Mehta, 2001; Wunsch et al., 2006).

In the current research study, causal relations being tested include: (a) the influence of personality traits on consumers' perceived product values; (b) the influence of perceived product values on perceived satisfaction; and (c) the influence of perceived satisfaction on intention of continuous use. While close correlations (Mill's second criterion) are found between perceived product values and perceived satisfaction, and between perceived satisfaction and intention of continuous use, the correlations between various personality traits and perceived product values somehow vary. The researcher may consider excluding those personality traits showing no significant correlation with any of the perceived product values from the regression tests.

On the one hand, the general logical sense would agree that the proposed predictors come before their respective outcome variable in the three concerned relations (a, b, c) described above. On the other hand, the study sets out to enhance and update the conceptual framework along the line of "perceived values – satisfaction – behavioural intention" models drawn from previous studies (detailed in **Chapter 2 Literature Review** and **Chapter 3 Research**

Framework and Hypotheses, and summarised in **Table 2**). The temporal and conceptual relations have been acknowledged, tested and verified in different studies with a range of predictor values. So adding an updated perceived innovative value should not jeopardise the established causal path between perceived product values and perceived satisfaction. Hence the first and fourth criteria recommended by Mill and other scholars are fulfilled.

Concerning potential confounders (Mill's third criterion), possible influencers affecting the value-satisfaction causal relations could be personal characteristics like personality traits, age and gender, etc. In the current study, personality traits have been included for testing as antecedents as well as moderators. Stratified sampling has been applied for the survey with quotas on age and gender, so as to facilitate the designer/user role-taking scenarios on the one hand, and to avoid the undesirable impact of uneven distribution between gender and age groups on the other hand. Plausible challenges confronting the sampling control could be: actual recruitment may not fill the quota for all strata, or evenly filled strata become uneven after data cleansing. Nevertheless, if there are further potential confounding variables identified, the multivariable adjustment approach may be applied to evaluate the "effect modification" of the suspected variable(s) and have them controlled, provided the suspects are practically measurable.

Reliability

Reliability concerns about the consistency and stability of findings produced by a data collection or analysis technique in different occasions (Saunders et al., 2012). Reliability is commonly checked through approaches such as test-re-test and internal consistency test. More specific aspects of reliability could include the consistency of research information across different languages.

Test re-test

In the current study, the instruments and their prototypes and pilot versions have been tested and retested to improve their validity and reliability. Final

versions of the instruments may be further retested in subsequent studies of future research.

Internal consistency

The Cronbach's Alpha test has been applied to check the internal consistency of the measurements in the two pilots and full-scale surveys of the current study. The test results in the pilots helped to identify potential consistency issues in the measurement items and / or their combinations, which were enhanced in the final survey.

Consistency across languages

The use of multiple translators or the back-translation approach have been recommended by scholars to ensure the consistency of measurements across languages for cross-cultural research (Brislin, 1970; Sperber, 2004). In the current study, back-translation has been applied to ensure the measurement scales originated in English would be measuring same things when they are translated into Chinese. Those measurement scales and specific terms originated from the English literature and adopted for use in the current study were back-translated from Chinese to English by another translator who had no knowledge of the original. The back-translated copies were compared with the originals to check the consistency of meaning, and adjustments were made where needed.

CHAPTER 5: RESEARCH PROCESSES, RESULTS AND DISCUSSIONS

5.1 Part One – Mental Modelling

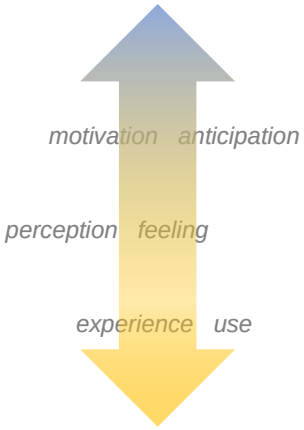
5.1.1 Framework development

In Part One of the current research, a mental modelling framework was created for eliciting and interpreting participants' perceptions and use experiences along the four domains of utilitarian, hedonic, social, and innovative values adapted from the consumption value perception studies (Sheth et al., 1991b; Brown & Venkatesh, 2005; Kim & Han, 2009; Kalafatis et al., 2010; Rivas et al., 2022). Reference has also been made with the goal-orientation approach of the uses and gratification theory (Rubin, 1984; Leung & Wei, 2000; Moon et al., 2022) and hierarchical abstraction framework of the means-end chain model (Jung, 2014).

The mental models, Model A eliciting user experience and perception, and Model B eliciting anticipations for a better smartphone, were constructed by participants (through the MindMaster online application) illustrating how the participants used and wished to use their smartphones to satisfy needs and achieve goals. The elicited mental models were consolidated into the designers' and nondesigners' group models, compared and analysed. Valued goals, anticipations, and differences (between the designer group and nondesigner group) identified in Part One have been incorporated into the Part Two Survey for further checking.

The means-end chain approach (Jung, 2014) reviewed in **Section 2.6** has been made reference to when designing the perception framework for Mental Model A. The mental modelling framework spread from high to low level of abstraction along the theme (Level 1), domains (Level 2), goals (Level 3), values / consequences (Level 4), affordances (Level 5), and product attributes / features (Level 6) as shown in **Table 9**.

Table 9: Mental Modelling – perception framework for Model A (from Level 1 to 6)

Mental Modelling Framework	
L1 – Theme I use my smartphone to ……	***Participant's perception*** *High level of abstraction*
L2 – Domains Participants were to extend their perception lines from each of the four domains of utilitarian, hedonic, social, and innovative……along L3-L4-L5-L6	
L3 – Goals e.g. To be uptrend	
L4 – Values / Consequences e.g. individualisation	
L5 – Affordances e.g. auto information search and management	
L6 – Product attributes / features e.g. AI equipped information manager	*Low level of abstraction*

A card pool has been composed to work with the mental modelling framework, facilitating the expression of participants not so familiar with mindmapping (more likely the nondesigners), and hence promoting authenticity and fairness (Lincoln and Guba, 1986) among the participants. The card pool provided all participants with a series of prompt cards at the different levels, from which they could pick the desirable elements to be placed into Model A if they wished to. They could also create their own elements. The approach has integrated the methodology and techniques from the conventional card sorting and path finding (Soranzo and Cooksey, 2015) with better flexibility within a framework.

The card pool was firstly composed with reference to user manuals of popular smartphone brands (globally and in China) such as Apple, Samsung and Huawei, and past studies on smartphone use and perceptions, such as Leung and Wei's study (2000) on users' motives, Zu et al.'s study (2016) concerning the impact of personality traits on the adoption of mobile apps, and Stachl et al.'s studies (2017, 2020) on association between smartphone user behaviour and personality traits. The draft card set was then tested with a small group of China university students / graduates, and re-tested after adjustments made.

While Model A called for the participants' reflection of their perception and use experience with their smartphone in the role of a "user", Model B requested all participants to somehow play a "designer" role in brainstorming for a better smartphone which might resolve the pain-points they had identified in Model A. A SCAMPER framework (MindTools, 2022) was adapted for use in the brainstorming for enhancement ideas providing prompts for possible lines of thought along "Substitute", "Combine", "Adapt", "Modify", "Put to another use", "Eliminate" and "Reverse" (**Figure 18**).



Figure 18: Mental Modelling – SCAMPER brainstorming framework (MindTools, 2022) for Model B

5.1.2 Elicitation and analyses of mental models

As discussed in **Section 4.3.1** concerning sampling, for Part One Mental Modelling, 49 students meeting the research requirement were recruited through the faculties and student / graduate coordinators of China's universities, of whom 27 in design related specialisms and 22 in non-design-related specialisms. Online mental modelling sessions were conducted in May and June of 2021 using the smartphone as a product exemplar. The university

students of design related specialisms represented the designers, while university students of other specialisms represented the nondesigners.

As discussed in **Section 4.4** Ethical considerations, at the beginning of the online meeting session before the mental modelling activity started, a research brief and consent form (**Appendices 3a & 3b**) was passed to the participant for his / her reading and return with digital signature. The brief and consent form clearly stated the research purpose, nature, participant's expected role and time spent, the required video / audio recording, confidentiality of the collected data, their right to withdraw at any time, contact of the researcher, and access to further information about the research, etc.

During the online modelling session (on Tencent Meeting platform), the individual participant was requested to: (1) represent his / her perceptions of smartphone use experience in a mental model with the MindMaster online mindmapping tool (Mental Model A) applying the Mental Modelling Framework of **Table 9**; (2) indicate his / her priorities among the four domains of utilitarian, hedonic, social, and innovative; (3) identify and highlight (in red) his / her most important line of goal-value-affordance-attribute under each of the domains; (4) identify and highlight (in blue) the line of goal-value-affordance-attribute in the model he / she found the goal most unfulfilled; and (5) brainstorm ideas in a second mental model, i.e. Mental Model B, with the SCAMPER framework (MindTools, 2022) (**Figure 18**) for resolving the pain-point with the unfulfilled goal identified in Mental Model A.

Samples of participant-constructed perception mental models (Model A) and anticipation mental models (Model B) can be referred to in **Appendices 4a** and **4b** respectively.

Content and visual analyses were carried out with the mental models. The data analysis has made reference to the qualitative analytical processes of categorising; unitising data; recognising themes, patterns and relationships; and developing propositions (Saunders et al., 2012). Clarification and / or validation of data with the participants were carried out as appropriate.

Consolidation and comparison of the 49 x 2 mindmaps (Model A and B) has been conducted. During the consolidation and analysing processes, the consolidated group models were drawn up with elements shortlisted, sorted and compared considering their frequencies of occurrence across the group participants' models. Hence the analytical processes for the Part One Mental Modelling have integrated the qualitative content and visual analysis approaches with a relatively quantitative shortlisting criterion in trying to strike a balance between critical judgment and objectivity. **Figures 19-22** shows the consolidated mental models of the designers' and nondesigners' "important perceptions of user experience" in Model A and "anticipated better smartphones" in Model B as part of the outcomes. Findings from the Part One Mental Modelling (such as cherished values / features, and product enhancements suggested by the respondents) have been incorporated into the Part Two survey questionnaire for further testing.

5.1.3 Findings and discussions

Model A

The consolidated mental models presented in **Figure 19 and 20** illustrate that the breadth of elements perceived as "important" under the four domains of utilitarian 实用性, hedonic 感受性, social 社会性 and innovative 创新性 values varies between the designer-user (DU) and nondesigner-user (NDU) groups. The nondesigner-user group's consolidated mental model shows a relatively balanced proportion among the four domains, while the designer-user group's consolidated mental model shows broader ranges of elements under innovative and hedonic domains, and a narrower range of elements under utilitarian and social domains in comparison with the nondesigner-users.

There are some common elements along the perception lines of goals (L3) – values (L4) – affordances (L5) – attributes (L6) and links identified by both groups as important, which are highlighted "apple green" in the consolidated

mental models in **Figure 19 and 20**. (Please refer to the keys in Figure 19 and 20.)

The recognised patterns are summarised below and also highlighted in **Figure 19 and 20** for easy noting and comparison:

The communication concerns are mainly found under the social and utilitarian domains. It is noted that the nondesigner-user group seems to concern more about communicating with their friends (朋友) and the community (社群) (DU:NDU = 2:10), whereas the designer-user group seems to concern more about communicating with their family members 家人 (DU:NDU = 7:2).

Both the designer-users and nondesigner-users show some concerns about self-identity (自我形象) and personalisation (个人化) (DU:NDU = 5:5). While the designer-users relayed those related elements mainly under the innovative domain and occasionally under the hedonic domain, the nondesigner-users have them across the three domains of innovative, hedonic and social. Here is a point to note, that the self-identity measurement item, which was originally categorised under hedonic value with reference to past literature, was found to cross-load between hedonic and social values in the factor analysis of data from the full-scale survey of Part Two. Hence the multi-fitting of this self-identity item was apparent in both the Part One mental models and Part Two survey results.

Elements related to controllability (掌控) show up in the designer-user groups' mental model but not that of the nondesigner-users (DU:NDU = 5:0). For instance, while the nondesigner-users mention the receiving, searching and displaying of information, the designer-users are thinking of the control of information. The designer-user group has also raised a concern with a higher-level controllability issue about the human-phone interaction as a whole: the designer user wished to be in control of the smartphone instead of being controlled by the smartphone (such as when and how the human-phone interactions take place).

Elements related to creative affordances / supports show up more frequently in the designer-user groups' mental model than that of the nondesigner-users (DU:NDU = 11:2), which is as expected for the designers to use their smartphone to support their creative tasks. The same app may be used by the two groups for varied purposes, such as the designer-users may use a video app for image editing while the nondesigner-users may just use it for recording purpose.

Another element frequently appears in both mental models is "微信 Weixin" (DU:NDU = 9:8), the popular communication and service platform in the Chinese community. It is not highlighted in the figures as it is found almost everywhere.

These exploratory findings indicate that it is likely for the designer-users and nondesigner-users to perceive and value their use of smartphone differently. If the designers use their own mental models to design the smartphones, the nondesigner-users may find inadequacy in certain aspects and too much in other aspects. Attempts will be made to further cross-check these findings in the Part Two survey.

Model B

Figure 21 and 22 illustrate the consolidated Model Bs from mental models constructed by the participants playing the role of "designer-designers" and "nondesigner-designers" in brainstorming anticipated enhancements (which might be goals / values, affordances or attributes / features) for better smartphones. The common elements between designer-designers' and nondesigner-designers' models are highlighted in the figures for easy noting and comparison.

Model B again demonstrates the varied focuses among the designer-designer (DD) and nondesigner-designer (NDD) groups. The consolidated NDD model shows a clear emphasis in the utilitarian domain with 4 lines of anticipations along "more effective use", "more personalised / sustainable use", "better

convenience" and "better integration". The other three domains of hedonic, social and innovative only each show one line of thought, concerning "better enjoyment", "experiential communication" and "human-phone integration" respectively.

Despite the DD's Model B also shows a wider branch of ideas under the utilitarian domain, it has relatively better balance in the other three domains. While the lines of thoughts in the NDD's Model B are also embraced in the DD's Model B, there are additional thoughts relating to better fulfilment of social needs, well-being, control, safe of mind, and creativity in the DD's Model B.

Overall

As a whole, apart from the differences in focuses discussed above, there are some general tendencies observed from the designers' and nondesigners' mental models A and B.

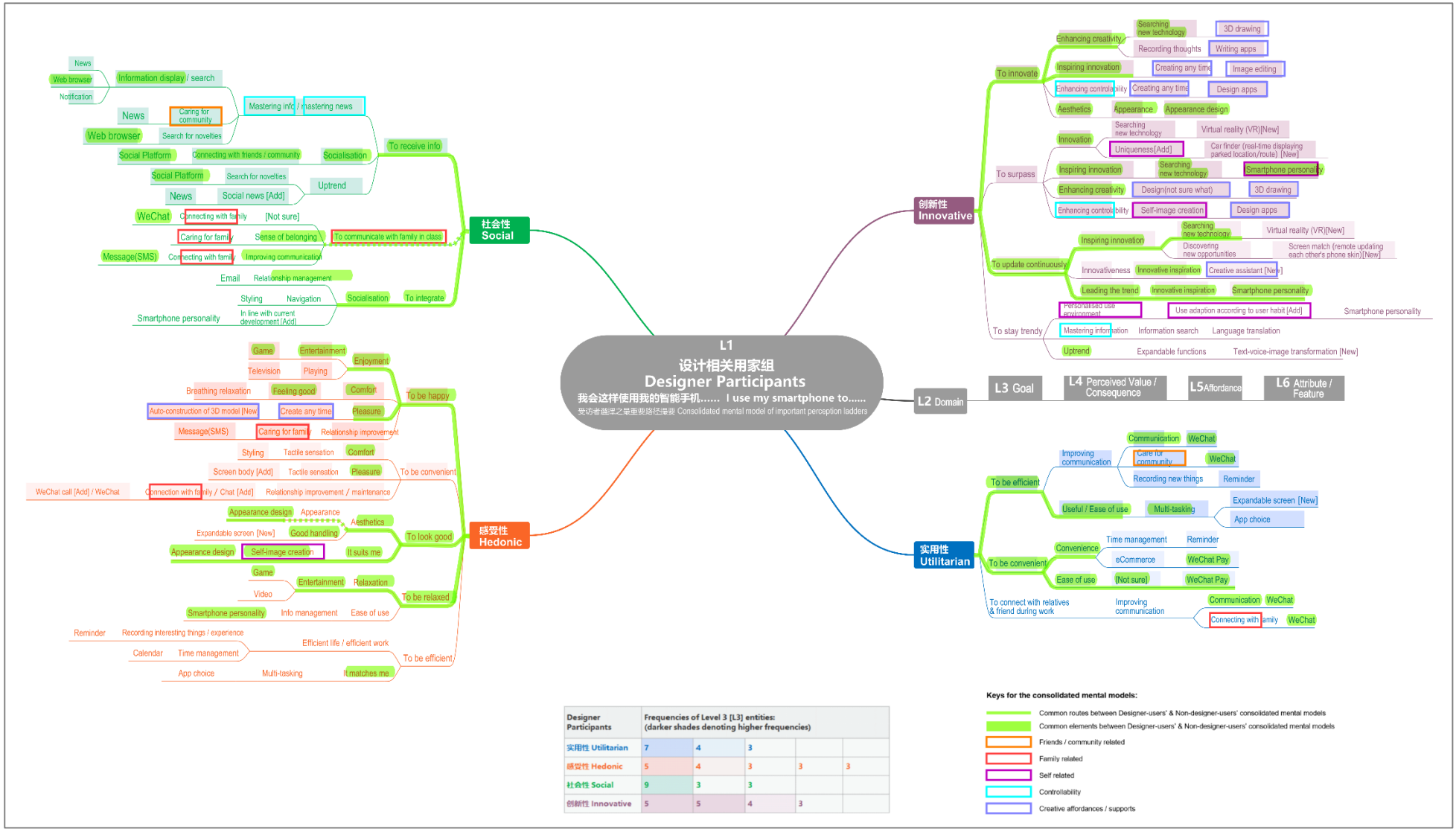
Both the designers' and nondesigners' models show certain traversing of elements across the domains, such as utilitarian goals like convenience and efficiency, and social goal of communication, are also found in the hedonic domain. This may reflect the proposition from some literature that the perceived extrinsic values (like utilitarian value) would contribute to the perceived intrinsic values (like hedonic value) which becomes a mediator to perceived satisfaction and / or intention of continuous use.

The nondesigners tend to bring up more tangible, somehow more instrumental or extrinsic ideas, while the designers may bring up more abstract, intangible and somehow more intrinsic concepts, such as controllability and safe of mind anticipated for the smartphone. These apparent differences would be checked again in the survey questionnaire to see if they are rooted from a potential designer/nondesigner difference in their ability to conceptualise and express abstract / intangible ideas, or if they just reflect different group focuses. If the former is true, such difference in abstraction and tangibility levels may be among the contributive factors for the communication gap between designers /

products and users. The above finding in some way aligns with Guo et al.'s study (2023) that designers and users (non-designers) had different "schema" (mental models) showing up through their different product interpretations, with the users inclining towards more "life-oriented" interpretation.

Another example is that the designers' mental model shows more emphasis on communication with the family which may be of more intrinsic regard while the nondesigners' mental model shows more emphasis on communication with colleagues, friends and community which may be of more extrinsic concerns. Leung and Wei (2000) pointed out that the motives of phone communication vary between instrumental / extrinsic and ritualistic / intrinsic. While talking to colleagues to facilitate completion of tasks is clearly instrumental, socialisation with friends and communities may also carry more long-term pragmatic motives. Talking to family members is regarded as intrinsic most of the time if the motive is to show affection.

These findings and participant-suggested design directions for better smartphones would be incorporated into the Part Two's survey questionnaire for further testing. The preliminary conceptual framework drawn from the literature review was refined in regard to the findings, and hypotheses were also finetuned for testing in the Part 2 study.



Designer Participants	Frequencies of Level 3 [L3] entities: (darker shades denoting higher frequencies)				
实用性 Utilitarian	7	4	3		
感受性 Hedonic	5	4	3	3	3
社会性 Social	9	3	3		
创新性 Innovative	5	5	4	3	

Figure 19: Model A – Designer-users' consolidated mental model of important goals, values, affordances and attributes / features for smartphones, indicating the common routes and elements between Designer-users' and Nondesigner-users' consolidated mental models, and other highlights for comparison

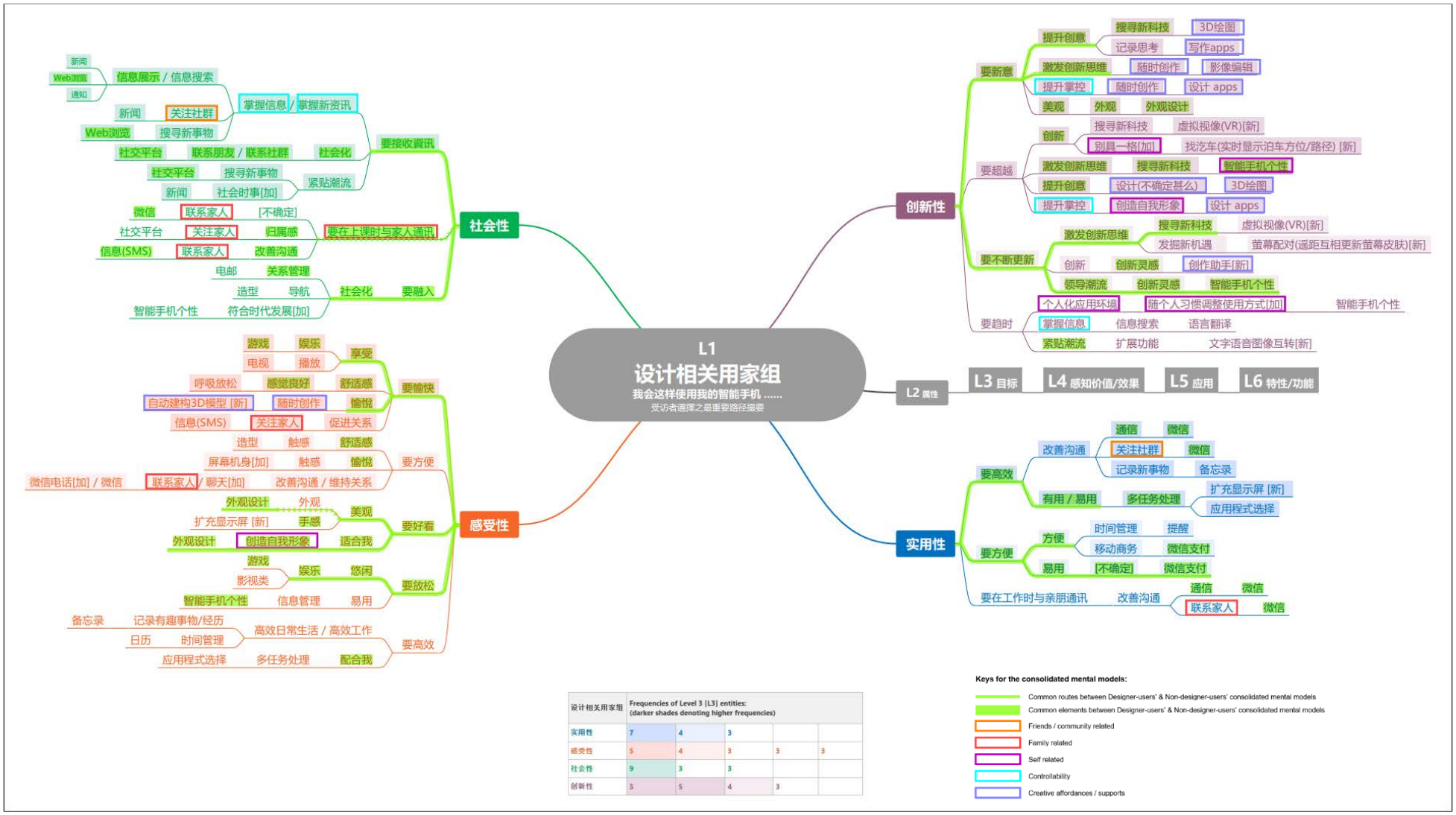
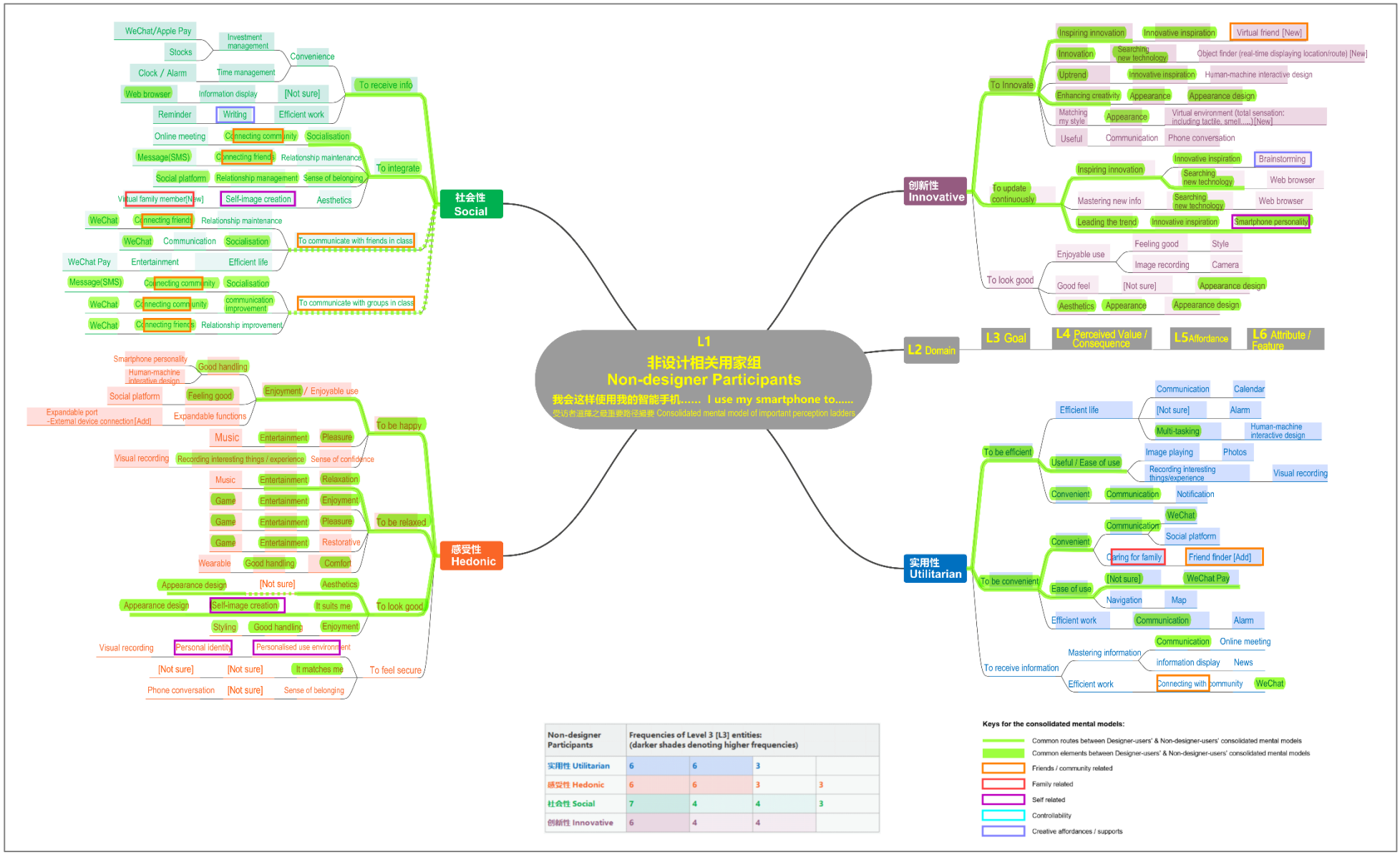


Figure 19 (Chinese version): Model A – Designer-users' consolidated mental model of important goals, values, affordances and attributes / features for smartphones, indicating the common routes and elements between Designer-users' and Nondesigner-users' consolidated mental models, and other highlights for comparison



Non-designer Participants	Frequencies of Level 3 [L3] entities: (darker shades denoting higher frequencies)			
实用性 Utilitarian	6	6	3	
感受性 Hedonic	6	6	3	3
社会性 Social	7	4	4	3
创新性 Innovative	6	4	4	

Figure 20: Model A – Nondesigner-users' consolidated mental model of important goals, values, affordances and attributes / features for smartphones, indicating the common routes and elements between Designer-users' and Nondesigner-users' consolidated mental models, and other highlights for comparison

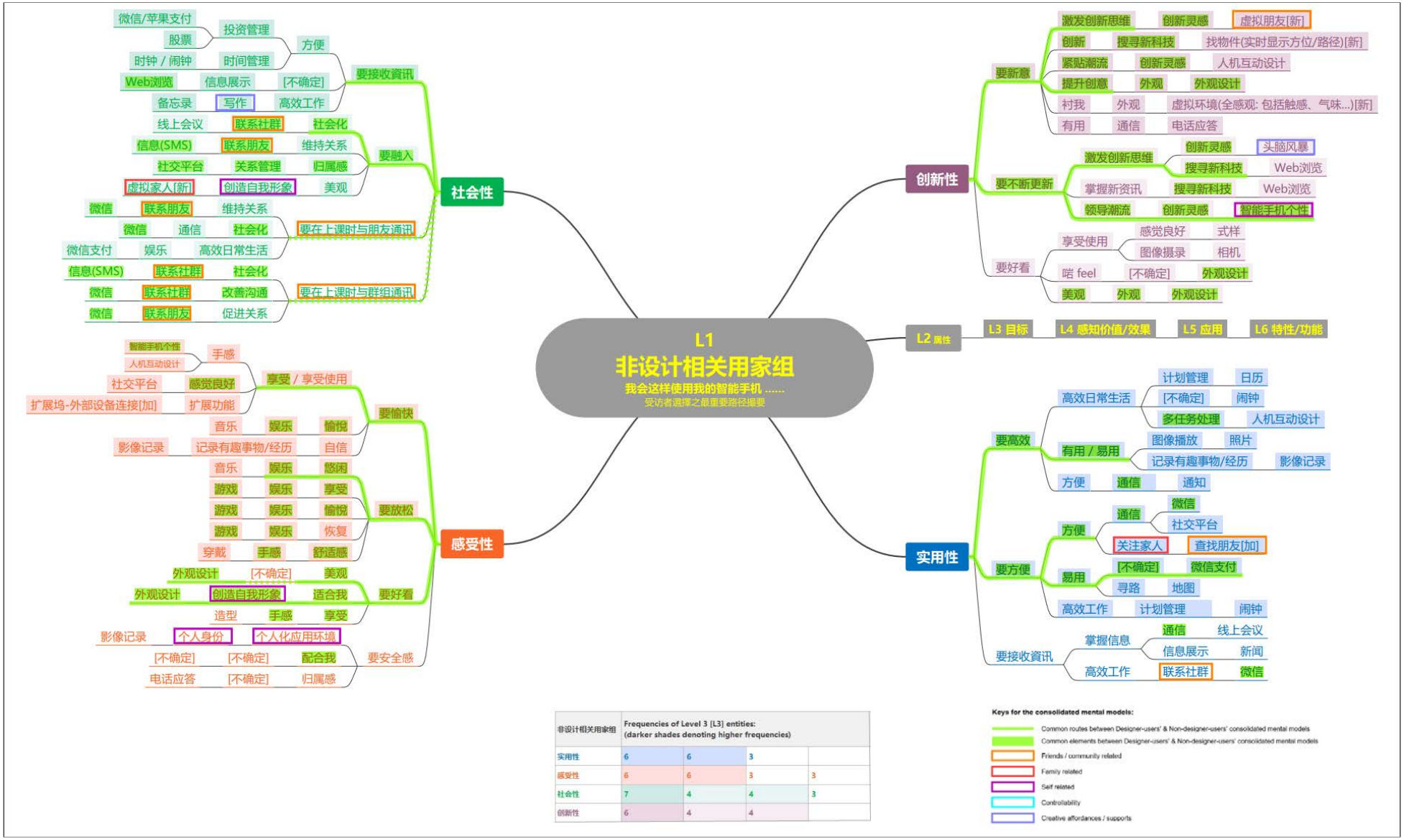


Figure 20 (Chinese version): Model A – Nondesigner-users' consolidated mental model of important goals, values, affordances and attributes / features for smartphones, indicating the common routes and elements between Designer-users' and Nondesigner-users' consolidated mental models, and other highlights for comparison

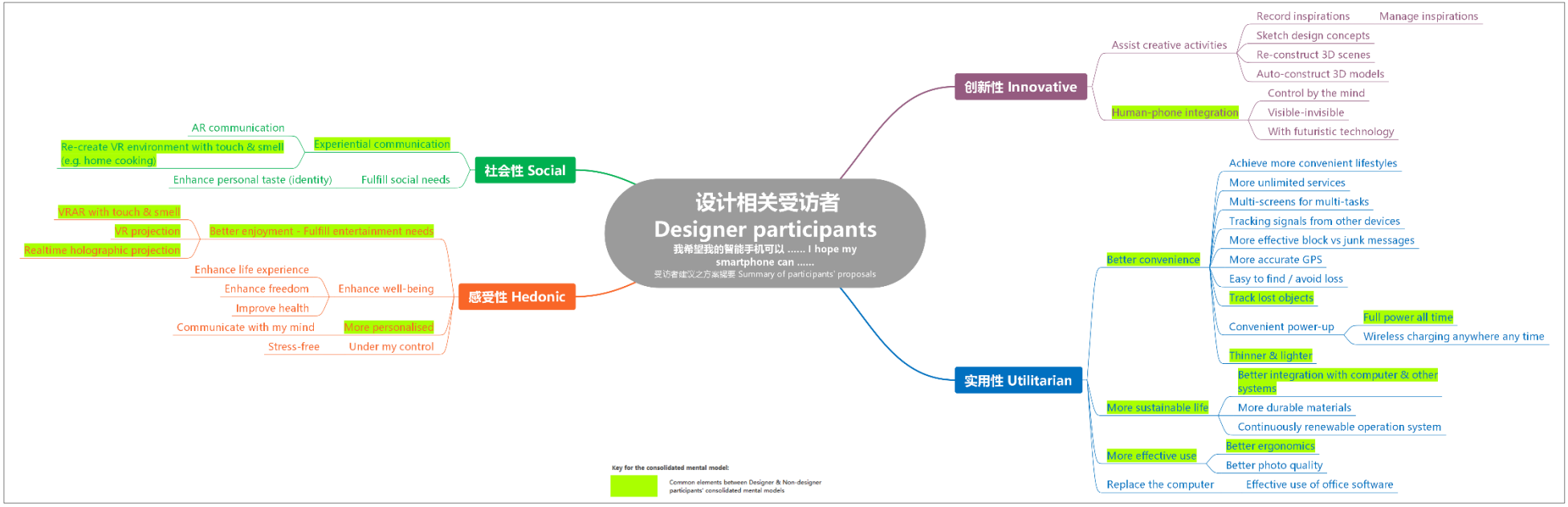


Figure 21: Model B – Designer-designers' consolidated mental model of anticipated goals / values, affordances and attributes / features for better smartphones, with the common elements between Designer-designers' and Nondesigner-designers' models highlighted for comparison

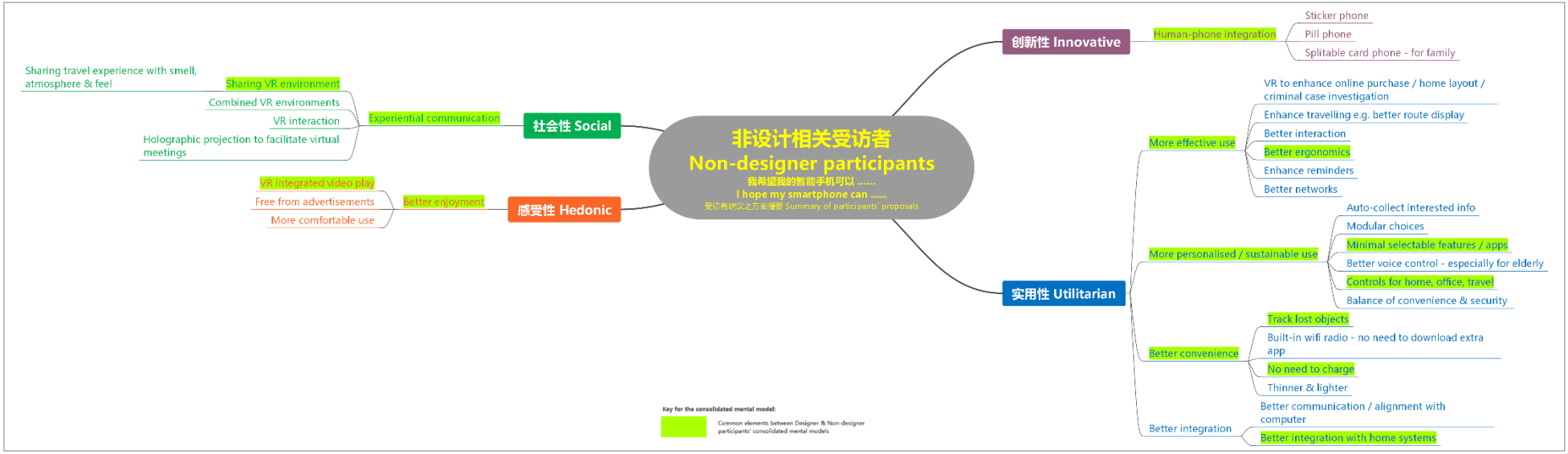


Figure 22: Model B – Nondesigner-designers' consolidated mental model of anticipated goals / values, affordances and attributes / features for better smartphones, with the common elements between Designer-designers' and Nondesigner-designers' models highlighted for comparison

5.2 Part Two – Survey

5.2.1 Operational definitions of key variables

Further to the conceptual definitions of key variables discussed in **Section 3.2.1**, the respective operational definitions of key attributes in the conceptual framework, in relation to their evaluation in the Survey, are summarised below before reviewing the development of the measurement scales for the constructs in the next section.

Attributes in the Conceptual Framework:

Perceived product values	assessed by the four constructs of perceived utilitarian values, perceived hedonic values, perceived social values, and perceived innovative values – with the relatively intrinsic values (perceived hedonic and social values) possibly mediating between the extrinsic values (perceived utilitarian and innovative values) and perceived satisfaction / intention of (continuous) use (Leung & Wei, 2000; Kalafatis et al., 2010)
Perceived utilitarian value	the perceived benefits acquired from the product's functional performance (Sheth et al., 1991a)
Perceived hedonic value	the perceived benefits acquired from the feelings or affective states that the product arouses (Batra & Ahtola, 1991; Sheth et al., 1991a)

Perceived social value	the perceived benefits acquired from the product's capacity to enhance social self-concept or social connection (Sheth et al., 1991a; Sweeney & Soutar, 2001)
Perceived innovative value	the perceived benefits acquired from a product's capacity to arouse curiosity, or provide novelty or differentiated experience (Sheth et al., 1991a; Sethi et al., 2001)
Perceived satisfaction	Perceived fulfilment of expected performance from the product (Oliver & Swan, 1989) with corresponding affective state
Intention of continuous use	Inclination to continue using the product (Bhattacherjee, 2001)
Individual innovativeness (An individual characteristic proposed as antecedent and moderator for testing)	the willingness of an individual to try out new products / features in the context of smartphone (the exemplar smart communication product referred to in the current study)
Personality traits (Individual characteristics proposed as moderators for testing)	tested under the five Big Five dimensions (Costa & McCrae, 1985) of Openness to Experience, Neuroticism, Extraversion, Agreeableness, and Conscientiousness
Openness to experience	personality traits showing open-mindedness, active imagination, aesthetic sensitivity, and intellectual curiosity (such as being creative, adventurous, variety-seeking, and appreciating arts, poetry or philosophical discussions)

Neuroticism	personality traits showing emotional instability (such as being anxious, worried, nervous, insecure, or depressed)
Extraversion	personality traits showing sociable and outgoing characteristics (such as being out-spoken, active, and enjoying parties and talking to people)
Agreeableness	personality traits showing kindness and compatibility (such as being courteous, cooperative, tolerant, and trusting)
Conscientiousness	personality traits showing industriousness and orderliness (such as being diligent, responsible, organised, thorough, and planful)
Designer and nondesigner	Designers refer to participants / respondents who practice design as a student or a professional Nondesigners refer to participants / respondents who study / work in specialisms other than design

5.2.2 Development of measurement scales

As discussed in previous chapters, an enhanced and updated conceptual framework has been proposed to adequtely reflect the values involved in the user experience with contemporary products and to facilitate the systemic comparison between the designers' and users' perceptions. The proposed conceptual framework is developed from the "perceived values – satisfaction – behavioural intention" associations suggested / tested in previous literature. The measurement items for the key constructs of the framework including perceived product values, perceived satisfaction, intention of use / continuous use, and the proposed moderating personal factors of individual innovativeness and personality traits, have been adapted from validated scales of previous empirical studies, with adjustments to fit the current study's context. **Table 10** shows the evolvement of versions of measurement items (applied in a 7-point likert scale) along the research stages, and the reference sources. Adjustments are made in consideration of findings from the Part One research and reliability test results of the Pilot 1 and 2 surveys, which are further discussed in the following sections. The Pilot 1 questionnaire is intended to test more comprehensive sets of measurement items for subsequent screening and consolidation as appropriate to enhance the questionnaire's conciseness and keep it at an acceptable length.

Table 10: Survey – Measurement scales development

Measurement items for key constructs of the conceptual framework and proposed quantifiable moderators	Pilot 1	Pilot 2	Full-scale Survey
1. Perceived Utilitarian Values			
Measurement items for "perceived utilitarian value" for the product, adapted from Sheth et al. (1991a), "system usability scale" of Brooke (1996), PERVAL of Sweeney and Soutar (2001), and Venkatesh et al. (2002)			
I find this smartphone easy to use.	Y	Y	Y
This smartphone helps me solve a lot of problems.	Y		Y
This smartphone helps me do my tasks efficiently.	Y		
This smartphone helps me improve my efficiency.		Y	
This smartphone helps me handle my work / study efficiently.	Y		
This smartphone helps me handle my health efficiently.	Y		
This smartphone helps me handle my daily living efficiently.	Y		
This smartphone helps me handle my work / study / living efficiently.		Y	Y
This smartphone performs consistently.	Y		

	This smartphone offers value for money.	Y		
	I needed to learn a lot before I can use this smartphone completely. (R)	Y		
	My interaction with this smartphone is clear and understandable.	Y	Y	Y
	I will find it easy to get this smartphone to do what I want it to do.	Y		
2.	**Perceived Hedonic Values**			
	Measurement items for "perceived hedonic value" for the product, adapted from Sheth et al. (1991a), PERVAL of Sweeney and Soutar (2001), and Mishra (2016)			
	Using this smartphone is uninteresting. (R)	Y	Y	Y#
	Using this smartphone gives me pleasure.			Y
	Using this smartphone makes me feel good.	Y		
	Using this smartphone makes me feel happy.	Y	Y	Y
	Using this smartphone makes me feel relaxed.	Y		
	Using this smartphone is an enjoyment.	Y	Y	
	I enjoy using this smartphone.			Y
	Using this smartphone matches my personality.	Y	Y	Y*
	Note: ** The item of "using this smartphone matches my personality" has been migrated from hedonic value to social value for the final analysis, as discussed in Section* 5.5.6 "Assessing construct validity".			
3.	**Perceived Social Values**			
	Measurement items for "perceived social value" for the product, adapted from Sheth et al. (1991a), PERVAL of Sweeney and Soutar (2001), and Wang et al. (2007)			
	Using this smartphone improves my communication with others.	Y	Y	Y
	Using this smartphone makes a good impression on other people.	Y	Y	Y
	Using this smartphone improves the way I am perceived.	Y		
	I find connection with this smartphone.	Y		
	Using this smartphone gives me talking points in social life.	Y	Y	Y
	Owning this smartphone makes me feel differently about myself.	Y		
	Using this smartphone makes me stand out among my friends.	Y		
	This smartphone does not relate to me. (R)	Y		
	Using this smartphone enhances my connection with the community.		Y	Y
4.	**Perceived Innovative Values**			
	Measurement items for "perceived innovative value" for the product, adapted from Sheth et al. (1991a), and Im and Workman (2004)			
	The smartphone I'm using is novel.	Y	Y	Y
	The smartphone I'm using is different from the ordinary.	Y	Y	Y
	The smartphone I'm using has surprising features.	Y	Y	Y
	The smartphone I'm using is un-innovative. (R)	Y		
	Using this smartphone inspires my imagination.	Y	Y	Y
5.	**Perceived Satisfaction**			
	Measurement items for "perceived satisfaction", adapted from "satisfaction scales" of Oliver and Swan (1989) and Spreng et al. (1996), scale for measuring "anticipated satisfaction" of Shiv and Huber (2000), and Sweeney & Soutar (2001)			
	I feel good using this smartphone.	Y		
	I feel frustrated using this smartphone. (R)	Y		
	I feel pleased using this smartphone.	Y	Y	Y
	I feel satisfied using this smartphone.	Y	Y	Y

	I will recommend people around (friends and relatives) to use this smartphone.		Y		
6.	**Intention of use / continuous use**				
	Measurement items for "intention of continuous use", adapted from Wang (2013), and Bhattacherjee (2001)				
	I intend to continue using this smartphone in the next half year.		Y		
	I predict that I would continue using this smartphone in a year.		Y		
	I expect my use of smartphone to continue in the future.		Y		
	I expect that I would use this smartphone. / I expect that I would continue using this smartphone.			Y	Y
	I would use this smartphone without hesitation to satisfy my needs.		Y	Y	Y
	I will not continue using this smartphone. (R)		Y		
7.	**Individual Characteristic – Individual Innovativeness** (moderator to be tested)				
	Measurement items for "user innovativeness", adapted from Goldsmith and Hofacker (1991), and Pagani (2007)				
	If I heard a new smartphone was available I would be interested to know more about it.		Y	Y	Y
	If I heard a new smartphone was available I would be interested enough to adopt it.		Y	Y	Y
	I would consider adopting a new smartphone, even if I had not tried it.		Y	Y	Y
	Compared to my friends I make little use of smartphones. (R)		Y		
	In general, I am the last in my circle of friends to know the launch of new smartphones. (R)		Y	Y	
	In general, I am the early ones in my circle of friends to know the launch of new smartphones.				Y
	I know more about new smartphones than other people do.		Y		
	Before adopting a new smartphone I think about the benefits introduced by the innovation. (R)		Y		
	Note: *Two 7-item sets, one set addressing the smartphone and another set addressing the smartphone apps concerning comparable aspects, were put into trial in the Pilot 1 questionnaire.*				
8.	**Individual Characteristic – Personality Traits** (moderator to be tested)				
	Measurement items for "personality traits", scale items for Big Five Personality Traits (in Chinese) are mainly adapted from the China Family Panel Studies 中国家庭追踪调查 (as cited in 吴琼 & 谷丽萍, 2020), with reference from Zhang et al. (2019), and Rammstedt and John (2007).				
	Openness (to experience)	Love adventure and challenge the norms		Y	Y
		Have an active imagination		Y	Y
		Creative with new ideas		Y	Y
	Neuroticism	Relaxed, handle stress well. (R)		Y	
		Feel tense and jittery.			Y
		Get nervous easily.		Y	Y
		Always worry.		Y	Y
	Extraversion	Enjoy talking to people.		Y	Y
		Reserved. (R)		Y	
		Outgoing.			Y
		Sociable.		Y	Y
	Agreeableness	Tend to forgive.		Y	Y
		Sometimes rude or impolite. (R)		Y	

	Always polite and courteous.			Y
	Considerate and kind to almost everyone.		Y	Y
Conscientiousness	Perform tasks conscientiously.		Y	Y
	Tends to be lazy. (R)		Y	Y[#]
	Work hard to accomplish tasks.			Y
	Work efficiently.		Y	Y

Notes:

(R) Reverse-worded items

[#] The Pilot 1 and Pilot 2 questionnaires used several reverse-worded items to keep respondents alert so as to reduce the potential agreement bias, but the analyses found that some respondents might have been confused by the reverse-worded items. As discussed in Section 5.4.2. "From Pilot 2 to the full-scale survey", to minimise such potential confusion, the final full-scale survey rationalised the reverse-worded items to the minimal two items for them to perform the alerting and counter-checking functions only. These two reverse-worded items (marked with [#]) are not included into the data set for the final inferential analyses.

5.2.3 Piloting and testing

Two rounds of pilot tests were run with 46 and 43 responses respectively before implementing the full-scale survey which targeted for around 790-800 responses. The pilot runs with relatively small but relevant samples aimed to test all aspects preparing for the final survey, including: the distribution channels, the design and flow of questionnaire, the clarity and appropriateness of questions, the response patterns, and reliability of the measurement scales, etc. The pre-testing would help ensure respondents understand the questions as the researcher intended and that items and response options were relevant to respondents and adequately address constructs (Colbert et al., 2019). Ruel et al. (2016) pointed out that a pre-test was a critical examination of the survey instrument helping determine if it would function properly as a valid and reliable research tool.

In the current study, the second pilot survey was considered necessary as there were quite a few significant adjustments made after the first pilot, such as extending the target sample from purely university students to cover also young professionals, the introduction of scenario-type questions, and inclusion of questions on personality traits (potential moderators) in the questionnaire. The invitation of respondents through the Tencent Survey platform was also tested to get acquaintance of the administrative procedures and assess the response

quality. The development of the survey tool along Pilot 1, Pilot 2 and the full-scale survey would be further discussed in the next few sections.

5.3 Part Two – Survey – Pilot 1

(questionnaire in Appendix 5b)

For the Pilot 1 survey test, a total of 47 students from China's universities, invited through the university faculties and student / graduate coordinators, responded to the Pilot 1 questionnaire. One of the responses was screened out as that respondent was currently living in Hong Kong. To avoid the influence of Hongkong-Mainland cultural and institutional differences affecting the test results, the Hong Kong case was excluded from the subsequent analysis. Among the remaining 46 respondents, 25 were in design related specialisms and 21 were in non-design-related specialisms. **Table 5** in **Section 4.3** "Sampling" shows the demographic characteristics of the respondents.

Statistical analyses conducted with data from the Pilot 1 questionnaire included:

- Checking the data healthiness
- Generating and reviewing the demographic characteristics of respondents and descriptive statistics
- Checking the reliability of the measurement scales – with Cronbach's Alpha tests
- Checking the correlation between variables – with correlation tests
- Checking the causal relations – with regression tests (with bootstrapping)
- Checking the group differences – with t-tests (with bootstrapping)
- Checking the association between the respondents' grouping and their priority order of perceived product values – with Chi-square Test of Independence
- Checking interaction effects among variables, such as the mediating and moderating effects – with regression and Process Macro (with bootstrapping) (Hayes, 2022)

5.3.1 Checking data healthiness and normality

The healthiness of data was checked, such as consistency of responses to positive and reverse-worded items addressing same / related matters and presence of "longstring" of same-choice answers across items. The descriptive statistics of key variables are given in **Table 11**. The normality of the data was examined. The general guideline is that data sets with a skewness and kurtosis (excess) within ±1.0 can be regarded as normally distributed (Hair et al., 2017). While all data of Pilot 1 had a skewness value less than ±1.0, two of them showed a kurtosis value slightly above ±1.0 at 1.020 and -1.127. It would be acceptable considering the small sample size for the exploratory test. Hence normality of the data set could be assumed and it was justified to conduct parametric analyses with the data.

Table 11: Survey (Pilot 1 test) – Descriptive statistics of key variables (in projected conceptual framework)

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
User Innovativeness (Before revision)	46	2.64	5.93	4.6848	.64726	-.627	.350	1.020	.688
User Innovativeness (After revision)	46	2.75	6.67	5.1413	.77815	-.586	.350	.838	.688
Perceived Utilitarian Value	46	4.36	6.91	5.5040	.50551	.112	.350	.359	.688
Perceived Hedonic Value	46	3.67	6.50	5.4891	.70571	-.768	.350	-.322	.688
Perceived Social Value	46	2.63	6.50	4.6821	.96058	-.146	.350	-.293	.688
Perceived Innovative Value	46	2.80	6.20	4.4435	.74107	-.065	.350	-.347	.688
Perceived Satisfaction	46	3.60	6.80	5.5609	.63473	-.572	.350	.676	.688
Intended Continuous Use (Before revision)	46	4.00	7.00	5.8261	.79957	-.430	.350	-.538	.688
Intended Continuous Use (After revision)	46	4.25	7.00	5.7717	.81450	-.174	.350	-1.127	.688

5.3.2 Checking reliability of measurement scales

The Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability. **Table 12** summarises the Cronbach's Alpha coefficients of variables in the projected conceptual framework. Four of the 7 concerned scales had scored Cronbach's alpha of .7 or above which was considered good (Nunnally, 1978). Two of the scales have Cronbach's alpha between .6 and .7 which was considered acceptable, especially considering the sample size of the pilot test was relatively small.

Table 12: Survey (Pilot 1 test) – Summary of Cronbach's Alpha tests for key constructs

Variables (under "User Experience" section of Pilot 1 questionnaire)		**Number of items**	**Cronbach's Alpha**
1	User Innovativeness	14	.798
2	Perceived Utilitarian Value	11	.628
3	Perceived Hedonic Value	6	.863
4	Perceived Social Value	8	.844
5	Perceived Innovative Value	5	.598
6	Perceived Satisfaction	5	.724
7	Intention of continuous use	5	.673

Attention was paid to the scale of Perceived Innovative Value with a Cronbach's alpha of .598, in fact very close to .6. As the scale had been designed with items to measure the innovative value of the smartphone at slightly varied levels / angles (refer to **Table 10** and **Appendix 5b**), which added together to form a composite measure of product innovativeness, it was reasonable if the responses of an individual respondent did not align across all items. Hence the Cronbach's Alpha value might not truly reflect the actual reliability of the scale. In such case, reliability would have to be checked with factor analysis with a bigger sample, or with the test re-test approach (Ruel et al., 2016). Meanwhile, the scale items were refined to enhance the clarity, and a remark would be

added to make respondents better aware of the reversely worded item if it was to be kept for this scale.

Based on the statistics of the Cronbach's Alpha tests (e.g. Cronbach's Alpha if Item Deleted), those items with less reliability were removed / adjusted for the next stages of Pilot 2 test and full-scale survey questionnaire. One of the adjustments included adding remarks to make respondents better aware of the reversely worded items which were formulated to prevent response bias and check inattention, but which might sometimes cause confusion in respondents' answers (Sonderen et al., 2013). The values of "User Innovativeness (after revision)" and "Intention of continuous use (after revision)" used in the later regression and t-test analyses were mean values calculated with the identified less-reliable item(s) removed.

More details of the statistical testing, analyses and discussions for the Pilot 1 test are available upon request. The next **Section 5.3.3** shows the evolving conceptual frameworks and the list of hypotheses preliminarily tested in the Pilot 1 questionnaire (**Table 13**). The proposed evolvements for subsequent testing would be further discussed.

5.3.3 Evolvement of conceptual frameworks and hypotheses

As discussed in **Chapter 3** "Research Framework and Hypotheses", the hypotheses drawn earlier with reference to the literature reviewed were trial-tested in Pilot 1 with results listed in **Table 13** below. (More details of the statistical testing, analyses and discussions for Pilot 1 are available upon request.)

Table 13: Survey (Pilot 1 test) – Hypotheses preliminarily tested

Hypotheses – preliminary testing		
H1:	**A product with high perceived values leads to a higher perceived satisfaction for users.**	**Checked with regression**
	H1a: A product with high perceived utilitarian value leads to a higher perceived satisfaction for users.	Not supported
	H1b: A product with high perceived hedonic value leads to a higher perceived satisfaction for users.	Supported
	H1c: A product with high perceived social value leads to a higher perceived satisfaction for users.	Not supported
	H1d: A product with high perceived innovative value leads to a higher perceived satisfaction for users. *Note: H1d is not shown in Figures 23 and 24 as it was found non-significant in prior literature, but it was still tested to prove the non-significance.*	Not supported
H2:	**A product with high perceived satisfaction leads to a higher rate of intention of continuous use for the product.**	Supported
H3:	**A product with high perceived values leads to a higher rate of intention of continuous use for the product.**	
	H3a: A product with high perceived utilitarian value leads to a higher rate of intention of continuous use for the product.	Not supported
	H3b: A product with high perceived hedonic value leads to a higher rate of intention of continuous use for the product.	Not supported
	H3c: A product with high perceived social value leads to a higher rate of intention of continuous use for the product.	Not supported
	H3d: A product with high perceived innovative value	Supported

	leads to a higher rate of intention of continuous use for the product. *Note: H3a, 3b and 3c are not shown in Figures 23 and 24 as they were found non-significant in prior literature, but they were still tested to prove the non-significance.*	
H4:	**There are differences in the perceived innovativeness of designers and nondesigners.**	**Checked with t-tests** Not supported
H5:	**There are differences in the perception of designers and nondesigners towards the product values, user satisfaction, and intention of continuous use for the product.**	**Checked with t-tests**
	H5a: There are differences in the perception of designers and nondesigners towards the perceived utilitarian value of a product.	Not supported
	H5b: There are differences in the perception of designers and nondesigners towards the perceived hedonic value of a product.	Not supported
	H5c: There are differences in the perception of designers and nondesigners towards the perceived social value of a product.	Not supported
	H5d: There are differences in the perception of designers and nondesigners towards the perceived innovative value of a product.	Not supported
	H5e: There are differences in the perception of designers and nondesigners towards the perceived satisfaction from a product.	Not supported
	H5f: There are differences in the perception of designers and nondesigners towards the intention of continuous use for a product.	Not supported
H6:	**There are differences in the perception of users with varied levels of innovativeness towards the product values, user satisfaction, and intention of continuous use for the product.**	**Checked with t-tests**
	H6a: There are differences in the perception of users with varied levels of innovativeness towards the perceived utilitarian value of a product.	Supported
	H6b: There are differences in the perception of users with varied levels of innovativeness towards the perceived hedonic value of a product.	Not supported
	H6c: There are differences in the perception of users with varied levels of innovativeness towards the perceived social value of a product.	Not supported
	H6d: There are differences in the perception of users with varied levels of innovative value towards the perceived innovative value of a	Not supported

	product.	
H6e:	There are differences in the perception of users with varied levels of innovativeness towards the perceived satisfaction from a product.	Not supported
H6f:	There are differences in the perception of users with varied levels of innovativeness towards the intention of continuous use for a product.	Not supported
H7:	**The causal relations between the perceived product values and perceived satisfaction are moderated by user factors.**	**Checked with regression and Process Macro**
H7a:	The causal relation between the perceived utilitarian value of a product and perceived satisfaction is moderated by the factor of whether the user is a designer / user innovativeness.	NA*
H7b:	The causal relation between the perceived hedonic value of a product and perceived satisfaction is moderated by the factor of whether the user is a designer / user innovativeness.	Not supported
H7c:	The causal relation between the perceived social value of a product and perceived satisfaction is moderated by the factor of whether the user is a designer / user innovativeness.	NA*
H7d:	The causal relation between the perceived innovative value of a product and perceived satisfaction is moderated by the factor of whether the user is a designer / user innovativeness.	NA*
	*Note: * As the causal relations between the perceived utilitarian / social / innovative values and perceived satisfaction were shown as non-significant in the tests, the moderation effects of the user factors would not show significance.*	
H8:	**The causal relations between the perceived product values and intention of continuous use are moderated by user factors.**	**Checked with regression and Process Macro**
H8a:	The causal relation between the perceived utilitarian value of a product and intention of continuous use is moderated by the factor of whether the user is a designer / user innovativeness.	NA#
H8b:	The causal relation between the perceived hedonic value of a product and intention of continuous use is moderated by the factor of whether the user is a designer / user innovativeness.	NA#
H8c:	The causal relation between the perceived	NA#

	social value of a product and intention of continuous use is moderated by the factor of whether the user is a designer / user innovativeness.	
H8d:	The causal relation between the perceived innovative value of a product and intention of continuous use is moderated by the factor of whether the user is a designer / user innovativeness. *Note: # As the causal relations between the perceived utilitarian / hedonic / social values and intention of continuous use were shown as non-significant in the tests, the moderation effects of the user factors would not show significance.*	Not supported
H9:	**The causal relation between the perceived satisfaction and intention of continuous use is moderated by user factors.**	**Checked with regression and Process Macro**
H9a:	The causal relation between the perceived satisfaction and intention of continuous use is moderated by the factor of whether the user is a designer / user innovativeness.	Not supported

Based on the findings from the Pilot 1 questionnaire and mental models of the Part One research, updates were made with the research framework, hypotheses, and research instruments.

Below shows an overview of hypotheses updates, building on findings from the Part One research, and Pilot 1 and 2 tests, for further testing in the full-scale survey (full list of updated hypotheses in **Table 1**):

- Updated after Pilot 1: H5, H6, H7, H8, H9, H10, H11, H12, H13
- Further updated after Pilot 2: H6, H7

The conceptual framework was updated, to incorporate the mediating flows between the value constructs, and the proposed individual's characteristics as moderators (**Figures 25**). The questionnaire was adjusted and enhanced accordingly for further testing in Pilot 2 and the full-scale survey.

Figure 23 to 25 shows the evolvement of the conceptual framework along the stages. **Figure 23** is the early-version conceptual framework projected from the

literature preliminarily tested in Pilot 1, while **Figure 24** reflects the Pilot 1 testing results. **Figure 25** is the version updated for testing in the subsequent Pilot 2 and full-scale surveys, with reference to the findings from the Part One mental models, the Pilot 1 test survey, and further review of literature.

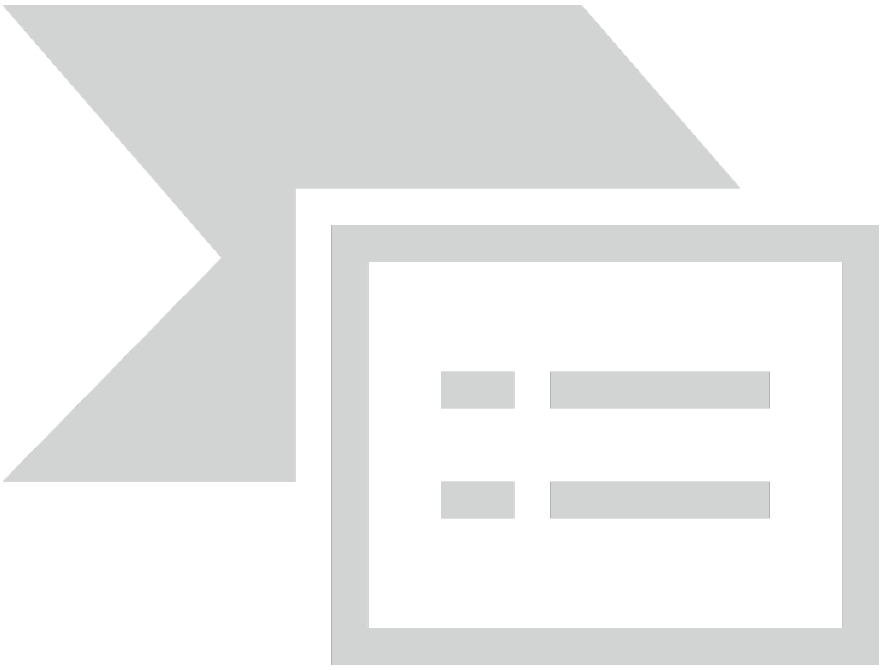


Figure 23: Conceptual framework (early projected version) illustrating the user experience, with impact of the perceived values on users' satisfaction and continuous adoption of the product, and the moderating effects of individual's factors

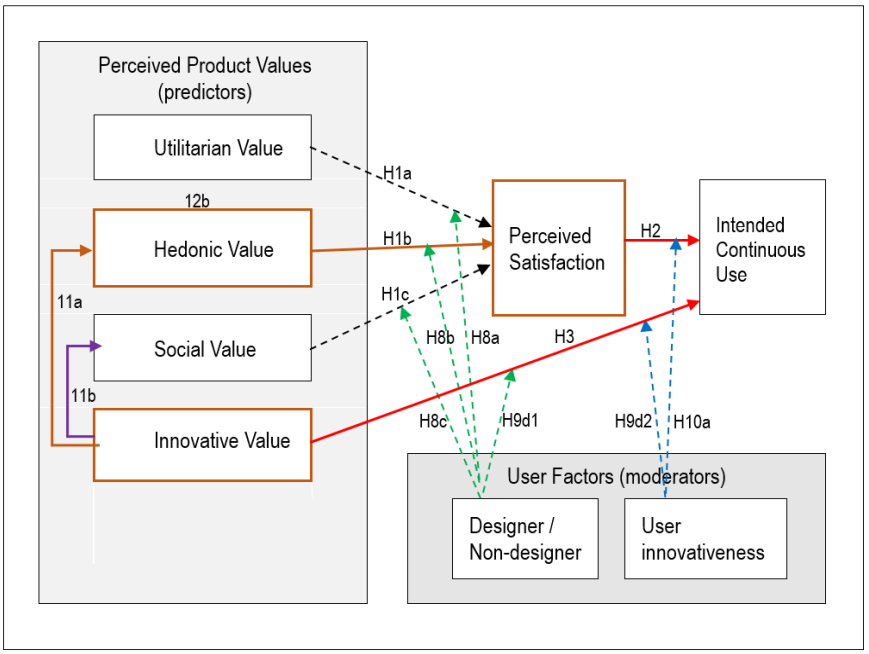


Figure 24: Conceptual framework (Pilot 1 testing results) illustrating the user experience, with impact of the inter-related perceived values on users' satisfaction and continuous adoption of the product, and the moderating effects of individual's factors

(Causal relations with statistical significance from results of the Pilot 1 questionnaire are shown in bold solid lines.)

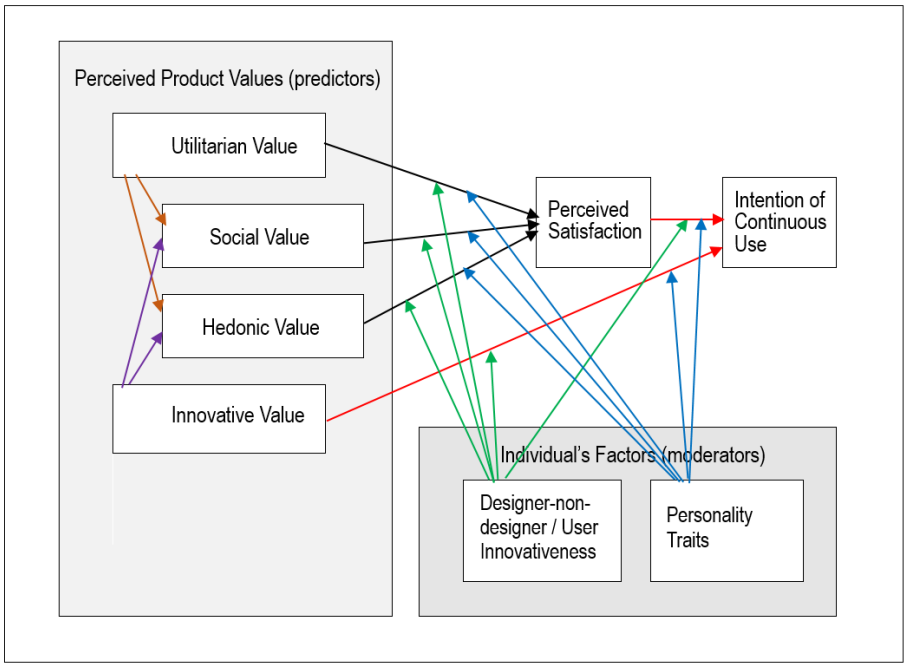


Figure 25: Conceptual framework (updated after Pilot 1 for testing in Pilot 2) illustrating the user experience, with impact of the inter-related perceived values on users' satisfaction and continuous adoption of the product, and the moderating effects of individual's factors

Updates for hypotheses

The following causal relations were proposed for updating the conceptual framework and subsequent testing in the Pilot 2 and full-scale surveys:

(1) **Perceived innovative value contributes to perceived social value and perceived hedonic value (supported by regression tests of pilot questionnaire results), and may subsequently lead to perceived satisfaction / intention of continuous use.** The proposed relations would make sense in situations such as when an innovative product improves the social image of the owner and generates talking points in social occasions enhancing relations contributing to positive social values, or when it induces good feelings for the user contributing to positive hedonic value (provided that the product is well designed and the innovation meets the user's need).

(2) **Perceived utilitarian value contributes to perceived social value and perceived hedonic value (supported by analysis from the mental models), and may subsequently lead to perceived satisfaction / intention of continuous use.** The elicited mental models showed a tendency for the participants to map the social communication related perceptions (goals / values / affordances / product attributes) under the utilitarian domain, implying that they cherished the utilitarian value of the smartphone as it ultimately enabled / maintained / enhanced social communication and relations. On the other hand, the participants also attributed positive hedonic values to utilitarian benefits such as the smooth interaction with his / her smartphone or the sense of comfort trusting the smartphone to remind him / her on important tasks to be done.

The above observed inter-relations and roles for the intrinsic values (hedonic values and social values) mediating the impact of the extrinsic values (utilitarian value and innovative value) also aligned with findings in some prior literature (Davis, 2013; Kalafatis et al., 2010). Two additional hypotheses were drawn to reflect (1) and (2) as below (with the sub-hypotheses listed in **Table 1**):

H8: The perceived intrinsic values (hedonic and social values) mediate the relations between the perceived extrinsic values (utilitarian and innovative values) and perceived satisfaction.

H9: The perceived intrinsic values (hedonic and social values) mediate the relations between the perceived extrinsic values (utilitarian and innovative values) and intention of continuous use.

(3) **Testing of moderating effects by individual's factors would be extended to relevant personal traits, apart from designer / nondesigner and individual innovativeness.** Further literature review has been conducted on the influence of user characteristics on product use experience and perception. Apart from user's experience and common demographic variables such as age, gender and education level, user personality has emerged as an influential factor for investigating pre- or post-purchase consumer behaviour. While the designer/nondesigner difference in product interaction was found significant in some prior researches, the underlying factors for the difference (without much address) might appear to be the possibly varied product expertise (e.g. knowledge and experience) but they could also be the possibly different personalities between the designers and average users. In fact, there have been studies about the relation between people's personalities and their choices of career. A look into the personality factor may help better understand the communication or mis-communication between designers and users, and also the differences among the users in their interaction with the same product. The following 3 related hypotheses are drawn for further testing (with the sub-hypotheses listed in **Table 1**):

H11: The individual characteristics moderate the causal relations between the perceived values and perceived satisfaction.

H12: The individual characteristics moderate the causal relations between the perceived values and intention of continuous use.

H13: The individual characteristics moderate the causal relations between the perceived satisfaction and intention of continuous use.

Discussion

Despite the analyses of the Pilot 1 questionnaire results only showed evidences statistically significant to support some of the expected causal relations and between-group differences, certain tendencies were observable though not statistically significant. Factors contributing to the less-than-significant statistical results for the other causal relations and between-group differences may include:

- the small sample size
- the homogeneity of the sampled respondents – with similarities in personal characteristics, or being conditioned during the research processes
- the characteristics of the product exemplar

While the small sample size would be addressed in the full-scaled survey, the higher than expected homogeneity of the participants' responses may be a result of:

(a) Similar personal characteristics – The participants were all young university students (with a few graduates) who were receptive to new products and innovations, no matter they were designers or not.

(b) Conditioned by the role – In Part One and Pilot 1 of the research, the designers were supposed to respond in the role of a user instead of a designer of the product, such that they might not fully demonstrate their designer traits.

(c) Conditioned by the participatory creative activity – Prior to responding to the Pilot 1 questionnaire which included the questions measuring user innovativeness and other perceived values, the respondents had completed two mental models. The second mental model (Model B) requested the respondents to brainstorm for new ideas to resolve the pain-points identified in the first mental model (Model A) through a SCAMPER creative exercise (MindTools, 2022). This process might have brought up the creativity / innovativeness or other designerly characteristics of the nondesigner respondents to a certain extent.

All the above may have contributed in narrowing the differences between the

designer and nondesigner groups. To address (a), extension of the sampling scope beyond university students was considered. The heterogeneity of the sample might be increased to an appropriate level by extending the scope of respondents from “university students” to “young consumers” (say age 18 to 40). To address (b), situational / scenario type questions would be considered to manage / switch roles. This would involve quite a significant adjustment for the questionnaire which would require another pilot run. The issue (c) should not cause concern for the subsequent surveys. If there is such dual-activity session in future research, the inducive activity had better be arranged after the participants have responded to the questions measuring group differences.

In respect of the product exemplar, the smartphone, a communication product continuously incorporating new technologies and innovations, used by the majority of the target population, was chosen as an exemplar for discussion in eliciting the respondents’ mental models and in the survey. This sampled product has demonstrated an interesting phenomenon: a majority (70-80%) of the respondents have put up the utilitarian value domain as the most important in the mental modelling exercise as well as in the Pilot 1 questionnaire, but the correlation and regression test results showed little connection between the perceived utilitarian value and perceived satisfaction and intention of continuous use. Such phenomenon might be related to the matured development of the smartphone’s basic functions, such that the utilitarian value, though important, was no longer a differentiating factor for user satisfaction. While this doubt would be checked with a larger sample size in the full-scale survey, the next pilot test might try introducing more novel / distinctive product models on top of the respondents’ current smartphone in use.

5.4 Part Two – Survey – Pilot 2

(questionnaire in Appendix 5c)

From the Pilot 1 findings discussed in **Section 5.3**, it was suspected that factors contributing to the less-than-significant statistical results for the between-group differences may include: the small sample size, the homogeneity of the sampled respondents, and the characteristics of the product exemplar.

Adjustment of questionnaire for Pilot 2

To address the concern on the over-homogeneity of responses across the two groups (designer-users and nondesigner-users) found from the analytical results of the Pilot 1 questionnaire, the Pilot 2 questionnaire has been redesigned to:

(1) request the respondent to respond on two smartphone products, one being used by the individual respondent plus another one more "novel" model with features "favoured" by the respondent; and

(2) extend the target respondents from the relatively homogenous "university students" to the more heterogeneous "educated young consumers".

As there have been quite distinctive revisions for the questionnaire incorporating (1) and (2) above plus the other findings from the Stage One mental models, a second pilot run has been found necessary to check the appropriateness of questionnaire items and arrangement before the full-scale survey.

In the Pilot 2 questionnaire, respondents were asked to compose a "new" smartphone weighing a list of innovative design options, and then comment on the perceived product values firstly in the role of "designer" and then in the role of "targeted user". The set of scaled responses from individual respondents in the role of "designer" and "targeted user" respectively would be compared by paired-samples t-test.

Introducing personality traits into the Pilot 2 questionnaire

Further literature review has been conducted on the influence of user characteristics on product use and perception. There have been studies about the relation between people's personalities and their choices of career as well as consumption behaviours. A look into the personality factor may help better understand the communication or mis-communication between designers and users, and also the differences among the users in their interaction with the same product. Related discussions can be referred to in **Section 2.8** under the "Literature Review" chapter.

Balancing the design and length of questionnaire

While introducing an additional smartphone model and a set of items for testing personality, the items in the measurement scales for the perceived product values (utilitarian, hedonic, social and innovative), satisfaction and intention of use / continuous use have been rationalised and trimmed in number considering the Cronbach's Alpha coefficients and other indexes found in the Pilot 1 analytical tests. Hence the overall length of the Pilot 2 questionnaire was similar to that of the Pilot 1 questionnaire.

Checking data healthiness

Responses were collected from 55 respondents invited through the Tencent Survey platform. The healthiness of data was checked: such as consistency of responses to positive and reverse-worded items addressing same / related matters; and presence of "longstring" of same-choice answers across items, raising the question of whether the concerned respondent was responding in a responsible manner. Seven cases were screened. Another 5 outlier cases were identified with the sorting method and Z-score larger than ±3 (Shiffler, 1988; Frost, 2019) in their responses to the key constructs. After screening out the above 12 cases, the remaining 43 cases were used for onward analyses. Among the 43 respondents, 17 were in design related specialisms and 26 were in non-design-related specialisms.

The summary of respondents' demographic characteristics has been given in **Table 6** in **Section 4.3** "Sampling". The descriptive statistics of key variables are given in **Table 14**. The normality of data was examined after the data cleansing. If the general guideline of skewness and kurtosis (excess) within ±1.0 was applied (Hair et al., 2017), there is one item (among 24 items) attracting attention with a skewness of -1.5 and a kurtosis of 3.8. Considering the trial nature of the pilot survey with small sample size, and the varied ranges of acceptable skewness and kurtosis values for assuming data normality (such as -2 to +2 skewness and -11 to +4 kurtosis (excess) supported by Curran et al. (1996) and Hair et al. (2010)), special treatment of the data seemed not worthwhile. As the data set of the later full-scale survey with a target sample size of around 790 is highly expected to show normality, trial tests of parametric analyses were hence proceeded with the Pilot 2 data set to test other aspects of statistical behaviours bearing in mind the one slightly outstanding item.

Statistical **analyses conducted with data from the Pilot 2 questionnaire**

Cronbach's Alpha for the measurement scales, especially the adjusted scales for perceived values and additional scales for personality traits, were checked for their reliability. Despite the measurement of personality traits did use an existing scale in Chinese language with validated applications by a Mainland public survey, the reverse-worded items seemed to have caused confusion in the responses resulting in a low Alpha coefficient for some of the variables. Since it is difficult to control the environment and disturbances where and when the respondents fill in the online questionnaire, it is desirable to avoid the potential confusion caused by reverse-wordings of the questions in the subsequent full-scale survey.

Other analyses were conducted to get a feel on the viability of the adjusted questions, including regression tests on the causal relations, independent samples t-tests on the group differences, paired samples t-tests on the role differences, and mediation and moderation tests on the intervention / interaction effects among variables. A summary of findings with implications for the next-

stage survey is given in the following section. Detailed statistical results would not be reported here as the purpose of the pilot test was not for generating those data.

Table 14: Survey (Pilot 2 test) – Descriptive statistics of key variables

	Descriptive Statistics								
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
(B1) Perceived product values, satisfaction, intention to use – based on respondent's current smartphone									
Perceived Utilitarian Value	43	4.25	7.00	5.9826	.63479	-.531	.361	.744	.709
Perceived Hedonic Value	43	3.75	7.00	5.8721	.66452	-.924	.361	1.191	.709
Perceived Social Value	43	3.75	7.00	5.4593	.94795	-.146	.361	-1.214	.709
Perceived Innovative Value	43	2.50	6.75	4.8837	1.02549	-.361	.361	-.160	.709
Perceived Satisfaction	43	4.00	7.00	5.8140	.75611	-1.015	.361	1.270	.709
Intention of continuous use	43	4.00	7.00	5.8721	.69943	-.723	.361	.873	.709
(B3) Perceived product values, satisfaction, intention to use – based on new smartphone "designed" with enhancements by the respondent in the designer's perspective									
Perceived Utilitarian Value	43	5.00	7.00	6.2500	.55367	-.372	.361	-.046	.709
Perceived Hedonic Value	43	3.50	7.00	6.1221	.73471	-1.517	.361	3.788	.709
Perceived Social Value	43	4.00	7.00	5.9651	.74718	-.728	.361	.435	.709
Perceived Innovative Value	43	3.75	7.00	6.0349	.86874	-.894	.361	.045	.709
Perceived Satisfaction	43	5.00	7.00	6.2326	.61090	-.408	.361	-.465	.709
Intention of Use	43	5.00	7.00	6.1744	.67156	-.310	.361	-.838	.709
(B4) Perceived product values, satisfaction, intention to use – based on new smartphone "designed" with enhancements by the respondent in the user's perspective									
Perceived Utilitarian Value	43	4.50	7.00	6.1686	.60681	-.805	.361	1.111	.709
Perceived Hedonic Value	43	4.25	7.00	5.9767	.70672	-.319	.361	-.251	.709
Perceived Social Value	43	4.25	7.00	5.9419	.70466	-.340	.361	-.358	.709
Perceived Innovative Value	43	3.75	7.00	6.0640	.85407	-1.142	.361	1.370	.709
Perceived Satisfaction	43	4.00	7.00	6.0581	.74169	-.897	.361	1.176	.709
Intention of Use	43	4.00	7.00	6.0814	.74746	-.920	.361	1.218	.709
(C9 & C10) Individual characteristics (with reverse-worded items)									
User Innovativeness (4 items)	43	3.50	7.00	5.4186	.74746	-.207	.361	.212	.709
Openness (3 items)	43	3.67	7.00	5.3333	.79682	-.362	.361	-.128	.709
Neuroticism (3 items)	43	1.33	6.00	4.0000	.86679	-.554	.361	1.204	.709
Extraversion (3 items)	43	2.33	6.00	4.4186	.83283	-.075	.361	-.102	.709
Agreeableness (3 items)	43	3.00	6.67	5.2636	.92741	-.608	.361	-.182	.709
Conscientiousness (3 items)	43	3.33	7.00	4.9922	.90702	-.026	.361	-.421	.709

(To be continued)

Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
(C9 & C10) Individual characteristics (without reverse-worded items)									
User Innovativeness (3 items)	43	3.33	7.00	5.6434	.88609	-.392	.361	-.374	.709
Openness (3 items)	43	3.67	7.00	5.3333	.79682	-.362	.361	-.128	.709
Neuroticism (2 items)	43	1.50	7.00	4.8023	1.10270	-.517	.361	.441	.709
Extraversion (2 items)	43	2.50	6.50	5.0814	1.04043	-.443	.361	-.651	.709
Agreeableness (2 items)	43	3.50	6.50	5.3721	.84581	-.691	.361	-.374	.709
Conscientiousness (2 items)	43	4.00	7.00	5.5930	.76575	-.329	.361	-.617	.709

5.4.1 Summary of key findings

Reverse-worded items are used by researchers in questionnaires to avoid acquiescence (agreement) bias and screen careless responses, but such items may sometimes cause confusion in respondents' answers and ultimately reduce the reliability of the scales (Sonderen et al., 2013). The Pilot 2 questionnaire used several reverse-worded items to keep respondents alert hoping to reduce the potential agreement bias: 1 out of 16 among the items for perceived utilitarian / hedonic / social / innovative values; 1 out of 4 in the items for individual innovativeness; and 4 out of 15 among the items for personality traits. The reverse-worded items did cause confusion in some of the respondents' answers. As mentioned above, 7 cases with obvious inconsistency in their answers to reverse-worded items and / or "longstring" of same answers have been screened out before conducting the inferential analyses. The analyses involving variables measured with reverse-worded items have been conducted with and without the reverse-worded items for comparison.

The inter-relations among the four perceived product values projected in the Pilot 1 analysis that "perceived innovative value contributes to perceived social value and perceived hedonic value" and "perceived utilitarian value contributes to perceived social value and perceived hedonic value" are found significant in the Pilot 2 data. The interactions have been further tested with the serial mediation model (model 80) of Process Macro in SPSS (Hayes, 2022). The following mediation effects are found significant, hence supporting the updated hypotheses of H8 and H9:

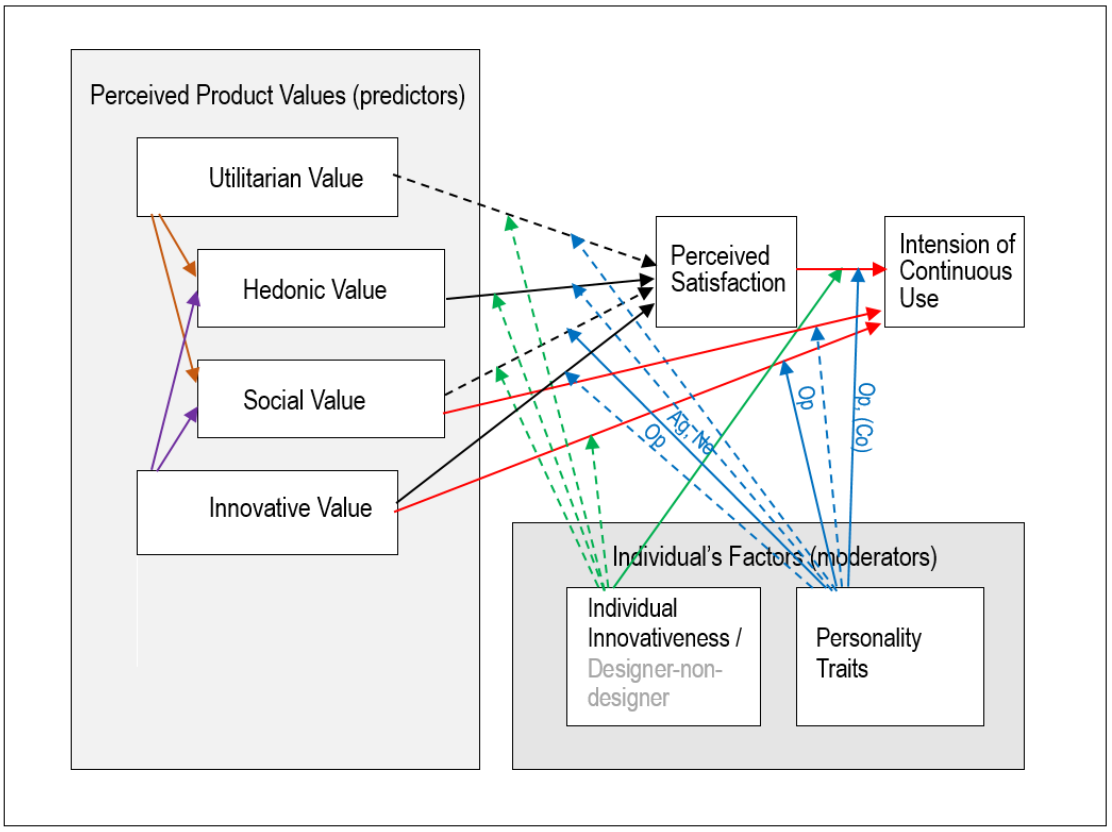
<u>Perceived hedonic value and perceived social value mediating the predictive effects of perceived utilitarian value</u>

- "Perceived utilitarian value" (predictor) contributes through "perceived hedonic value" (mediator 1) and "perceived satisfaction" (mediator 2) to "intention of continuous use" (outcome);
- "Perceived utilitarian value" (predictor) contributes through "perceived social value" (mediator) to "intention of continuous use" (outcome).

Perceived hedonic value and perceived social value mediating the predictive effects of perceived innovative value

- "Perceived innovative value" (predictor) contributes through "perceived hedonic value" (mediator 1) and "perceived satisfaction" (mediator 2) to "intention of continuous use" (outcome);
- "Perceived innovative value" (predictor) contributes through "perceived social value" (mediator) to "intention of continuous use" (outcome);
- "Perceived innovative value" (predictor) contributes through "perceived satisfaction" (mediator) to "intention of continuous use" (outcome);
- At the same time, "perceived innovative value" also directly contributes to "intention of continuous use".

Similar to the analysis of data from the Pilot 1 data set, the designer / nondesigner factor does not lead to statistically significant between-group differences or moderation of the causal effects, when tested with independent samples t-tests and Process Macro (Hayes, 2022) model 76 respectively. On the other hand, some potential moderating effects by "individual innovativeness" and the personality traits of openness, agreeableness, neuroticism and conscientiousness have shown up in the tests with the Process Macro model 76, as illustrated in the conceptual framework in **Figure 26**.



Co: Conscientiousness; Ag: Agreeableness: Ex: Extraversion; Ne: Neuroticism; Op: Openness

Figure 26: Conceptual framework (Pilot 2 testing results) illustrating the user experience, with impact of the inter-related perceived values on users' satisfaction and continuous adoption of the product, and the moderating effects of individual's factors

(Causal relations with statistical significance from results of the Pilot 2 questionnaire are shown in bold solid lines.)

5.4.2. From Pilot 2 to the full-scale survey

All hypothesised relations would be further tested in the full-scale survey for verification with a larger sample.

The comparison by paired samples t-test between the sets of scaled responses on perceived values and satisfaction from individual respondents in the role of "designer" and in the role of his / her imagined "targeted user" found no statistically significant differences. The result might imply that perceiving the product values from two different perspectives during the short time duration was a difficult task beyond the capacity of most respondents; or that the respondents found it difficult to imagine the value perception of his / her target user; or that the outcomes from the self-selection of target users were too divergent to support the emergence of a significant tendency. Therefore, the questionnaire for the full-scale survey is further adjusted considering the above possibilities.

In Pilot 2 and the later full-scale survey, scenario questions were designed into the survey questionnaires to trigger the role-taking responses of respondents as users and as designers, so that apart from comparing the perceptions of designer-users against nondesigner-users, other comparisons across roles could be made. The cross-comparisons were expected to widen the perspectives in discovering the designer/user differences and underpinning factors contributing to the differences. Role-playing approach and scenario questions have been applied by researchers in qualitative (Stanton et al.,1956; Brown et al., 2014) and quantitative studies (Atzmüller & Steiner, 2010; Utomo et al., 2020) respectively for eliciting situational responses and were found especially useful when the topics concerned respondents' beliefs, attitudes or judgements.

With reference to the statistics of the Cronbach's Alpha tests, those items with less reliability including the reverse-worded items have been removed / replaced / adjusted for the final-stage questionnaire.

The reverse-worded items were maintained at the minimal for them to perform the expected alerting function: keeping the 1 out of 16 among the items for perceived utilitarian / hedonic / social / innovative values; and reducing their number from 4 out of 15 to 1 out of 15 among the items for personality traits. Additional precautions are made by:

- Alerting the respondents with a remark under the questions with reverse-worded items asking the them to “carefully read and answer the question as the items below are worded in both positive and reverse directions”.
- Pairing the reverse-worded item with a positive worded item in the same meaning for counter-checking and onward analysis.

The order of some questions has been re-arranged for enhancing flow and attention. For example, the scaled measurements for personality traits and individual innovativeness have been moved from the end to the beginning of the “Respondent’s Background” section to catch better attention.

The fine-tuned questionnaire is in **Appendix 5d**.

5.5 Part Two – Survey – Full-Scale

(final questionnaire in Appendix 5d)

5.5.1 Data collection

The total number of responses received for the full-scale survey was 1203. Respondents were invited both through faculties of China's universities and the Tencent Survey platform. A stratified sampling technique was employed when inviting responses from the Tencent Survey platform to strike a better balance between the gender and age groups, so as to facilitate the designer/user role-taking scenarios on the one hand, and to avoid the potential confounding concern arisen from gender and age distribution bias on the other hand. After the data cleansing process which has screened out 77 outliers and 335 potentially invalid responses according to pre-set criteria, 791 responses (232 designers and 559 nondesigners) were used for subsequent analyses. **Table 8** in **Section 4.3** "Sampling" shows the demographic characteristics of the respondents.

5.5.2 Data cleansing

Before proceeding to analyse the data, the data's healthiness was checked and cleansed according to the following pre-set criteria.

Outliers with Z-score over 3

Outlier cases were identified and eliminated with the sorting method and Z-score larger than ±3 (Shiffler, 1988; Frost, 2019) in their responses to the key constructs. It is recognised that Z-scores beyond +/- 3 are very extreme, since in a population that follows the normal distribution, Z-score values beyond +/- 3 only have a probability of 0.0027 (2 x 0.00135). (77 cases* were identified.)

Unreasonable short completion time

Cases with average completion time of less than 2 second per item were screened out, as researchers generally recognise that it is not reasonable for a normal person to complete a questionnaire with serious consideration in an average per item time of less than 2 seconds (Curran, 2015). (10 cases* were identified.)

LongString answers

The presence of "longstring" of same-choice answers across items raises the question of whether the concerned respondent is responding in a responsible and serious manner. There are varied standards for LongString (Curran, 2015). The current study applied the criterion that if more than half of the items in a multi-item question return with the same answer, it would be regarded a LongString with questionable validity. If there were two or more LongString answers out of the 5 main question series in the questionnaire, the response case would be screened out. (319 cases* were identified.)

Contradictory answers for corresponding normal and reverse-worded questions

Reverse-worded items have been used by researchers to reduce acquiescence (agreement) bias and screen careless responses in questionnaires, but such items may sometimes cause confusion in respondents' answers and ultimately reduce the reliability of the scales (Sonderen et al., 2013). As previously discussed, considering the Pilot 1 and 2 experience, all the 6 reverse-worded questions in the Pilot 2 questionnaire have been converted to normal-worded questions for scoring in the final questionnaire. Three of the 6 reverse-worded questions were kept at different sections of the questionnaire, next to their counterpart normal-worded question, just as check points for careless responses. Responses with contradictory answers for all 3 pairs of normal and reverse-worded questions were screened out. (14 cases* were identified.)

Respondents outside the prescribed demographic ranges

The target sample for the full-scale survey was set to be respondents with tertiary education or above at the age of 18 to 40 studying / working in design and non-design fields to facilitate the setup of cross-group comparison. The responses were scanned against the prescribed criteria, and 23 cases outside the prescribed demographic ranges were not included for data analyses in the current study. (23 cases* were identified.)

Respondents outside Mainland China

To avoid as far as possible, the interference of influential factors other than those targeted for comparison, respondents with residence outside Mainland China were screened out. (2 cases* were identified.)

* As there are certain overlaps among the problem cases identified above, an actual total of 412 responses out of the 1203 collected responses were disqualified based on the pre-set criteria including outliers. After cleansing, a set of 791 valid responses were subsequently analysed.

5.5.3 Descriptive statistics and normal distribution of data

The summary of respondents' demographic characteristics has been given in **Table 8** in **Section 4.3** "Sampling". The descriptive statistics of key variables are given in **Table 15**. The data shows normality after cleansing. With reference to the general guideline that data sets with a skewness and kurtosis (excess) within ±1.0 can be regarded as normally distributed (Hair et al., 2017), all the skewness and kurtosis values in this data set are within ±1.0 after the elimination of outliers, and normality of the data could be assumed. It was hence justified to apply parametric analyses for the data.

5.5.4 List of statistical tests

After ensuring the data healthiness and normal distribution, further statistical analyses conducted with data from the full-scale survey included:

- Checking the reliability of the measurement scales with Cronbach's Alpha tests
- Checking the construct validity with factor analysis
- Checking the causal relations with regression tests (with bootstrapping)
- Checking the group differences with independent-samples t-tests (with bootstrapping)
- Checking the role differences with paired-samples t-tests and independent-samples t-tests (with bootstrapping)
- Checking interaction effects among variables, such as the mediating and moderating effects – with regression-based Process Macro (with bootstrapping) (Hayes, 2022)

Table 15: Survey (full-scale) – Descriptive statistics of key variables

	Descriptive Statistics								
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
(B1) Perceived Values - for smartphone currently used by respondent									
Perceived Utilitarian Value - for smartphone currently used by respondent	791	3.50	7.00	6.0180	.69120	-.819	.087	.976	.174
Perceived Hedonic Value - for smartphone currently used by respondent	791	3.25	7.00	5.8138	.78092	-.678	.087	.130	.174
Perceived Hedonic Value - for smartphone currently used by respondent (modified)	791	3.33	7.00	5.9928	.80318	-.828	.087	.455	.174
Perceived Social Value - for smartphone currently used by respondent	791	1.75	7.00	5.1283	1.02869	-.367	.087	-.117	.174
Perceived Social Value - for smartphone currently used by respondent (modified)	791	2.20	7.00	5.1580	.95534	-.292	.087	-.274	.174
Perceived Innovative Value - for smartphone currently used by respondent	791	1.00	7.00	4.6599	1.12679	-.241	.087	-.029	.174
Perceived Satisfaction - for smartphone currently used by respondent	791	2.50	7.00	5.5980	.89595	-.530	.087	-.088	.174
Intention of continuous use - for smartphone currently used by respondent	791	2.50	7.00	5.6960	.93837	-.722	.087	.247	.174
(B2a) Perceived Values - for new smartphone with respondent's preferred enhancements									
Perceived Utilitarian Value - for new smartphone with respondent's preferred enhancements	791	3.50	7.00	6.0676	.74088	-.787	.087	.529	.174
Perceived Hedonic Value - for new smartphone with respondent's preferred enhancements	791	3.25	7.00	5.8976	.77741	-.622	.087	.027	.174
Perceived Hedonic Value - for new smartphone with respondent's preferred enhancements (modified)	791	3.67	7.00	6.0704	.79571	-.865	.087	.438	.174
Perceived Social Value - for new smartphone with respondent's preferred enhancements	791	2.00	7.00	5.2873	1.07018	-.352	.087	-.487	.174
Perceived Social Value - for new smartphone with respondent's preferred enhancements (modified)	791	2.00	7.00	5.3057	1.02394	-.298	.087	-.538	.174
Perceived Innovative Value - for new smartphone with respondent's preferred enhancements	791	2.00	7.00	5.2494	1.10272	-.429	.087	-.371	.174
Perceived Satisfaction - for new smartphone with respondent's preferred enhancements	791	3.00	7.00	5.7870	.90243	-.772	.087	.172	.174
Intention of use - for new smartphone with respondent's preferred enhancements	791	3.00	7.00	5.8780	.90496	-.909	.087	.594	.174
(B2) Perceived importance of enhancements for own self									
Enhancing Utilitarian Value - User's perceived importance	791	2.33	5.00	4.1275	.57105	-.625	.087	.047	.174
Enhancing Hedonic Value - User's perceived importance	791	2.00	5.00	4.0107	.62664	-.425	.087	-.159	.174
Enhancing Social Value - User's perceived importance	791	1.13	5.00	3.5158	.72669	-.292	.087	-.277	.174
Enhancing Innovative Value - User's perceived importance	791	1.33	5.00	3.6898	.74646	-.385	.087	-.079	.174
Enhancing Overall Value - User's perceived importance	791	2.00	5.00	4.0903	.64959	-.498	.087	-.139	.174
(B3a) Projected importance of enhancements for one of the target user groups (18-25 male)									
Enhancing Utilitarian Value - Designer's projected importance for target user group (18-25 male)	172	2.83	5.00	4.3014	.55272	-.582	.185	-.522	.368

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Enhancing Hedonic Value - Designer's projected importance for target user group (18-25 male)	172	2.50	5.00	4.1531	.60789	-.422	.185	-.754	.368
Enhancing Social Value - Designer's projected importance for target user group (18-25 male)	172	2.00	5.00	3.7776	.72293	-.354	.185	-.516	.368
Enhancing Innovative Value - Designer's projected importance for target user group (18-25 male)	172	2.17	5.00	4.0048	.71384	-.464	.185	-.539	.368
Enhancing Overall Value - Designer's projected importance for target user group (18-25 male)	172	2.40	5.00	4.1256	.65716	-.395	.185	-.702	.368
(B3b) Projected importance of enhancements for one of the target user groups (18-25 female)									
Enhancing Utilitarian Value - Designer's projected importance for target user group (18-25 female)	201	2.50	5.00	4.1542	.60689	-.478	.172	-.642	.341
Enhancing Hedonic Value - Designer's projected importance for target user group (18-25 female)	201	2.50	5.00	4.2496	.56914	-.506	.172	-.472	.341
Enhancing Social Value - Designer's projected importance for target user group (18-25 female)	201	1.50	5.00	3.7767	.72789	-.458	.172	-.299	.341
Enhancing Innovative Value - Designer's projected importance for target user group (18-25 female)	201	1.50	5.00	3.7711	.77487	-.423	.172	.061	.341
Enhancing Overall Value - Designer's projected importance for target user group (18-25 female)	201	2.20	5.00	4.0149	.68204	-.414	.172	-.359	.341
(B3c) Projected importance of enhancements for one of the target user groups (26-40 male)									
Enhancing Utilitarian Value - Designer's projected importance for target user group (26-40 male)	230	2.33	5.00	4.2855	.56386	-.541	.160	-.252	.320
Enhancing Hedonic Value - Designer's projected importance for target user group (26-40 male)	230	2.00	5.00	4.0362	.63643	-.509	.160	-.128	.320
Enhancing Social Value - Designer's projected importance for target user group (26-40 male)	230	1.75	5.00	3.7250	.65786	-.285	.160	-.141	.320
Enhancing Innovative Value - Designer's projected importance for target user group (26-40 male)	230	2.17	5.00	3.9036	.71649	-.206	.160	-.836	.320
Enhancing Overall Value - Designer's projected importance for target user group (26-40 male)	230	2.20	5.00	4.1826	.67678	-.603	.160	-.093	.320
(B3d) Projected importance of enhancements for one of the target user groups (26-40 female)									
Enhancing Utilitarian Value - Designer's projected importance for target user group (26-40 female)	188	2.50	5.00	4.0798	.62752	-.289	.177	-.577	.353
Enhancing Hedonic Value - Designer's projected importance for target user group (26-40 female)	188	2.50	5.00	4.2456	.58487	-.638	.177	.046	.353
Enhancing Social Value - Designer's projected importance for target user group (26-40 female)	188	1.50	5.00	3.7926	.76315	-.727	.177	.421	.353
Enhancing Innovative Value - Designer's projected importance for target user group (26-40 female)	188	1.00	5.00	3.7465	.87200	-.467	.177	-.002	.353
Enhancing Overall Value - Designer's projected importance for target user group (26-40 female)	188	2.00	5.00	4.1277	.73031	-.611	.177	-.190	.353

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
(C1&2) Individual Characteristics									
Individual Characteristic - Innovativeness (in respect of smartphone)	791	1.75	7.00	5.1185	1.06487	-.260	.087	-.420	.174
Individual Characteristic - Openness (Big Five Personality Traits)	791	2.00	7.00	5.1584	1.02014	-.193	.087	-.481	.174
Individual Characteristic - Neuroticism (Big Five Personality Traits)	791	1.00	7.00	4.6738	1.25703	-.487	.087	-.082	.174
Individual Characteristic - Extraversion (Big Five Personality Traits)	791	1.00	7.00	4.8753	1.28440	-.300	.087	-.493	.174
Individual Characteristic - Agreeableness (Big Five Personality Traits)	791	3.00	7.00	5.6498	.80470	-.495	.087	-.023	.174
Individual Characteristic - Conscientiousness (Big Five Personality Traits)	791	2.67	7.00	5.4024	.89882	-.262	.087	-.531	.174

5.5.5 Assessing reliability of measurement scales

The Cronbach's Alpha tests have been applied to check the reliability, particularly the internal consistency, of the measurement scales for the survey. The Alpha coefficients indicate the average reliability on whether the items are measuring the same construct (Burns & Burns, 2008). An Alpha value of .70 or above is in general desirable while an Alpha value of .60 may be acceptable especially for exploratory research (Hair et al., 2010).

The Cronbach's Alpha coefficients for the key variables are summarised in **Table 16**. All variables except three show an Alpha coefficient above 7.0 or 8.0. The three exceptions with marginal Alpha values are: (a) perceived satisfaction at .658; (b) personality trait of agreeableness at .638; and (c) user's perceived importance in enhancing utilitarian value at .683.

It is recognised by researchers that the Cronbach's Alpha coefficient of constructs with less than 3 items may not truly reflect their reliability, which is the case of (a) where the variable "perceived satisfaction" only consists of two items.

For case (b), the set of 15-item personality traits measurement scale was adopted from a Chinese language scale (translated from Big Five personality scale) tested in the China Family Panel Studies since 2008 (吴琼 & 谷丽萍, 2020). After the testing in Pilot 2 and conversion of the 4 reverse-worded items into normal-worded items, the Cronbach's Alpha coefficients have improved quite significantly. For further improvement if the test is re-run, the researcher may consider adding more items to the variable "agreeableness" from the Big Five scale pool, or replace the 15-item scale with a 20 or more item scale. Of course a balance between the scale reliability, the length of questionnaire, and the respondents' patience and concentration has to be addressed.

For case (c), as stated in **Table 16**, this group of variables (for assessing the importance of enhancements in a new smartphone) are not the conventional type of multi-item measurement scales requiring consistency within the variable.

Instead, they are composite scores reflecting the respondent's perceived importance for 5-8 future design options under each value group (utilitarian, hedonic, social, innovative, and overall). As such, the priorities given by the respondent to options under a particular value group do not necessarily show consistency across the group. Hence the Cronbach's Alpha values are just shown for reference.

Considering the above, the measurement scales have got satisfactory internal consistency (where Cronbach's Alpha applies) and the resulted data can be regarded as reliable for subsequent statistical analyses.

Table 16: Survey (full-scale) – Summary of Cronbach's Alpha tests for key constructs

Variables	Number of cases	Number of items	Cronbach's Alpha	
(B1/B2a) Perceived values, satisfaction and intention of (continuous) use				
			Current Smartphone	Envisaged New Smartphone
Perceived Utilitarian Value	791	4	.753	.824
Perceived Hedonic Value	791	4	.798	.787
Perceived Hedonic Value (modified)	791	3	.840	.846
Perceived Social Value	791	4	.797	.870
Perceived Social Value (modified)	791	5	.802	.876
Perceived Innovative Value	791	4	.808	.854
Perceived Satisfaction	791	2	.658	.729
Intention of Continuous Use / Intention of Use	791	2	.715	.742
(C1&2) Individual's characteristics				
Individual Innovativeness	791	4	.818	
Personality Trait – Openness	791	3	.773	
Personality Trait – Neuroticism	791	3	.770	
Personality Trait – Extraversion	791	3	.860	
Personality Trait – Agreeableness	791	3	.638	
Personality Trait – Conscientiousness	791	3	.701	
(B2) Perceived importance of enhancements in new smartphone (for own self) *Note: This group of variables are not the conventional type of multi-item measurement scales. Instead, they are composite scores reflecting the respondent's perceived importance for 5-8 future design options under each value group, and the priorities given by the respondent to options under a particular value group does not necessarily show consistency across the group. Hence the Cronbach's Alpha values are just shown for reference.*				
Enhancing Utilitarian Value - User's perceived importance	791	6	.683	
Enhancing Hedonic Value - User's perceived importance	791	6	.758	
Enhancing Social Value - User's perceived importance	791	8	.841	
Enhancing Innovative Value - User's perceived importance	791	6	.852	
Enhancing Overall Value - User's perceived importance	791	5	.819	

5.5.6 Assessing construct validity

Factor Analysis was conducted with the measurement items of the independent variables to check the construct validity and factor loading. The extraction method of Principal Component Analysis (PCA) and rotation method of Varimax were applied for their recognised robustness (Burns & Burns, 2008). Other methods like Principal Axis Factoring (PAF) and direct oblimin have been considered and tested, as some researchers recommended using the oblique instead orthogonal rotation methods for working with correlated variables, but the outcomes were very much similar to PCA.

The Rotated Component Matrix (**Table 17**) and Correlation Matrix (**Appendix 9a**) can be examined to assess the convergent validity (degree of association among the measurement items of a construct) and discriminant validity (the lack of association among different constructs) within the construct validity. By looking at the definitions, the discriminant validity appears not applicable to my research model, which projects the existence of inter-relations between the four perceived values with the intrinsic values (hedonic value and social value) being mediators of the causal relations between the extrinsic values (utilitarian value and innovative value) and perceived satisfaction / intention of (continuous) use.

With regard to convergent validity, 15 of the 16 items loaded onto their primary factors above .59 up to .84. Item S5 “using this smartphone matches my personality” was the only item riding across two factors (.430 under the hedonic factor and .432 under the social factor) without a distinctive primary loading. Hence the overall load distribution has demonstrated high coherence of items within variables and thus convergent validity of the measurements.

The total variance explained was also satisfactory at 59.3% (**Appendix 9b**), as researchers like Hair et al. (2010) recommended 60% as the satisfactory level while others like Pallant (2007) and Field (2009) recommended 50% or above.

Concerning the fence-sitter item S5 “using this smartphone matches my personality”, it was originally grouped under hedonic value based on literature

reference and considering the fact that personality relates more to the self and a match with one's personality is somewhat a gut feeling. However, the cross-loading may imply that the Chinese may see the smartphone's match of personality a value for the individual to stand out among social groups, and hence resulted in a high correlation with the social items. While revisiting the original items under perceived social values, the item S2 "using this smartphone makes a good impression on other people" could be a good companion of item S5 – i.e. the smartphone matches the individual's personality and thus makes a good impression on other people. Considering such, item S5 has been migrated from hedonic value to social value, further enhancing the internal consistency (indicated by the improved Cronbach's Alpha coefficients) and convergent validity.

Cronbach's Alpha test was conducted again for the modified perceived hedonic value scale with 3 items and modified perceived social value scale with 5 items. **Table 16** shows an improvement of Alpha coefficient signifying better reliability for both scales: the modified perceived hedonic value scale improved from .798 to .840; whereas the modified perceived social value scale improved from .797 to .802.

Another interesting phenomenon found in the factor loading exercise was that the items designed for measuring perceived utilitarian value and for measuring perceived hedonic value are all loaded under one factor instead of two (**Table 17**). The most possible reason is the expected inter-relation between the two perceived values, one influencing the other, rather than the possibility of their items measuring similar things. Here, apart from the computational outcomes by the Principal Component Analysis, human cognitive power is needed to judge the distinctiveness among the items measuring the two perceived values. It is clear-cut that items U1 to U4 describing the ease of use, problem solving, efficiency, and clear understandable interaction, are related to utilitarian value; whereas items H1 to H3 describing happy feeling, pleasure, and enjoyment, are related to hedonic value.

The inter-relatedness of perceived utilitarian value and perceived hedonic value is evident if the outcomes of the mediation tests (details in **Appendix 12a**) are examined:

1a. perceived utilitarian value → intention of continuous use:
$\beta = .20$, $p < .05$

1b. perceived utilitarian value → perceived hedonic value → intention of continuous use:
$\beta = .14$, $p < .05$

2a. perceived utilitarian value → perceived satisfaction → intention of continuous use:
$\beta = .08$, $p < .05$

2b. perceived utilitarian value → perceived hedonic value → perceived satisfaction → intention of continuous use:
$\beta = .13$, $p < .05$

The above mediation test results indicate that perceived hedonic value is a strong mediator between the relations from perceived utilitarian value to intention of continuous use (1b) and to perceived satisfaction (2b). The effect mediated through hedonic value in 2b ($\beta = .13$, $p < .05$) is even stronger than the more direct effect in 2a ($\beta = .08$, $p < .05$).

In practice, the user would perceive the utilitarian value upon fulfillment of the instrumental goals and tasks, which would also trigger an emotional good state (such as contended, relaxed, pleased), and ultimately leading to satisfaction and or continuous use of the product.

Table 17: Survey (full-scale) – Factor Analysis (for independent variables) – Principal Component Analysis with Varimax Rotation

Rotated Component Matrix[a]

		Component		
		1 (Utilitarian / Hedonic)	2 (Social)	3 (Innovative)
U1	Perceived Utilitarian Value 1 – I find this smartphone easy to use. 我觉得这个智能手机易于使用。	.622	-.008	.025
U2	Perceived Utilitarian Value 2 – This smartphone helps me solve a lot of problems. 这个智能手机帮助我解决很多问题。	.762	.057	.116
U3	Perceived Utilitarian Value 3 – This smartphone helps me handle my work / study / living efficiently. 这个智能手机帮助我有效地处理我的工作／学习／生活事项。	.722	.063	.121
U4	Perceived Utilitarian Value 4 – My interaction with this smartphone is clear and understandable. 我与这个智能手机的互动是清晰和容易理解的。	.672	.120	.070
H1	Perceived Hedonic Value 1 – Using this smartphone makes me feel happy. 使用这个智能手机让我感觉愉快。	.782	.176	.122
H2	Perceived Hedonic Value 2 – Using this smartphone gives me pleasure. 使用这个智能手机带给我乐趣。	.768	.198	.059
H3	Perceived Hedonic Value 3 – I enjoy using this smartphone. 我享受使用这个智能手机。	.689	.213	.208
S1	Perceived Social Value 1 – Using this smartphone improves my communication with others. 使用这个智能手机可增强我与其他人的沟通。	.310	.702	-.027
S2	Perceived Social Value 2 – Using this smartphone makes a good impression on other people. 使用这个智能手机给其他人留下好印象。	.129	.608	.385
S3	Perceived Social Value 3 – Using this smartphone gives me talking points in social life. 使用这个智能手机让我在社交生活中多了话题。	.044	.800	.289
S4	Perceived Social Value 4 – Using this smartphone enhances my connection with the community. 使用这个智能手机促进我与社群共融。	.046	.821	.208
S5	Perceived Social Value 5 – Using this smartphone matches my personality. 这个智能手机配合我的个性。 *(Migrated from Perceived Hedonic Value)*	.430	.432	.264
I1	Perceived Innovative Value 1 – The smartphone I'm using is novel. 我使用的智能手机是新颖的。	.155	.441	.590
I2	Perceived Innovative Value 2 – The smartphone I'm using is different from the ordinary. 我使用的智能手机与一般智能手机不同。	.016	.125	.794
I3	Perceived Innovative Value 3 – The smartphone I'm using has surprising features. 我使用的智能手机有令人惊喜的功能。	.188	.131	.838
I4	Perceived Innovative Value 4 – Using this smartphone inspires my imagination. 这個智能手机的使用給了我想象空间。	.206	.269	.735

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

5.5.7 Verifying causal relations: Regression Analyses

To verify the conceptual framework and causal relations projected in the hypotheses H1, H2, H3, and H14, multiple linear regression tests were conducted. The results are reported below.

5.5.7.1 Hypothesis 1 – test results and discussion

H1: A product with high perceived values leads to a higher perceived satisfaction for users.

Results

Multiple linear regression tests were conducted with the independent variables of perceived utilitarian, hedonic, social and innovative values, and the dependent variable of perceived satisfaction. The regression results indicated that there was a collective significant relationship between the independent variables of perceived utilitarian, hedonic, social and innovative values, and the dependent variable of perceived satisfaction, $F(4, 786) = 157.33$, $p < .05$, $R^2 = .45$.

The individual independent variables were further examined:
Perceived utilitarian value significantly predicted perceived satisfaction,
$\beta = .13$, $t = 3.70$, $p < .05$.
Perceived hedonic value significantly predicted perceived satisfaction,
$\beta = .34$, $t = 9.16$, $p < .05$.
Perceived social value significantly predicted perceived satisfaction,
$\beta = .07$, $t = 2.00$, $p < .05$.
Perceived innovative value significantly predicted perceived satisfaction,
$\beta = .32$, $t = 9.62$, $p < .05$.

Hence, H1 with its sub-hypotheses H1a to H1d (detailed in **Table 33**) are all supported.

The regression data can be referred to in **Appendix 10a**.

Discussion

Here, perceived hedonic value is recognised as the strongest predictor for perceived satisfaction, followed by perceived innovative value and perceived utilitarian value. Perceived social value is found to be a comparatively weak predictor of perceived satisfaction.

Despite perceived utilitarian value has been emphasised by participants in the Part One mental models and ranked high in a direct question in the survey asking the respondents to prioritise the 4 perceived product values (**Table 31**), its predictive power for satisfaction only ranks the third in the regression test. A possible reason may be that most smartphones (at least those used by the young university students and working professionals in China) have more or less similar functionalities nowadays. So good functions are well expected and hence do not bring extra satisfaction. On the other hand, the later mediation test (in **Section 5.5.9**) would indicate that a large part of the effect of perceived utilitarian value on perceived satisfaction routes through the mediators of perceived hedonic value and perceived social value.

5.5.7.2 Hypotheses 2 and 3 – test results and discussion

H2: A product with high perceived satisfaction leads to a higher rate of intention of continuous use for the product.
H3: A product with high perceived values leads to a higher rate of intention of continuous use for the product.

Results

Multiple linear regression tests were conducted with the independent variables of perceived satisfaction, perceived utilitarian, hedonic, social and innovative values, and the dependent variable of intention of continuous use. The regression results indicated that there was a collective significant relationship between the independent variables of perceived satisfaction, perceived utilitarian, hedonic and innovative values, and the dependent variable of intention of continuous use, $F(5, 785) = 116.50$, $p < .05$, $R^2 = .43$.

The individual independent variables were further examined:
Perceived satisfaction significantly predicted intention of continuous use,
$\beta = .37$, $t = 10.29$, $p < .05$.
Perceived utilitarian value significantly predicted intention of continuous use,
$\beta = .15$, $t = 4.05$, $p < .05$.
Perceived hedonic value significantly predicted intention of continuous use,
$\beta = .16$, $t = 4.05$, $p < .05$.
Perceived innovative value significantly predicted intention of continuous use,
$\beta = .09$, $t = 2.50$, $p < .05$.

Hence, H2 is supported; whereas H3 is supported for its sub-hypotheses concerning perceived utilitarian (H3a), hedonic (H3b) and innovative (H3d) values, but not perceived social values (H3c).

The regression data can be referred to in **Appendix 10b**.

Discussion

When intention of continuous use is the outcome, perceived satisfaction seems the strongest predictor. But satisfaction would not come out of nothing. Perceived hedonic value and perceived utilitarian value are the two strong root predictors. Perceived social value continues to be the weakest and simply shows no significant effect on intention of continuous use.

The perceived social value's weak predictive power for perceived satisfaction / intention of continuous use is a bit surprising at the first instance, as the mobile phone has basically been a communication tool playing an important role in social life. Previous studies have also indicated sociability as an important motivator for using mobile devices (Leung & Wei, 2000; Palen et al., 2000). However, more recent research (Youn, 2016) found that with the more and more multi-functioning and fast connections for the smartphone, users tend to use it more for solitary activities such as seeking information, playing games, or indulging in entertainments, and less for social contacts.

5.5.7.3 Hypothesis 14 – test results and discussion

H14: The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived values of a product.

H14a: The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived utilitarian value of a product.

H14b: The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived hedonic value of a product.

H14c: The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived social value of a product.

H15d: The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived innovative value of a product.

Results

Multiple linear regression tests were conducted with the independent variables of individual characteristics, including Individual Innovativeness (in respect of smartphone) and the Big Five personality traits (openness to experience, neuroticism, extraversion, agreeableness, and conscientiousness), and the dependent variable of perceived product values (perceived utilitarian value, perceived hedonic value, perceived social value, and perceived innovative value). The regression results indicated that there was a collective significant relationship between the independent variables of individual characteristics and each of the dependent variable of perceived utilitarian, hedonic, social and innovative values:

Individual characteristics → Perceived utilitarian value (for current smartphone)
$F(6, 784) = 15.07$, $p < .05$, $R^2 = .10$

Individual characteristics → Perceived utilitarian value (for new smartphone)
$F(6, 784) = 22.33$, $p < .05$, $R^2 = .15$

Individual characteristics → Perceived hedonic value (for current smartphone)
$F(6, 784) = 14.29$, $p < .05$, $R^2 = .10$

Individual characteristics → Perceived hedonic value (for new smartphone)
$F(6, 784) = 20.91$, $p < .05$, $R^2 = .14$

Individual characteristics → Perceived social value (for current smartphone)
$F(6, 784) = 40.03$, $p < .05$, $R^2 = .24$

Individual characteristics → Perceived social value (for new smartphone)
$F(6, 784) = 47.86$, $p < .05$, $R^2 = .27$

Individual characteristics → Perceived innovative value (for current smartphone)
$F(6, 784) = 32.31$, $p < .05$, $R^2 = .20$

Individual characteristics → Perceived innovative value (for new smartphone)
$F(6, 784) = 33.96$, $p < .05$, $R^2 = .21$

The statistically significant causal relations between individual independent variables and dependent variables are listed below with their statistical data presented in **Table 18** on the next page.

H14a is supported for:	Inn, Op, Ag, Co → PUV(C)	Inn, Op, Ex, Ag, Co → PUV(N)
H14b is supported for:	Op, Ag → PHV(C)	Inn, Op, Ag → PHV(N)
H14c is supported for:	Inn, Op, Ex, Ag, Co → PSV(C)	Inn, Op, Ex, Ag → PSV(N)
H14d is supported for:	Inn, Op, Ex, Co → PIV(C)	Inn, Op, Ne, Ag → PIV(N)

Keys:
PUV = Perceived Utilitarian Value; PHV = Perceived Hedonic Value; PSV = Perceived Social Value; PIV = Perceived Innovative Value; SAT = Perceived Satisfaction; ICU = Intention of Continuous Use; Op = Openness; Ne = Neuroticism; Ex: Extraversion; Ag = Agreeableness; Co = Conscientiousness; Inn = Individual Innovativeness;
(C) = for smartphone currently used by respondent;
(N) = for new smartphone with respondent's preferred enhancements

Overall, H14 with its sub-hypotheses H14a to H14d are supported for the respective individual characteristics as reported.

The regression data can be referred to in **Appendix 11a** (regarding the smartphone currently used by respondent) and **Appendix 11b** (regarding the new smartphone with respondent's preferred enhancements).

Table 18: Survey (full-scale) – Statistical results of Multiple Linear Regression tests evaluating influence of Individual's Characteristics on Perceived Product Values, for the smartphone currently used by respondent and the new smartphone with respondent's preferred enhancements

(only statistical data of significant causal relations are presented in the table)

IV: Individual's Characteristics / DV:	Perceived Utilitarian Value		Perceived Hedonic Value		Perceived Social Value		Perceived Innovative Value	
	For current phone	For new phone	For current phone	For new phone	For current phone	For new phone	For current phone	For new phone
Collective Relationship	$F(6, 784) = 15.07$, $R^2 = .10$	$F(6, 784) = 22.33$, $R^2 = .15$	$F(6, 784) = 14.29$, $R^2 = .10$	$F(6, 784) = 20.91$, $R^2 = .14$	$F(6, 784) = 40.03$, $R^2 = .24$	$F(6, 784) = 47.86$, $R^2 = .27$	$F(6, 784) = 32.31$, $R^2 = .20$	$F(6, 784) = 33.96$, $R^2 = .21$
Individual Innovativeness (in respect of smartphone)	$\beta = .08$, $t = 2.12$	$\beta = .12$, $t = 3.10$	N.S.	$\beta = .11$, $t = 2.79$	$\beta = .20$, $t = 5.55$	$\beta = .24$, $t = 7.01$	$\beta = .23$, $t = 6.19$	$\beta = .24$, $t = 6.70$
Openness to experience	$\beta = .09$, $t = 1.97$	$\beta = .08$, $t = 1.74$ ($p = .08$) #	$\beta = .10$, $t = 2.01$	$\beta = .10$, $t = 2.20$	$\beta = .09$, $t = 2.11$	$\beta = .14$, $t = 3.36$	$\beta = .11$, $t = 2.54$	$\beta = .21$, $t = 4.64$
Neuroticism	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	$\beta = .06$, $t = 1.97$
Extraversion	N.S.	$\beta = .09$, $t = 2.09$	N.S.	N.S.	$\beta = .13$, $t = 3.18$	$\beta = .10$, $t = 2.49$	$\beta = .09$, $t = 2.19$	N.S.
Agreeableness	$\beta = .18$, $t = 4.49$	$\beta = .23$, $t = 5.71$	$\beta = .22$, $t = 5.39$	$\beta = .24$, $t = 6.01$	$\beta = .07$, $t = 1.89$ ($p = .06$) #	$\beta = .16$, $t = 4.18$	N.S.	$\beta = .13$, $t = 3.24$
Conscientiousness	$\beta = .10$, $t = 2.14$	$\beta = .12$, $t = 2.69$	N.S.	N.S.	$\beta = .16$, $t = 3.85$	N.S.	$\beta = .12$, $t = 2.87$	N.S.
Hypotheses supported:	H14a		H14b		H14c		H14d	

Note:

$p < .05$ for the reported significant causal relations, unless otherwise specified

: $p < .10$

N.S.: Not statistically significant

For current phone: for smartphone currently used by respondent

For new phone: for new smartphone with respondent's preferred enhancements

Blue highlights: denote collective relations with variance explained (R^2) for 20% or more

Green highlights: denote results with Standardized Coefficients Beta (β) of .20 or above

Discussion

At the outset, it should be noted that the primary purpose of conducting this series of regression tests is to first verify the projected influence of individual characteristics on the individual's perceived product values, as specified in hypothesis 14. Then if designer/nondesigner differences are identified through the separately conducted t-tests (**Sections 5.5.8.1 and 5.5.8.2**) in both the cause and outcome variables across the verified causal links between specific individual characteristics and perceived product values, it would be reasonable to project that the specific characteristic difference is among the contributing factors for the respective value perception difference. To serve this ultimate purpose, only antecedents relating to individual's characteristics with potential contribution to the designer/nondesigner differences in value perception are included for the regression tests here. Other non-human antecedental factors possibly also influencing value perception, such as product attributes, are not the focus of interest of the current study and hence not covered in the study. For future product-focused research, more comprehensive investigation of different potential factors influencing product value perception may be conducted.

The regression results indicated that there was a collective significant causal relation between the predictors of individual characteristics and each of the outcome variable of perceived utilitarian, hedonic, social and innovative values. Across the four domains of perceived product values, relatively stronger collective causal relations are found under the perceived social and innovative values (with more than 20% of variance explained) than the perceived utilitarian and hedonic values (with variance explained between 10-15%). In general, with a few exceptions, the causal links regarding the "new smartphone with the respondent's preferred enhancements" appeared stronger than the causal links when the same factors were correspondingly considered for the "smartphone currently used by respondent". This is understandable for the respondents to have shown more intensive perceptions towards the new smartphone with their preferred enhancements, hence rendering the stronger links between their personal characteristics and their perceptions.

When examining each of the individual characteristics, Openness to experience is recognised to have the broadest range of influence on all the four perceived values

regarding both current and new smartphones, followed by individual innovativeness and agreeableness which were influencing all the four perceived values regarding the new smartphone. Neuroticism showed the narrowest range of influence on only the perceived innovative value regarding the new smartphone. While both extraversion and conscientiousness showed no impact on perceived hedonic value, they were influencing the other three perceived values for the current and / or new smartphone.

When examining along the perceived values, both perceived utilitarian and hedonic values found their strongest influencer to be agreeableness, followed by individual innovativeness; and both perceived social and innovative values found their strongest influencer to be individual innovativeness, followed by agreeableness in the case of perceived social value, and followed by openness to experience in the case of perceived innovative value.

5.5.8 Testing differences: T-test Analyses

A series of t-tests were conducted to check the between-group or within-group differences projected in hypotheses H4, H5, H6 and H7. The results are reported below.

H4: There are differences in the perception of designers and nondesigners towards the product values, user satisfaction, and intention of use / continuous use for the product.

5.5.8.1 Hypothesis 4 – test results and discussion

Results

Independent samples t-tests were conducted to test hypothesis 4 with the sub-hypotheses H4a-H4f (detailed list of sub-hypotheses in **Table 33**). Results (**Table 19**) indicated that the designers (M = 5.41, SD = 1.05) perceived higher Innovative Value for the new smartphone with his / her preferred enhancements than the nondesigners (M = 5.18, SD = 1.12), $t(789) = 2.64$, $p<.05$. Equal variances were assumed, as the data has displayed normality and the Levene's test showed a significance of 0.095 which was above the cutoff point of 0.05.

Results (**Table 19**) also indicated the following marginally significant differences:

The designers (M = 4.77, SD = 1.18) perceived slightly higher Innovative Value for the his / her current smartphone than the nondesigners (M = 4.62, SD = 1.10), $t(789) = 1.73$, $p<.10$. Equal variances were assumed, as the data has displayed normality and the Levene's test showed a significance of 0.10 which was above the cutoff point of 0.05.

The designers (M = 5.91, SD = .87) perceived slightly lower Hedonic Value for the his / her current smartphone than the nondesigners (M = 6.03, SD = .77), $t(389) = -1.70$, $p<.10$. Equal variances were not assumed, as the Levene's test showed a significance

of 0.03 which was below the cutoff point of 0.05, despite the data has displayed normality.

The designers (*M* = 6.15, *SD* = .79) perceived slightly higher Hedonic Value for the new smartphone with his / her preferred enhancements than the nondesigners (*M* = 6.04, *SD* = .80), $t(789) = 1.70$, $p<.10$. Equal variances were assumed, as the data has displayed normality and the Levene's test showed a significance of 0.34 which was above the cutoff point of 0.05.

Hence, the hypothesis "H4d: There are differences in the perception of designers and nondesigners towards the perceived innovative value of a product." is supported; and the hypothesis "H4b: There are differences in the perception of designers and nondesigners towards the perceived hedonic value of a product." is marginally supported.

Discussion

The direct comparison between designer-users and nondesigner users yielded quite consistent results across the Pilot 1 and Pilot 2 tests, and the full-scale survey. Not many statistically significant differences were found among the perceived values, satisfaction or intention of use / continuous use. With the larger sample of the full-scale survey, a statistically significant difference (with $p<.05$) emerged in the perceived innovative value for the new smartphone with respondent's preferred enhancements, while less strong differences (with $p<.10$) are apparent in the perceived innovative value for the current smartphone used by the respondent and in the perceived hedonic value for both new and current smartphones of the respondents.

It is noted that the perceived-innovative-value difference is found more significant regarding the new smartphone with the respondent's preferred enhancements ($t(789) = 2.64$, $p<.05$) than the smartphone currently used by the respondent ($t(789) = 1.73$, $p<.10$), which implies that the additional enhancements preferred by the respondent had rendered the new smartphone better differentiated in the innovative aspects than the current smartphone inducing more significant differences in the perceived values between designers and nondesigners.

With regard to the perceived hedonic value, an interesting phenomenon is observed. The perceived-hedonic-value difference between designers and nondesigners changed from $t(389) = -1.70$, $p<.10$ for the respondent's current smartphone to $t(789) = 1.70$, $p<.10$ for the new smartphone with the respondents' preferred enhancements. When examining the change in the absolute perceived values, the designer group's mean perceived hedonic value changed from $M = 5.91$, $SD = .87$ for the current smartphone to $M = 6.15$, $SD = .79$ for the new smartphone with their preferred enhancements; whereas the nondesigner group's mean perceived hedonic value changed from $M = 6.03$, $SD = .77$ for the current smartphone to $M = 6.04$, $SD = .80$ for the new smartphone. A possible scenario could be: that the current smartphone used by the respondents had induced a lower perceived hedonic value among the designers than among the nondesigners, likely because the current phone's hedonic features could meet the hedonic need of nondesigners but not that of the designers; and that the designers picked up more additional enhancements in the hedonic aspects for the new smartphone for meeting their need than the nondesigners did, so that the new phone induced a higher perceived hedonic value among the designers than the nondesigners whose perceived hedonic value remained almost the same for both current and new phones.

The identified greater emphasis in innovative and hedonic values for the designer respondents in the Survey aligns with the finding from Part One Mental Modelling that the designer group's consolidated mental model shows broader ranges of elements under the innovative and hedonic domains. It also echoes with the general belief and literature findings that designers are more creative, they value innovations more, and relate more with the hedonic value as all design phases involve emotions and creative persons are believed to be more emotional (Nettle, 2006; Westerman et al., 2007; Sas & Zhang, 2010).

As discussed above, designers are supposed to be more novel-seeking and / or hedonic-value-seeking, and place more emphasis on the innovative and / or hedonic aspects of their smartphones. They might buy more innovative / emotionally pleasing smartphones, use more innovative / hedonic features available, or cherish the innovative / hedonic benefits more. On the other hand, the product designers and

producers should be alert that the nondesigner general users may not cherish a smartphone’s innovative and hedonic features / values as much as the designer-users do, and should hence strike a good balance or provide appropriate options when launching new products / features in order to cater for users with varied perceptions / needs.

Table 19: Survey (full-scale) – Independent Samples T-tests comparing Designer Group vs Nondesigner Group – in Perceived Values, Perceived Satisfaction, and Intention of Use / Continuous Use

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Perceived Utilitarian Value - for smartphone currently used by respondent	Equal variances assumed	.025	.874	-.557	789	.578	-.03007	.05400	-.13608	.07594
	Equal variances not assumed			-.552	423.267	.581	-.03007	.05450	-.13719	.07706
Perceived Hedonic Value (Modified) - for smartphone currently used by respondent	Equal variances assumed	4.895	.027	-1.786	789	.075	-.11185	.06264	-.23481	.01111
	Equal variances not assumed			-1.699	389.069	.090*	-.11185	.06583	-.24128	.01759
Perceived Social Value (Modified) - for smartphone currently used by respondent	Equal variances assumed	.116	.734	.861	789	.389	.06427	.07462	-.08221	.21075
	Equal variances not assumed			.864	434.630	.388	.06427	.07440	-.08195	.21049
Perceived Innovative Value - for smartphone currently used by respondent	Equal variances assumed	2.648	.104	1.728	789	.084*	.15186	.08789	-.02067	.32438
	Equal variances not assumed			1.684	408.523	.093	.15186	.09019	-.02544	.32915
Perceived Satisfaction - for smartphone currently used by respondent	Equal variances assumed	.706	.401	-.064	789	.949	-.00446	.07002	-.14190	.13298
	Equal variances not assumed			-.065	446.977	.948	-.00446	.06893	-.13993	.13101
Intention of continuous use - for smartphone currently used by respondent	Equal variances assumed	.386	.535	.752	789	.452	.05513	.07330	-.08877	.19902
	Equal variances not assumed			.756	436.676	.450	.05513	.07293	-.08820	.19846
Perceived Utilitarian Value - for new smartphone with respondent's preferred enhancements	Equal variances assumed	5.662	.018	1.536	789	.125	.08880	.05781	-.02469	.20228
	Equal variances not assumed			1.483	400.871	.139	.08880	.05987	-.02890	.20649
Perceived Hedonic Value (Modified) - for new smartphone with respondent's preferred enhancements	Equal variances assumed	.908	.341	1.704	789	.089*	.10576	.06207	-.01608	.22760
	Equal variances not assumed			1.714	437.353	.087	.10576	.06171	-.01552	.22704
Perceived Social Value (Modified) - for new smartphone with respondent's preferred enhancements	Equal variances assumed	.294	.588	1.441	789	.150	.11515	.07991	-.04171	.27202
	Equal variances not assumed			1.454	440.717	.147	.11515	.07917	-.04045	.27076
Perceived Innovative Value - for new smartphone with respondent's preferred enhancements	Equal variances assumed	2.794	.095	2.641	789	.008**	.22657	.08580	.05815	.39498
	Equal variances not assumed			2.708	456.832	.007	.22657	.08366	.06216	.39097
Perceived Satisfaction - for new smartphone with respondent's preferred enhancements	Equal variances assumed	.014	.905	1.335	789	.182	.09406	.07044	-.04422	.23233
	Equal variances not assumed			1.335	431.623	.183	.09406	.07045	-.04441	.23253
Intention of Use - for new smartphone with respondent's preferred enhancements	Equal variances assumed	.086	.770	1.148	789	.251	.08114	.07066	-.05757	.21985
	Equal variances not assumed			1.146	429.670	.253	.08114	.07082	-.05805	.22033

** $p<.05$
* $p<.10$

Bootstrap for Independent Samples Test

			Bootstrap[a]				
						95% Confidence Interval	
		Mean Difference	Bias	Std. Error	Sig. (2-tailed)	Lower	Upper
Perceived Utilitarian Value - for smartphone currently used by respondent	Equal variances assumed	-.03007	.00115	.05465	.574	-.13722	.07861
	Equal variances not assumed	-.03007	.00115	.05465	.573	-.13722	.07861
Perceived Hedonic Value (Modified) - for smartphone currently used by respondent	Equal variances assumed	-.11185	.00030	.06567	.088	-.24061	.01568
	Equal variances not assumed	-.11185	.00030	.06567	.091*	-.24061	.01568
Perceived Social Value (Modified) - for smartphone currently used by respondent	Equal variances assumed	.06427	-.00202	.07479	.393	-.08401	.20874
	Equal variances not assumed	.06427	-.00202	.07479	.395	-.08401	.20874

Bootstrap for Independent Samples Test

		Mean Difference	Bootstrap[a]				
			Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval	
						Lower	Upper
Perceived Innovative Value - for smartphone currently used by respondent	Equal variances assumed	.15186	-.00145	.09031	.094*	-.02406	.32743
	Equal variances not assumed	.15186	-.00145	.09031	.095	-.02406	.32743
Perceived Satisfaction - for smartphone currently used by respondent	Equal variances assumed	-.00446	-.00071	.06824		-.14065	.13130
	Equal variances not assumed	-.00446	-.00071	.06824		-.14065	.13130
Intention of continuous use - for smartphone currently used by respondent	Equal variances assumed	.05513	-.00154	.07200		-.09235	.18911
	Equal variances not assumed	.05513	-.00154	.07200		-.09235	.18911
Perceived Utilitarian Value - for new smartphone with respondent's preferred enhancements	Equal variances assumed	.08880	-.00021	.06012	.145	-.02743	.20563
	Equal variances not assumed	.08880	-.00021	.06012	.143	-.02743	.20563
Perceived Hedonic Value (Modified) - for new smartphone with respondent's preferred enhancements	Equal variances assumed	.10576	-.00111	.06200	.091*	-.01843	.22832
	Equal variances not assumed	.10576	-.00111	.06200	.091	-.01843	.22832
Perceived Social Value (Modified) - for new smartphone with respondent's preferred enhancements	Equal variances assumed	.11515	-.00168	.08032	.146	-.04370	.27054
	Equal variances not assumed	.11515	-.00168	.08032	.145	-.04370	.27054
Perceived Innovative Value - for new smartphone with respondent's preferred enhancements	Equal variances assumed	.22657	-.00069	.08512	.009**	.06159	.39557
	Equal variances not assumed	.22657	-.00069	.08512	.009	.06159	.39557
Perceived Satisfaction - for new smartphone with respondent's preferred enhancements	Equal variances assumed	.09406	-.00186	.07115	.186	-.05002	.23366
	Equal variances not assumed	.09406	-.00186	.07115	.186	-.05002	.23366
Intention of use - for new smartphone with respondent's preferred enhancements	Equal variances assumed	.08114	-.00215	.07152	.255	-.06095	.21843
	Equal variances not assumed	.08114	-.00215	.07152	.254	-.06095	.21843

a Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

** $p<.05$
* $p<.10$

5.5.8.2 Hypothesis 5 – test results and discussion

H5: There are differences in the individual characteristics between designers and nondesigners, including individual innovativeness and personality traits.

Results

Independent samples t-tests were conducted to test hypothesis 5 with the sub-hypotheses H5a-H5f (detailed list of sub-hypotheses in **Table 33**). Results (**Table 20**) indicated that the designers (M = 5.36, SD = 1.00) scored higher in the personality trait of "openness to experience" than the nondesigners (M = 5.07, SD = 1.02), $t(789) = 3.64$, $p<.05$. Equal variances were assumed, as the data has displayed normality and the Levene's test showed a significance of 0.96 which was above the cutoff point of 0.05.

Results (**Table 20**) also indicated that the designers (M = 5.22, SD = 1.05) scored slightly higher in the "individual innovativeness" than the nondesigners (M = 5.08, SD = 1.07), $t(789) = 1.71$, $p<.10$. Equal variances were assumed, as the data has displayed normality and the Levene's test showed a significance of 0.91 which was above the cutoff point of 0.05.

Hence, the hypothesis "H5b: There are differences in the personality trait of 'openness to experience' between designers and nondesigners." is supported; and the hypothesis "H5a: There are differences in the 'individual innovativeness' between designers and nondesigners." is marginally supported.

Discussion

The identified significant difference in openness to experience between the designers and nondesigners with a t-value of 3.64 ($p<.05$) aligns with people's normal expectation that designers are more imaginative, have more new ideas and like to think out of the box. It also aligns with past studies that artistic creators such as writers, poets and visual artists tended to be high on the five-factor dimensions of openness to experience

and neuroticism (Nettle 2005), although the other expected difference in neuroticism did not show up.

The difference in individual innovativeness between the designers and nondesigners was marginally significant, with a t-value of 1.70 (p<.10). Individual innovativeness was included as a separate variable to measure the respondent's product specific innovativeness, which varied from the personality trait of openness to experience which was supposed to be part of the general personality of the individual.

Certain psychological studies suggested that individuals with particular personality traits would tend to opt for corresponding career types, and hence professionals in different careers might show different traits of personality (Holland, 1985; Hammond, 1991; Hannah, 1994; Caprara et al., 2003; Nettle, 2005, 2006). The personality aspect of differences between designers and nondesigners may call for a more focused study in future researches.

Underlying contribution to designer/nondesigner differences

Considered in tandem with the designer/nondesigner differences in perceived product values identified in **Section 5.5.8.1**, and the contributing antecedental factors for the respective perceived product values identified in **Section 5.5.7.3**, the underlying contributory relations can be mapped out as follows:

1. The designers'/nondesigners' innate characteristic difference in "individual innovativeness" possibly contributes to the designers'/nondesigners' perceived differences in the "innovative value" and "hedonic value" for a product.

2. The designers'/nondesigners' innate personality trait difference in "openness to experience" possibly contributes to the designers'/nondesigners' perceived differences in the "innovative value" and "hedonic value" for a product.

The causal relations of "individual innovativeness" and "openness to experience" influencing "perceived innovative value" and "perceived hedonic value" have been checked and supported by the multiple linear regression tests reported in **Section 5.5.7.3 (Table 19)**.

As perceived innovative value is an interpretation by an individual about the product's novelty related benefits, whereas the "individual innovativeness" and personality trait of "openness to experience" are the individual's internal characteristics associated with novelty seeking tendencies (their definitions in **Section 3.4**), it is reasonable to project the designer/nondesigner differences in "individual innovativeness" and "openness to experience" personality trait as contributing factors for the designer/nondesigner difference in "perceived innovative value".

Regarding the influence of "individual innovativeness" and "openness to experience" on "perceived hedonic value", the causal effect may be direct and / or indirect. On the one hand, individuals with high level of "innovativeness" and "openness to experience" would enjoy experiencing and be open to wide range of experiences including hedonic (emotional and sensory) experiences. On the other hand, as the four perceived product values are found to be inter-related as reported in the later **Section of 5.5.9**, "individual innovativeness" and "openness to experience" may influence "perceived hedonic value" indirectly through "perceived innovative value".

Table 20: Survey (full-scale) – Independent Samples T-tests comparing Designer Group vs Nondesigner Group – in Individual Characteristics

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Individual Characteristic - Innovativeness (in respect of smartphone)	Equal variances assumed	.013	.911	1.707	789	.088*	.14183	.08306	-.02122	.30488
	Equal variances not assumed			1.721	439.588	.086	.14183	.08239	-.02010	.30375
Individual Characteristic - Openness (Big Five Personality Traits)	Equal variances assumed	.003	.958	3.644	789	.000**	.28813	.07906	.13294	.44332
	Equal variances not assumed			3.662	436.250	.000	.28813	.07869	.13348	.44278
Individual Characteristic - Neuroticism (Big Five Personality Traits)	Equal variances assumed	.282	.595	.642	789	.521	.06305	.09821	-.12972	.25583
	Equal variances not assumed			.640	428.503	.523	.06305	.09855	-.13064	.25675
Individual Characteristic - Extraversion (Big Five Personality Traits)	Equal variances assumed	3.690	.055	1.640	789	.101	.16431	.10020	-.03239	.36100
	Equal variances not assumed			1.589	403.792	.113	.16431	.10340	-.03897	.36758
Individual Characteristic - Agreeableness (Big Five Personality Traits)	Equal variances assumed	.622	.430	1.156	789	.248	.07265	.06283	-.05069	.19598
	Equal variances not assumed			1.128	409.592	.260	.07265	.06440	-.05394	.19923
Individual Characteristic - Conscientiousness (Big Five Personality Traits)	Equal variances assumed	.000	.998	.750	789	.454	.05265	.07022	-.08518	.19049
	Equal variances not assumed			.747	427.537	.456	.05265	.07053	-.08598	.19129

** $p<.05$
* $p<.10$

Bootstrap for Independent Samples Test

			Bootstrap[a]				
						95% Confidence Interval	
		Mean Difference	Bias	Std. Error	Sig. (2-tailed)	Lower	Upper
Individual Characteristic - Innovativeness (in respect of smartphone)	Equal variances assumed	.14183	-.00134	.08030	.078*	-.01672	.30502
	Equal variances not assumed	.14183	-.00134	.08030	.079	-.01672	.30502
Individual Characteristic - Extraversion (Big Five Personality Traits)	Equal variances assumed	.16431	.00272	.10285	.105	-.03475	.36655
	Equal variances not assumed	.16431	.00272	.10285	.103	-.03475	.36655
Individual Characteristic - Agreeableness (Big Five Personality Traits)	Equal variances assumed	.07265	-.00052	.06348	.244	-.05417	.19582
	Equal variances not assumed	.07265	-.00052	.06348	.246	-.05417	.19582
Individual Characteristic - Openness (Big Five Personality Traits)	Equal variances assumed	.28813	-.00120	.07769	.000**	.13299	.43230
	Equal variances not assumed	.28813	-.00120	.07769	.000	.13299	.43230
Individual Characteristic - Conscientiousness (Big Five Personality Traits)	Equal variances assumed	.05265	.00118	.06964	.446	-.08195	.19511
	Equal variances not assumed	.05265	.00118	.06964	.449	-.08195	.19511
Individual Characteristic - Neuroticism (Big Five Personality Traits)	Equal variances assumed	.06305	-.00116	.09842	.525	-.13444	.24618
	Equal variances not assumed	.06305	-.00116	.09842	.525	-.13444	.24618

a Unless otherwise noted, bootstrap results are based on 2000 bootstrap samples

** $p<.05$
* $p<.10$

5.5.8.3 Hypothesis 6 – test results and discussion

H6: There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the utilitarian, hedonic, social, innovative, and overall values of a new smartphone.

Results

Paired samples t-tests were conducted to test hypothesis 6 with the sub-hypotheses H6a-H6e (detailed list of sub-hypotheses in **Table 33**). Results (**Table 21**) indicated that differences were found in the importance perceived / projected by both the designer and nondesigner groups. In the sections that follow, the following terms (definitions given in **Chapter 3** as well) would be used to facilitate the discussion:

Designer-designer (DD)	A real-world designer (self-reported) who played a designer role in response to particular question(s) in the questionnaire
Designer-user (DU)	A real-world designer (self-reported) who played a user role in response to particular question(s) in the questionnaire
Nondesigner-designer (NDD)	A real-world nondesigner (self-reported) who played a designer role in response to particular question(s) in the questionnaire
Nondesigner-user (NDU)	A real-world nondesigner (self-reported) who played a user role in response to particular question(s) in the questionnaire

Across the four pairs of sub-groups in different age and gender, there are quite a large number of incidents (16 in total, 6 from the DD sub-groups and 10 from the NDD sub-groups) found with significant differences supporting the sub-hypotheses. In order to present a clear and comparable picture of the results, a table (**Table 21**) is consolidated to report the test results across the four paired samples indicating the key statistics of mean (*M*), standard deviation (*SD*), *t* value, degree of freedom (*df*) and significance (*p*), and the sub-hypotheses supported. While the sub-hypothesis H6e involving the general "overall value" is not supported, the following 4 sub-hypotheses are supported in the specific groups as shown in **Table 21**:

H6a: There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the utilitarian value of a new smartphone.

H6b: There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the hedonic value of a new smartphone.

H6c: There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the social value of a new smartphone.

H6d: There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the innovative value of a new smartphone.

Discussion

In this part of the survey questionnaire, the respondents were presented a list of potential future design options and enhancements under the 5 value groups (utilitarian, hedonic, social, innovative, and overall) for the new smartphone (detailed questionnaire in **Appendix 5d**). These options were drawn up from the Part One mental models (including the varied focuses identified between the designer and nondesigner groups reflected in Model A, and the participants' anticipations on "how they wished to use the smartphone for" suggested in Model B) and making reference to global design and technology trends. The respondents were first asked to weigh the design options for their own future phone in the role of a user. Then they were assigned a target user group of different age and gender from themselves, and asked to weigh the design options for the assigned target user group in the role of a designer. This setting resembled the scenario questions used by some researchers in surveys (Atzmüller & Steiner, 2010; Utomo, 2020).

It is noted that the t-values in **Table 21** are all negative, implying that those respondents were projecting a higher importance of the enhancements for their target user group than for themselves. They might be right or wrong that their specific target users do have greater needs for certain design enhancements, which would be checked in the next independent samples t-tests comparing the users' own perceived weightings and their corresponding designers' projected weightings for them.

What is found special now is that all the 16 identified differences indicate a projection of greater needs for the target users than the respondents' own self. When these differentiated projections are sorted under the value-based hypotheses in **Table 21**, it is noticeable that:

All the male target user groups were projected to have greater needs for utilitarian and innovative design enhancements.

All the female target user groups, plus the younger male user group (of age 18-25), were projected to have greater needs for hedonic design enhancements.

All four target user groups, male and female, were projected to have greater needs for social design enhancements.

When examining the over-projections made by the designer-designers and nondesigner-designers, there tend to be more incidents made by the nondesigner-designers (10 incidents) than the designer-designers (6 incidents). Perhaps the designers were a bit more alert of avoiding the potential over-projection through their training and working experience.

Table 21: Survey (full-scale) – Summary of Paired Samples T-tests comparing respondent's perceived importance for own self in user's role vs the same respondent's projected importance for target user group in designer's role – in enhancing Utilitarian, Hedonic, Social, Innovative, and Overall Values* of a new smartphone

**** these are mean values computed from responses to 5-8 enhancement items under each value; the enhancement items are shown in the final questionnaire in Appendix 5d.***

DD / NDD	Table	Role-taking designers	*M, SD*	Target user group	*M, SD*	Significant differences indicated in t-test results – taking a designer role compared vs taking a user role	*t*(df), *p*	Hypotheses supported
NDD1	Table 22	Age 26-40 female nondesigner-designers	*M* = 4.17, *SD* = .60	Age 18-25 male users	*M* = 4.30, *SD* = .55	The respondent group(s) taking a designer's role projected a higher importance for enhancing the utilitarian value for the target user group than for their own self as a user.	*t*(144) = -2.61, *p*<.05	H6a
NDD2	Table 24	Age 18-25 female nondesigner-designers	*M* = 4.19, *SD* = .53	Age 26-40 male users	*M* = 4.31, *SD* = .59		*t*(151) = -2.59, *p*<.05	
NDD3	Table 22	Age 26-40 female nondesigner-designers	*M* = 4.00, *SD* = .61	Age 18-25 male users	*M* = 4.16, *SD* = .62	The respondent group(s) taking a designer's role projected a higher importance for enhancing the hedonic value for the target user group than for their own self as a user.	*t*(144) = -3.12, *p*<.05	H6b
DD1	Table 23	Age 26-40 male designer-designers	*M* = 4.07, *SD* = .65	Age 18-25 female users	*M* = 4.39, *SD* = .54		*t*(63) = -4.41, *p*<.05	
NDD4	Table 23	Age 26-40 male nondesigner-designers	*M* = 3.90, *SD* = .60	Age 18-25 female users	*M* = 4.19, *SD* = .57		*t*(136) = -5.96, *p*<.05	
NDD5	Table 25	Age 18-25 male nondesigner-designers	*M* = 4.00, *SD* = .63	Age 26-40 female users	*M* = 4.32, *SD* = .54		*t*(124) = -5.53, *p*<.05	
DD2	Table 22	Age 26-40 female designer-designers	*M* = 3.58, *SD* = .66	Age 18-25 male users	*M* = 3.84, *SD* = .70	The respondent group(s) taking a designer's role projected a higher importance for enhancing the social value for the target user group than for their own self as a user.	*t*(26) = -2.21, *p*<.05	H6c
NDD6	Table 22	Age 26-40 female nondesigner-designers	*M* = 3.47, *SD* = .68	Age 18-25 male users	*M* = 3.77, *SD* = .73		*t*(144) = -5.73, *p*<.05	
DD3	Table 23	Age 26-40 male designer-designers	*M* = 3.60, *SD* = .82	Age 18-25 female users	*M* = 4.00, *SD* = .57		*t*(63) = -4.47, *p*<.05	
NDD7	Table 23	Age 26-40 male nondesigner-designers	*M* = 3.38, *SD* = .79	Age 18-25 female users	*M* = 3.68, *SD* = .77		*t*(136) = -4.54, *p*<.05	
DD4	Table 24	Age 18-25 female designer-designers	*M* = 3.53, *SD* = .63	Age 26-40 male users	*M* = 3.75, *SD* = .67		*t*(77) = -3.14, *p*<.05	
NDD8	Table 25	Age 18-25 male nondesigner-designers	*M* = 3.52, *SD* = .74	Age 26-40 female users	*M* = 3.82, *SD* = .75		*t*(124) = -5.05, *p*<.05	
DD5	Table 22	Age 26-40 female designer-designers	*M* = 3.73, *SD* = .49	Age 18-25 male users	*M* = 4.04, *SD* = .65	The respondent group(s) taking a designer's role projected a higher importance for enhancing the innovative value for the target user group than for their own self as a user.	*t*(26) = -2.77, *p*<.05	H6d
NDD9	Table 22	Age 26-40 female nondesigner-designers	*M* = 3.63, *SD* = .75	Age 18-25 male users	*M* = 4.00, *SD* = .73		*t*(144) = -6.12, *p*<.05	
DD6	Table 24	Age 18-25 female designer-designers	*M* = 3.66, *SD* = .77	Age 26-40 male users	*M* = 3.93, *SD* = .65		*t*(77) = -3.34, *p*<.05	
NDD10	Table 24	Age 18-25 female nondesigner-designers	*M* = 3.71, *SD* = .70	Age 26-40 male users	*M* = 3.89, *SD* = .75		*t*(151) = -3.32, *p*<.05	

Table 22: Survey (full-scale) – Paired Samples T-tests comparing respondent's (age 26-40 female) perceived importance for own self in user's role vs the same respondent's projected importance for target user group (age 18-25 male) in designer's role – in enhancing Utilitarian, Hedonic, Social, Innovative, and Overall Values* of a new smartphone

**** these are mean values computed from responses to 5-8 enhancement items under each value; the enhancement items are shown in the final questionnaire in Appendix 5d.***

Paired Samples Test

Respondent's (age 26-40 female) perceived importance for own self in user's role –
vs the same respondent's projected importance for target user group (age 18-25 male) in designer's role

Outcomes grouped under Designers & Nondesigners			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Designers	Pair 1	Enhancing Utilitarian Value	-.20988	.60198	.11585	-.44801	.02826	-1.812	26	.082
	Pair 2	Enhancing Hedonic Value	-.19136	.58416	.11242	-.42245	.03973	-1.702	26	.101
	Pair 3	Enhancing Social Value	-.26389	.62050	.11941	-.50935	-.01843	-2.210	26	.036
	Pair 4	Enhancing Innovative Value	-.31481	.59076	.11369	-.54851	-.08112	-2.769	26	.010
	Pair 5	Enhancing Overall Value	.11852	.61584	.11852	-.12510	.36214	1.000	26	.327
Non-designers	Pair 1	Enhancing Utilitarian Value	-.12874	.59341	.04928	-.22614	-.03133	-2.612	144	.010
	Pair 2	Enhancing Hedonic Value	-.15747	.60883	.05056	-.25741	-.05753	-3.115	144	.002
	Pair 3	Enhancing Social Value	-.29914	.62886	.05222	-.40236	-.19591	-5.728	144	.000
	Pair 4	Enhancing Innovative Value	-.36782	.72380	.06011	-.48662	-.24901	-6.119	144	.000
	Pair 5	Enhancing Overall Value	-.02207	.63819	.05300	-.12683	.08269	-.416	144	.678

Table 23: Survey (full-scale) – Paired Samples T-tests comparing respondent's (age 26-40 male) perceived importance for own self in user's role vs the same respondent's projected importance for target user group (age 18-25 female) in designer's role – in enhancing Utilitarian, Hedonic, Social, Innovative, and Overall Values* of a new smartphone

**** these are mean values computed from responses to 5-8 enhancement items under each value; the enhancement items are shown in the final questionnaire in Appendix 5d.***

Paired Samples Test

Respondent's (age 26-40 male) perceived importance for own self in user's role –
vs the same respondent's projected importance for target user group (age 18-25 female) in designer's role

Outcomes grouped under Designers & Nondesigners			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Designers	Pair 1	Enhancing Utilitarian Value	-.13802	.58233	.07279	-.28348	.00744	-1.896	63	.063
	Pair 2	Enhancing Hedonic Value	-.31250	.56695	.07087	-.45412	-.17088	-4.410	63	.000
	Pair 3	Enhancing Social Value	-.39453	.70543	.08818	-.57074	-.21832	-4.474	63	.000
	Pair 4	Enhancing Innovative Value	.10417	.69102	.08638	-.06845	.27678	1.206	63	.232
	Pair 5	Enhancing Overall Value	-.04375	.56058	.07007	-.18378	.09628	-.624	63	.535
Non-designers	Pair 1	Enhancing Utilitarian Value	-.05839	.54817	.04683	-.15101	.03422	-1.247	136	.215
	Pair 2	Enhancing Hedonic Value	-.29075	.57096	.04878	-.38722	-.19429	-5.960	136	.000
	Pair 3	Enhancing Social Value	-.29653	.76532	.06539	-.42584	-.16723	-4.535	136	.000
	Pair 4	Enhancing Innovative Value	-.05961	.70006	.05981	-.17789	.05867	-.997	136	.321
	Pair 5	Enhancing Overall Value	.02190	.55555	.04746	-.07196	.11576	.461	136	.645

Table 24: Survey (full-scale) – Paired Samples T-tests comparing respondent's (age 18-25 female) perceived importance for own self in user's role vs the same respondent's projected importance for target user group (age 26-40 male) in designer's role – in enhancing Utilitarian, Hedonic, Social, Innovative, and Overall Values* of a new smartphone

**** these are mean values computed from responses to 5-8 enhancement items under each value; the enhancement items are shown in the final questionnaire in Appendix 5d.***

Paired Samples Test

Respondent's (age 18-25 female) perceived importance for own self in user's role –
vs the same respondent's projected importance for target user group (age 26-40 male) in designer's role

Outcomes grouped under Designers & Nondesigners			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Designers	Pair 1	Enhancing Utilitarian Value	-.10470	.54990	.06226	-.22868	.01928	-1.682	77	.097
	Pair 2	Enhancing Hedonic Value	.07906	.58832	.06661	-.05359	.21171	1.187	77	.239
	Pair 3	Enhancing Social Value	-.22276	.62635	.07092	-.36398	-.08154	-3.141	77	.002
	Pair 4	Enhancing Innovative Value	-.26282	.69502	.07870	-.41952	-.10612	-3.340	77	.001
	Pair 5	Enhancing Overall Value	-.04103	.57872	.06553	-.17151	.08946	-.626	77	.533
Non-designers	Pair 1	Enhancing Utilitarian Value	-.11952	.56882	.04614	-.21068	-.02836	-2.590	151	.011
	Pair 2	Enhancing Hedonic Value	-.03399	.65563	.05318	-.13906	.07108	-.639	151	.524
	Pair 3	Enhancing Social Value	-.09539	.65779	.05335	-.20081	.01002	-1.788	151	.076
	Pair 4	Enhancing Innovative Value	-.18311	.68026	.05518	-.29213	-.07410	-3.319	151	.001
	Pair 5	Enhancing Overall Value	-.03947	.57637	.04675	-.13184	.05290	-.844	151	.400

Table 25: Survey (full-scale) – Paired Samples T-tests comparing respondent's (age 18-25 male) perceived importance for own self in user's role vs the same respondent's projected importance for target user group (age 26-40 female) in designer's role – in enhancing Utilitarian, Hedonic, Social, Innovative, and Overall Values* of a new smartphone

**** these are mean values computed from responses to 5-8 enhancement items under each value; the enhancement items are shown in the final questionnaire in Appendix 5d.***

Paired Samples Test

Respondent's (age 18-25 male) perceived importance for own self in user's role –
vs the same respondent's projected importance for target user group (age 26-40 female) in designer's role

Outcomes grouped under Designers & Nondesigners			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Designers	Pair 1	Enhancing Utilitarian Value	.07937	.67326	.08482	-.09019	.24892	.936	62	.353
	Pair 2	Enhancing Hedonic Value	.06614	.65071	.08198	-.09774	.23002	.807	62	.423
	Pair 3	Enhancing Social Value	-.18254	.81993	.10330	-.38904	.02396	-1.767	62	.082
	Pair 4	Enhancing Innovative Value	-.07407	.94886	.11955	-.31304	.16489	-.620	62	.538
	Pair 5	Enhancing Overall Value	-.10476	.81348	.10249	-.30963	.10011	-1.022	62	.311
Non-designers	Pair 1	Enhancing Utilitarian Value	-.00133	.60223	.05386	-.10795	.10528	-.025	124	.980
	Pair 2	Enhancing Hedonic Value	-.31867	.64481	.05767	-.43282	-.20451	-5.525	124	.000
	Pair 3	Enhancing Social Value	-.30300	.67151	.06006	-.42188	-.18412	-5.045	124	.000
	Pair 4	Enhancing Innovative Value	-.11200	.76311	.06825	-.24710	.02310	-1.641	124	.103
	Pair 5	Enhancing Overall Value	-.02880	.56380	.05043	-.12861	.07101	-.571	124	.569

5.5.8.4 Hypothesis 7 – test results and discussion

H7: There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role for enhancing the utilitarian, hedonic, social, innovative, and overall values of a new smartphone.

Results

Independent samples t-tests were conducted to test hypothesis H7 and the sub-hypotheses H7a-H7e (detailed list of sub-hypotheses in **Table 33**). Results indicated that:

Over-estimation of importance in enhancing utilitarian value for target user group(s)

The target user group's (age 18-25 males) own perceived importance (M = 4.11, SD = .59) in enhancing the utilitarian value of a new smartphone was lower than the projected importance for the group by another respondent group (age 26-40 females) in the designer role (M = 4.30, SD = .55), $t(358) = -3.24$, $p<.05$. (**Table 26**)

The target user group's (age 26-40 males) own perceived importance (M = 4.07, SD = .54) in enhancing the utilitarian value of a new smartphone was lower than the projected importance for the group by another respondent group (age 18-25 females) in the designer role (M = 4.29, SD = .56), $t(429) = -4.01$, $p<.05$. (**Table 28**)

Over-estimation of importance in enhancing hedonic value for target user group(s)

The target user group's (age 18-25 females) own perceived importance (M = 4.04, SD = .63) in enhancing the hedonic value of a new smartphone was lower than the projected importance for the group by another respondent group (age 26-40 males) in the designer role (M = 4.25, SD = .57), $t(429) = -3.58$, $p<.05$. (**Table 27**)

The target user group's (age 26-40 females) own perceived importance (M = 3.99, SD = .60) in enhancing the hedonic value of a new smartphone was lower than the

projected importance for the group by another respondent group (age 18-25 males) in the designer role (M = 4.25, SD = .58), t(358) = -4.10, p<.05. (**Table 29**)

Over-estimation of importance in enhancing social value for target user group(s)

The target user group's (age 18-25 males) own perceived importance (M = 3.53, SD = .77) in enhancing the social value of a new smartphone was lower than the projected importance for the group by another respondent group (age 26-40 females) in the designer role (M = 3.78, SD = .72), t(358) = -3.14, p<.05. (**Table 26**)

The target user group's (age 18-25 females) own perceived importance (M = 3.59, SD = .65) in enhancing the social value of a new smartphone was lower than the projected importance for the group by another respondent group (age 26-40 males) in the designer role (M = 3.78, SD = .73), t(429) = -2.86, p<.05. (**Table 27**)

The target user group's (age 26-40 males) own perceived importance (M = 3.45, SD = .80) in enhancing the social value of a new smartphone was lower than the projected importance for the group by another respondent group (age 18-25 females) in the designer role (M = 3.73, SD = .66), t(429) = -3.92, p<.05. (**Table 28**)

The target user group's (age 26-40 females) own perceived importance (M = 3.48, SD = .67) in enhancing the social value of a new smartphone was lower than the projected importance for the group by another respondent group (age 18-25 males) in the designer role (M = 3.79, SD = .76), t(358) = -4.06, p<.05. (**Table 29**)

Over-estimation of importance in enhancing innovative value for target user group(s)

The target user group's (age 18-25 males) own perceived importance (M = 3.65, SD = .80) in enhancing the innovative value of a new smartphone was lower than the projected importance for the group by another respondent group (age 26-40 females) in the designer role (M = 4.00, SD = .71), t(358) = -4.47, p<.05. (**Table 26**)

The target user group's (age 26-40 males) own perceived importance (M = 3.76, SD = .74) in enhancing the innovative value of a new smartphone was lower than the

projected importance for the group by another respondent group (age 18-25 females) in the designer role (M = 3.90, SD = .72), t(429) = -1.99, p<.05. (**Table 28**)

Under-estimation or over-estimation of importance in enhancing overall value for target user group(s)

The target user group's (age 18-25 females) own perceived importance (M = 4.14, SD = .62) in enhancing the overall value of a new smartphone was higher than the projected importance for the group by another respondent group (age 26-40 males) in the designer role (M = 4.01, SD = .69), t(429) = 2.04, p<.05. (**Table 27**)

The target user group's (age 26-40 males) own perceived importance (M = 4.02, SD = .64) in enhancing the overall value of a new smartphone was lower than the projected importance for the group by another respondent group (age 18-25 females) in the designer role (M = 4.18, SD = .68), t(429) = -2.62, p<.05. (**Table 28**)

Hypotheses supported

Hence, all the following five sub-hypotheses of hypothesis H7 are supported by the T-test(s) with specific target user groups as reported above:

H7a: There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the utilitarian value of a new smartphone.

Supported in groups of: Age 26-40 females designing for age 18-25 males
Age 18-25 females designing for age 26-40 males

H7b: There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the hedonic value of a new smartphone.

Supported in groups of: Age 26-40 males designing for age 18-25 females
Age 18-25 males designing for age 26-40 females

H7c: There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the social value of a new smartphone.

Supported in groups of: Age 26-40 females designing for age 18-25 males
Age 26-40 males designing for age 18-25 females
Age 18-25 females designing for age 26-40 males
Age 18-25 males designing for age 26-40 females

H7d: There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the innovative value of a new smartphone.

Supported in groups of: Age 26-40 females designing for age 18-25 males
Age 18-25 females designing for age 26-40 males

H7e: There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the overall value of a new smartphone.

Supported in groups of: Age 26-40 males designing for age 18-25 females
Age 18-25 females designing for age 26-40 males

Discussion

The phenomena revealed by the results of these independent samples t-tests were quite consistent with the last lot of paired samples t-test.

Again, most of the significant t-values are negative, except the one for "enhancing overall value" for age 18-25 females in **Table 27** with a positive t-value of 2.04. Negative t-values imply that the target users' own perceived importance in enhancing a specific value in the new smartphone is lower than the projected importance for the group by the role-taking designers. In other words, the role-taking designers have over-estimated the needs of the target user groups. The distribution of over-estimation coincides with that in the last lot of paired samples t-tests:

All the male target user groups were over-estimated for their needs for utilitarian and innovative design enhancements.

All the female target user groups were over-estimated for their needs for hedonic design enhancements.

All four target user groups, males and females of different ages, were over-estimated for their needs for social design enhancements.

The age 26-40 male target user group were over-estimated for their needs for overall design enhancements, whereas the age 18-25 female target user group were under-estimated for their needs for overall design enhancements.

Table 26: Survey (full-scale) – Independent Samples T-tests comparing target users' (age 18-25 male) own perceived importance in user's role vs the projected importance by another respondent group (age 26-40 female) taking the designer role – in enhancing Utilitarian, Hedonic, Social, Innovative, and Overall Values* of a new smartphone

**** these are mean values computed from responses to 5-8 enhancement items under each value; the enhancement items are shown in the final questionnaire in Appendix 5d.***

Independent Samples Test

Target user's (age 18-25 male) own perceived importance in user's role –
vs the projected importance for the target user group by another respondent (age 26-40 female) in designer's role

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Enhancing Utilitarian Value	Equal variances assumed	.089	.766	-3.243	358	.001	-.19586	.06039	-.31463	-.07709
	Equal variances not assumed			-3.252	357.789	.001	-.19586	.06022	-.31429	-.07743
Enhancing Hedonic Value	Equal variances assumed	.049	.824	-1.464	358	.144	-.09725	.06641	-.22784	.03334
	Equal variances not assumed			-1.469	357.781	.143	-.09725	.06622	-.22747	.03297
Enhancing Social Value	Equal variances assumed	.370	.543	-3.139	358	.002	-.24770	.07891	-.40288	-.09252
	Equal variances not assumed			-3.148	357.754	.002	-.24770	.07869	-.40244	-.09295
Enhancing Innovative Value	Equal variances assumed	1.158	.283	-4.470	358	.000	-.35768	.08002	-.51505	-.20032
	Equal variances not assumed			-4.492	357.844	.000	-.35768	.07963	-.51428	-.20108
Enhancing Overall	Equal variances assumed	.403	.526	-.717	358	.474	-.05218	.07278	-.19530	.09095
	Equal variances not assumed			-.720	358.000	.472	-.05218	.07249	-.19474	.09038

Table 27: Survey (full-scale) – Independent Samples T-tests comparing target users' (age 18-25 female) own perceived importance in user's role vs the projected importance by another respondent group (age 26-40 male) taking the designer role – in enhancing Utilitarian, Hedonic, Social, Innovative, and Overall Values* of a new smartphone

**** these are mean values computed from responses to 5-8 enhancement items under each value; the enhancement items are shown in the final questionnaire in Appendix 5d.***

Independent Samples Test

Target user's (age 18-25 female) own perceived importance in user's role –
vs the projected importance for the target user group by another respondent (age 26-40 male) in designer's role

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Enhancing Utilitarian Value	Equal variances assumed	3.058	.081	.299	429	.765	.01679	.05620	-.09367	.12724
	Equal variances not assumed			.297	409.900	.767	.01679	.05651	-.09429	.12786
Enhancing Hedonic Value	Equal variances assumed	.951	.330	-3.581	429	.000	-.20901	.05836	-.32372	-.09429
	Equal variances not assumed			-3.607	428.672	.000	-.20901	.05794	-.32289	-.09512
Enhancing Social Value	Equal variances assumed	2.655	.104	-2.858	429	.004	-.19033	.06659	-.32121	-.05944
	Equal variances not assumed			-2.838	405.602	.005	-.19033	.06707	-.32217	-.05848
Enhancing Innovative Value	Equal variances assumed	.545	.461	-1.074	429	.283	-.07767	.07229	-.21976	.06443
	Equal variances not assumed			-1.070	412.346	.285	-.07767	.07262	-.22041	.06508
Enhancing Overall Value	Equal variances assumed	1.171	.280	2.039	429	.042	.12768	.06261	.00463	.25074
	Equal variances not assumed			2.026	406.841	.043	.12768	.06303	.00379	.25158

Table 28: Survey (full-scale) – Independent Samples T-tests comparing target users' (age 26-40 male) own perceived importance in user's role vs the projected importance by another respondent group (age 18-25 female) taking the designer role – in enhancing Utilitarian, Hedonic, Social, Innovative, and Overall Values* of a new smartphone

**** these are mean values computed from responses to 5-8 enhancement items under each value; the enhancement items are shown in the final questionnaire in Appendix 5d.***

Independent Samples Test

Target user's (age 26-40 male) own perceived importance in user's role –
vs the projected importance for the target user group by another respondent (age 18-25 female) in designer's role

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Enhancing Utilitarian Value	Equal variances assumed	.484	.487	-4.013	429	.000	-.21503	.05358	-.32034	-.10971
	Equal variances not assumed			-4.022	424.722	.000	-.21503	.05346	-.32010	-.10995
Enhancing Hedonic Value	Equal variances assumed	.160	.689	-1.385	429	.167	-.08432	.06087	-.20397	.03532
	Equal variances not assumed			-1.387	423.426	.166	-.08432	.06079	-.20381	.03516
Enhancing Social Value	Equal variances assumed	10.344	.001	-3.922	429	.000	-.27600	.07037	-.41431	-.13768
	Equal variances not assumed			-3.871	387.280	.000	-.27600	.07131	-.41619	-.13580
Enhancing Innovative Value	Equal variances assumed	.071	.790	-1.986	429	.048	-.13994	.07046	-.27844	-.00144
	Equal variances not assumed			-1.981	416.449	.048	-.13994	.07065	-.27881	-.00107
Enhancing Overall Value	Equal variances assumed	2.067	.151	-2.618	429	.009	-.16669	.06368	-.29185	-.04152
	Equal variances not assumed			-2.628	426.406	.009	-.16669	.06344	-.29137	-.04200

Table 29: Survey (full-scale) – Independent Samples T-tests comparing target users' (age 26-40 female) own perceived importance in user's role vs the projected importance by another respondent group (age 18-25 male) taking the designer role – in enhancing Utilitarian, Hedonic, Social, Innovative, and Overall Values* of a new smartphone

**** these are mean values computed from responses to 5-8 enhancement items under each value; the enhancement items are shown in the final questionnaire in Appendix 5d.***

Independent Samples Test

Target user's (age 26-40 female) own perceived importance in user's role –
vs the projected importance for the target user group by another respondent (age 18-25 male) in designer's role

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Enhancing Utilitarian Value	Equal variances assumed	1.089	.297	1.241	358	.215	.08010	.06452	-.04680	.20699
	Equal variances not assumed			1.244	357.598	.214	.08010	.06436	-.04648	.20668
Enhancing Hedonic Value	Equal variances assumed	.011	.916	-4.102	358	.000	-.25526	.06223	-.37763	-.13288
	Equal variances not assumed			-4.099	353.995	.000	-.25526	.06227	-.37773	-.13279
Enhancing Social Value	Equal variances assumed	.980	.323	-4.055	358	.000	-.30854	.07608	-.45817	-.15891
	Equal variances not assumed			-4.078	357.490	.000	-.30854	.07566	-.45733	-.15975
Enhancing Innovative Value	Equal variances assumed	6.988	.009	-1.194	358	.233	-.10111	.08467	-.26761	.06540
	Equal variances not assumed			-1.204	354.222	.229	-.10111	.08395	-.26620	.06399
Enhancing Overall Value	Equal variances assumed	4.445	.036	-.029	358	.977	-.00208	.07176	-.14320	.13904
	Equal variances not assumed			-.029	356.091	.977	-.00208	.07124	-.14219	.13803

5.5.8.5 Further discussion on the over-projection of user needs

Following previous discussions on the test results in **Sections 5.5.8.3** and **5.5.8.4**, the coinciding of the over-projection of user needs by the role-taking designers with the commonly shared gender stereotypes do not appear to be accidental. Apparently, the role-taking designers have applied the pre-conceptions in their mind about what the male and female users need respectively, such as male users would need new smartphones with higher utilitarian and innovative values while female users would need new smartphones with higher hedonic values. The pre-conceptions are likely part of the built-up mental models of the respondents.

The phenomenon demonstrates that for the real-world designers and nondesigners alike, when they put themselves into the role of a designer in the survey, they may start to see themselves better off and see the users as less knowledgeable / capable and need more to “catch up”. Such mind set, in a real-world project, may likely lead to over-designing with features that the users do not really need. In fact, early architect / designer in early 20th century with modernist thinking categorised all users as “average people” who did not know what was good and were there to receive the benefits distributed to them through design (Siu, 2003). Such expert-against-average-people view positing the designers on a higher ground than the users who need to be taken care of have not gone away as the world evolves. For instance, the Nielson Norman Group has been advocating on its website the design guides that “all users are stupid” and that "users are not designers……so don't listen to them; watch them” (Nielson, 2001, 2008). Despite the Group’s good intention that if a design is easy-to-use for "stupid" users it will work well for most users, the unbalanced perception on designer and user efficacies is apparent.

Despite designers may cognitively recognised such self-boasting thinking as inappropriate nowadays when participatory design programmes are proclaiming equity for all participants, the scenario questions in the conducted survey as well as real-life design cases demonstrate that the same thinking and doing are still going on.

What is the magic in the designer hat? Why does it make the wearer think that others need more? It may not be a matter of the “designer” hat, but a tendency for the

professionals / experts to position themselves higher than the “average people”. Wang et al. (2017) conducted a study on the role between self-efficacy and stereotype activation. When primed with the stereotype of an occupation requiring high or low mental efforts, the participants in the study unknowingly changed their self-efficacy beliefs and performed better or worse respectively in a given test.

So what about letting the real-world users put on the designer’s hat so as to confer them the designer self-efficacy and let them design for themselves? In fact the participatory design practice is trying to do this. It has been advocated for years that the designers should take up a facilitator role to enable the users to design for themselves, but this has come into challenges for both designers and users. For the designers, it has been difficult if not impossible for them to take off their designer hat which they have worn for long time. For the users, it has been revealed in the Part One Mental Modelling activity that they may not be so well-versed in conceptualising and expressing needs which are less tangible and more intrinsic. Design thinking has been a trendy training for most specialisms in schools and for many professionals in the workplace. Design thinking tries to address the designer/user gap through empathy training, which seems inadequate to resolve the problem up to now. It may be time for the design educators and businesses to review the issue and work the way out in attaining a coherent level of (self-)efficacy among the designers, products, and users, which may involve longer-term education programme enhancements, intuitive designer/user engagement, shorter-term priming activities, and more.

5.5.9 Testing mediation effects: Mediation Analyses

As it has been projected that the perceived intrinsic values (perceived hedonic and social values) mediate the causal relations between the perceived extrinsic values (utilitarian and innovative values) and perceived satisfaction / intention of continuous use, two mediation tests were performed with Model 80 (serial and parallel mediation) (**Figure 27**) of the SPSS Process Macro (Hayes, 2022) to assess the mediation effects and check the hypotheses.

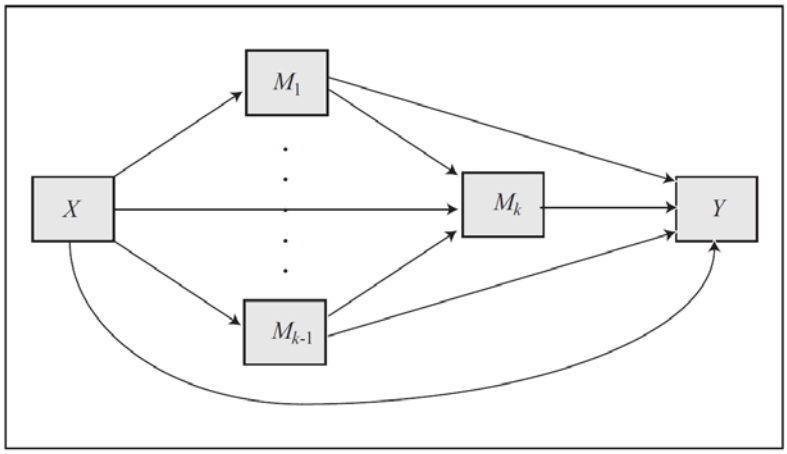


Figure 27: Model 80 of SPSS Process Macro (serial and parallel mediation) (Hayes, 2022)

5.5.9.1 Hypothesis 8, 9, 10 – test results and discussion

List of hypotheses tested:

H8: The perceived intrinsic values (hedonic and social values) mediate the relations between the perceived extrinsic values (utilitarian and innovative values) and perceived satisfaction.

H8a: Perceived hedonic value mediates the relation between perceived utilitarian value and perceived satisfaction.

H8b: Perceived social value mediates the relation between perceived utilitarian value and perceived satisfaction.

H8c: Perceived hedonic value mediates the relation between perceived innovative value and perceived satisfaction.

H8d: Perceived social value mediates the relation between perceived innovative value and perceived satisfaction.

H9: The perceived intrinsic values (hedonic and social values) mediate the relations between the perceived extrinsic values (utilitarian and innovative values) and intention of continuous use.

H9a: Perceived hedonic value mediates the relation between perceived utilitarian value and intention of continuous use.

H9b: Perceived social value mediates the relation between perceived utilitarian value and intention of continuous use.

H9c: Perceived hedonic value mediates the relation between perceived innovative value and intention of continuous use.

H9d: Perceived social value mediates the relation between perceived innovative value and intention of continuous use.

H10: The perceived satisfaction mediates the relations between the perceived values and intention of continuous use.

H10a: Perceived satisfaction mediates the relation between perceived utilitarian value and intention of continuous use.

H10b: Perceived satisfaction mediates the relation between perceived hedonic value and intention of continuous use.

H10c: Perceived satisfaction mediates the relation between perceived social value and intention of continuous use.

H10d: Perceived satisfaction mediates the relation between perceived innovative value and intention of continuous use.

Results (independent variable: perceived utilitarian value)

Mediation analysis was performed with Model 80 of the SPSS Process Macro (Hayes, 2022) to assess the mediating role of perceived hedonic value (PHV), perceived social value (PSV), and perceived satisfaction (SAT) in the causal relation between perceived utilitarian value (PUV) and intention of continuous use (ICU). The results (detailed SPSS Process results in **Appendix 12a**) revealed:
A significant total effect of PUV on ICU (β = .63, p < .05, CI [.54, .71]).
A significant direct effect of PUV on ICU (β = .20, p < .05, CI [.10, .29]).
A significant indirect effect of PUV on ICU (β = .43, p < .05, CI [.34, .53]).

There were a number of significant mediating relations contributing to the above overall indirect effect (Ind), including:
Ind1: PUV → PHV → ICU (H9a: β = .14, p < .05, CI [.06, .22])
Ind2: PUV → PSV → ICU (H9b: β = .04, p < .05, CI [.01, .07])
Ind3: PUV → SAT → ICU (H10a: β = .08, p < .05, CI [.03, .13])
Ind4: PUV → PHV → SAT → ICU (H8a, H10b: β = .13, p < .05, CI [.09, .18])
Ind5: PUV → PSV → SAT → ICU (H8b, H10c: β = .04, p < .05, CI [.03, .06])

All the Confidence Intervals (CI) in the above effects did not contain zero, and with the p less than .05, which indicated that these effects were statistically significant.

Hence, the effect of perceived utilitarian value on intention of continuous use was partially mediated by perceived hedonic value, perceived social value, and perceived satisfaction. Among the indirect effects, Ind1 (mediated by PHV) was the strongest, followed by Ind4 (mediated by PHV and SAT) and Ind3 (mediated by SAT).

After all, the hypotheses H8a, H8b, H9a, H9b, H10a, H10b and H10c are supported.

Discussion

The above mediation test results indicate that perceived hedonic value is a strong mediator between the causal relations from perceived utilitarian value to intention of

continuous use (Ind1) and to perceived satisfaction (Ind4). The mediated effect in Ind4 (β = .13, p < .05) is even stronger than the more direct effect in Ind3 (β = .08, p < .05).

In practice, the results imply that the user would perceive the utilitarian value upon fulfilment of the instrumental goals and tasks, which would also trigger emotional good states and / or bring about social appreciation or enhance social relations, and ultimately leading to satisfaction and / or continuous use of the product.

Results (independent variable: perceived innovative value)

Similarly, mediation analysis was performed with Model 80 of the SPSS Process Macro (Hayes, 2022) to assess the mediating role of perceived hedonic value (PHV), perceived social value (PSV), and perceived satisfaction (SAT) in the causal relation between perceived innovative value (PIV) and intention of continuous use (ICU). The results (detailed SPSS Process results in **Appendix 12b**) revealed:
A significant total effect of PIV on ICU (β = .34, p < .05, CI [.28, .39])
A significant direct effect of PIV on ICU (β = .07, p < .05, CI [.01, .13])
A significant indirect effect of PIV on ICU (β = .26, p < .05, CI [.21, .32])

There were a number of significant mediating relations contributing to the above overall indirect effect (Ind), including:
Ind1: PIV → PHV → ICU (H9c: β = .07, p < .05, CI [.05, .10])
Ind3: PIV → SAT → ICU (H10d: β = .11, p < .05, CI [.08, .14])
Ind4: PIV → PHV → SAT → ICU (H8c, H10b: β = .05, p < .05, CI [.03, .06])
Ind5: PIV → PSV → SAT → ICU (H8d, H10c: β = .01, p < .05, CI [.0002, .03])

All the Confidence Intervals (CI) in the above effects did not contain zero, and with the p less than .05, which indicated that these effects were statistically significant.

Hence, the effect of perceived innovative value on intention of continuous use was partially mediated by perceived hedonic value, perceived social value, and perceived satisfaction. Among the indirect effects, Ind3 (mediated by SAT) was the strongest, followed by Ind1 (mediated by PHV) and Ind4 (mediated by PHV and SAT).

After all, the hypotheses H8c, H8d, H9c, H10b, H10c and H10d are supported.

H9d is not supported, since the mediation effect of PIV → PSV → ICU is not significant (β = .02, CI [-.01, .06]).

Discussion

In this model, the total indirect effect (β = .26, p < .05) is much stronger than the direct effect (β = .07, p < .05) of perceived innovative value on Intention of Continuous Use. Perceived social value is a weak mediator between perceived innovative value and perceived satisfaction, but not a mediator between perceived innovative value and intention of continuous use. This aligns with the earlier regression test result that the causal relation between PSV and ICU was not significant.

The perceived social value's weak predictive power for perceived satisfaction / intention of continuous use (as tested and discussed in **Sections 5.5.7.1 and 5.5.7.2**) and its weak mediating effect somehow deviate from general expectation, since the mobile phone has basically been recognised as an essential communication tool playing important roles in social life. While earlier studies have indicated sociability as an important motivator for using mobile devices (Leung & Wei, 2000; Palen et al., 2000), more recent research (Youn, 2016) found that users tend to use the smartphones more for solitary activities such as seeking information, playing games, or indulging in entertainments, and less for social contacts, making full use of the smartphone's multiple, expanding functions and fast connections.

5.5.10 Testing moderation effects of individual characteristics: Moderated Mediation Analyses

As it has been projected that individual characteristics may moderate the causal relations between the perceived product values and perceived satisfaction, between the perceived product values and intention of continuous use, and between the perceived satisfaction and intention of continuous use, analyses were conducted with Model 59 (moderated mediation) (**Figure 28**) of the SPSS Process Macro (Hayes, 2022) to assess the moderation effects and check the hypotheses H11, H12 and H13.

Process Model 59 was employed for its fit with the study's conceptual framework, where a-path denoted the causal relation from the perceived values to perceived satisfaction, b-path denoted the causal relation from perceived satisfaction to intention of continuous use, and c'-path denoted the causal relation from the perceived values to intention of continuous use. As the causal relations and mediation effects have been verified through the regression and mediation tests and reported in the above **Section 5.5.7** and **5.5.9**, this section focuses on reporting the evidence for the moderation effects.

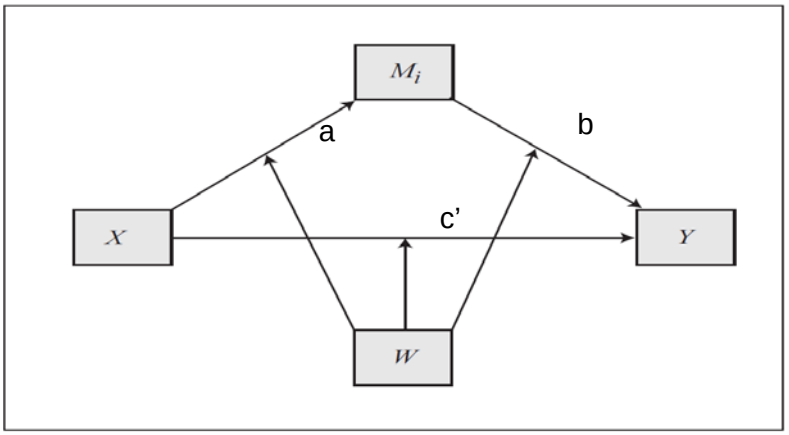


Figure 28: Model 59 of SPSS Process Macro (moderated mediation) (Hayes, 2022)

5.5.10.1 Hypothesis 11, 12, 13 – test results and discussion

Hypotheses tested with SPSS Process Model 59 included:

H11: The individual characteristics moderate the causal relations between the perceived values (PUV, PHV, PSV, PIV) and perceived satisfaction (SAT).

H12: The individual characteristics moderate the causal relations between the perceived values (PUV, PHV, PSV, PIV) and intention of continuous use (ICU).

H13: The individual characteristics moderate the causal relations between the perceived satisfaction (SAT) and intention of continuous use (ICU).

Note: PUV = Perceived Utilitarian Value; PHV = Perceived Hedonic Value; PSV = Perceived Social Value; PIV = Perceived Innovative Value

Results

The individual characteristics projected as moderators and tested were: individual designation of being a designer or not (DND); individual innovativeness (INNO); and individual personality traits of openness to experience (OPEN), neuroticism (NEUR), extraversion (EXTR), agreeableness (AGRE), and conscientiousness (CONS).

Significant moderating effects indicated in the SPSS Process tests are presented in **Table 30**, with the corresponding scatterplots (**Figure 29 to 34**) visually illustrating the moderated relations, and the detailed results from the Process tests shown in **Appendices 13a to 13f** for reference. The tests evidenced six statistically significant moderating effects. Five of them moderated the causal relations from the perceived hedonic / utilitarian values to perceived satisfaction (i.e. a-path) by the moderators of designer or nondesigner (Interaction 1), individual innovativeness (Interactions 2 & 3), neuroticism (Interaction 4), and extraversion (Interaction 5). One of them moderated the causal relation from the perceived hedonic value to intention of continuous use (i.e. c'-path) by the moderator of individual's openness to experience (Interaction 6).

To summarise, the following sub-hypotheses of H11 and H12 are supported:

H11a: The individual designation of being a designer or not moderates the causal relations between the perceived values and perceived satisfaction. (For PHV → SAT)

H11b: The individual innovativeness moderates the causal relations between the perceived values and perceived satisfaction. (For PUV → SAT, PHV → SAT)

H11d: The individual personality trait of neuroticism moderates the causal relations between the perceived values and perceived satisfaction. (For PUV → SAT)

H11e: The individual personality trait of extraversion moderates the causal relations between the perceived values and perceived satisfaction. (For PHV → SAT)

H12c: The individual personality trait of openness to experience moderates the causal relations between the perceived values and intention of continuous use. (For PHV → ICU)

Table 30: Significant moderating effects indicated in SPSS Process tests (Model 59)

Int.	Causal relation	Significant moderation on a-path	Significant moderation on b-path	Significant moderation on c'-path	Scatter-plot	Detailed results from Process	Hypothesis supported
1.	PHV → SAT → ICU	PHV x DND β = .17, *SE* = .07, p < .05, CI [.04, .31]	-----	-----	Fig 29	Appendix 13a	H11a
2.	PHV → SAT → ICU	PHV x INNO β = -.12, *SE* = .03, p < .05, CI [-.18, -.06]	-----	-----	Fig 30	Appendix 13b	H11b
4.	PUV → SAT → ICU	PUV x INNO β = -.11, *SE* = .04, p < .05, CI [-.18, -.04]	-----	-----	Fig 31	Appendix 13c	H11b
5.	PUV → SAT → ICU	PUV x NEUR β = -.07, *SE* = .03, p < .05, CI [-.14, -.003]	-----	-----	Fig 32	Appendix 13d	H11d
6.	PHV → SAT → ICU	PHV x EXTR β = -.07, *SE* = .03, p < .05, CI [-.12, -.02]	-----	-----	Fig 33	Appendix 13e	H11e
7.	PHV → SAT → ICU	-----	-----	PHV x OPEN β = .09, *SE* = .04, p < .05, CI [.02, .16]	Fig 34	Appendix 13f	H12c

Note

PUV: Perceived utilitarian value
PHV: Perceived hedonic value
PSV: Perceived social value
PIV: Perceived innovative value
SAT: Perceived satisfaction
ICU: Intention of continuous use

DND: Individual designation of being a designer or not
INNO: Individual innovativeness
OPEN: Openness to experience
NEUR: Neuroticism
EXTR: Extraversion
AGRE: Agreeableness
CONS: Conscientiousness

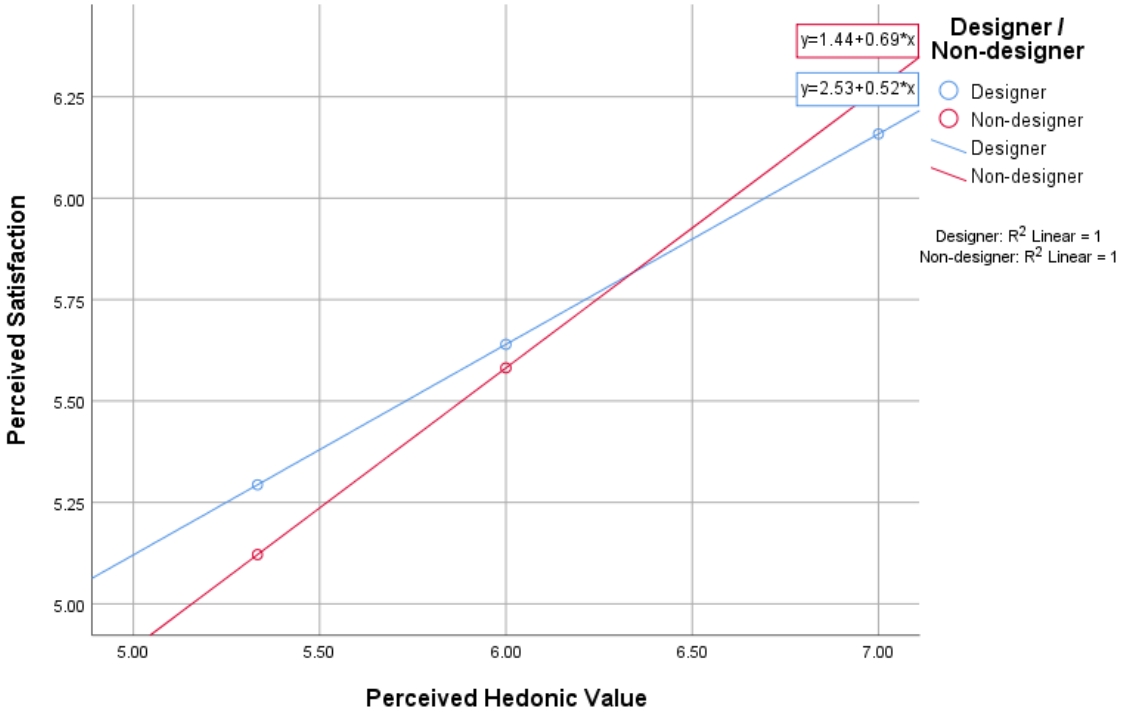


Figure 29: Designer / Nondesigner as a moderator on causal relation between Perceived Hedonic Value and Perceived Satisfaction

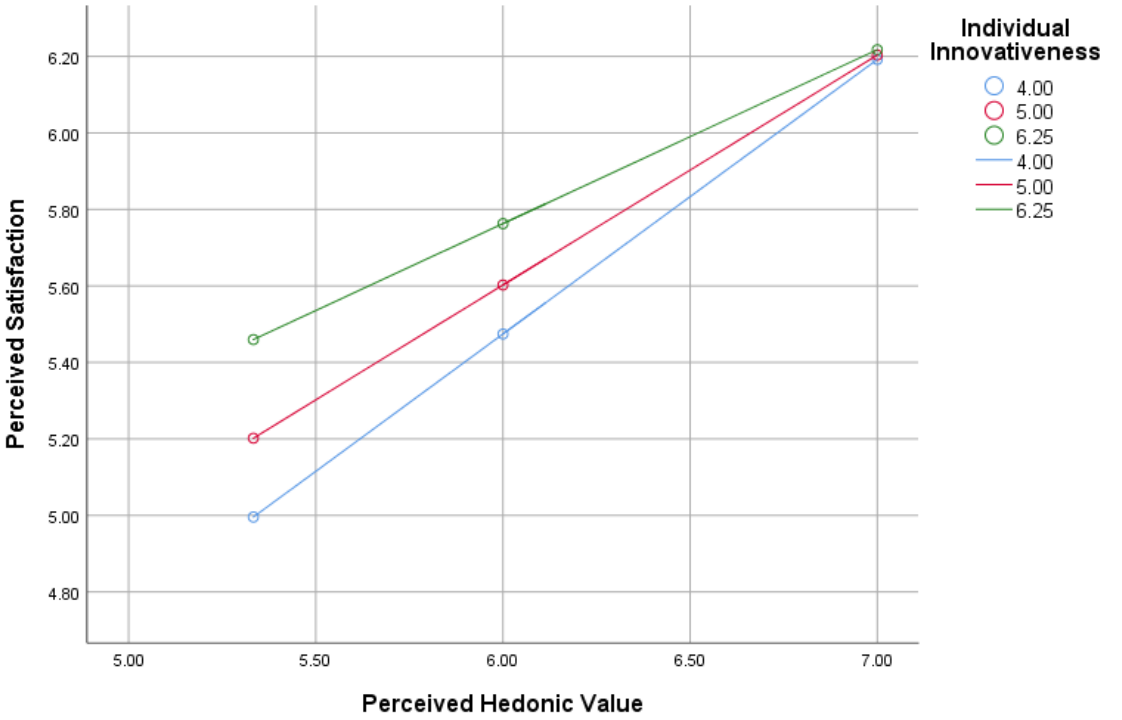


Figure 30: Individual Innovativeness as a moderator on causal relation between Perceived Hedonic Value and Perceived Satisfaction

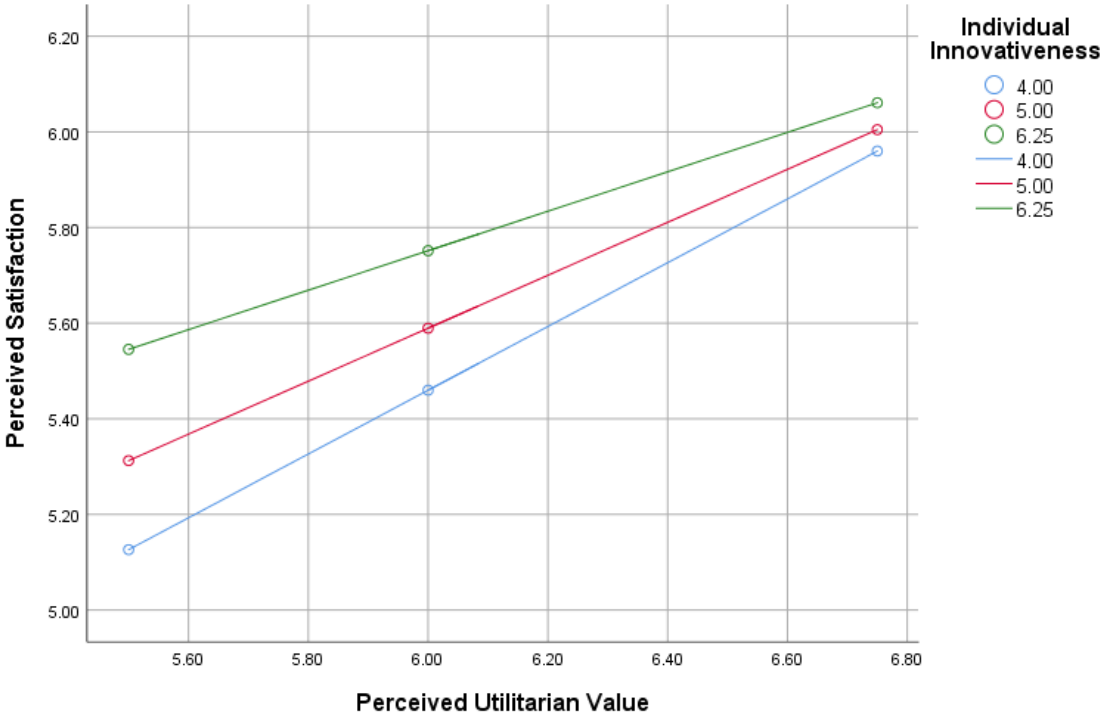


Figure 31: Individual Innovativeness as a moderator on causal relation between Perceived Utilitarian Value and Perceived Satisfaction

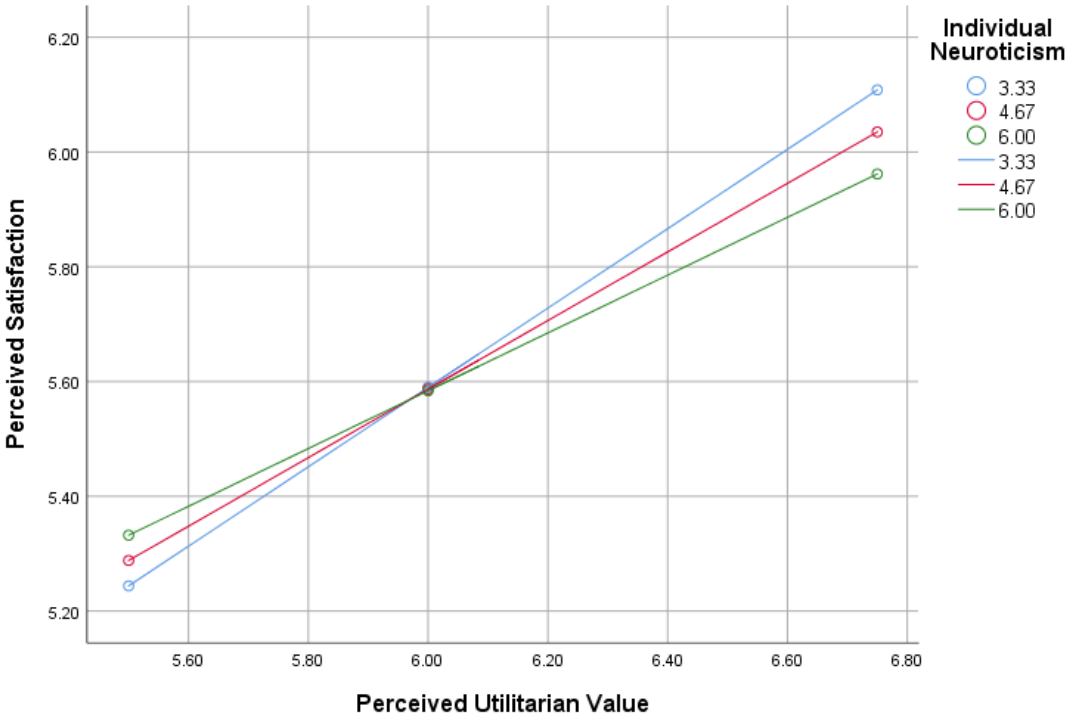


Figure 32: Individual Neuroticism as a moderator on causal relation between Perceived Utilitarian Value and Perceived Satisfaction

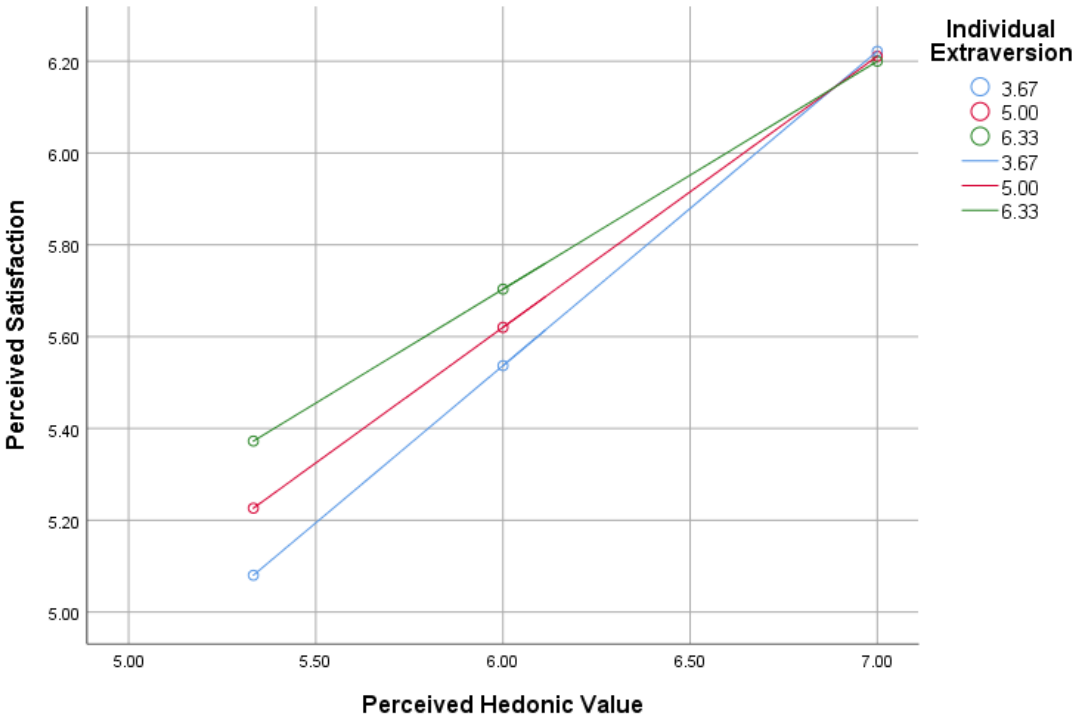


Figure 33: Individual Extraversion as a moderator on causal relation between Perceived Hedonic Value and Perceived Satisfaction

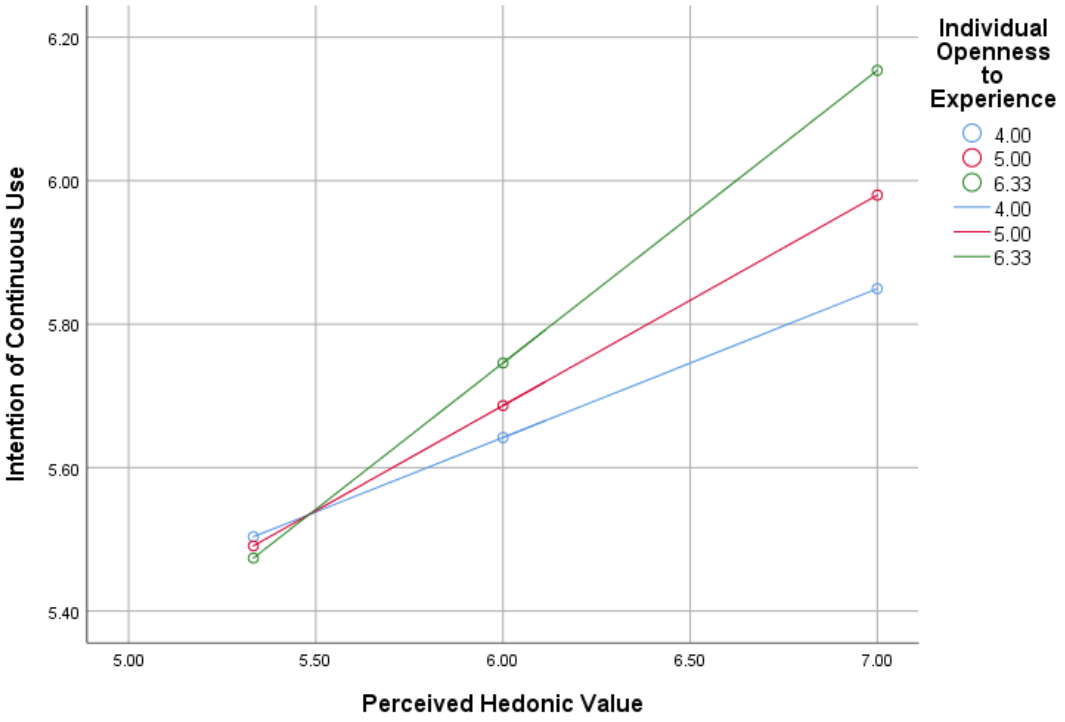


Figure 34: Individual Openness to Experience as a moderator on causal relation between Perceived Hedonic Value and Intention of Continuous Use

Discussion

Five of the six significant moderation effects acted on the a-path from the perceived value to perceived satisfaction. These moderated a-paths started either with perceived hedonic value or perceived utilitarian value. The possible reason why significant moderation effects were not detected with the a-paths between perceived social / innovative value and perceived satisfaction may be due to the less strong causal relations along these a-paths.

On the other hand, only one moderation effect acted on the c'-path from perceived hedonic value to intention of continuous use.

Four of the six significant moderators were clearly creativity related (designer / nondesigner; individual innovativeness x 2; openness to experience). The other two significant moderators are Neuroticism and Extraversion. Neuroticism has been recognised by previous studies as related to creativity on the one hand, and self-consciousness, self-control, fussy and picky attitude, and aspiring for sense of belonging on the other hand (Nettle, 2005, 2006; Xu et al., 2016). Extraversion has been recognised as relating to active, outgoing, and sociable characters valuing close and warm interpersonal relationship (Stachl et al., 2020; Xu et al., 2016).

The scatterplots from **Figures 29 to 34** helped to illustrate the moderation effects. **Figure 29** portrayed the designer / nondesigner status moderating the impact of perceived hedonic value on perceived satisfaction. The slope analyses for **Figures 30, 31, 32 and 33** depicted the moderation dampening the positive relations between the concerned perceived values and perceived satisfaction, while **Figure 34** depicted the moderation strengthening the positive relation between the concerned perceived value and intention of continuous use.

In particular, the slope analysis in **Figure 29** portrayed a steeper slope for the nondesigners, implying that an increase in the perceived hedonic value would result in a more intense increase of satisfaction for nondesigners than designers. Despite the designers might be more sensitive to the hedonic influences at the lower level of perceived hedonic value where they perceived a relatively higher satisfaction than the nondesigners, the nondesigners became more reactive to the hedonic influences as the perceived

hedonic value increased ultimately perceiving higher level of satisfaction than the designers when the perceived hedonic value was on the high side.

Figure 30 depicted a flatter slope for high individual innovativeness (green line of 6.25) and a steeper slope for low individual innovativeness (blue line of 4.00), implying that individual innovativeness dampened the positive relationship between perceived hedonic value and perceived satisfaction. At the lower level of perceived hedonic value, individuals with high innovativeness displayed a higher sensitivity to hedonic influences and perceived higher satisfaction than the individuals with low innovativeness, but their slope flattened out with the rise of perceived hedonic value. As the level of hedonic influences increased, the less innovative individuals became more reactive to the hedonic influences ultimately perceiving similar level of satisfaction as the innovative individuals when the perceived hedonic value was on the high side.

Figure 31 illustrated a comparable situation portraying a flatter slope for high individual innovativeness (green line of 6.25) and a steeper slope for low individual innovativeness (blue line of 4.00), implying that individual innovativeness also dampened the positive relationship between perceived utilitarian value and perceived satisfaction. At the lower level of perceived utilitarian value, individuals with high innovativeness displayed a higher sensitivity to utilitarian influences and perceived higher satisfaction than the individuals with low innovativeness, but their slope flattened out with the rise of perceived utilitarian value. As the level of utilitarian influences increased, the less innovative individuals became more reactive to the utilitarian influences ultimately narrowing the gap of satisfaction with the innovative individuals when the perceived utilitarian value was on the high side.

Figure 32 illustrated a flatter slope for high individual neuroticism (green line of 6.00) and a steeper slope for low individual neuroticism (blue line of 3.33), representing a negative moderating effect of individual's neuroticism on the positive relationship between perceived utilitarian value and perceived satisfaction. The impact of perceived utilitarian value on satisfaction started higher (on the low side of perceived utilitarian value) but ended lower (on the high side of perceived utilitarian value) for individuals with high neuroticism compared with those with low neuroticism. The slope pattern differed from those of Figure 30 and 31 in that the high neuroticism and low neuroticism slopes crossed

over early around the perceived utilitarian value of 6.00, implying that a larger portion of the high-neuroticism individuals perceived lower satisfaction than the low-neuroticism individuals. One possible reason for the high-neuroticism individuals to demonstrate a flatter slope of satisfaction with the increase of perceived utilitarian value may be due to their recognised “fussy and picky”, that is demanding and hard-to-please, attitude. The illustrated tendency is also in line with the literature’s previous finding about neuroticism’s negative correlation with perceived usefulness (Xu et al., 2016).

Figure 33 depicted a similar picture as Figure 30, with a flatter slope for high individual extraversion (green line of 6.33) and a steeper slope for low individual extraversion (blue line of 3.67), implying that individual extraversion dampened the positive relationship between perceived hedonic value and perceived satisfaction. At the lower level of perceived hedonic value, individuals with high extraversion displayed a higher sensitivity to hedonic influences and perceived higher satisfaction than the individuals with low extraversion, but their slope flattened out with the rise of perceived hedonic value. As the level of hedonic influences increased, the low-extraversion individuals became more reactive to the hedonic influences ultimately perceiving similar level of satisfaction as the high-extraversion individuals when the perceived hedonic value was on the high side.

The patterns of moderating effects illustrated in **Figures 29, 30, 31** and **33** may suggest that higher sensitivity, especially to hedonic influences, is shared by designers, and individuals with high level of innovativeness or extraversion, whereas nondesigners and individuals with low level of innovativeness or extraversion may need stronger hedonic influences to trigger their sense of satisfaction.

The slope analysis in **Figure 34** portrayed a steeper slope for high individual openness to experience (green line of 6.33) and a flatter slope for low individual openness to experience (blue line of 4.00), implying that individual openness to experience strengthened the positive relationship between perceived hedonic value and intention of continuous use. The levels of intention of continuous use started similar or just a little bit lower for individuals with high level of openness to experience compared with those with low level of openness to experience, but ended with an enlarged gap for individuals with varied level of openness to experience on the high side of perceived hedonic value. The

pattern implied that the more open individuals were willing to make firmer commitments to continuous use of the product when high hedonic value had been experienced.

Underlying contribution to designer/nondesigner differences

Apart from the aim of enriching the proposed conceptual framework, another important purpose for checking the potential moderation roles of the individual characteristics within the framework is to discover whether and how they might contribute to the differences / gaps to be identified between designers and nondesigners / users. Cross-examining the designer/nondesigner differences identified by the t-tests and moderating factors identified by the moderation tests, certain phenomena and potential associations emerged.

The t-tests reported in **Sections 5.5.8.1 and 5.5.8.2** have identified designer/nondesigner differences respectively in their perceived product values including “perceived innovative value” and “perceived hedonic value”, and their personal characteristics including “individual innovativeness” and “openness to experience”. The causal relations of “individual innovativeness” and “openness to experience” influencing “perceived innovative value” and “perceived hedonic value” have been checked and supported by the multiple linear regression tests reported in **Section 5.5.7.3 (Table 19)**. Three of these four variables with identified designer/nondesigner differences found their roles again in the significant moderations reported in this section, which were “individual innovativeness”, “openness to experience”, and “perceived hedonic value”, with “perceived innovative value” missing out. The moderation tests have depicted the following two significant relations among the three identified variables:

- “individual innovativeness” moderating the impact of “perceived hedonic value” on “perceived satisfaction”; and
- “openness to experience” moderating the impact of “perceived hedonic value” on “intention of continuous use”.

Hence the underlying contributory relations mapped out in **Section 5.8.8.2** can be further expanded as:

1.1. The designers’/nondesigners' innate characteristic difference in “individual innovativeness” possibly contributes to the designers’/nondesigners' perceived differences in the “innovative value” and “hedonic value” for a product.

1.2. The designers’/nondesigners' innate characteristic difference in “individual innovativeness” may further contribute to the designer/nondesigner difference in the causal relation between “perceived hedonic value” and “perceived satisfaction” through its moderator role.

2.1. The designers’/nondesigners' innate personality trait difference in “openness to experience” possibly contribute to the designers’/nondesigners' perceived differences in the “innovative value” and “hedonic value” for a product.

2.2. The designers’/nondesigners' innate personality trait difference in “openness to experience” may further contribute to the designer/nondesigner difference in the causal relation between “perceived hedonic value” and “intention of continuous use” through its moderator role.

5.6 Overview of major findings

Findings of the research conducted through mental modelling and survey with role-based scenario questions have contributed in understanding the perception of product values and experience, and the possible differences between designers' and users' perceptions. Relevant findings (such as designer and nondesigner differences in group characteristics and value perception, anticipated smartphone enhancements) from the Stage One Mental Modelling have been incorporated into the Stage Two Survey for verification. An overview of the major findings is recapitulated below, before it comes to the final discussions and conclusions in **Chapter 6**.

In Part One, tendencies identified from the mental model analysis include: the traversing of extrinsic utilitarian goals into the intrinsic hedonic domain; designers emphasising more intrinsic communication with the family while nondesigners emphasising more extrinsic communication with colleagues, friends and community; designers bringing up more abstract, intangible and intrinsic concepts / suggestions (such as controllability and safe of mind) than non-designers. When further checked in the survey on whether designers and nondesigners are actually perceiving different levels of importance on the mattes of "sense of control" and "sense of security", no significant between-group difference is found. If both groups perceive similar importance for these concerned matters as reflected from the likert-scale responses in the survey but such concerns are missing in the mental models created by the nondesigners, it may imply that the nondesigners are less capable of articulating and communicating such somehow abstract and intangible concepts even with the help of the mental modelling visualisation tool.

In Part Two, findings from the hypothses testing on survey data collected from 791 respondents (**Table 33**) show support for the conceptual framework with enhancements and updates proposed along the "perceived values – satisfaction – behavioural intention" model (**Figure 35**).

Apart from confirming with previous literature that consumers' perceived product

values (utilitarian, hedonic, social, and innovative) affect their satisfaction and ultimately their intention of continous use for the product, the study finds that the perceived intrinsic values (hedonic and social values) mediate the causal relations between the perceived extrinsic values (utilitarian and innovative values) and perceived satisfaction. The updated “innovative value” also demonstrates significance in the designer/nondesigner value perception difference which may relate to the variations revealed between the two groups in individual innovativeness and openness to experience. Amid the updated set of perceived product values, while perceived hedonic and innovative values are recognised to have stronger impact on satisfaction, perceived utilitarian and hedonic values are recognised to have stronger direct impact on intention of continous use. The perceived social value shows an unexpected weak impact on satisfaction, no direct impact on intention of continous use, and no mediating effect on the relation between perceived innovative value and intention of continuous use. This phenomenon, signaling a possible value shift, with the focus of smartphone use shifting from social communication to personal enjoyment, is discussed in **Sections 5.5.7.2, 5.5.9.1 and 6.1.1**.

Among the tested antecedents of individual characteristics, individual innovativemness, openness, and agreeableness are found to be the common factors influencing all perceived product values (utilitarian, hedonic, social, and innovative) for the “new smartphone with the respondent's preferred enhancements”, and influencing most perceived product values for the “smartphone currently used by the respondent”. Both extraversion and conscientiousness are found to influence three of the four perceived product values except hedonic value, for either the new or existing smartphone; whereas neuroticism shows a pinpointed influence only on perceived innovative value for the new smartphone.

The projection that individual characteristics may moderate the influence of perceived product values on satisfaction or intention of continous use is supported for a number of moderating effects. While “being a designer or not”, individual innovativeness, and extraversion moderate the influence of perceived hedonic value on perceived satisfaction, individual innovativeness and

neuroticism moderate the influence of perceived utilitarian value on perceived satisfaction. On the other hand, openness to experience moderates the influence of perceived hedonic value on intention of continuous use.

For the comparisons between real-world designers and nondesigners (users), designers are found to perceive higher innovative value (high significance) and hedonic value (lower significance) in their product value perception, and show greater openness to experience (high significance) and innovativeness (lower significance) in their individual characteristics, as compared with nondesigners. Such variations in the two groups' individual characteristics are potential contributors for their differences in value perception.

More prominent differences have been recognised in the comparisons between role-taking designers and users grouped in respect of age and gender. Firstly, there are general tendencies for the respondents to project (in a designer role) a higher importance of (need for) the smartphone enhancements for their target user group than for their own self (in a user role) (test results of Hypothsis 6). Secondly, the gaps found between the target user's own perceived importance (in a user role) for the smartphone enhancements and the importance projected by another individual (in a designer role) for the respective target user indicate that the role-taking designers have often over-estimated the needs of their target user group (test results of Hypothsis 7). Thirdly, stereotyping tendencies are observed. For examples, all the male target user groups were over-estimated for their needs for utilitarian and innovative design enhancements, whereas all the female target user groups were over-estimated for their needs for hedonic design enhancements.

Articulating across the above findings, the study has identified important designer/user differences / gaps and explored the potential underpinning factors. The designer/user value perception differences, such as designers perceiving higher innovative and hedonic values, may be ascribable to the differences found in individual innovativeness and personality traits (such as designers with greater openness to experience). The long recognised designer/user communication gap (Norman, 1988, 2013; Crilly et al., 2008;

Krippendorff, 1989, 2006; Beeman, 2022; Guo, 2023) may possibly be a consequence of their innate difference in abstraction and tangibility levels. The identified need prediction discrepancy between role-taking designers and role-taking users may be explained to some extent by the potential imbalance of designer and user self-efficacies projected from findings of prior studies (Wang et al., 2017; Siu, 2003; Nielson, 2001, 2008; Alqudah, 2021; Almarzouqi, 2022). The identification of gaps and their prospective underlying factors hinted the potential directions to bridge the gaps, improve designer-product-user interaction, and ultimately enhance user experience. Implications of the research findings will be further discussed in the next chapter (**Chapter 6**).

CHAPTER 6: DISCUSSIONS AND CONCLUSIONS

6.1 Discussions

The research aims at understanding the perception of product values and experience, and investigating the possible differences between designers' and users' perceptions. An enhanced and updated conceptual framework has been proposed to adequtely reflect the values involved in the user experience with contemporary products and to enable the systemic comparison between the designers' and users' perceptions. Exploratory empirical research methods have been developed to facilitate elicitation and testing of data. **Figure 35** shows the final conceptual framework with the supported hypotheses, and **Table 33** summarises the tested and supported hypotheses.

This section discusses how the research aims have been fulfilled highlighting the following aspects:

- Enhancing and updating of the conceptual framework for the "perceived values – satisfaction – behavioural intention" model (in relation to research question 1)
- Differences / gaps identified between designers and nondesigners, and the underlying factors (in relation to research questions 2 and 3)
- Development and testing of exploratory empirical research methods

6.1.1 Enhancing and updating of the conceptual framework

Rooted from the "perceived values – satisfaction – behavioural intention" models proposed / tested in previous literature, the current study has enhanced, tested and updated the conceptual framework integrating relevant attributes and interactions in aspects including: adding the perceived innovative value to the perceived utilitarian, hedonic and social values of the TAM and UTAUT model series to address the innovative nature of today's fast-advancing products (such as the exemplar smart communication products); recognising the inter-value relations with intrinsic values mediating the impact of the extrinsic values on perceived satisfaction and intention of continuous use in a product context; and

proposing individual's characteristics as potential antecedents / moderators embracing the factors of designer / nondesigner, individual's innovativeness and personality traits, beyond the commonly tested demographic and user experience factors.

The innovative value and potential value shift

The survey results supported the proposed updates. The regression tests (**Section 5.5.7**) indicated that the added "perceived innovative value" was the second most important predictor of perceived satisfaction (β = .32, t = 9.62, p < .05) right after "perceived hedonic value" (β = .34, t = 9.16, p < .05). This implied that for contemporary products such as the smartphone, its innovative value is highly cherished by users determining user satisfaction. On the other hand, the perceived social effect was found to be a weak predictor of perceived satisfaction (β = .07, t = 2.00, p < .05) which was a bit surprising as the mobile phone was supposed to play a substantial role in socialising and maintaining social relations as a communication tool. Earlier studies had indicated sociability as an important motivator for using mobile devices (Leung & Wei, 2000; Palen et al., 2000). However, a shift of importance among the mobile functions and perceived values has been emerging. Youn (2016) found that with the more multi-functioning and fast connections for the smartphone, users tended to use it more for solitary activities, such as seeking information, playing games, or indulging in entertainments, than making social contacts. Such growing importance of the smartphone's use for enjoyments like gaming and entertaining activities no doubt contributes to the rise of the hedonic value being the strongest predictor for perceived satisfaction.

The inter-value relations

The proposed mediating effects of the intrinsic values (hedonic and social) between the perceived extrinsic values (utilitarian and innovative) and perceived satisfaction / intention of continuous use were evidenced in the mediation analyses (**Section 5.5.9**). The mediation test results indicated perceived hedonic value being a stronger mediator than perceived social value, possibly

explained by the above apparent phenomena of the smartphone becoming more a self-indulging multi-functional entertainment and net surfing companion than a social communication tool.

Having a closer examination of the items under social value, the two items with highest average scores were “using this smartphone improves my communication with others” and “using this smartphone matches my personality” scoring 5.68 and 5.28 respectively (on 7-point likert scale). Such scores were around the middle range of all the value item scores. When weighing the design options for enhancing the new smartphone, the respondents weighed the design options for “enhancing social values” as least important among the four value domains, for themselves as well as for their target users, as shown in the descriptive statistics (**Table 15**). Considering these results altogether, a possible interpretation could be that the respondents’ smartphones were still performing their basic social communication role (perhaps less through phone calls, but more through the messaging apps and social media platforms) though less valued by the users than the phones’ more hedonic roles. The respondents might not have much concern nor anticipation for user experience in the social aspect, and hence the perceived social value was not a strong predictor of satisfaction from using the smartphone. So a potential value shift away from the social value towards the hedonic value for mobile communication products like the smartphone is apparent, but the extent of shift is unconfirmed and likely keeps changing over time. It may need a longitudinal study or a series of repeated studies to trace the evolvement.

The close interplay of the utilitarian value and hedonic value should also be given special attention. Despite a majority of the respondents have put up the utilitarian value as the most important in their mental models as well as in the survey questionnaire (68.6% in **Table 31**), its predictive power for satisfaction only ranks the third (β = .13, t = 3.70, p < .05) in the regression test after the hedonic value (β = .34, t = 9.16, p < .05) and innovative value (β = .32, t = 9.62, p < .05) (**Section 5.5.7.1**). What has happened is that a large part of the effect of perceived utilitarian value on perceived satisfaction routes through the mediators of perceived hedonic value and perceived social value (in particular

perceived hedonic value) as indicated in the mediation test results (**Section 5.5.9.1**). The comparative ratio of the direct effect of perceived utilitarian value on perceived satisfaction against the indirect effect through perceived hedonic value and perceived social value respectively is 0.08 : 0.13 : 0.04. Possible interpretations could be that most smartphones (at least those used by the young university students and working professionals in China) have more or less similar functionalities nowadays. So good functions are well expected and hence do not bring direct satisfaction, while the fulfillment of the instrumental goals / tasks may trigger good emotional states (such as contended, relaxed, pleased) ultimately leading to satisfaction. The important implication here is that more attention should be given to user experience rather than just the product features during R&D, especially experience which relates users' emotional and sensational responses.

Table 31: Priorities of the product values for an ideal smartphone

(from responses to a direct question in the full-scale survey)

What is your priorities of the product values for an ideal smartphone? 您认为一个理想的智能手机，其价值的重要性排序是？	Designers		Nondesigners		Total	
	Count	%	Count	%	Count	%
Innovative Value as first priority 创新价值	38	16.4%	56	10.0%	94	11.9%
Hedonic Value as first priority 感受价值	32	13.8%	91	16.3%	123	15.5%
Social Value as first priority 社会价值	9	3.9%	22	3.9%	31	3.9%
Utilitarian Value as first priority 实用价值	153	65.9%	390	69.8%	543	68.6%
Total	232	100.0%	559	100.0%	791	100.0%

Another intertwining question across the perceived product values was considered about the positioning of a measurement item to be under perceived hedonic or social value. The value measurement item "using this smartphone matches my personality" (S5 in **Table 17**) was initially placed under perceived hedonic value in reference to the literature. Some previous studies, mostly conducted in western countries (e.g. Wiedmann et al., 2009; Manchiraju & Diddi, 2015), associated personality or personal identity with the hedonic value which encompassed the internal and sensory feelings. Such association would work well if the personality match was recognised as self-fulfilment satisfying the desire for self-congruence. However, the personality match reinforcing

one's self-identity could be more than a self-fulfilment. The individual might see it as a self-expression for gaining recognition or appreciation in a social group (Markus & Kitayama, 2010). Then the personality match would have a close link with the social value. The current study adapted the above measurement item from the literature firstly under the hedonic value, and later migrate it to social value considering the following rationale:

(1) indication of the factor loading with the item riding across hedonic (.430) and social (.432) values both with moderate loading (**Table 17**);
(2) the tendency of the Chinese culture in concerning others' evaluation on the expression of the self (Yang, 1993); and
(3) relatedness of the concerned item with another item under the social value group (S2 "using this smartphone makes a good impression on other people") – positioning the two related items in the same group enhanced the internal consistency of the scale.

The above case demonstrated the need for adjustment of measurement scales when adopting or adapting them across cultures.

<u>The antecedental and moderating factors</u>

As previous research found the individual characteristics (including personality traits) either influencing relationships as moderators or directly affecting user perceptions, the proposed conceptual framework incorporated and tested individual characteristics (including individual innovativeness and personality traits) as antecedents (for the perceived product values) as well as moderators. To recognise the underlying contributive factors for the designer/nondesigner differences identified in the tests, the t-test results reported in **Sections 5.5.8.1 and 5.5.8.2**, the regression test results reported in **Section 5.5.7.3**, and moderation test results reported in **Section 5.5.10.1** were considered in tandem in mapping out the contributory relations. The mapped-out contributory relations and discussions can be referred to in the previous **Section 5.5.10.1** and the following **Section 6.1.2**.

With regard to the projection of individual's factors as moderators on the user

experience causal relations, the supported moderators were mostly creativity / novelty related (including designer / nondesigner, individual's innovativeness, neuroticism, openness to experience), effecting on relations between the hedonic / utilitarian value and satisfaction (**Section 5.5.10**). Four of the six supported moderations involved hedonic value while two involved utilitarian value; and five of them involved perceived satisfaction while one involved intention of continuous use. The moderation by creativity / novelty related characteristics on impact of hedonic value is quite expectable considering the connection of creativity to emotional sensitivity found in previous studies (Nettle, 2006; Westerman et al., 2007; Sas & Zhang, 2010) and evidenced in the current study. On the other hand, the other personality traits of neuroticism and extraversion were found negatively moderating the impact of perceived utilitarian value and hedonic value respectively on perceived satisfaction. While the negative association of neuroticism with utilitarian perception was in line with the literature's finding about its negative correlation with perceived usefulness (Xu et al., 2016), the expectation for extraversion to effect on the impact of perceived social value, and openness to experience to effect on the impact of perceived innovative value, was not substantiated.

Although there have been a number of studies on the association of personality traits and mobile phone use patterns, there is little prior investigation on how personality traits might moderate the causal relations along the chain of "perceived values – satisfaction – behavioural intention". The current study is quite exploratory in this aspect and further research with more focused investigation is required to better understand the potential impact and implications.

6.1.2 Differences / gaps identified between designers and nondesigners, and underlying factors contributing to the differences

The principle of triangulation has been employed to verify the findings across different parts of the study. For instance, identified differences in value focuses and abstraction levels between the designer and nondesigner groups in the Part

One mental models were further checked in questions of the survey questionnaire in Part Two.

As discussed in the early sections, designer/user or designer/nondesigner differences and possible factors contributing to the differences have been identified from Part One and Part Two of the research, which are summarised and reviewed below.

Observed / verified differences in value focuses – macro and micro levels

At the more macro levels across the four domains of utilitarian 实用性, hedonic 感受性, social 社会性 and innovative 创新性 in the consolidated mental models of important perceptions from Part One, the designer group's model had shown broader ranges of perceptions under the innovative and hedonic domains than the nondesigner group (**Section 5.1.3**). These observed differences between the designers and nondesigners were evidenced again in the Part Two Survey. The t-test results in **Section 5.5.8.1** indicated that the designers (M = 5.41, SD = 1.05) (on 7-point likert scale) perceived higher innovative value for the new smartphone (with respondent's preferred enhancements) than the nondesigners (M = 5.18, SD = 1.12), $t(789) = 2.64$, $p<.05$. In addition to the marginally significant designer/nondesigner differences in perceived hedonic value identified in **Section 5.5.8.1**, another t-test on the groups' weightings given to the design options for enhancing the new smartphone (**Appendix 14**) indicated that the designers (M = 4.33, SD = .766) (on 5-point likert scale) weighed a higher importance for enhancing the hedonic value of the new smartphone than the nondesigners (M = 4.21, SD = .809), $t(789) = 2.03$, $p<.05$.

On the other hand, the more micro level differences identified among the perception elements in the groups' Part One mental models were not found statistically significant in the Part Two Survey (t-test result in **Appendix 14**), despite there were certain observable differences in the mean item scores between the designer and nondesigner groups. For instance, the designers' consolidated group mental model shows more emphasis on communication with the family which may be of more intrinsic regard while the nondesigners' group

mental model shows more emphasis on communication with colleagues, friends and community which may be of more extrinsic concerns (Leung & Wei, 2000). The survey results showed quite similar weightings given by the two groups for design options enhancing communication with family members, friends or community. A possible reason for the contrasts between the Part One and Part Two results could reflect that such identified differences are not consistent, or it could be related to the different modes of enquiry. In the mental modelling process of Part One, the participants more likely worked with instinctive thinking putting down what came up to their mind. In answering the survey questions of Part Two, the respondents might apply more cognitive thinking when weighing the design options presented before them, when influences such as social-desirability bias might creep in (Paulhus, 1984).

Individual innate characteristic and personality trait differences contributing to designer/nondesigner differences as antecedental and moderating factors

As discussed in earlier sections, the potential relevance of individual characteristics and personality as among the underlying factors for the designer/nondesigner differences could stem from the personality-career-inclination perspective (e.g. Holland, 1985; Hammond, 1991; Hannah, 1994; Caprara et al., 2003; Nettle, 2005, 2006; Hu et al., 2017), or the consumer perception perspective (e.g. Varnali, 2013; Zu et al., 2016; Stachl et al., 2017, 2020). Previous research found the individual characteristics / personality traits either influencing relationships as moderators, or directly affecting user perceptions, both of which might subsequently contribute to the perception differences between groups. Therefore, the current study tested individual's characteristics as antecedents (for the perceived product values) as well as moderators in terms of designer / nondesigner, individual innovativeness and personality traits, beyond the commonly tested demographic and user experience factors.

The t-tests reported in **Sections 5.5.8.1 and 5.5.8.2** have identified designer/nondesigner differences respectively in their perceived product values including "perceived innovative value" and "perceived hedonic value", and their

personal characteristics including “individual innovativeness” and “openness to experience”. The causal relations of the innate personal characteristics of “individual innovativeness” and “openness to experience” influencing the perceived “innovative value” and “hedonic value” have been checked and supported by the multiple linear regression tests reported in **Section 5.5.7.3 (Table 19)**. Three of these four variables with identified designer/nondesigner differences found their roles again in the significant moderations reported in **Section 5.5.10.1**, which were “individual innovativeness”, “openness to experience”, and “perceived hedonic value”, with “perceived innovative value” missing out.

As perceived innovative value is an interpretation by an individual about the product’s novelty related benefits, whereas the “individual innovativeness” and personality trait of “openness to experience” are the individual’s internal characteristics associated with novelty seeking tendencies (their definitions in **Section 3.4**), it is reasonable to project the designers’/nondesigners’ innate differences in “individual innovativeness” and “openness to experience” personality trait as contributing factors for the designers’/nondesigners’ perceived difference in “innovative value”.

Regarding the influence of designers’/nondesigners’ innate differences in “individual innovativeness” and “openness to experience” on their perceived difference in “hedonic value”, the causal effect may be direct and / or indirect. On the one hand, individuals with high level of “innovativeness” and “openness to experience” would enjoy experiencing and be open to wide range of experiences including hedonic (emotional and sensory) experiences. On the other hand, as the four perceived product values are found to be inter-related as reported in **Section of 5.5.9** and discussed above, “individual innovativeness” and “openness to experience” may influence “perceived hedonic value” indirectly through “perceived innovative value”.

Considering the above test results and analyses in tandem, the underlying contributory relations are mapped out as:

(1) The designers'/nondesigners' innate characteristic difference in "individual innovativeness" possibly contributes to the designers'/nondesigners' perceived differences in the "innovative value" and "hedonic value" for a product. The innate characteristic difference in "individual innovativeness" may further contribute to the designers'/nondesigners' difference in the causal relation between "perceived hedonic value" and "perceived satisfaction" through its moderator role.

(2) The designers'/nondesigners' innate personality trait difference in "openness to experience" possibly contributes to the designers'/nondesigners' perceived differences in the "innovative value" and "hedonic value" for a product. The innate personality trait difference in "openness to experience" may further contribute to the designers'/nondesigners' difference in the causal relation between "perceived hedonic value" and "intention of continuous use" through its moderator role.

Such moderator roles on the causal relations influencing satisfaction and behavioural intention may in turn contribute to the potential designer/user gaps concerning the adoption and utilisation of new products / features / technologies.

Difference in abstraction and tangibility levels contributing to designer/user communication gap

In the Part One Mental Modelling, the nondesigners tended to bring up more tangible, somehow more instrumental or extrinsic ideas, while the designers brought up certain more abstract, intangible and somehow more intrinsic concepts, such as controllability (掌控感) and safe of mind (安全感) anticipated from the smartphone (**Section 5.1.3**). In the Part Two Survey, the nondesigner group (Controllability: *M* = 4.12, *SD* = .831; Safe of mind: *M* = 4.29, *SD* = .836) gave comparably high weightings like the designers (Controllability: *M* = 4.17, *SD* = .854; Safe of mind: *M* = 4.37, *SD* = .795) to the two related design options for the new smartphone (on 5-point likert scale) (**Appendix 14**). Such phenomenon might imply that the nondesigners also believed that controllability and safe of mind were important, but the concepts were too abstract or

intangible for them to think up or literally express. The observed gap in abstract thinking and expression of relatively intangible ideas between designers and nondesigners can be among the contributing factors for the designer/user communication gap commonly identified in prior studies, which may in turn hinder the effectiveness of product interaction as well as participatory design programmes in which the nondesigners are supposed to be the key players. The issue deserves designers' and businesses' attention to convey product messages to the users (mostly nondesigner audience) in more concrete and tangible languages understandable by the audience. It also calls for further investigation to come up with applicable resolutions to empower the nondesigner participants in conceptualising and expressing somehow abstract or intangible thoughts during participatory design activities, which might involve programme design, training, priming / conditioning, or other approaches.

Need projection discrepancy and the potential contributing factor of excessive designer self-efficacy

Scenario typed questions were applied in the survey, which aimed at inducing the change of role between "user" and "designer". The resulted role change was evidenced in the group norm demonstrated by the respondents in the designer role over-projecting their target users' needs when compared with the needs they had perceived for themselves in the user role (**Section 5.5.8.3**), as well as when compared with the target users' self-perceived needs (**Section 5.5.8.4**). Possibilities are two-folded. The phenomena, in the survey scenario or in real life, may imply either a tendency for the designers' to over-project users' needs, or the users' not realising their own needs especially if the concerned needs are of less tangible nature.

If it was the designers' over-projection, why the nondesigner-designers[4] and designer-designers did it alike? In fact, the nondesigner-designers over-

Footnote [4] :

Designer-designer (DD): A real-world designer (self-reported) who played a designer role in response to particular question(s) / task(s) in the research

Designer-user (DU): A real-world designer (self-reported) who played a user role in response to particular question(s) / task(s) in the research

Nondesigner-designer (NDD): A real-world nondesigner (self-reported) who played a designer role in response to particular question(s) / task(s) in the research

Nondesigner-user (NDU): A real-world nondesigner (self-reported) who played a user role in response to particular question(s) / task(s) in the research

projected in more items than the designer-designers in the survey, perhaps because the designer-designers who were also real-life designers had been trained to avoid such mis-projection despite they did not succeed in avoiding it completely. As discussed in **Section 5.5.8.5**, one possible cause for the over-projection of user needs could be the professional self-efficacy of designers at work, which leads the professionals (not only designers) to position themselves above the "average people" who are in need of their professional services for improving their well-being (Siu, 2003; Nielson, 2001, 2008; Wang et al., 2017).

The over-projection also showed clear patterns, and not just "casual guesses". The respondents had really thought over the scenario questions and designed for their designated target user group applying their prescribed mental models. The resulted patterns of over-projection coincided very well with the commonly shared gender stereotypes, such as seeing utilitarian and innovative values more important for male users, and hedonic values more important for female users. So it was possible that the scenario question had triggered the designer self-efficacy and user stereotyping at the same time among the respondents playing the role of designer. Hence the designer self-efficacy, or its excess, is a possible contributing factor for the discrepancies in need perception between the role-taking as well as real-life designers and users. This factor's potential impact deserves more attention than it currently receives, since such mis-alignment in the designer/user need perception could be a critical cause for a "well-designed" product being not so well-accepted by the users.

The identification of the above differences / gaps and potential underpinning factors contributing to the gaps would provide a base for future studies by researchers and an overview for the industry's understanding and consideration for further plans and actions. **Table 32** below provides an overview of the differences / gaps identified between designers and nondesigners, the underlying factors contributing to the differences, and the suggested implications / recommendations. Recommendations for the industry would also be further discussed in **Section 6.2**.

Table 32: Overview of differences / gaps identified between designers and nondesigners, underlying factors contributing to the differences, and suggested implications / recommendations

Gap area	Sections (with related data / analyses / discussions)	Identified designer/nondesigner differences	Projected contributing factors	Implications / recommendations for the industry
Differences in value focuses – Individual innate characteristic and personality trait differences contributing to designers'/ nondesigners' value perception gaps	2.7 & 2.8 5.1.3 5.5.8.1 5.5.8.2 Appendix 14 5.5.7.3 5.5.10.1 6.1.2 6.2	Designers placing more emphasis on the innovative and / or hedonic aspects of products e.g. smartphones. Value perception differences – such as designers perceiving higher innovative and hedonic values.	The designers'/nondesigners' innate characteristic difference in "individual innovativeness" and personality trait difference in "openness to experience" possibly contributes (as antecedental factors) to the designers'/nondesigners' perceived differences in the "innovative value" and "hedonic value" for a product.	The innate characteristics and personality traits of individuals are relatively hard to change, despite they are believed to be adjustable to varied extents through learning and experience (Varnali, 2013; Baker, 2004). While the adjustments (if desirable) would take considerable time, persistent efforts and profound engagement, designers and businesses should in the meantime be alert of the gaps and underlying factors, in order to make necessary accommodation and adaptation in strategies. The product designers and producers should be alert that the nondesigner general users may not cherish a product's innovative and hedonic features / values as much as the designers do, and should hence strike a good balance or provide appropriate options when designing / launching new products / features in order to cater for users with varied perceptions / needs.
	5.5.8.1 5.5.10.1 6.1.2 6.2	Designers'/nondesigners' difference in the causal relation between "perceived hedonic value" and "perceived satisfaction"	The designers'/nondesigners' innate characteristic difference in "individual innovativeness" may contribute to variations in the causal relation between "perceived hedonic value" and "perceived satisfaction" through its moderator role.	
	5.5.8.2 5.5.10.1 6.1.2 6.2	designers'/nondesigners' difference in the causal relation between "perceived hedonic value" and "intention of continuous use"	The designers'/nondesigners' innate personality trait difference in "openness to experience" may contribute to variations in the causal relation between "perceived hedonic value" and "intention of continuous use" through its moderator role.	
Difference in abstraction and tangibility levels contributing to designer/user communication gap	2.2 5.1.3 Appendix 14 6.1.2 6.2	The designer/user communication gap has been identified in prior studies (Norman, 1988, 2013; Crilly et al., 2008; Krippendorff, 1989, 2006), which may in turn hinder the effectiveness of product interaction	The nondesigners / general users were observed to be less capable in conceptualising and expressing abstract or less tangible ideas. The observed difference in abstract thinking and expression between designers and	Designers and businesses should convey product messages to the users (mostly nondesigner audience) in more concrete and tangible languages understandable by the audience. It calls for further investigation to come up with

Gap area	Sections (with related data / analyses / discussions)	Identified designer/nondesigner differences	Projected contributing factors	Implications / recommendations for the industry
		as well as participatory design programmes.	nondesigners can be among the contributing factors for the designer/user communication gap.	applicable resolutions to empower the nondesigner participants in conceptualising and expressing abstract or intangible thoughts during participatory design activities, which might involve programme design, training, priming / conditioning, or other approaches.
Need projection discrepancy and the potential contributing factor of excessive designer self-efficacy	2.9 5.5.8.3 5.5.8.4 5.5.8.5 6.1.2 6.2	The survey analyses revealed over-estimation of need-levels for specific products / features projected by the role-taking designers when compared to users' own perceived need-levels. The resulted patterns of over-projection also coincided with the commonly shared gender stereotypes, such as seeing utilitarian and innovative values more important for male users, and hedonic values more important for female users.	One possible contributing factor for the over-projection of user needs could be the professional self-efficacy of designers at work, which leads the professionals (including designers) to position themselves above the "average people" who are in need of their professional services for improving their well-being (Siu, 2003; Nielson, 2001, 2008; Wang et al., 2017). The projected imbalance of designer and user self-efficacies (mostly with excessive designer self-efficacy) and user stereotyping are suggested to be among the underpinning factors for the observed need projection discrepancy.	Being alert of the need projection gap and potential self-efficacy imbalance, the businesses / designers / marketers should: Project user needs based on actual data, instead of merely from the experience and "insight" of the designers and / or marketers. Empower instead of intimidating the users to unleash their potential contribution while boosting their self-efficacy, e.g. by communicating the intangibles in more tangible ways and / or tailoring communication in language of the user group's domain. Plan for long-term engagement e.g. user-designer communities and user education programmes, and short-term priming activities within participatory design programmes, to promote user and designer interaction and co-creation, help balance designer and user self-efficacies, hence nourishing users' communication / creative capacities and willingness to express thoughts / ideas, receive product messages, and try new products.

6.1.3 Development and testing of exploratory empirical research methods

The study has investigated and tested exploratory empirical research approaches in its Part One Mental Modelling and Part Two Survey processes.

Firstly, the mental modelling technique has been developed to allow the inductive research to be conducted online with semi-structured framework of laddered abstraction facilitating participants' thoughts and expressions as well as onward comparison and analysis. The technique has integrated the essences of mindmapping, card sorting and path finding in the elicitation of participants' perceptions on smartphone use experience which would be difficult to identify through conventional interviewing methods. The mental modelling process with the laddered framework has enabled the participants to reflect more deeply their perceptions on goals and values, not just use patterns, forming a comprehensive visual-textual representation of their models in mind.

Secondly, scenario questions were designed into the survey questionnaire to trigger the role-taking responses of respondents first as users and later as designers, so that apart from comparing the perceptions of designer-users against nondesigner-users, other cross-comparisons across roles could be made including: perceptions of designer-designers against nondesigner-designers; perceptions of the same respondent as a user against as a designer; and perceptions of role-taking users against role-taking designers. The cross-comparisons have widened the perspectives in discovering the designer/user differences and underpinning factors contributing to the differences. Role-playing approach and scenario questions have been applied by researchers in qualitative (Stanton et al.,1956; Brown et al., 2014) and quantitative studies (Atzmüller & Steiner, 2010; Utomo et al., 2020) respectively for eliciting situational responses and were found especially useful when the topics concerned respondents' beliefs, attitudes or judgements. The current study has made reference to examples in the previous literature. As discussed in **Section 6.1.2**, the scenario questions appeared to have successfully triggered the role change which was evidenced in the group norm demonstrated by the respondents in the designer role over-projecting their target users' needs.

Table 33: Final hypotheses tested (with indication of supported hypotheses)

Hypotheses tested			
H1:	**A product with high perceived values leads to a higher perceived satisfaction for users.**		
	H1a:	A product with high perceived utilitarian value leads to a higher perceived satisfaction for users.	Supported
	H1b:	A product with high perceived hedonic value leads to a higher perceived satisfaction for users.	Supported
	H1c:	A product with high perceived social value leads to a higher perceived satisfaction for users.	Supported
	H1d:	A product with high perceived innovative value leads to a higher perceived satisfaction for users.	Supported
H2:	**A product with high perceived satisfaction leads to a higher intention of continuous use for the product.**		Supported
H3:	**A product with high perceived values leads to a higher intention of continuous use for the product.**		
	H3a:	A product with high perceived utilitarian value leads to a higher intention of continuous use for the product.	Supported
	H3b:	A product with high perceived hedonic value leads to a higher intention of continuous use for the product.	Supported
	H3c:	A product with high perceived social value leads to a higher intention of continuous use for the product.	-----
	H3d:	A product with high perceived innovative value leads to a higher intention of continuous use for the product.	Supported
H4:	**There are differences in the perception of designers and nondesigners towards the product values, user satisfaction, and intention of use / continuous use for the product.**		
	H4a:	There are differences in the perception of designers and nondesigners towards the perceived utilitarian value of a product.	-----
	H4b:	There are differences in the perception of designers and nondesigners towards the perceived hedonic value of a product.	Marginally supported
	H4c:	There are differences in the perception of designers and nondesigners towards the perceived social value of a product.	-----
	H4d:	There are differences in the perception of designers and nondesigners towards the perceived innovative value of a product.	Supported
	H4e:	There are differences in the perception of designers and nondesigners towards the perceived satisfaction from a product.	-----

	H4f:	There are differences in the perception of designers and nondesigners towards the intention of use / continuous use for a product.	-----
H5:	**There are differences in the individual characteristics between designers and nondesigners, including individual innovativeness and personality traits.**		
	H5a:	There are differences in the level of individual innovativeness between designers and nondesigners.	Marginally supported
	H5b:	There are differences in the personality trait of openness to experience between designers and nondesigners.	Supported
	H5c:	There are differences in the personality trait of neuroticism between designers and nondesigners.	-----
	H5d:	There are differences in the personality trait of extraversion between designers and nondesigners.	-----
	H5e:	There are differences in the personality trait of agreeableness between designers and nondesigners.	-----
	H5f:	There are differences in the personality trait of conscientiousness between designers and nondesigners.	-----
H6:	**There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the utilitarian, hedonic, social, innovative, and overall values of a new smartphone.**		
	H6a:	There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the utilitarian value of a new smartphone.	Supported in groups of: 26-40 F NDD for 18-25 M* 18-25 F NDD for 26-40 M
	H6b:	There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the hedonic value of a new smartphone.	Supported in groups of: 26-40 F NDD for 18-25 M 26-40 M DD for 18-25 F 26-40 M NDD for 18-25 F 18-25 M NDD for 26-40 F
	H6c:	There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the social value of a new smartphone.	Supported in groups of: 26-40 F DD for 18-25 M 26-40 F NDD for 18-25 M 26-40 M DD for 18-25 F 26-40 M NDD for 18-25 F 18-25 F DD for 26-40 M 18-25 M NDD for 26-40 F
	H6d:	There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the innovative value of a new smartphone.	Supported in groups of: 26-40 F DD for 18-25 M 26-40 F NDD for 18-25 M 18-25 F DD for 26-40 M 18-25 F NDD for 26-40 M
	H6e:	There are differences in the perception of an individual when taking a user role and a designer role (designing for a specific target user group) towards the importance in enhancing the overall value of a new smartphone.	-----

* Note: "26-40 F NDD for 18-25 M" denotes "Age 26-40 female nondesigner-designers designing for age 18-25 males"

H7:	**There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the utilitarian, hedonic, social, innovative, and overall values of a new smartphone.**	
H7a:	There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the utilitarian value of a new smartphone.	Supported in groups of: 26-40 F for 18-25 M [#] 18-25 F for 26-40 M
H7b:	There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the hedonic value of a new smartphone.	Supported in groups of: 26-40 M for 18-25 F 18-25 M for 26-40 F
H7c:	There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the social value of a new smartphone.	Supported in groups of: 26-40 F for 18-25 M 26-40 M for 18-25 F 18-25 F for 26-40 M 18-25 M for 26-40 F
H7d:	There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the innovative value of a new smartphone.	Supported in groups of: 26-40 F for 18-25 M 18-25 F for 26-40 M
H7e:	There are differences between the target user's own perceived importance in a user role and the importance projected by another individual for the target user in a designer role, towards enhancing the overall value of a new smartphone.	Supported in groups of: 26-40 M for 18-25 F 18-25 F for 26-40 M

[#] Note: "26-40 F for 18-25 M" denotes "Age 26-40 females designing for age 18-25 males"

H8:	**The perceived intrinsic values (hedonic and social values) mediate the relations between the perceived extrinsic values (utilitarian and innovative values) and perceived satisfaction.**	
H8a:	Perceived hedonic value mediates the relation between perceived utilitarian value and perceived satisfaction.	Supported
H8b:	Perceived social value mediates the relation between perceived utilitarian value and perceived satisfaction.	Supported
H8c:	Perceived hedonic value mediates the relation between perceived innovative value and perceived satisfaction.	Supported
H8d:	Perceived social value mediates the relation between perceived innovative value and perceived satisfaction.	Supported

H9:	**The perceived intrinsic values (hedonic and social values) mediate the relations between the perceived extrinsic values (utilitarian and innovative values) and intention of continuous use.**	
H9a:	Perceived hedonic value mediates the relation between perceived utilitarian value and intention of continuous use.	Supported

	H9b:	Perceived social value mediates the relation between perceived utilitarian value and intention of continuous use.	Supported
	H9c:	Perceived hedonic value mediates the relation between perceived innovative value and intention of continuous use.	Supported
	H9d:	Perceived social value mediates the relation between perceived innovative value and intention of continuous use.	-----
H10:	**The perceived satisfaction mediates the relations between the perceived values and intention of continuous use.**		
	H10a:	Perceived satisfaction mediates the relation between perceived utilitarian value and intention of continuous use.	Supported
	H10b:	Perceived satisfaction mediates the relation between perceived hedonic value and intention of continuous use.	Supported
	H10c:	Perceived satisfaction mediates the relation between perceived social value and intention of continuous use.	Supported
	H10d:	Perceived satisfaction mediates the relation between perceived innovative value and intention of continuous use.	Supported
H11:	**The individual characteristics moderate the causal relations between the perceived values and perceived satisfaction.**		
	H11a:	The individual designation of being a designer or not moderates the causal relations between the perceived values and perceived satisfaction.	Supported for PHV → SAT
	H11b:	The individual innovativeness moderates the causal relations between the perceived values and perceived satisfaction.	Supported for PUV → SAT PHV → SAT
	H11c:	The individual personality trait of openness to experience moderates the causal relations between the perceived values and perceived satisfaction.	-----
	H11d:	The individual personality trait of neuroticism moderates the causal relations between the perceived values and perceived satisfaction.	Supported for PUV → SAT
	H11e:	The individual personality trait of extraversion moderates the causal relations between the perceived values and perceived satisfaction.	Supported for PHV → SAT
	H11f:	The individual personality trait of agreeableness moderates the causal relations between the perceived values and perceived satisfaction.	-----
	H11g:	The individual personality trait of conscientiousness moderates the causal relations between the perceived values and perceived satisfaction.	-----
H12:	**The individual characteristics moderate the causal relations between the perceived values and intention of continuous use.**		

H12a:	The individual designation of being a designer or not moderates the causal relations between the perceived values and intention of continuous use.	-----
H12b:	The individual innovativeness moderates the causal relations between the perceived values and intention of continuous use.	-----
H12c:	The individual personality trait of openness to experience moderates the causal relations between the perceived values and intention of continuous use.	Supported for PHV → ICU
H12d:	The individual personality trait of neuroticism moderates the causal relations between the perceived values and intention of continuous use.	-----
H12e:	The individual personality trait of extraversion moderates the causal relations between the perceived values and intention of continuous use.	-----
H12f:	The individual personality trait of agreeableness moderates the causal relations between the perceived values and intention of continuous use.	-----
H12g:	The individual personality trait of conscientiousness moderates the causal relations between the perceived values and intention of continuous use.	-----

H13:	**The individual characteristics moderate the causal relations between the perceived satisfaction and intention of continuous use.**	
H13a:	The individual designation of being a designer or not moderates the causal relations between the perceived satisfaction and intention of continuous use.	-----
H13b:	The individual innovativeness moderates the causal relations between the perceived satisfaction and intention of continuous use.	-----
H13c:	The individual personality trait of openness to experience moderates the causal relations between the perceived satisfaction and intention of continuous use.	-----
H13d:	The individual personality trait of neuroticism moderates the causal relations between the perceived satisfaction and intention of continuous use.	-----
H13e:	The individual personality trait of extraversion moderates the causal relations between the perceived satisfaction and intention of continuous use.	-----
H13f:	The individual personality trait of agreeableness moderates the causal relations between the perceived satisfaction and intention of continuous use.	-----
H13g:	The individual personality trait of conscientiousness moderates the causal relations between the perceived satisfaction and intention of continuous use.	-----

H14:	**The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived values of a product.**

H14a:	The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived utilitarian value of a product.	Supported for Inn,Op,Ag,Co → PUV(C) Inn,Op,Ex,Ag,Co → PUV(N)
H14b:	The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived hedonic value of a product.	Supported for Op,Ag → PHV(C) Inn,Op,Ag → PHV(N)
H14c:	The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived social value of a product.	Supported for Inn,Op,Ex,Ag,Co → PSV(C) Inn,Op,Ex,Ag → PSV(N)
H15d:	The individual characteristics (including individual innovativeness and personality traits) influence the individual's perceived innovative value of a product.	Supported for Inn,Op,Ex,Co → PIV(C) Inn,Op,Ne,Ag → PIV(N)

Note:

PUV = Perceived Utilitarian Value; PHV = Perceived Hedonic Value; PSV = Perceived Social Value;

PIV = Perceived Innovative Value; SAT = Perceived Satisfaction; ICU = Intention of Continuous Use;

Op = Openness; Ne = Neuroticism; Ex: Extraversion; Ag = Agreeableness; Co = Conscientiousness;

Inn = Individual Innovativeness;

(C) = for smartphone currently used by respondent;

(N) = for new smartphone with respondent's preferred enhancements

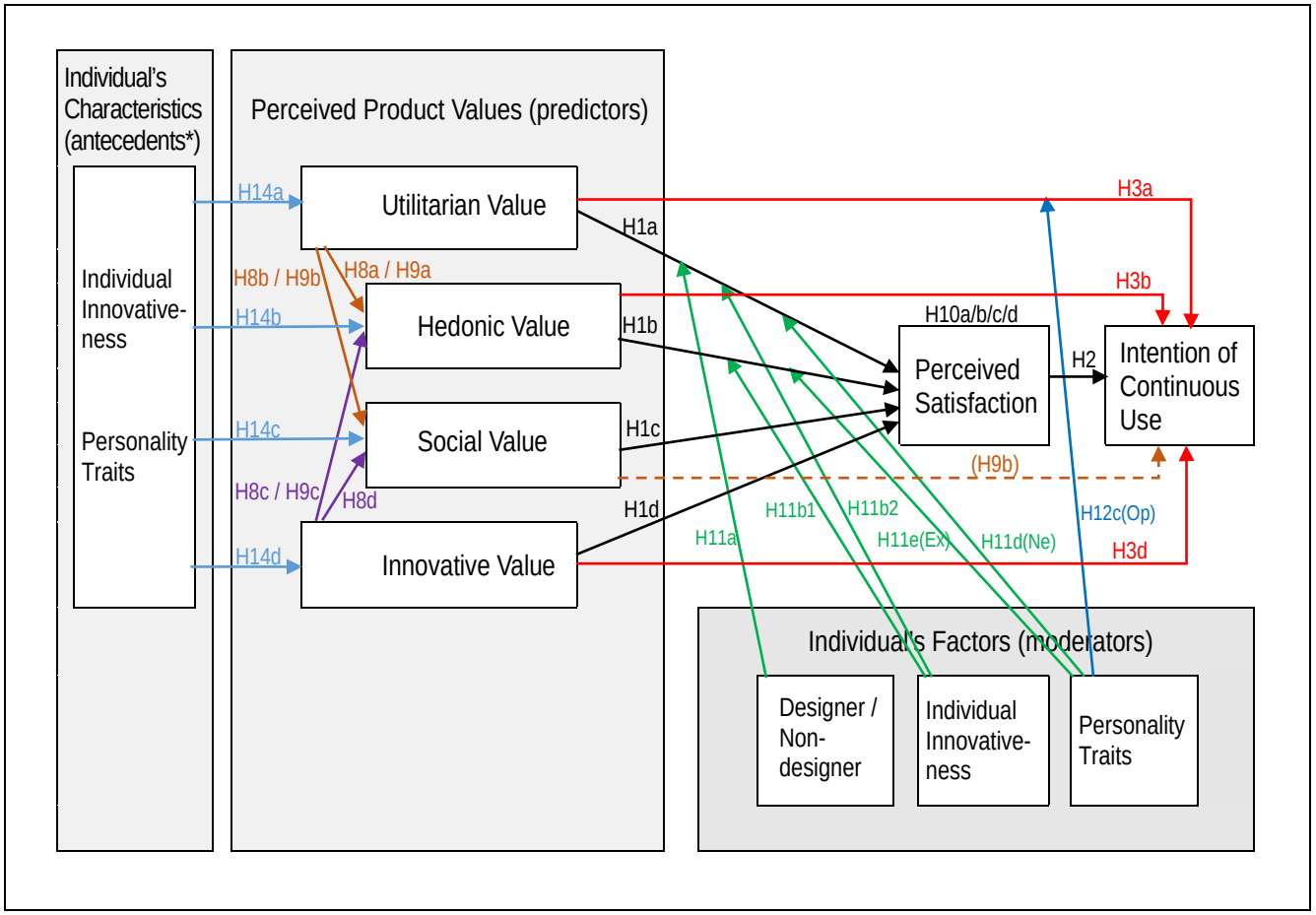


Figure 35: Final conceptual framework illustrating the user experience, with impact of the inter-related perceived values on users' satisfaction and continuous adoption of the product, and the antecedental and moderating effects of individual's factors

Notes:

1. Only causal relations with statistical significance from results of the full-scale survey are shown.
2. * Only antecedents relating to individual's characteristics with potential contribution to the designer/nondesigner differences in value perception are included for testing here. Other non-human antecedental factors influencing value perception, such as product attributes, are not the focus of interest of the current study and hence not covered in the study. For future product-focused research, more comprehensive investigation of different potential factors influencing product value perception should be conducted.
3. Keys

   PUV = Perceived Utilitarian Value; PHV = Perceived Hedonic Value; PSV = Perceived Social Value;
   PIV = Perceived Innovative Value; SAT = Perceived Satisfaction; ICU = Intention of Continuous Use;
   Op = Openness; Ne = Neuroticism; Ex: Extraversion; Ag = Agreeableness; Co = Conscientiousness;
   Inn = Individual Innovativeness;
   (C) = for smartphone currently used by respondent;
   (N) = for new smartphone with respondent's preferred enhancements
4. Supported causal relations for H14

H14a is supported for:	Inn,Op,Ag,Co → PUV(C)	Inn,Op,Ex,Ag,Co → PUV(N)
H14b is supported for:	Op,Ag → PHV(C)	Inn,Op,Ag → PHV(N)
H14c is supported for:	Inn,Op,Ex,Ag,Co → PSV(C)	Inn,Op,Ex,Ag → PSV(N)
H14d is supported for:	Inn,Op,Ex,Co → PIV(C)	Inn,Op,Ne,Ag → PIV(N)

6.2 Conclusions, implications and recommendations

As introduced in **Chapter 4 Research Methodology**, the current research has integrated the paradigms of interpretivism (inductive approach) and positivism (deductive approach) at different stages. The research flows from "inductive" in the first part to "deductive" in the second part, which coincides with the "exploratory sequential design" defined by Creswell (2013). While the first inductive part (mental modelling) collects and analyses the participants' thoughts in a relatively explorative manner, the findings were fed into the second deductive part (survey) for further investigation and verification.

Through the research implementation, the methodological design flowing from 'inductive" to "deductive" has been tested and found appropriate for the topic under investigation. As the study starts out to investigate a not-so-much researched aspect of human perception, i.e. designers' and users' perception gap in product values and experience, an inductive approach is needed in eliciting respondents' thoughts and insights. Instead of collecting separate fragments of thoughts, the study elicits designers' and users' (nondesigners') perceptions in form of mental models which are holistic representations linking up respondents' goals and values with the product affordances and attributes (Mental Model A). The study uses a "direct" elicitation technique with the respondents constructing their own model via an online mindmapping platform. Such direct elicitation is preferred over indirect elicitation techniques, such as interviewing and then mapping of elicited information by the researcher, which may possibly induce researcher / interpretation biases (LaMere et al., 2020). The laddered mental modelling framework designed for the purpose enables users to reflect more deeply their perceptions on goals and values, on top of just use patterns, forming a comprehensive visual-textual representation of their models in mind, which would be difficult to attain through conventional interviewing methods. The framework has also provided a relevant structure for onward analysis and comparison between designers' and users' mental models.

Most social researches (and those commercial researches seeking consumer insights) are recognised to have involved both inductive and deductive

reasoning at different stages with methodologies applied in a complementary way (Trochim, 2006). In the current study, the research is designed to have findings from the Part One Mental Modelling fed into the Part Two survey for further verification. In reality, apart from a simple transfer of information from Part One to Part Two, findings from the Mental Modelling analysis have inspired further exploration and analytical perspectives, including the role-based scenario questions, inter-relations across the product values and potential antecedental and moderating effects from individuals' factors of personality traits. With further literature support, these perspectives have been included, developed and tested in the subsequent pilot test and final full-scale survey, with meaningful results attained (as discussed in Chapter 5 and Section 6.1).

Concluding summary

The research's aims of understanding the perception of product values and user experience, and investigating the possible differences between designers' and users' perceptions, have been fulfilled through the Part One Mental Modelling and Part Two Survey.

As mental models are believed to "provide predictive and explanatory power for understanding the interaction" of users with products (Norman, 1983), the mental models of designers and users on product use expereince, perceptions and anticipations have been elicited and compared to investigate the potential dsigner-user gaps, which might account for why users fail to interact with a product the same way as a designer expects, or the other way round, why the designer fails to predict how the users interact with the product. In the business sense, such understanding may enable the designers and producers to grasp why many "well-designed" products do not perform as well in the market, and how the situation could be turned around.

In eliciting the mental models of designers and users for comparison, product exemplars such as the smart communication products (e.g. smartphone) have been referred to in the mental modelling activities and surveys. The elicitation and analysis of the mental models from designers and nondesigners in Part

One of the research have helped to substantialise the focuses and contexts for subsequent research in Part Two.

An enhanced and updated conceptual framework has been proposed to adequtely reflect the values involved in the user experience with contemporary products and to facilitate the systemic comparison between the designers' and users' perceptions. The current study has outlined and tested a conceptual framework enhancing and updating the conventional "perceived values – satisfaction – behavioural intention" model(s) integrating relevant attributes and interactions in aspects including: adding the perceived innovative value to the perceived utilitarian, hedonic and social values of the TAM and UTAUT model series to address the innovative nature of today's fast-advancing products; recognising the inter-value relations with intrinsic values mediating the impact of the extrinsic values on perceived satisfaction and intention of continuous use in a product context; and proposing individual's characteristics as potential antecedents / moderators embracing the factors of designer / nondesigner, individual's innovativeness and personality traits, beyond the commonly tested factors of demographics and user expertise.

The study has investigated and tested exploratory empirical research methods in its Part One Mental Modelling and Part Two Survey processes. On the one hand, the mental modelling technique has been developed to allow the inductive research to be conducted online with semi-structured framework of laddered abstraction facilitating participants' thoughts and expressions as well as onward comparison and analysis. On the other hand, a critical development of the research was the progress from comparing the differences between designers and nondesigners only by their real-world (self-reported) status to comparing the perceptions of role-taking designers and users. Scenario typed questions were designed and applied in the survey, which have successfully induced the switch of role between user and designer, possibly with the change in efficacy beliefs in the process. The role change was evidenced in the group norm demonstrated by the respondents in the designer role over-projecting their target users' needs above the needs they had perceived for themselves in the user role, as well as the stereotyping of gender needs the role-taking designers

imposed on their designated male or female user groups. The role-play revealed that the underpinning factor(s) for certain aspects of the designer/user gaps may have rooted to some extent from the varied levels of self-efficacy between the "professionals / experts" (including the designers) and the "average people / layman" (Siu, 2003; Nielson, 2001, 2008; Wang et al., 2017), as self-efficacy is believed to affect not only an individual's self-perception but also moderate the individual's relative perception of others (Harris et al., 2008).

From the literature search, the existence of designer/user gaps has been suggested / evidenced in prior studies such as those reviewed in Chapter 2 of this thesis (Norman, 1988, 2013; Chamorro-Koc & Popovic, 2008; Cata & Martz, 2015; Khalaj & Pedgley, 2019). However, apart from the generally presumed problems such as communication (Crilly et al., 2008; Krippendorff, 1989, 2006), knowledge and / or experience discrepancy (Chamorro-Koc & Popovic, 2008; Cata & Martz, 2015), and inadequate user research (Norman, 1988, 2013), there appeared a scarcity of studies on reasons / factors underlying the designer/user gaps. Triangulating across the Mental Modelling (Part One) and Survey (Part Two) findings of the current research, differences / gaps between designers and users, and their underpinning factors, have been identified. As summarised in Section 6.1.2, the innate individual characteristic and personality trait differences (such as designers with higher innovativeness and openness to experience) may contribute to value perception differences (such as designers perceiving higher innovative and hedonic values); the difference in abstraction and tangibility levels may contribute to the designer/user communication gap; and the potential imbalance of designer and user self-efficacies may contribute to the need projection discrepancy.

The identification of the designer/user differences / gaps and potential underpinning factors contributing to the gaps would add to the existing understanding providing a base for future research and an overview for the industry's reference and consideration for further plans and actions. Implications and recommendations for the academic and industry would be further discussed below.

Implications and recommendations for the academia and industry

Having proved the projected conceptual model updates and exploratory research approaches, and identified the designer/user differences / gaps with possible underpinning factors, the study would contribute to the academia and industry in the following aspects.

Academically, the study has added to the existing knowledge through:

- Enhancing and updating of the conceptual framework for the “perceived values – satisfaction – behavioural intention” model
- Empirical exploration with the mental modelling technique developing the semi-structured framework of laddered abstraction
- Empirical exploration with scenario questions for inducing the user and designer role-taking in the survey
- Identification of differences and gaps between designers’ and users’ mental models of product values and perception, and need projection
- Suggesting potential contributive factors (such as the innate character differences in individual innovativeness and personality traits, abstraction and tangibility levels, and self-efficacy) underpinning the observable / perceived gaps

The study has added to the academic knowledge through enhancing, testing and updating of the conceptual framework for the conventional “perceived values – satisfaction – behavioural intention” model(s) integrating relevant attributes and interactions including: adding the perceived innovative value to the perceived utilitarian, hedonic and social values for today’s fast-advancing products; recognising the inter-value relations between intrinsic and extrinsic values in a product context; and testing individual’s characteristics as antecedents / moderators in terms of designer / nondesigner, individual’s innovativeness and personality traits, beyond the commonly tested demographic and user experience factors.

Exploratory empirical research methods have been developed and tested (may also refer to **Section 6.1.3**). The mental modelling technique was developed

enabling the inductive research to be conducted online (or onsite) with semi-structured framework of laddered abstraction which has facilitated participants' thoughts and expressions as well as onward comparison and analysis. Building on the application of scenario questions in previous literature, scenario-type questions were designed for inducing the user and designer role-taking in the survey to allow a series of cross-comparisons across roles. The explorations may also inspire the researchers or tool developers to design better research and / or product development tools which may ultimately enhance user experience.

The identification of designer/user differences / gaps in their mental models of product value focuses and perception, and need projection, has further contributed to the current understanding. The suggestion of corresponding underpinning factors in the innate characteristics of personality and innovativeness, abstraction and tangibility levels, and designer / user self-efficacy, provides inspiration, opportunities and directions for further focused research. All the identified gaps with their potential contributing factors deserve onward investigation and study.

On the other hand, the findings of the study provide indications and recommendations for designers and businesses on:

- Understanding of the inter-relations illustrated and tested in the updated conceptual model between the perceived product values, user satisfaction, and behavioural intention
- Practical methods and tools for understanding users' perceptions through the elicitation of mental models regarding the goals, values, affordances, uses and anticipation for products / services
- Understanding of identified differences / gaps between designers' and users' product value focuses and perception, and need projection
- Awareness of underpinning factors in the inherent, somehow difficult-to-change, innate characteristics of personality and innovativeness, abstraction and tangibility levels, and designer / user self-efficacy, so as to design and communicate with these differences in mind

- Suggestion of long-term strategies in addressing critical gaps and their contributive factors (including the self-efficacy difference) to minimise their potential hindrance on designer-product-user interaction, product adoption, and user experience

The research findings provide an overview for the designers and businesses to understand the intrigue relations illustrated and tested in the enhanced and updated conceptual model between the users' perceived product values, satisfaction, and behavioural intention. For instance, the businesses should be aware of: the inter-relations between the perceived extrinsic values (utilitarian and innovative values) and intrinsic values (hedonic and social values), especially the close interplay of the utilitarian and hedonic values; the values' relative importance perceived by the users; the values' impact on user satisfaction / (continuous) use intention; the potential value shift over time; and the potential moderating effects of the user characteristics on satisfaction / (continuous) use intention. All these should be taken into account in the strategic planning for product R&D and marketing. While businesses planning for smart communication products / services may make reference to findings from the current study, businesses in other product areas may make reference to the study's research frameworks and methodologies when conducting their own research.

The mental modelling technique was developed and tested to allow the elicitation of participants' (supposedly users in business application) mental models on product perception and use experience through online or onsite research with semi-structured frameworks of laddered abstraction. The technique enables users to reflect more deeply their perceptions on goals and values, not just use patterns, forming a comprehensive visual-textual representation of their models in mind, which would be difficult to attain through conventional interviewing methods. The framework, aiming to facilitate users' thoughts and expressions as well as the organisation's onward comparison and analysis, could be adjusted to fit the business' research purpose and product / service categories.

The designers and businesses should understand the identified differences / gaps between designers' and users' value focuses and perception, and need projection, from the users' perspectives, and be alert of the corresponding underpinning factors of innate character difference in personality and innovativeness, abstraction and tangibility levels, and self-efficacy. The findings from this study indicate that users are in general less sensitive than designers in perceiving hedonic and innovative values. Such gaps might be due to differences in personality, such as the users' lower score than the designers in the personality trait of "openness to experience", and possibly other trait differences not yet verified in the current study. Other note-worthy factors include: the general users being less capable in conceptualising and expressing abstract or less tangible ideas, which may contribute to the recognised designer/user communication gap; and the projected designer/user self-efficacy difference, which may contribute to the observed need projection discrepancy.

It would be difficult, if not impossible, to bridge the identified gaps (in value perception, communication, and need projection) without addressing the contributing factors (of individual innovativeness and personality traits, abstraction and tangibility levels, and self-efficacy). These underlying contributive factors are relatively innate characteristics of an individual and could be rooted partly from born instinct although also believed to be adjustable to varied extents through learning and experience (Baker, 2004; Bandura, 1977a). While the desirable adjustments would take considerable time, persistent efforts and profound engagement, designers and businesses should in the meantime be alert of the factors underlying the gaps and make necessary accommodation and adaptation in order to minimise their potential hindrance on the designer-product-user interaction, product adoption, and ultimate user experience. For instance, designers and producers should be aware of the expert vs average people dilemma in relation to the self-efficacy inducement and stereotyping activation processes to make good use of them instead of being hindered by them. The self-efficacy inducement may be applied for levitating the thinking and expressing capacity of the participants in participatory design programmes, in order to address the difficulty of nondesigners in conceptualising and expressing abstract and less tangible ideas.

Excessive designer self-efficacy and user stereotyping are suggested to be among the underpinning factors contributing to the over-estimation of need-levels for specific products / features projected by the designers when compared to users' own perceived need-levels. But possibilities are two-folded. Apart from the possible tendency for the designers' to over-project users' needs, it might be possible that the users do not realise their own needs especially if the concerned needs are of less tangible nature, or both scenarios are true to different extents. On the one hand, the businesses are encouraged to find it out with their own user groups, possibly by focused, in-depth research through interviews, focus groups, or other appropriate approaches. On the other hand, designers and businesses are recommended to project user needs based on actual data, either captured from the business' own database, from the industry's big data, or from dedicated research if resources allowed, instead of merely from the experience and "insight" of the designers and / or marketers. Designer efficacy (a designer's actual design ability) and self-efficacy (a designer's belief in his / her own design ability) are essential for creating good designs with good product efficacy, but it is just as crucial to strike a balance on where and how they play.

Concerning the other side of the coin, about the user self-efficacy in adopting / utilising new / complex products, and in conceptualising and communicating their thoughts especially with the more intangible needs / concepts / feelings, the business is recommended to plan ahead for appropriate and adequate engagement with the target users to synchronise their self-efficacy before and in parallel with the product development / launch stages. Long-term user education programmes or short-term priming activities within participatory design programmes would help nourish users' self-efficacy and hence their communication / creative capacities, and willingness for expressing thoughts / ideas, receiving product messages, and trying new products. In fact, apart from individual programmes / events, user and designer communication and co-creation should preferably be a continuous involvement such as through the forming of user-designer communities to promote sharing, discussion, input / feedback, and learning. Such interaction and cross-pollination opportunities

among users and designers not only help balancing the perceived designer and user self-efficacies (Social Cognitive Theory (Bandura, 1977a, 1986) as discussed in **Section 2.9**), but also address other commonly acknowledged designer/user gaps and contributive factors, like communication gap, inadequate user research, and knowledge / experience discrepancies. The assimilation and adaption benefits of user participatory activities have been explicated by some scholars in association with the Social Learning Theory (Bandura, 1977b, 2001; Stibe & Oinas-Kukkonen, 2014) and Social Facilitation Theory (Flynn & Amanatullah, 2012; Stibe & Oinas-Kukkonen, 2014). While the Social Learning Theory explains the acquiring of new knowledges / concepts / behaviours through social experiences and interactions, the Social Facilitation Theory conceives that the presence of coactors may influence human behaviour in social situations. In more recent studies from the cognitive and social neuroscience perspectives, researchers such as van Ments and Treur (2021, 2022) studied the modelling (emulating) of cognitive metaphors as internal mental models which might be adapted through the neural mechanisms of "mirror neuron activation" leading to subsequent "internal simulation". Such social-neuro adaptation mechanisms are expected to be possibly induced during properly conducted "participatory design" activities, supporting the acknowledgement of participatory design as a way to fuse the designer/user gaps and to promote user recognition of the product / brand concepts.

Figure 36 projects a pathway from the current scenario with unbalanced efficacies / self-efficacies across the designer-product-user chain towards the desired balanced scenario, through appropriate self-efficacy regulating approaches. Examples of product related activities are provided under an extended series of Bandura's sources of self-efficacy (Bandura, 1977a, 1986) embracing performance accomplishment, vicarious experience, social persuasion, and physiological / affective states. It is worth noting that the user-designer community provides multiple opportunities: for instances, it may run co-design activities which nourish users' self-efficacies through "performance accomplishment"; it may serve as a platform for user case sharing by which both users and designers may regulate their self-efficacies through "vicarious experience" (observing others' accomplishment); it may facilitate "social

persuasion" via online blogs / forums or off-line gatherings; it may serve as a channel for sequential distribution of information / news of product launches, revisions, and technology applications, etc, so as to build up users' product knowledge / expertise; all the above activities may help tune the users' physiological / affective states, such as alleviating some users' anxiety in handling complex or technology-advanced products; and the community may serve as a convenient research recruitment platform where the designers may learn / discover from real-life users their first-hand user experiences and genuine needs.

The above examples demonstrate that the self-efficacy regulating activities serve both the designers and users in order to gear towards the ultimate balance across the designer-product-user chain; and that self-efficacy should not be dealt with as a separate entity from the other potential contributive factors for the designer/user gaps, but in fact designer/user self-efficacy regulation should work closely together with the fostering of designer/user communication, mutual understanding, and users' product expertise.

On the other hand, as it is impossible to have all current and potential users engaged in dedicated programmes or communities as they come and go, the designers and marketers had better try wherever possible empowering instead of intimidating the users to unleash their potential contribution while also boosting their self-efficacy, for instance, by communicating the intangibles in more tangible ways when facing a broad user audience, and tailoring communication in language of the user group's domain (considering content, context, format, media, etc) when facing specific user groups (Gabrysiak et al., 2012). A coherence across the designer, product and user efficacies, perceived and actual, would definitely benefit the generation and adoption of good designs which further enhance user experiences, contributing to user satisfaction, customer loyalty and business sustainability.

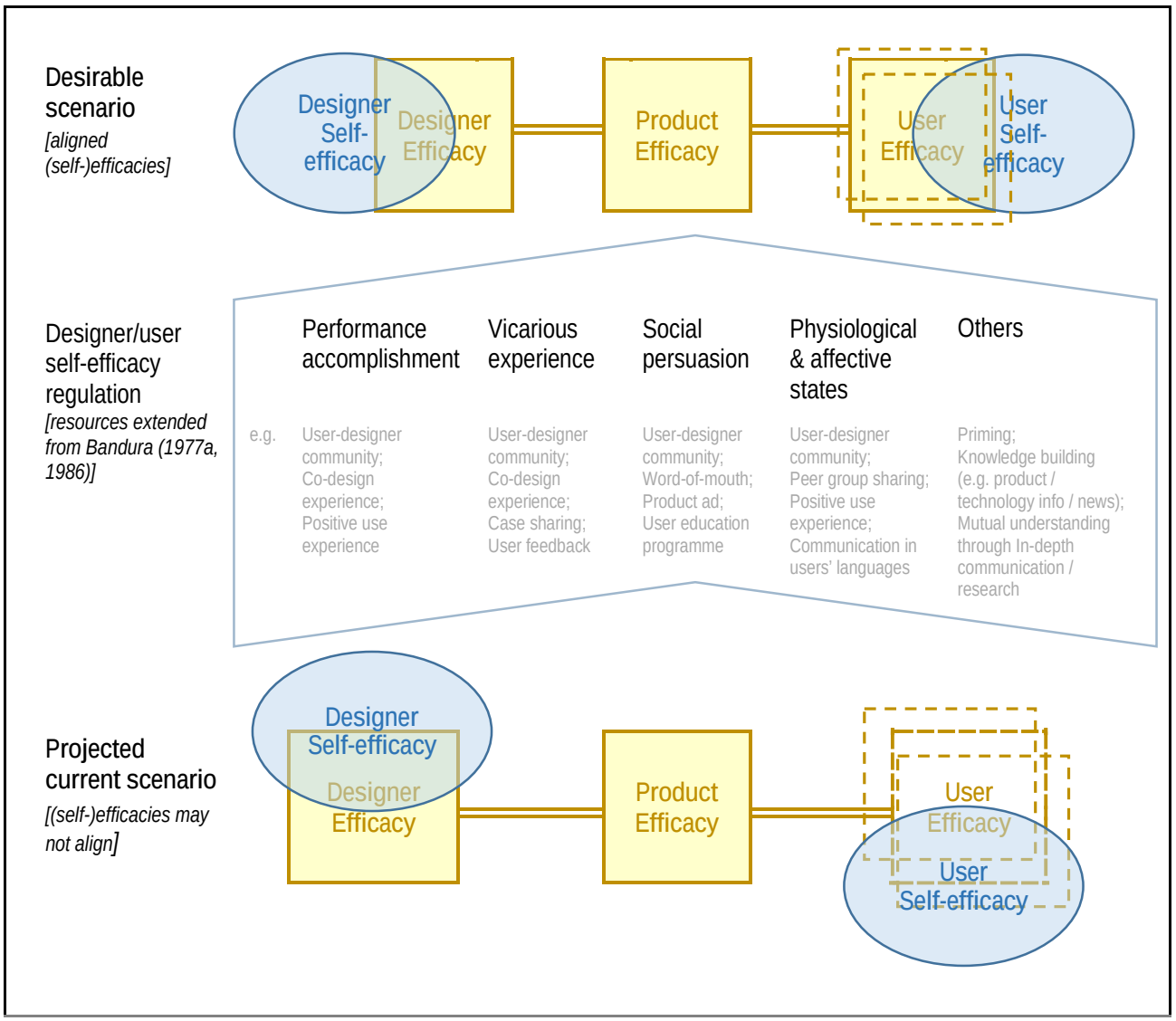


Figure 36: Towards a balance of (self-)efficacies across the designer-product-user chain – from current to desirable scenario

Note:

Efficacy here refers to the actual capacity of a person (designer or user) or a product to accomplish desired tasks and objectives; whereas self-efficacy (aka perceived self-efficacy) refers to a person's own perceived capacity to accomplish the desired tasks and objectives.

The multiple dashed boundaries of "User Efficacy" illustrate the possibly wide-ranged product related efficacies among the users (of varied backgrounds), which are mostly not known by the designers. The designer/user self-efficacy regulating activities may help reveal some of the user efficacies, and narrow the range by enhancing users' expertise in general.

6.3 Limitations and future research

Comprehensive action model framework for future research. As discussed at the beginning of Chapter 2 and in Section 2.3, a framework has been laid out by the researcher at the early planning stage for developing a comprehensive "action model" for product R&D. The action model would integrate Norman's user action cycle and recommended design principals (Norman, 1988, 2013) with the utilitarian-hedonic value perception approach (Batra & Ahtola, 1991; Zaichkowsky, 1994; Voss et al., 2003; Mouri, 2005) aiming at narrowing the identified gaps (designer/user, psychological/physical) with an actionable model accompanied by a set of application tools (**Figures 8, 9 and 11**). Despite such inclusive model and tools have been long anticipated, their development requires the investment of persistent efforts and time for working out the theoretical grounding, the empirical applications, and repeating tests with industry in honing the model and range of tools. For this DBA thesis, attention is first pinpointed at the product "conceptual model / mental model" and its association with user experience in addressing the issue of designer/user gap (as highlighted in **Figure 10**). The comprehensive framework would be a good reference for planning future studies to work towards the goals in phases.

CX as a series of UX. While user experience (UX), as defined by its early 1990s proposers, is meant to describe the totality of interactions that actual and potential users may have with an organisation and its products / services (Norman, 1988 & 2013; Salazar, 2019), some scholars use another term "customer experience (CX)" to more explicitly differentiate the extensive experiences from pre-purchase to post-purchase and post-consumption (Shaw & Ivens, 2002; Laming & Mason, 2014; Lewis, 2014; Rusu et al., 2020 & 2023). Apart from the activity range and time scope, the level of specificness has been another distinction made by scholars between UX and CX. For example, Salazar (2019) and Quiñones and Rojas (2023) acknowledge CX as a series of UX, implying that CX often represents the broader and more general experience with the brand / company as a whole, whereas UX refers to the experience of more specific interactions with the company's products / systems / services. It is also recognised that while addressing broader experiences, CX tends to

place less focus on the actual product use experience from the end-user's point of view if compared to UX, as a customer may or may not be an end-user of the product after all (Genex-Insights, 2021).

Since different stages of the consumer journey (such as pre-purchase and post-purchase) tend to vary in their dispositions and focuses, it would be meaningful to closely and distinctly examine individual sectors of the journey. It is surely of interest to study all parts and the whole, and then their cross-interactions and comparisons. However, such a comprehensive broad-scale investigation seems not affordable, in terms of time and resources, by the current study as part of a DBA programme. As discussed in earlier sections (e.g. Sections 1.1 and 2.1), considering the more abundant studies on pre-purchase and point-of-purchase consumer behaviour suggesting the neediness for dedicated post-purchase consumer experience study, and the more direct interaction between products and users during the actual use stage after purchase, this study chooses to focus on the post-purchase "user experience" which is a specific and important sector of the whole "customer experience". It would be worthwhile to carry out subsequent researches embracing the other sectors of the consumer journey, enabling cross-comparisons and synthesis of the findings into a bigger picture.

Online research constraints. While the current research has been transformed from partly onsite to fully online in response to the pandemic impact, it also came across the inherited challenges of online research, such as, firstly the limited control on the environment where and when the participants were participating. To address this concern, the survey sample size was expanded to allow adequate quota for data cleansing in maintaining data quality. Secondly, another common constraint of online research was that the participants / respondents were limited to those IT-able persons with online access. This concern however did not have much impact on the current study, considering the 70.9% internet penetration rate in Mainland China (**Table 3**) and the study's target participants being smartphone users studying / working in design and non-design fields with tertiary education or above at the age of 18 to 40. It was reasonable to believe that these well-educated young people all

possess at least the basic IT skills and online access through their smartphone, or more. Thirdly, the purely online situation would not support verification of findings via alternative research modes like observation. As such, the current study had triangulated its findings across the two different online research modes of mental modelling and survey where applicable.

Self-report constraints. The use of self-administered questionnaire in the Part Two Survey may also inherit the common challenges with self-reported responses, including the dependence on the respondents' trustworthiness and potential influence from various response biases (Choi & Pak, 2005). Efforts had been made to avoid the potential biases, such as: arranging the likert scale options in ascending order (from strongly disagree to strongly agree) to avoid effects of the left-side selection bias doubling up with the acquiescence bias; including reverse-worded items to minimise acquiescence bias; and using indirect questions where the concerned issue might induce social-desirability bias. Some researchers applied various social-desirability scales in the questionnaire to check the respondents' tendency towards giving socially desirable answers and "correct" the scores accordingly (Reynolds, 1982; Fisher & Katz, 2000) but other scholars doubted the effectiveness of such scales (Uziel, 2010; Lanz et al., 2022).

Online and onsite modes. The current study provided exploratory experiences for mental modelling and role-taking through online platforms. For future research involving deep thinking process or role switching, it might still be preferable to conduct those activities onsite, allowing better control of the environment, avoidance of disruptions, and necessary pre-activity priming and warming up for the participants. The integration of visual-textual-verbal communication could also be better encouraged in an onsite setting, which might help the participants conceptualise and express more abstract / intangible thoughts / concepts when needed. Researchers conducting similar research in the future may compare the effectiveness of online and onsite modes, when the onsite mode is feasible after the pandemic.

Geographical transferability and generalisability. The current study was

conducted with a non-random sample from Mainland China. It needs further research to test the transferability of the methodologies and / or findings to other populations. In fact, Mainland China is a vast country with different regional cultures. Hence future research may zoom-in or zoom-out to investigate different sectors and / or focuses on the related topics. While the conceptual and methodological frameworks are expected to be applicable for researching other populations, it is reasonable to anticipate variations in the research findings. Since peoples from different countries are possibly born different and live differently with diverse heritages and in diverse environments (political, economic, social-cultural, and technological), it is unrealistic to expect them to perceive and value a product with the same tendencies. The potential variation in findings is just what makes cross-country analyses intriguing and worthwhile.

Considering the case of Mainland China, an Asian communist country with regulated "socialist market economy", if compared with a Western country with "free" market economy, their different governmental and institutional systems, and varied economic, social, cultural practices would assumedly lead to different consumer behaviours, experiences and perceptions. For instance, the control from government and traditional ethics might restrain the way people use their smartphones, undermine individual's innovativeness or people's perceived value for novelties in products. The tariff imposed on imported smartphones might limit consumers' product choices and drive up the use of China phones. From the perspective of Hofstede's cultural dimensions (Hofstede, 2023; Wronski & Klann, 2020), China is regarded high in Power Distance, Motivation towards Achievement and Success (Masculinity), and Long Term Orientation; and low in Individualism (i.e. high in Collectivism), Indulgence (i.e. high in Restraint), and Uncertainty Avoidance. Assumedly, the high Power Distance might intensify the self-efficacy and communication gap between the "expert" designers and "layman" users. The strong Motivation towards Achievement and Success might cause people to sacrifice family and leisure priorities to work, use their personal phone for work activities and hence boosting up the perceived utilitarian value for the smartphone experience. The strong Long Term Orientation, associated with thriftiness and perseverance, might imply price-concern and hesitation in acquiring new phones. The low

indulgence might restrain the hedonic value perception of Chinese smartphone users. One the other hand, the low Uncertainty Avoidance implies adaptability, entrepreneurship, and daringness to venture and try new things, which are somehow paradoxical with some of the tendencies envisaged above.

As reflected in the statistical outlook, China shows a mobile connection rate of 125% in 2022, amid the East Asia and Pacific rate of 130, the global rate of 108% and US rate of 110% (World Bank, 2023). The Chinese smartphone users upgrade their smartphones faster than American and European users. The average life cycle of smartphones in China in 2018 was 21 months versus 24.7 months in the United States and 27.7 months in European countries of France, Germany, Italy, Spain and the United Kingdom (CNBC, 2019, May 17). With the global political, economic and pandemic uncertainties in the past few years, it is projected that the smartphone upgrade cycle is lengthening to over 40 months for China and the world in 2023 or beyond (Counterpoint, 2023, June 13; Strategy Analytics, 2022, June 29). Statistics (Deloitte, 2017) also show that China is ahead of the average adoption rate of the developed countries for new technologies such as Internet of Things (IoT) and epayment via their smartphones. Interestingly, the developing countries have displayed an average higher adoption rate of mobile IoT and epayment (led by China and India) than the developed world. In embracing these new technologies, China and her developing-country[5] counterparts share other similar patterns, including: a high percentage of users demonstrating somewhat “addictive” behaviours of checking their smartphones round-the-clock in the middle of the night (over 70%) and within 5 minutes after waking up in the morning (over 50%); and a low awareness of security risk when transmitting sensitive personal information online, as over 80% of the survey respondents from the developing countries have shared some kind of personal information online (Deloitte, 2017). There are views that the higher adoption rate of mobile payment in the developing countries compared with the developed countries is because users in the developing countries are less guarded against the security and privacy

[5] Whether Mainland China is a “developing” or “developed” nation has been under debate after she has become the world's second largest economy and manufacturing powerhouse. China still classifies herself as a "developing" country in the World Trade Organisation (WTO), while the International Monetary Fund (IMF) calls her an "emerging and developing economy" (Kanwit, 2023, August 28).

risks involved in mobile / online data transmission.

The above data hint that China users are using their mobile phones in similar ways as their corresponding counterparts, often from the developing countries and sometimes from both the developing and developed worlds. Despite being a communist nation and a country with relatively prudent cultures, there seems little evidence that her political, economic or social-cultural constraints have undermined the smartphone consumers' innovative use of the phones and their adoption of new smartphones and mobile technologies.

After all, a key focus of the current study is to compare across the designers and users by assessing their relative differences rather than measuring the absolute levels of the respondents' perceived values. In a single country study, as both the designer group and user group are under the macro environments of the same nation and supposedly being exposed to similar political, economic, social-cultural and technological influences, such PEST characteristics should not be hindering the general validity of the study's findings in its representation for the country's population. However, in a vast country like China consisting of varied regional cultures, and possible differences in wealth and infrastructure, researchers may consider further stratifying the sample, on top of the current sampling criteria on education level, age and gender, so as to reinforce the sample's representativeness for the population and hence enhancing the generalisability and external validaity of the research. For instance, proportionate quotas may be assigned to clusters of regions sharing similar characteristics, such as well-developed versus less-developed clusters.

For future research of cross-country studies, it would be meaningful to investigate the designer/user gap in developing versus developed countries, or in countries with diverging cultural dimensions (Hofstede, 2023) such as small versus big Power Distance, low versus high Motivation towards Achievement and Success, low versus high Uncertainty Avoidance, or Indulgence versus Restraint. Such setting would enrich the studies by exploring if these background variations moderate the value perception of designers and users and the gap between them, and further verify the transferability of the

conceptual and methodological frameworks for researching other populations.

Generalisability across product categories. Future research may further verify the level and aspect of generalisability of the research frameworks and methodologies for their application across product / service categories. While it is highly plausible to generalise the tested conceptual relations along "perceived product values, satisfaction and use intension", the interplay of designer/user differences, and the key research methods of laddered mental-modelling and role-based survey questionnairing, appropriate adaptation is expected among the product-use related prompt / choice elements in the mental-modelling framework and survey questions. Studies with different-natured product exemplars may also find varied weightings across the four product values, and their comparative impact on perceived satisfaction and use intension. For instance, high-complexity and / or instrumental products (such as multifunctional printer-copiers) may find higher weighting for the perceived utilitarian value; advanced-technology products (such as autonomous vehicles) may find higher weighting for the perceived innovative value; self-identifying (such as personal accessories) or status-relevant (such as luxury fashion handbags) products may find higher weighting for the perceived social value; and self-indulging (such as games) or ritualistic (such as aroma therapy, ceremonial tea making) products may find higher weighting for the perceived hedonic value (Fuchs et al., 2013; Song et al, 2022).

Being moderately complex and technology-advanced, socially exposed and self-identifying as well as self-indulging, the smartphone has been chosen as the product exemplar to start with in testing the conceptual framework proposed in this study for its all-rounded involvement with all four product values – utilitarian, hedonic, social, and innovative. Riding on the experience and findings of this study, the conceptual and methodological frameworks may be applied with adaptations where needed for subsequent verification with similar or different product / service categories / sub-categories. From the businesses' point of view, it may be desirable to further segment the product concerned when conducting their study, so as to more explicitly understand the potentially varied user perception such as in the high-end versus basic product segments.

In the current product exemplar of smartphones, apart from the price level, other meaningful segmentation may consider the phone operation system (IOS, Android, Windows, etc.) and the brand origin country (e.g. China, non-China). The brand origin country factor would be more profound for cross-country studies. The fast growing China brands are sharing around 80% of the Mainland China domestic market in recent few years; and gain high popularity in some developing countries where consumers look for "value for money", as the China smartphones for export are recognised as having "good specs at competitive pricing"; but are far less popular in the developed countries where Apple and Samsung smartphones dominate the market share (Statista, 2023, September 25; Counterpoint, 2023, September; Counterpoint, 2019, July 3). Despite the comparable functional features across China and non-China smartphones, the psychological intention of consumers owning and using a China phone or non-China phone may likely differ. Owning and using an iPhone 15 Pro (non-China brand) might be perceived as a self-identity symbol inducing related social values, more often than a top ranged Oppo (popular China brand) smartphone.

Value shift, personality traits, self-efficacy and self-others perception discrepancies. Findings of the current research revealed a number of tendencies and possibilities, which may have built on or vary from previous studies, inviting future research to further verify. For instance, the potential value shift in the social perception for smartphones suggested in previous studies (e.g. Youn, 2016) was also noticeable in the current study. Such transition may need to be traced across years with a longitudinal research or a series of repeated studies. The moderating role of the personality traits on user experience may need a more focused study to discover the comprehensive picture, as only some of the traits' influences suggested in previous literature have been reflected in the results of the current study. The coherence across the designer, product and user (self-)efficacies would deserve further research, not only to address the designers' over-projection of user-needs, but also to achieve an unconstrained designer-product-user communication / interaction chain which would benefit the generation of good designs delivering good user experiences.

To further verify the possible effect of designer self-efficacy on participants' responses, future research could include a control group projecting other user group's needs from a "layman's perspective", for comparison with the experiment group projecting in the role of designers. However, the research question and process have to be tactfully designed in order to immune the control group from any "designer-role" influence, since the act of "projecting the needs of a specific user group other than themselves" is in fact an execution of a designer's role even though terms like "in a designer's role" or "to design for" are not explicitly used. The research design has to make sure that the "designer-role" priming applies only to the experiment group but not the control group.

Whether the discrepancies in need perception (a critical gap issue with mis-aligned projection) found from the survey responses are more associated with the "expert" designer and "layman" user roles with self-efficacy difference, or somewhat also associated with the differentiated evaluation for the self and others (possibly moderated by self-efficacy as well), to what extent and how these factors contribute to the designer/user gaps, and how such discrepancies could be aligned to bridge the gaps, will require investigation and verification in future studies. A further question could be whether these considerations on the bridging of professional-consumer gaps through regulating the expert-layman self-efficacies and / or self-others perception discrepancies might be generalised to different design domains or other professions.

All in all, it is hoped that the current study's findings, research opportunities identified, and research methods developed and tested, may stimulate researchers to conduct further vigorous research along the designer-product-user chain, and tool developers to design more robust research tools for eliciting users' perceptions and genuine needs, desirably with corresponding product development tools for enhancing the ultimate user experience.

BIBLIOGRAPHY

BIBLIOGRAPHY

Agarwal, R., & Prasad, J. (1998). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research, 9*(2), 204-215.

Aguirre-Urreta, M., & Marakas, G. M. (2008). Comparing conceptual modeling techniques: A critical review of the EER vs. OO empirical literature. *Database for Advances in Information Systems, 39*(2), 9-32.

Ainsworth, A. B., Pentina, I., Aditya, S. M., & Mohammed Slim, B. M. (2017). Mobile payments adoption by US consumers: An extended TAM. *International Journal of Retail & Distribution Management, 45*(6), 626-640.

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. *Action Control,* 11–39.

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes, 50,* 179-211.

Alalwan, A. A., Baabdullah, A. M., Rana, N. P., Tamilmani, K., & Dwivedi, Y. K. (2018). Examining adoption of mobile internet in Saudi Arabia: Extending TAM with perceived enjoyment, innovativeness and trust. *Technology in Society, 55,* 100-110.

Albert, W. (2013). *Measuring the user experience: Collecting, analyzing, and presenting usability metrics* (2nd ed.). Elsevier Science.

Ali, I., & Nosheen, F. W. (2021). The relationship between mobile self-efficacy and mobile-based personal information management practices: A systematic review. *Library Hi Tech, 39*(1), 126-143.

Allitt, M., & Frampton, S. (2022). Beyond 'born not made': challenging character, emotions and professionalism in undergraduate medical education. *Medical Humanities, 48*(4), 461-470.

Almarzouqi, A., Aburayya, A., & Salloum, S. A. (2022). Determinants predicting the electronic medical record adoption in healthcare: A SEM-Artificial Neural Network approach. *PLoS One, 17*(8).

Almasri, A. K. M. (2015). A hybrid proposed framework based on quality factors (QF) and technology acceptance model (TAM) for mobile learning process: Higher education students in Jordanian universities. *International Journal of Information, Business and Management, 7*(3), 200-212.

AlQudah, A. A., Al-Emran, M., & Shaalan, K. (2021). Technology acceptance in healthcare: A systematic review. *Applied Sciences, 11*(22), Article 10537.

American Psychological Association. (n.d.-a). Perception. In *APA dictionary of psychology*. Retrieved February 18, 2022, from https://dictionary.apa.org/perception

American Psychological Association. (n.d.-b). Mental model. In *APA dictionary of psychology*. Retrieved February 18, 2022, from https://dictionary.apa.org/mental-model

American Psychological Association. (n.d.-c). Self-efficacy. In *APA dictionary of psychology*. Retrieved July 15, 2022, from https://dictionary.apa.org/self-efficacy

American Psychological Association. (n.d.-d). Personality Trait. In *APA dictionary of psychology*. Retrieved February 18, 2022, from https://dictionary.apa.org/personality-trait

Amin, M. (2016). Internet banking service quality and its implication on e-customer satisfaction and e-customer loyalty. *International Journal of Bank Marketing, 34*(3), 280-306.

Arruda Filho, E. J. M., & Dholakia, R. R. (2013). Hedonism as a decision factor and technologic Usage. *Revista Brasileira de Gestão de Negócios, 15*(48), 343-361.

Arthur, Charles (March 6, 2013). "Google Glass: is it a threat to our privacy?" (https://www.theguardian.com/technology/2013/mar/06/google-glass-threat-to-our-privacy). *The Guardian*. London. Retrieved March 7, 2013.

Atzmüller, C., & Steiner, P. M. (2010). Experimental vignette studies in survey research. Methodology, 6(3), 128–138.

Baker, C. (2004). *Behavioral genetics: An introduction to how genes and environments interact through development to shape differences in mood, personality, and intelligence*. NY: American Association for the Advancement of Science.

Bakirtas, H., Bakirtas, I., & Çetin, M. A. (2015). Effects of utilitarian and hedonic shopping value and consumer satisfaction on consumer behavioral Intentions / Faydaci ve hazci alisveris degeri ve tüketici tatmininin tüketicinin davranissal niyetleri üzerindeki etkileri. *Ege Akademik Bakis, 15*(1), 91-98.

Bandura, A. (1977a). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191–203.

Bandura, A. (1977b). *Social Learning Theory*. Englewood Cliffs, New Jersey: Prentice Hall.

Bandura, A. (1986). *Social foundations of thought and action: A Social Cognitive Theory.* Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (2001). *Social Cognitive Theory of Mass Communication*. *Media Psychology, 3* (3), 265-299.

Bandura, A., & Locke, E. A. (2003). Negative self-efficacy and goal effects revisited. *Journal of Applied Psychology, 88*(1), 87-99.

Bansal, H. S., Taylor, S. F., & James, Y. S. (2005). Migrating" to New Service Providers: Toward a Unifying Framework of Consumers' Switching Behaviors. *Journal of The Academy of Marketing Science, 33*(1), 95-115.

Bard, J. (2016). *UX design defined*. Retrieved from http://uxdesign.com/ux-defined

Batra, R., & Ahtola, O. T. (1991). Measuring the hedonic and utilitarian sources of consumer attitudes. *Marketing Letters*, *2*(2), 159-170.

Beeftink, F., Van Eerde, W., Rutte, C. G., & Bertrand, J. W. (2012). Being successful in a creative profession: The role of innovative cognitive style, self-regulation, and self-efficacy. *Journal of Business and Psychology, 27*(1), 71-81.

Beeman, W. O. (2022). Ethnography for smart service systems in product design. *Journal of Media & Management, 4*(1), 1-4.

Bentler, P. M. & Chou, C. P. (1987). Practical issues in structural modeling. *Sociological Methods & Research, 16*, 78-117.

Bettiga, D., Bianchi, A. M., Lamberti, L., & Noci, G. (2020). Consumers emotional responses to functional and hedonic products: A neuroscience research. *Frontiers in Psychology, 11*, Article 559779.

Bhattacherjee, A. (2001) Understanding Information Systems Continuance: An Expectation-Confirmation Model. MIS Quarterly, 25, 351-370.

BHPS. (2022). British Household Panel Survey. Retrieved from https://www.understandingsociety.ac.uk/about/british-household-panel-survey

Blumler, J. G., & Katz, E. (1974). The uses of mass communications: Current perspectives on gratifications research. Beverly Hills, CA: Sage.

Blumler, J. G., Katz, E., & Gurevitch, M. (1974). Utilization of mass communication by the individual. *The uses of mass communications: Current perspectives on gratifications research*, (s 19), 32.

Boddy, C. R. (2016). Sample size for qualitative research. *Qualitative Market Research: An International Journal, 19*(4), 426-432.

Booth, A. R., Norman, P., Harris, P. R., & Goyder, E. (2014). Using the theory of planned behavior and self-identity to explain chlamydia testing intentions in young people living in deprived areas. *British Journal of Health Psychology, 19*(1), 101-112.

Bouma, G.D. (2000). Ethics in human research. *The research process* (4th ed.) pp. 190-202. Melbourne, Australia: Oxford University Press.

Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology, 1*(3), 185–216.

Britannica Dictionary. (n.d.-a). Designer. In *Britannica Dictionary*. Retrieved February 19, 2022, from https://www.britannica.com/dictionary/designer

Britannica Dictionary. (n.d.-b). User. In *Britannica Dictionary.* Retrieved February 19, 2022, from https://www.britannica.com/dictionary/user

Britannica. (2018). *Industrial revolution*. Retrieved from www.britannica.com/print/article/287086

Brooke, J. (1996). SUS: A "quick and dirty" usability scale. In P. W. Jordan, B. Thomas, B. A. Weerdmeester, & A. L. McClelland (Eds.), *Usability Evaluation in Industry*. London: Taylor and Francis.

Brown, S.A. and Venkatesh, V. (2005). Model of Adoption of Technology in Households: A baseline model test and extension incorporating household life cycle, *MIS Quarterly 29*(3): 399–426.

Brown, T. (2009). *Change by design: How design thinking transforms organizations and inspires innovation*. Harper Collins Publishers.

Brown, T. J., Suter, T. A., & Churchill, G. A. (2014). *Basic marketing research: Customer insights and managerial action (8th ed.).* New York: Cengage Learning.

Burke, P. F. (2013). Seeking simplicity in complexity: The relative value of ease of use (EOU) based product differentiation. *Journal of Product Innovation Management, 30*(6), 1227-1241.

Burns, R. & Burns, R. (2008). *Business research methods and statistics using SPSS*. London: Sage Publication.

Butt, S., & Phillips, J. G. (2008). Personality and self reported mobile phone use. *Computers in Human Behavior, 24* (2), 346–360.

Cagan, J., & Vogel, C. M. (2002). *Creating breakthrough products: Innovation from product planning to program approval*. New Jersey: Pearson Education.

Cagan, J., & Vogel, C. M. (2012). *Creating breakthrough products: revealing the secrets that drive global innovation* (2nd ed.). New Jersey: Pearson Education.

Cambridge English Dictionary. (2022). Retrieved from https://dictionary.cambridge.org/dictionary/english/epistemic

Caprara, G., Barbaranelli, C., Consiglio, C., Picconi, L., & Zimbardo, P. G. (2003). Personalities of politicians and voters: unique and synergistic relationships. *Journal of Personality and Social Psychology, 84,* 849–856.

Carmeli, A., & Schaubroeck, J. (2007). The influence of leaders' and other referents' normative expectations on individual involvement in creative work. *The Leadership Quarterly, 18*(1), 35-48.

Carson, D., Gilmore, A., Perry, C., & Gronhaug, K. (2001). Case-based Research. *Qualitative marketing research* (pp. 92-112). London, UK: Sage.

Carvalho, L. F., Sette, C. P., & Ferrari, B. L. (2018). Problematic smartphone use relationship with pathological personality traits: Systematic review and meta-analysis. Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 12(3), article 5.

Cata, T., & Martz, B. (2015). Comparing mobile apps usability characteristics for designers and users. *Journal of International Technology and Information Management, 24*(4), Article 4.

Chakraborty, S. (2012). Product Semantics for Eco-efficiency: Redesigning product characters to communicate Eco-efficiency in home appliances. Doctoral dissertation. Politecnico Di Milano.

Chamorro-Koc, M. & Popovic, V. (2008). Using visual representation of concepts to explore users and designers' concepts of everyday products. *Design Studies, 29*, 142-159.

Chamorro-Koc, M., Popovic, V., Emmison, M. (2009). Human experience and product usability: Principles to assist the design of user-product interactions. *Applied Ergonomics, 40*(4), pp.648-656.

Chan, S. L. (2017a). Enhancement of user experience: Action model for product R&D – *Assignment of SBPD7001 Approach to Research and Academic Communication,* Assignment. University of Wales – Trinity Saint David, unpublished.

Chan, S. L. (2017b). *Current local practices in product R&D for enhancing user experience – Assignment of SBPD7002 Qualitative Research,* Assignment. University of Wales – Trinity Saint David, unpublished.

Chan, S. L. (2018). *Perception of product values and user experience – Assignment of SBPD7010 Quantitative Research Methods,* Assignment. University of Wales – Trinity Saint David, unpublished.

Chen, P. Y., & Krauss, A. O. (2005). Experiments, psychology. In K. Kempf-Leonard (Ed.), *Encyclopedia of Social Measurement* (pp. 911-918). Elsevier.

Chen, Yan, & Moon, Taesoo. (2015). An empirical study on consumer's continuous usage intention of smartphone services in China. *The Journal of Information Systems, 24*(1), 95-117.

Cheon, J., Lee, S., Crooks, S. M., & Song, J. (2012). An investigation of mobile learning readiness in higher education based on the theory of planned behavior. *Computers & Education, 59,* 1054-1064.

Choi, B. C., & Pak, A. W. (2005). A catalog of biases in questionnaires. *Preventing Chronic Disease, 2*(1), A13.

Choi, J., & Kim, S. (2016). Is the smartwatch an IT product or a fashion product? A study on factors affecting the intention to use smartwatches. *Computers in Human Behavior, 63,* 777-786.

Chong, P. Y. (2004). *Diffusion of new product style: A total "sales appeal" forecasting approach for product aesthetics design.* Dissertation. City University of Hong Kong.

Chou, J. R. (2011). A gestalt-minimalism-based decision-making model for evaluating product form design. *International Journal of Industrial Ergonomics, 41,* 607-616.

Chuah, S., Rauschnabel, P., Krey, N., Nguyen, B., Ramayah, T., & Lade, S. (2016). Wearable technologies: The role of usefulness and visibility in smartwatch adoption. *Computers in Human Behavior, 65*, 276-284.

Cila, N., Hekkert, P., & Visch, V. (2014). Digging for Meaning: The Effect of a Designer's Expertise and Intention on Depth of Product Metaphors. *Metaphor & Symbol, 29*(4), 257-277.

CNBC. (2019, May 17). *Smartphone users are waiting longer before upgrading – here's why*. Retrieved from https://www.cnbc.com/2019/05/17/smartphone-users-are-waiting-longer-before-upgrading-heres-why.html

Colbert, C. Y., French, J. C., Arroliga, A. C., & Bierer, S. B. (2019). Best practice versus actual practice: An audit of survey pretesting practices reported in a sample of medical education journals. *Medical Education Online, 24*(1).

Costa PT, McCrae RR (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) manual*. Odessa, Florida: Psychological Assessment Resources.

Costa, P. T., & McCrae, R. R. (1985). The NE0 Personality Inventory Manual. Odessa, FL: Psychological Assessment Resources.

Counterpoint Research. (2017, November 20). Chinese smartphone market: 2016 and 2017 overview. *Counterpoint Technology Market Research.* Retrieved from https://www.counterpointresearch.com/insights/chinese-smartphone-market-2016-and-2017-overview/

Counterpoint Research. (2019, July 3). Insights tag: Replacement cycle. *Counterpoint Technology Market Research.* Retrieved from https://www.counterpointresearch.com/insights_tag/replacement-cycle/

Counterpoint Research. (2023, June 13). *China's under $150 Smartphone Market Posts Surprising Surge in Q1 2023.* Retrieved from https://www.counterpointresearch.com/insights/china-smartphone-market-posts-surprising-surge-q1-2023/

Counterpoint Research. (2023, November 10). *China smartphone market share: Quarterly*. Retrieved from https://www.counterpointresearch.com/insights/china-smartphone-share/

Counterpoint Research. (2023, September). *Insights tag: Global smartphone market*. Retrieved from https://www.counterpointresearch.com/insights_tag/global-smartphone-market/

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* (2nd ed.). London: Sage.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Sage Publications.

Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory Into Practice, 39*(3), pp. 124-130.

Crilly, N., Maier, A., & Clarkson, P. J. (2008). Representing artefacts as media: Modelling the relationship between designer intent and consumer experience. *International Journal of Design, 2*(3), 15-27.

Crilly, N., Moultrie, J., & Clarkson, P. J. (2009). Shaping things: Intended consumer response and other determinants of product form. *Design Studies*, *30*(3), 224-254.

Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin. 52*(4).

Crowley, A. E., Spangenberg**,** E. R., & Hughes, K. R. (1992). Measuring the hedonic and utilitarian dimensions of attitudes toward product categories. *Marketing Letters, 3*(3), 239-249.

Cummings, J. A. and Sanders, L. (2019). *Introduction to psychology.* Saskatoon, SK: University of Saskatchewan Open Press.

Curran, P. (2015). Methods for the detection of carelessly invalid responses in survey data. *Journal of Experimental Social Psychology, 66*.

Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods, 1*(1), 16-29.

Daniel, M., & Tversky, B. (2012). How to put things together. *Cognitive Processing, 13*(4), 303-319.

Danova, T. (2014, September 9). Smart watch forecast: The Apple Watch may lead wrist-worn computers to mass market status. *Business Insider*. Retrieved from https://www.businessinsider.com/global-smartwatch-sales-and-the-apple-watch-2014-9

Dash, G., & Paul, J. (2021). CB-SEM vs PLS-SEM methods for research in social sciences and technology forecasting. *Technological Forecasting and Social Change, 173*, Article 121092.

DataReportal. (2022). *Digital 2022: China*. Retrieved from https://datareportal.com/reports/digital-2022-china?rq=China

Davis, F. D. (1985). A Technology Acceptance Model for empirically testing new end-user information systems: theory and results. *Massachusetts Institute of Technology.*

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), pp.319-340.

Davis, L., Ajzen, I., Saunders, J. & Williams, T. (2002). The decision of African American students to complete high school: An application of the Theory of Planned Behavior. *Journal of Educational Psychology.*

Davis, R., Lang, B., & Gautam, N. (2013). Modeling utilitarian-hedonic dual mediation (UHDM) in the purchase and use of games. *Internet Research, 23*(2), 229-256.

De Medeiros, I. L. & Batiz, E.C. (2012). The inclusion of ergonomic tools in the informational, conceptual and preliminary phases of the product design methodology. *Work, 41,* 1016-1023.

Decker, R., & Gnibba-Yukawa, K. (2010). Sales forecasting in high-technology markets: A utility-based approach. *Journal of Product Innovation Management, 27*(1), 115-129.

Dellaert, G. C., & Stremersch, S. (2005). Marketing mass-customized products: Striking a balance between utility and complexity. *Journal of Marketing Research, 42,* 219-227.

Deloitte. (2017). *Global mobile consumer trends: Second edition*. Retrieved from https://www.deloitte.com/global/en/Industries/tmt/perspectives/gx-global-mobile-consumer-trends.html

Demirbilek, O. & Sener, B. (2003). Product design, semantics and emotional response. *Ergonomics, 46*(13/14), 1346-1360.

Deng, L., Turner, D. E., Gehling, R., & Prince, B. (2010). User experience, satisfaction, and continual usage intention of IT. *European Journal of Information Systems, 19,* 60-75.

Dick, B. (1994). *Action research: is it too risky for thesis? [Address to Social Psychology Study Group].* School of Behavioural Science, Griffith University.

Digital Unite. (2022). What is a smartphone? Retrieved from https://www.digitalunite.com/technology-guides/smartphones-tablets/smartphones/what-smartphone

Dijk, M., Kemp, R., & Valkering, P. (2013). Incorporating social context and co-evolution in an innovation diffusion model – with an application to cleaner vehicles. *Journal of Evolutionary Economics, 23*(2), 295-329.

Dormehl, L. (2015, March 4). Apple Watch wins one of world's most prestigious design awards. *Cult of Mac*. Retrieved from https://www.cultofmac.com/314092/apple-watch-wins-one-worlds-prestigious-design-awards/

Doyle E. E. H., Harrison S. E., Hill S. R., Williams M., Paton D., Bostrom A. (2022). Eliciting mental models of science and risk for disaster communication: A scoping review of methodologies. *International Journal of Disaster Risk Reduction, 77*.

Ducharme, M. K., Licklider, B. L., Matthes, W. A., & Vannatta, R. A. (1995). *Conceptual and analysis criteria: A process for identifying quality educational research*. Des Moines, IA, The FINE Foundation.

Duckworth, A. L., Tsukayama, E., & May, H. (2010). Establishing causality using longitudinal hierarchical linear modeling: An illustration predicting achievement from self-control. *Social Psychological and Personality Science, 1*(4), 311–317.

Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2019). Re-examining the unified theory of acceptance and use of technology (UTAUT): Towards a revised theoretical model. *Information Systems Frontiers, 21*(3), 719–734.

Dwivedi, Y. K., Rana, N. P., Tamilmani, K., & Raman, R. (2020). A meta-analysis based modified Unified Theory of Acceptance and Use of Technology (Meta-UTAUT): A review of emerging literature. *Current Opinion in Psychology, 36,* 13-18.

Easterby, M., Thorpe, R., & Lowe, A. (1991). The philosophy of research design. *Management research: An introduction* (pp.21-43). London, UK: Sage.

Edell, J. A., & Burke, M. C. (1987). The Power of feelings in understanding advertising effects. *Journal of Consumer Research, 14,* 421-433.

Egan, S., & Stelmack, R. M. (2003). A personality profile of Mount Everest climbers. *Personality and Individual Differences, 34*, 1491–1494.

Elaver, R. (2012). *Form, function, emotion: Designing for the human experience*. Proceedings of the 14th International Conference on Engineering and Product Design Education, Antwerp, Belgium, 6-7 September.

Elliott, P. (1974). Uses and gratifications research: A critique and a sociological alternative. *The uses of mass communications: Current perspectives on gratifications research*, *3*, 249-268.

eMarketer. (2017, December 21) Wearables Still Far from Mass Adoption. eMarketer Trends, Forecasts & Statistics. Retrieved from https://www.emarketer.com/content/wearables-still-far-from-mass-adoption

Endsley, M. R. (2000). Situation models: An avenue to the modelling of mental models. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 1*, 61-64.

Etikan, I. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics. 5*(1).

Evans, M., & Sommerville, S. (2007). *Seeing is believing: The challenge of product semantics in the curriculum*. Proceedings of the 9th International Conference on Engineering and Product Design Education, Newcastle, United Kingdom, 13-14 September.

Farooq, M. S., Salam, M., Jaafar, N., Fayolle, A., Ayupp, K., Radovic-Markovic, M., & Sajid, A. (2017). Acceptance and use of lecture capture system (LCS) in executive business studies: Extending UTAUT2. *Interactive Technology and Smart Education, 14*(4), 329-348.

Field, A. (2009). *Discovering statistics using SPSS (4th ed.).* London, England: Sage.

Fink, A. (2010). Survey Research Methods. In *International Encyclopedia of Education (3rd ed.)* (pp152-160). Elsevier.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. MA: Addison-Wesley.

Fisher, R. J., & Katz, J. E. (2000). Social desirability bias and the validity of self-reported values. *Psychology & Marketing, 17*(2), 105.

Flynn, F. J., & Amanatullah, E. T. (2012). Psyched up or psyched out? The influence of cofactor status on individual performance. *Organization Science, 23* (2), 402-415.

Fokkinga, S., & Desmet, P. (2012). Darker shades of joy: The role of negative emotion in rich product experiences. *Design Issues, 28*(4), 42-56.

Franke, N., Keinz, P., & Schreier, M. (2008). Complementing mass customization toolkits with user communities: How peer input improves customer self-design. *Journal of Product Innovation Management, 25,* 546-559.

French, A., Macedo, M., Poulsen, J., Waterson, T., & Yu, A. (2016). *Multivariate Analysis of Variance (MANOVA)*. Retrieved from http://online.sfsu.edu/efc/classes/biol710/manova/ MANOVAnewest.pdf

Frost, J. (2019). 5 Ways to Find Outliers in Your Data. Retrieved from statisticsbyjim.com/basics/outliers/

Fuchs, C., Prandelli, E., Schreier, M., & Dahl, D. W. (2013). All that is users might not be gold: How labeling products as user designed backfires in the context of luxury fashion brands. *Journal of Marketing, 77*(5), 75–91.

Gabrysiak, G., Giese, H., Seibel, A. (2012). Towards next-generation Design Thinking II: Virtual multi-user software prototypes. In: Plattner, H., Meinel, C., Leifer, L. (eds) *Design Thinking Research. Understanding Innovation.* Berlin, Heidelberg: Springer.

Gabrysiak, G., Giese, H., Seibel, A. (2012). Towards next-generation Design Thinking II: Virtual multi-user software prototypes. In: Plattner, H., Meinel, C., Leifer, L. (eds.) *Design Thinking Research. Understanding Innovation.* Berlin, Heidelberg: Springer.

Gall, M. D., Gall, J. P., & Borg, W.R. (2007). *Educational research: An introduction* (8th ed.). Pearson / Allyn & Bacon.

Gelade, G. A. (1997). Creativity in conflict: The personality of the commercial creative. Journal of Genetic Psychology, 158, 67–68.

Gelman, A., & Hill, J. (2006). Causal inference using regression on the treatment variable. In *Data Analysis Using Regression and Multilevel/Hierarchical Models* (Analytical Methods for Social Research, pp. 167-198). Cambridge: Cambridge University Press.

Gelman, A., Hill, J., & Vehtari, A. (2020). Causal inference using regression on the treatment variable. In *Regression and Other Stories* (Analytical Methods for Social Research, pp. 363-382). Cambridge: Cambridge University Press.

Gemino, A., & Wand, Y. (2004). A framework for empirical evaluation of conceptual modeling techniques. *Requirements Engineering*, 9, 248-260.

Genex-Insights. (2021). *CX and UX: not the same thing*. Retrieved from https://www.bizcommunity.com/Article/196/458/223602.html#

Ghoshal, T. & Boatwright, P. (2009). Unwrapping the good news: Packaging pays, and “how”! The role of packaging in influencing product valuation. *Advances in Consumer Research, 8,* 254-256.

Ghoshal, T. (2010). *Nonconscious factors influencing attitude/behavior/judgment of product and sequences.* Dissertation. Tepper School of Business, Carnegie Mellon University.

Ghoshal, T. (2010). *Nonconscious factors influencing attitude/behavior/judgment of product and sequences.* Dissertation. Tepper School of Business, Carnegie Mellon University.

Ghoshal, T., & Boatwright, P. (2009). Unwrapping the good news: Packaging pays, and “how”! The role of packaging in influencing product valuation. *Advances in Consumer Research, 8,* pp.254-256.

Glaser, B. (1965). The constant comparative method of qualitative analysis. *Social Problems, 12*, 436–445.

Goffin, K. & Micheli, P. (2010). Maximizing the value of industrial design in new product development. *Research – Technology Management, September-October 2010,* 29-37.

Goldberg, L. R. (1981). Language and individual differences: The search for universals in personality lexicons. Review of Personality and Social Psychology, 2(1), pp.141-165.

Goldberg, L. R. (1983) The magical number five, plus or minus two: Some considerations on the dimensionality of personality descriptors. Paper presented at a Research Seminar, Gerontology Research Center, Baltimore, MD.

Goldsmith, R. E., & Hofacker, C.F. (1991). Measuring consumer innovativeness. *Journal of the Academy of Marketing Science, 19*, 209-221.

Goldstein, M., Nyberg, M. & Anneroth, M. Pers Ubiquit Comput (2003) 7: 372.

Goma-Freixanet, M. (1991). Personality profiles of subjects engaged in high physical risk sports. *Personality and Individual Differences, 12*, 1087–1094.

Good Design Award. (2018, September 3) Smart watch [Ticwatch S] – Complete list of the winners. *Japan Good Design Award*. Retrieved from http://www.g-mark.org/award/describe/43410?locale=en

Gopinath, K., Selvam, G., & Narayanamurthy, G. (2022). Determinants of the adoption of wearable devices for health and fitness: A meta-analytical study. *Communications of the Association for Information Systems, 50,* 445-480.

Grellhesl, Melanie & Punyanunt-Carter, Narissra. (2012). Using the uses and gratifications theory to understand gratifications sought through text messaging practices of male and female undergraduate students. Computers in Human Behavior. 28. 2175–2181. 10.1016/j.chb.2012.06.024.

GSOEP. (2022). German Socio-Economic Panel. Retrieved from https://www.eui.eu/Research/Library/ResearchGuides/Economics/Statistics/DataPortal/GSOEP

Guerin, B., & Innes, J. (2009). *Social facilitation*. Cambridge University Press.

Guo, N., Luk, T. T., Wang, M. P., Ho, S. Y., Fong, D. Y. T., Wan, A., Chan, S.S., & Lam, T. H. (2021). Self-reported screen time on social networking sites associated with problematic smartphone use in Chinese adults: A population-based study. *Frontiers in Psychiatry 11*, Article 614061.

Guo, S., Fan, S., & Meng, Y. (2023). The study of cognitive differences between designers and users based on schema theory. *Proceedings of the Design Society, 3,* 3513-3522.

Gutman, J. (1982) A means-end model based on consumer categorization processes. *Journal of Marketing, 46,* 60-72.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis (7th ed.).* Pearson Prentice Hall

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM) (2nd ed.)*. Thousand Oaks: Sage.

Hamaguchi, H. (2017). *Manner of innovation*. Conference speech. Hong Kong Design Institute.

Hammond, J., & Edelmann, R. J. (1991). The act of being: personality characteristics of professional actors, amateur actors, and non-actors. In G. D. Wilson (Ed.), *Psychology and performing arts* (pp. 123–131). Amsterdam: Swets & Zeitlinger.

Han, S. H. & Hong, S. W. (2003). A systematic approach for coupling user satisfaction with product design. *Ergonomics, 46*(13/14), 1441-1461.

Hannah, M. T., Domino, G., Hanson, R., & Hannah, W. (1994). Acting and personality change: the measurement of change in self-perceived personality characteristics during the actor's character development process. *Journal of Research in Personality, 28*, 277–286.

Hardeman, W., Johnston, M., Johnston, D. W., Bonetti, D., Wareham, N. J., & Kinmonth, A. L. (2002). Application of the theory of planned behaviour in behaviour change interventions: a systematic review. *Psychology & Health, 17*(2), 123.

Harris, P. R., Griffin, D. W., & Murray, S. (2008). Testing the limits of optimistic bias: Event and person moderators in a multilevel framework. *Journal of Personality and Social Psychology, 95*(5), 1225-1237.

Hassenzahl, M. & Tractinsky, N. (2006). User experience – a research agenda. *Behaviour & Information Technology, 25*(2), 91-97.

Hayes, A. F. (2022). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach (3rd ed.)*. New York: The Guilford Press.

Health Knowledge. (2016). *Confounding, interactions, methods for assessment of effect modification*. Retrieved from https://www.healthknowledge.org.uk/publichealthtextbook/researchmethods/1aepidemiology/confoundinginteractionsmethods

Hill, R. W., & Yousey, G. P. (1998). Adaptive and maladaptive narcissism among university faculty, clergy, politicians, and librarians. *Current Psychology, 17*, 163–188.

Hilton, E.C., Tomko, M.E., Murphy, A.R., Nagal, R., & Linsey, J.S. (2018). Impacts on design self-efficacy for students choosing to participate in a university makerspace.

Hoffman, R., & Elliott, L. (2010). Using Scenario-Based Envisioning to Explore Wearable Flexible Displays. ERGONOMICS IN DESIGN, (4). 4-8.

Hofstede Insights. (2023). *Country comparison tool*. Retrieved from https://www.hofstede-insights.com/country-comparison-tool

Holak, S.L., & Lehmann, D.R. (1990). Purchase intentions and the dimensions of innovation: an exploratory model. *Journal of Product Innovation Management, 7*(1), 59-73.

Holbrook, M. B. (1999). Consumer Value: A Framework for Analysis and Research.

Holbrook, M. B. (2005). Customer value and autoethnography: Subjective personal introspection and the meanings of a photograph collection. *Journal of Business Research, 58*(1), 45–61.

Holland, J. L. (1966). *The Psychology of Vocational Choice: A Theory of Personality Types and Model Environments*. Oxford: Blaisdell.

Holland, J. L. (1985). *Making vocational choices: a theory of vocational personalities and work environments*. Englewood Cliffs: Prentice-Hall.

Holtzblatt, K. (2015). *What makes things cool?* Retrieved from https://www.ebsco.com/blog/article/whatmakesthingscool

Hong, J. (2013). Considering privacy issues in the context of google glass. *Communications of the ACM. 56*. 10-11.

Hornbæk, K. (2008). Usability evaluation as idea generation. In E. Hvannberg, & E. Law (Ed.) *Maturing Usability: Quality in Software, Interaction and Value* (pp. 267-286). London: Springer.

Hox, J. J. & Bechger, T. M. (1998). An introduction to structural equation modeling. *Family Science Review, 11,* 354-373.

Hsiao, H. H., Hsiao, S. W., & Liang, S. M. (2016). Improving product based affordance with fuzzy theory for product development strategy. *International Journal of Production, 54*(18), 5522-5533.

Hsiao, K. (2017). What drives smartwatch adoption intention? Comparing apple and non-apple watches. *Library Hi Tech, 35*(1), 186-206.

Hu, T., Xiao, H., Nguyen, T. T., & Luo, J. (2017). What the language you tweet says about your occupation. *Proceedings of the International AAAI Conference on Web and Social Media, 10*(1).

Huang, E. (2008). Use and gratification in e-consumers. Internet Research, 18(4), 405-426.

Huang, W. Y. & Dubinsky, A. J. (2014). Measuring customer pre-purchase satisfaction in a retail setting. *The Service Industries Journal, 34*(3), 212-229.

Huang, Y. P. (2012). *Diffusion innovation, perceived usefulness, perceived ease of use, and user acceptance of information technology.* Proceedings of the 11th International Conference on e-Learning, e-Business, Enterprise Information Systems, and e-Government.

Huang, Y., Hong, J., & Chang, H. H. (2015). The impact of power on reliance on feelings versus reasons in decision making. *Asia-Pacific Advances in Consumer Research, 11*(156). Research Collection, Lee Kong Chian School Of Business, Singapore Management University.

Huang, Y., Pan, L., Wang, Y., Yan, Z., Chen, Y., Hao, X., & Xia, T. (2023). Exploring the user acceptance of online interactive mechanisms for live-streamed teaching in higher education institutions. *Sustainability, 15*(18), Article 13529.

Hur, W., Yoo, J., & Chung, T. (2012). The consumption values and consumer innovativeness on convergence products. *Industrial Management & Data Systems, 112*(5), 688-706.

IDC. (2018, June). New wearables forecast from IDC shows smartwatches continuing their ascendance while wristbands face flat growth. *International Data Corporation*. Retrieved from https://www.idc.com/getdoc.jsp?containerId=prUS44000018

Im, S., & Workman, J. (2004). Market orientation, creativity, and new product performance in high-technology firms. *Journal of Marketing, 68*, 114-132.

Iqbal, S., & Zeeshan, A. B. (2015). An investigation of university student readiness towards M-learning using technology acceptance model. *International Review of Research in Open and Distance Learning, 16*(4).

Jamison, K. R. (1989). Mood disorders and patterns of creativity in British writers and artists. *Psychiatry, 52*, 125–134.

Jha, S., & Adhikari, A. (2016). Goal congruence in hedonistic and utilitarian reasons for purchase and features of a product. South Asian Journal of Management, 23(2), pp.72-89.

John, O. P., & Srivastava, S. (1999). The big five trait taxonomy: History, measurement, and theoretical perspectives. In Pervin, L. A., & John, O. P. (Eds.), *Handbook of personality (pp. 102–138)*. New York, NY: Guilford Press.

Jones, M. A., Mothersbaugh, D. L. & Beatty, S. E. (2000). Switching barriers and repurchase intentions in services. *Journal of Retailing, 79*(2), 259-274.

Joo, J., & Sang, Y. (2013). Exploring Koreans' smartphone usage: An integrated model of the technology acceptance model and uses and gratifications theory. Computers in Human Behavior, 29(6), pp.2512-2518.

Jung, Y. (2014). What a smartphone is to me: Understanding user values in using smartphones. *Information Systems Journal, 24*(4), 299-321.

Kalafatis, S., Ledden, L., & Mathioudakis, A. (2010, June 22). *Re-specification of the theory of consumption values* [Paper presentation]. Emerging Issues in Business and Law, Kingston upon Thames, U.K.

Kanwit, G. (2023, August 28). Is China still a developing country?. *Voice of America*. Retrieved from https://www.voanews.com/a/is-china-still-a-developing-country/7244652.html

Karlsen, J. I. (1991). Action research as method: Reflections from a program for developing methods and readings competence. In W. F. Whyte (Ed.), *Participatory action research* (pp. 143-157), Newbury Park, CA: Sage.

Kasirye, F. (2021). The importance of needs in Uses and Gratification Theory (Version2). *Advance.*

Kenny, D. A. (1987). *Statistics for the social and behavioral sciences* (p.215). Boston: Little, Brown.

Khalaj, J., & Pedgley, O. (2019). A semantic discontinuity detection (SDD) method for comparing designers' product expressions with users' product impressions. *Design Studies, 62*(5), 36-67.

Kim, A., Luan, L., & Zipser, D. (2019). The Chinese luxury consumer. *The McKinsey Quarterly, 2019 September*.

Kim, B., & Han, I. (2009). What drives the adoption of mobile data services? An approach from a value perspective. *Journal of Information Technology, 24,* 35-45.

Kim, H. W., Chan, H. C., & Gupta, S. (2007). Value-based adoption of mobile internet: An empirical investigation. *Decision Support Systems, 43*(1), 111-126.

Kim, K. J., & Shin, D. H. (2015). An acceptance model for smart watches: Implications for the adoption of future wearable technology, *Internet Research, 25*(4), 527-541.

King, L., Walker, M. L., & Broyles, S. J. (1996). Creativity and the Five-Factor Model. Journal of Research in Personality, 30, 189–203.

Kitzinger, J. (1995). Qualitative research: Introducing focus groups. *British Medical Journal, 311(7000),* 299-302.

Kline, R. B. (2011). *Principles and practice of structural equation modeling (3rd ed.).* New York: Guildford.

Knijnenburg, B. P., Willemsen, M. C., Gantner, Z., Soncu, H., & Newell, C. (2012). Explaining the user experience of recommender systems. *User Modeling and User-Adapted Interaction, 22,* 441-504.

Knox, K. (2004). A researcher's dilemma – Philosophical and methodological pluralism. *Electronic Journal of Business Research Methods, 2*(2), 119-128.

Ko, H., Cho, C. H., & Roberts, M. S. (2005). Internet uses and gratifications: A structural equation model of interactive advertising. *Journal of Advertising, 34*(2), 57-70.

Ko, Y. H., Lai, Y. Y., & Yang, P. L. (2018). Exploring the effect of personality traits and the mediation effect of attendance rate on English language learning performance. Journal of Education Theory and Practice, Vol. 38.

Kotler, P., & Keller, K., (2012). *Marketing Management.* NJ: Prentice Hall.

Kourouthanassis, P., Boletsis, C., Bardaki, C., & Chasanidou, D. (2015). Tourists' responses to mobile augmented reality travel guides: The role of emotions on adoption behaviour. *Pervasive and Mobile Computing, 18,* 71-87.

Kraft, C. (2012). *User experience innovation: User centered design that works.* New York: Apress.

Kreifeldt, J. G. (2000). Ergonomic Product Design Course Format (ENP 161 – Human factors in product design) [Science Database]. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting 2000, 2.*

Krey, N., Stephanie Hui-Wen Chuah, Ramayah, T., & Rauschnabel, P. A. (2019). How functional and emotional ads drive smartwatch adoption: The moderating role of consumer innovativeness and extraversion. *Internet Research, 29*(3), 578-602.

Krippendorff, K. (1990). Product semantics: A triangulation and four design theories, In S. Vakeva (Ed.), *Product Semantics '89: Proceedings from the Products Semantics '89 Conference, 16-19 May (*pp. a1-a23). Helsinki: University of Industrial Arts.

Krippendorff, K. (2006). *The semantic turn: A new foundation for design*. Taylor & Francis.

Krippendorff, K., & Butter, R. (1984). Product semantics: Exploring the symbolic qualities of form. *Innovation, 3*(2), pp.4-9.

Kurt, S. (2021). *McClelland's Three Needs Theory: Power, achievement, and affiliation.* Retrieved from https://educationlibrary.org/mcclellands-three-needs-theory-power-achievement-and-affiliation/

Kwon, J., Lee, M., & Kim, H-R. (2014). Does a Creative Designer Necessarily Translate into the Creative Design of a Product? Exploring Factors Facilitating the Creativity of a New Product. *Creativity and Innovation Management, 24*(4), 675–692.

Kwon, K. S. (1999). Human Sensibility ergonomics in product design. *International Journal of Cognitive Ergonomics, 3*(1), pp.51-62.

Kwon, K. S. (1999). Human Sensibility ergonomics in product design. *International Journal of Cognitive Ergonomics, 3*(1), 51-62.

Kyngäs, H., Kääriäinen, M., & Elo, S. (2020). *The trustworthiness of content analysis.*

Lai, A. W. (1995). Consumer values, product benefits and customer value: A consumption behavior approach. *Advances in Consumer Research, 22,* 381-388.

Lai, J., & Tam, M. (2011). The moderating effects of purchase importance in customer satisfaction process: An empirical investigation. *Journal of Consumer Behaviour, 10,* 205-215.

Lam, S. Y. & Mukherjee, A. (2005). The effects of merchandise Coordination and juxtaposition on consumers' product evaluation and purchase intention in store-based retailing. *Journal of Retailing, 81*(3), 231-250.

LaMere, K., Mäntyniemi, S., Vanhatalo, J., & Haapasaari, P. (2020). Making the most of mental models: Advancing the methodology for mental model elicitation and documentation with expert stakeholders. *Environmental Modelling & Software, 124*.

Laming, C., & Mason, K. (2014). Customer experience – An analysis of the concept and its performance in airline brands. *Research in Transportation Business & Management, 10,* 15–25.

Landers, R. N. (2020). *Calculating LongString in Excel to detect careless responders. NeoAcademic*. Retrieved from https://neoacademic.com/2016/12/21/calculating-longstring-excel-detect-careless-responders/

Landwehr, J. R., Wentzel, D., & Herrmann, A. (2012). The tipping point of design: How product design and brands interact to affect consumers' preferences. *Psychology and Marketing, 29*(6), 422-433.

Langdon, P., Persad, U., & John Clarkson, P. (2010). Developing a model of cognitive interaction for analytical inclusive design evaluation. *Interacting with Computers, 22*(6), 510–529.

Lanz, L., Thielmann, I., & Gerpott, F. H. (2022). Are social desirability scales desirable? A meta-analytic test of the validity of social desirability scales in the context of prosocial behavior. *Journal of Personality, 90*, 203– 221.

Latif, K. F., Sajjad, A., Bashir, R., Shaukat, M. B., Khan, M.B., & Sahibzada, U.F. (2020). Revisiting the relationship between corporate social responsibility and organizational performance: The mediating role of team outcomes. *Corporate Social Responsibility and Environmental Management 2020*, 1–12.

Lee, H. (2013). Predicting and Understanding undergraduate students' intentions to gamble in a casino using an extended model of the Theory of Reasoned Action and the Theory of Planned Behavior. *Journal of Gambling Studies, 29*(2), 269-288.

Lee, H. S. & Mahony, M. O. (2004). Sensory evaluation and marketing: Measurement of a consumer concept. *Food Quality and Preference, 16,* 227-235.

Lee, Y., Hsieh, Y., & Hsu, C. N. (2011). Adding innovation diffusion theory to the technology acceptance model: Supporting employees' intentions to use e-learning systems. *Journal of Educational Technology & Society, 14*(4), 124-137.

Leech, J. (2013). *Psychology for designers*. Penarth: Five Simple Steps.

Leech, J. (2016), March. *Designing user interfaces using psychological principles*. User Experience Hong Kong 2016.

Leung, L. and R. Wei (2000) 'More Than Just Talk on the Move: Uses and Gratifications of the Cellular Phone', *Journalism and Mass Communication Quarterly* 77(2): 308–20.

Lewis, J. R. (2014). Usability: Lessons learned … and yet to be learned. *International Journal of Human-Computer Interaction, 30*(9), 663–684.

Liao, G., Chien, Y., Chen, Y., Hsiung, H., Chen, H., Hsieh, M., & Wu, W. (2017). What to Build for Middle-Agers to Come? Attractive and Necessary Functions of Exercise-Promotion Mobile Phone Apps: A Cross-Sectional Study. *JMIR mHealth and uHealth, 5*(5), 1-23.

Lidwell, W., Holden, K., & Butler, J. (2010). *Universal principles of design: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design*. Beverly, Massachusetts: Rockport Publishers.

Liébana-Cabanillas, F., Sánchez-Fernández, J., & Muñoz-Leiva, F. (2014). The moderating effect of experience in the adoption of mobile payment tools in Virtual Social Networks: The m-Payment Acceptance Model in Virtual Social Networks (MPAM-VSN). *International Journal of Information Management, 34*(2), 151–166.

Lilienfeld, Scott O., Lynn, Steven Jay, Lohr, Jeffrey M. (2014). *Science and Pseudoscience in Clinical Psychology*. Guilford Publications. ISBN 978-1462517510.

Liljedal, K. T. (2016). The effects of advertising consumer co-created new products. *Journal of Advertising Research, 56*(1), 53–63.

Lin, C., Baruch, Y., & Shih, W. (2012). Corporate social responsibility and team performance: The mediating role of team efficacy and team self-esteem: *Journal of Business Ethics, 108*(2), 167-180.

Lin, J. Y. 林季誼. (2007). *The current situation of illustrator incubation in colleges and universities in Taiwan 台灣各大學院校插畫人才培育之現況.* Taiwan: National Taiwan University of Science and Technology台灣: 國立台灣科技大學. Retrieved from http://pc01.lib.ntust.edu.tw/ETD-db/ETD-search/view_etd?URN=etd-0724107-130415

Lincoln, Y., & Guba, E. (1986). But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New Directions for Program Evaluation, Vol.30.*

Lottum, C. et al. (2006). Features of Kansei engineering characterizing its use in two studies: Men's everyday footwear and historic footwear. *Quality Reliability Engineering International, 22*(6), 629-650.

Malterud, K., Siersma, V., & Guassora, A. (2015). Sample size in qualitative interview studies: Guided by information power. *Qualitative Health Research, 1*.

Mandal, A. (2021). What is Efficacy?. News-Medical. Retrieved from https://www.news-medical.net/health/What-Does-Efficacy-Mean.aspx.

Manoogian, J. (2016). *Cognitive bias codex*. Design Hacks.

Markus, H. R., & Kitayama, S. (2010). Culture and self: A cycle of mutual constitution. *Perspectives on Psychological Science, 5*, 420–430.

Mason, M. (2010, August). Sample size and saturation in PhD studies using qualitative interviews. *Forum: qualitative social research, 11*(3).

McCrae, R. R. (1989). Why I advocate the Five-Factor Model: Joint analyses of the NEO-PI and other instruments, in D.M. Buss and N. Cantor (eds). Personality Psychology: Recent Trends and Emerging Directions. New York: Springer-Verlag, pp. 237–45.

McCrae, R. R., & Costa, Paul. (2008). Empirical and theoretical status of the five-factor model of personality traits. Sage handbook of personality theory and assessment, 1, pp.273-294.

McCrae, R., & John, O.P. (1992). An introduction to the five-factor model and its applications. *Journal of personality, 60*(2), 175-215 .

McCrae, Robert R., Costa, Paul T. (1989). "Reinterpreting the Myers-Briggs Type Indicator from the perspective of the Five-Factor Model of Personality*". Journal of Personality. 57*(1), 17–40.

McFadden, D. (1986). The choice theory approach to marketing research. *Marketing Science, 5*(4), 275-298.

Mehta, P.D. (2001). Control variables in research. In N. J. Smelser, & P. B. Baltes (Eds.), *International Encyclopedia of the Social & Behavioral Sciences* (pp. 2727-2730). Pergamon.

Meister, D. (1999). *The history of human factors and ergonomics*. Mahwah, N.J.: Lawrence Erlbaum Associates.

Mercun, T., Zumer, M., & Aalberg, T. (2017). Presenting bibliographic families using information visualization: Evaluation of FRBR-based prototype and hierarchical visualizations. Journal of The Association for Information Science and Technology, 68(2), 392-411.

Merriam-Webster Dictionary. (n.d.-a). Designer. In *Merriam-Webster.com dictionary*. Retrieved February 19, 2022, from https://www.merriam-webster.com/dictionary/designer

Merriam-Webster Dictionary. (n.d.-b). User. In *Merriam-Webster.com dictionary*. Retrieved February 19, 2022, from https://www.merriam-webster.com/dictionary/user

Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American Psychologist. 50*(9).

Meurzec, R. W., Koh, B., Koronis, G., Kang, J. K. S., Yogiaman, C., & Silva, A. (2019). Assessing regulatory focus differences in creative ideation: An examination of prevention and promotion mindsets on novelty and usefulness. *Cambridge University Press*.

Meuter, M. L., Bitner, M. J., Ostrom, A. L., & Brown, S. W. (2005). Choosing among alternative service delivery modes: An investigation of customer trial of self-service technologies. *Journal of Marketing, 69*(2), 61-83.

Middleton, C., Scheepers, R., & Tuunainen, V. K. (2014). When mobile is the norm: Researching mobile information systems and mobility as post-adoption phenomena. *European Journal of Information Systems, 23*(5), 503-512.

Mieczakowski, A., Langdon, P. M., Bracewell, R. H., Patmore, J. J., & Clarkson, P. J. (2012). Understandable by Design: How can products be designed to align with user experience? *Designing Inclusive Systems,* 133–142.

Mieczakowski, A., Langdon, P., & Clarkson, P. J. (2013). Investigating designers' and users' cognitive representations of products to assist inclusive interaction design. *Universal Access in the Information Society, 12*(3), 279-296.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook (2nd ed.)*. Thousand Oaks, CA: Sage.

MindMapping.com. (2022). *What is a Mind Map?* Retrieved from https://www.mindmapping.com/mind-map

MindTools. (2022). SCAMPER: Improving Products and Services. Retrieved from https://www.mindtools.com/pages/article/newCT_02.htm

Mishra, A. (2016). Attribute-based design perceptions and consumer-brand relationship: Role of user expertise. *Journal of Business Research, 69*(12), 5983-5992.

Mochimaru, M., Takahashi, M., Hatakenaka, N., & Horiuchi, H. (2012). Questionnaire survey of customer satisfaction for product categories towards certification of ergonomic quality in design. *Work, 41,* 956-959.

Mono, R. (1997). *Design for product understanding*. Sweden: Liber.

Moon, J. W., An, Y., & Norman, W. (2022). Exploring the application of the uses and gratifications theory as a conceptual model for identifying the motivations for smartphone use by e-tourists. *Tourism Critiques, 3*(2), 102-119.

Morville, P. (2004). *User experience design*. Retrieved from http://semanticstudios.com/user_experience_design/

Mouri, N. (2005). *A consumer-based assessment of alliance performance: An examination of consumer value, satisfaction and post-purchase behavior.* Dissertation. Department of Marketing, College of Business Administration, University of Central Florida.

Mugge, R., Schifferstein, H. N. J., & Schoormans, J. P. L. (2010). Product attachment and satisfaction: Understanding consumers' post-purchase behavior. *Journal of Consumer Marketing, 27*(3), 271-282.

Muratovski, G. (2016). *Research for Designers: A Guide to Methods and Practice.* London: Sage.

Muratovski, G., & Friedman, K. (2022). *Research for Designers: A Guide to Methods and Practice, 2nd Edition.* London: Sage

Myers, I. B., Myers, P. B. (1995) [1980]. *Gifts Differing: Understanding Personality Type*. Mountain View, CA: Davies-Black Publishing. ISBN 978-0-89106-074-1.

Myers-Briggs Type Indicator® (MBTI®). (2021). Official Myers Briggs Personality Test. www.themyersbriggs.com.

Nagamachi, M. (2010). *Kansei/Affective Engineering*. Taylor and Francis Group.

Nanda, P., Bos, J., Kramer, K., Hay, C., & Ignacz, J. (2008). Effect of smartphone aesthetic design on users' emotional reaction: An empirical study. *The TQM Journal, 20*(4), 348-355.

Nettle, D. (2005). Psychological profiles of professional actors. *Personality and Individual Differences, 40* (2006), 375–383.

Nettle, D. (2006). Schizotypy and mental health amongst poets, visual artists, and mathematicians, *Journal of Research in Personality, 40*(6), 876-890.

Newcomb, A. (2015). *From 'glassholes' to privacy issues: The troubled run of the first edition of Google Glass*. Retrieved from https://abcnews.go.com/Technology/glassholes-privacy-issues-troubled-run-edition-google-glass/story?id=28269049

Newzoo. (2021). Global Mobile Market Report.

Nichols, B. S. & Schumann, D. W. (2012). Consumer preferences for assimilative versus aspirational models in marketing communications: The role of product class, individual difference, and mood state. *Journal of Marketing Theory and Practice, 20*(4)*,* 359-375.

Nickitina, O. (2023). Spiritual intelligence as a predictor of creative self-beliefs. Dissertation. *ProQuest Dissertations & Theses Global*, 2760002599.

Nielsen, J. (1995). *10 usability heuristics for user interface design*. Retrieved from https://www.nngroup.com/articles/tenusabilityheuristics/

Nielson, J. (2001). *Are Users Stupid?.* Retrieved from https://www.nngroup.com/articles/are-users-stupid/

Nielson, J. (2008). *Bridging the Designer-User Gap*. Retrieved from https://www.nngroup.com/articles/bridging-the-designer-user-gap/

Norman, D. A. (1983). Some observations on mental models. In D. Gentner, & A. Stevens (Ed.), *Mental Models (*pp. 7-14*).* Hillsdale, NJ: Erlbaum.

Norman, D. A. (1988). *The psychology of everyday things*. New York: Basic Books.

Norman, D. A. (2004). *Emotional design: Why we love (or hate) everyday things*. New York: Basic Books.

Norman, D. A. (2013). *The design of everyday things: Revised and expanded edition*. New York: Basic Books.

Norman, D. A., & Nielsen, J. (2016). *The definition of user experience*. Retrieved from https://www.nngroup.com/articles/definition-user-experience/

O'Brien, R. (2001). Um exame da abordagem metodológica da pesquisa ação [An Overview of the Methodological Approach of Action Research]. In Roberto Richardson (Ed.), *Teoriae Prática da Pesquisa Ação [Theory and Practice of Action Research].* João Pessoa, Brazil: Universidade Federal da Paraíba. (English version).

Oe, H., Yamaoka, Y., & Sato, K. (2022). Liquid consumption of smartphones as devices for enhancing personal experiences: What do consumers expect from their smartphones and what makes them make purchasing decisions?. *Journal of Management Information and Decision Sciences, 25*(S6), 1-15.

Oe, H., Yamaoka, Y., & Sato, K. (2022). Liquid consumption of smartphones as devices for enhancing personal experiences: What do consumers expect from their smartphones and what makes them make purchasing decisions?. *Journal of Management Information and Decision Sciences, 25*(S6), 1-15.

Oliveira, T., Thomas, M., Baptista, G., & Campos, F. (2016). Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology. *Computers in Human Behavior, 61*, 404–414.

Oliver, R. L. & Swan, J. E. (1989). Consumer perceptions of interpersonal equity and satisfaction in transactions: A field survey approach. *Journal of Marketing, 53*(2), 21-35.

Olson, J. C., & Reynolds, T. J. (1983). Understanding consumers' cognitive structures: Implications for marketing strategy. In L. Percy, & A. G. Woodside (Ed.), *Advertising and Consumer Psychology* (pp. 51-57). Lexington, MA: Lexington Books.

Oran, D. P. (1991). Apply psychology to product design. *Machine Design, 63*(22), 37.

Oxford Learner's Dictionaries. (n.d.-a). Designer. In *Oxford Learner's Dictionaries.* Retrieved February 19, 2022, from https://www.oxfordlearnersdictionaries.com/definition/english/designer_1?q=designer

Oxford Learner's Dictionaries. (n.d.-b). User. In *Oxford Learner's Dictionaries.* Retrieved February 19, 2022, from https://www.oxfordlearnersdictionaries.com/definition/english/user?q=user

Ozcan, Yusuf & Kocak, Abdullah. (2003). Research Note: A Need or a Status Symbol? Use of Cellular Telephones in Turkey. European Journal of Communication - EUR J COMMUN. 18. 241-254. 10.1177/0267323103018002004.

Pagani, M. (2007). A vicarious innovativeness scale for 3g mobile services: Integrating the domain specific innovativeness scale with psychological and rational indicators. *Technology Analysis & Strategic Management, 19*(6), 709–728.

Paharia, N., & Swaminathan, V. (2019). Who is wary of user design? The role of power-distance beliefs in preference for user-designed products. *Journal of Marketing, 83*(3), 91–107.

Pallant, J. (2007). *SPSS survival manual*. Maidenhead, England: Open University Press.

Pardee, R. L. (1990). *Motivation Theories of Maslow, Herzberg, McGregor & McClelland. A Literature Review of Selected Theories Dealing with Job Satisfaction and Motivation.* Retrieved from https://eric.ed.gov/?id=ED316767

Park, J., & Han, S. H. (2013). Defining user value: A case study of a smartphone. *International Journal of Industrial Ergonomics, 43,* 274-282.

Parrish, P. (2006). Design as storytelling. *TechTrends, 50*(4), 72–82.

Patel, N. V. (2017). How Google Glass EE evades privacy questions that doomed the original. Retrieved from https://www.inverse.com/article/35199-google-glass-enterprise-edition-privacy-questions

Patil, P., Tamilmani, K., Rana, N. P., & Raghavan, V. (2020). Understanding consumer adoption of mobile payment in India: Extending Meta-UTAUT model with personal innovativeness, anxiety, trust, and grievance redressal. *International Journal of Information Management, 54*, Article 102144.

Paulhus, D. L. (1984). Two-component models of socially desirable responding. *Journal of personality and social psychology, 46*(3), 598.

PCPD. (2022). Personal Information Protection Law of the Mainland. Office of the Privacy Commissioner for Personal Data, Hog Kong. Retrieved from https://www.pcpd.org.hk/english/data_privacy_law/mainland_law/mainland_law.html

Pervin, L. A. (1994). A critical analysis of current trait theory. *Psychological Inquiry, 5*(2), 103–113.

Peter, J. P. & Olson, J. C. (1999). Introduction to affect and cognition. *Consumer behavior and marketing strategy*. McGraw-Hill Irwin.

Petiot, J-F., & Yannou, B. (2003). *How to comprehend and assess product semantics – A proposal for an integrated methodology*. Proceedings of the 14th International Conference on Engineering Design, Stockholm, Sweden, 19-21 August.

PolyU Design. (2016a). *Interaction Design (MDes).* Retrieved from http://www.sd.polyu.edu.hk/en/study-detail/interaction-design

PolyU Design. (2023a). *Innovative Business Design (MDes).* Retrieved from https://www.polyu.edu.hk/sd/study/tpg/innovative-business-design/programme-structure/

PolyU Design. (2023b). *Intelligent Systems Design (MDes).* Retrieved from https://www.polyu.edu.hk/sd/study/tpg/intelligent-systems-design/programme-structure/

PolyU Design. (2023c). *Smart Service Design (MDes).* Retrieved from https://www.polyu.edu.hk/sd/study/tpg/smart-service-design/programme-structure/

PolyU Design. (2023d). *Transitional Environments Design (MDes).* Retrieved from https://www.polyu.edu.hk/sd/study/tpg/transitional-environments-design/programme-structure/

PolyU Design. (2016b). *Multimedia and Entertainment Technology (MSc).* Retrieved from http://www.sd.polyu.edu.hk/en/study-detail/multimedia-and-entertainment-technology

PolyU Design. (2023e). *Innovative Multimedia Entertainment (MSc).* Retrieved from https://www.polyu.edu.hk/sd/study/tpg/innovative-multimedia-entertainment/programme-structure/

Poor, G. M., Jaffee, S. D., Leventhal, L. M., Ringenberg, J., Klopfer, D. S., Zimmerman, G., & Klein, B. A. (2016). Applying the Norman 1986 user-centered model to post-WIMP UIs: Theoretical predictions and empirical outcomes. *ACM Transactions on Computer-Human Interaction, 23*(5), Article 30, 1-33.

Powers, W. T. (1973). Behavior: The control of perception. Chicago: Aldine.

Powers, W. T. (1991). Commentary on Bandura's "human agency". *American Psychologist, 46*(2), 151-153.

Qazi, A., Raj, R. G., Tahir, M., Waheed, M., Khan, S. U. R., & Abraham, A. (2014). A preliminary investigation of user perception and behavioral intention for different review types: Customers and designers perspective. *The Scientific World Journal, 2014,* Article ID 872929, 8 pages.

Quiñones, D., & Rojas, L. (2023). Understanding the customer experience in human-computer interaction: a systematic literature review. *PeerJ Computer Science, 9*, e1219.

Quiñones, D., & Rojas, L. (2023). Understanding the customer experience in human-computer interaction: a systematic literature review. *PeerJ Computer Science*, *9*, e1219.

Rammstedt, B., & John, O.P. (2007). Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German. *Journal of Research in Personality, 41*(1), 203-212.

Rauschnabel, P., & Ro, Y. K. (2016). Augmented Reality Smart Glasses: An investigation of Technology Acceptance Drivers. *International Journal of Technology Marketing. 11*. 123-148.

Rauschnabel, P., Brem, A., & Ivens, B. S. (2015). Who will buy smart glasses? Empirical results of two pre-market-entry studies on the role of personality in individual awareness and intended adoption of Google Glass wearables. *Computers in Human Behavior, 49,* 635-647.

Read, W., Robertson, N., & McQuilken, L. (2011). A novel romance: The technology acceptance model with emotional attachment. *Australasian Marketing Journal, 19*(4), 223-229.

Red Dot. (2018, September 3) Red Dot Design Award: Apple Watch. *Red Dot Design Award.* Retrieved from https://www.red-dot.org/project/apple-watch-10510/

Rellinger, B. A. (2014). *The diffusion of smartphones and tablets in higher education: A comparison of faculty and student perceptions and uses. Dissertation*. Bowling Green State University.

Retorio. (2022). *What's the Difference Between the Big 5, the Enneagram, and MBTI?* Retrieved from https://www.retorio.com/blog/pre-employment-assessment-big-5

Reynolds, T. J., & Gutman, J. (1988). Laddering theory, method, analysis, and interpretation. *Journal of Advertising Research, 28,* 11-31.

Reynolds, T. J., & Olson, J. C. (2001). *Understanding consumer decision making: The means-end approach to marketing and advertising strategy.* Mahwah, NJ: Erlbaum.

Reynolds, W. (1982). Development of reliable and valid short forms of the Marlow-Crowne Social Desirability Scale. *Journal of Clinical Psychology, 38*, 119-125.

Rigotti, T., Schyns, B., & Mohr, G. (2008). A short version of the occupational self-efficacy scale: Structural and construct validity across five countries. *Journal of Career Assessment, 16*(2), 238–255.

Rijsdijk, S.A., Hultink, E.J., & Diamantopoulos, A. (2007). Product intelligence: Its conceptualization, measurement and impact on consumer satisfaction. *Journal of the Academy of Marketing Science, 35*(3), 340-356.

Rimal, R., & Juon, H. (2010). Use of the risk perception attitude framework for promoting breast cancer prevention. *Journal of Applied Social Psychology. 40*. 287-310.

Rivas, A. A., Liao, Y. K., Vu, M. Q., & Hung, C. H. (2022). Toward a comprehensive model of green marketing and innovative green adoption: Application of a Stimulus-Organism-Response Model. *Sustainability, 14*(6), Article 3288.

Roccas, S., Sagiv, L., Schwartz, S. H., & Knafo, A. (2002). The Big Five Personality Factors and Personal Values. *Personality and Social Psychology Bulletin. 28* (6): 789–801.

Rodgers, P., & Milton, A. (2011). *Product Design*. Laurence King Publishing.

Rogers, E. M. (1983). *Diffusion of innovations* (3rd ed.). London: The Free Press.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). London: The Free Press.

Roos, J. M. (2023). The intersection of personality traits and social media usage: Large-scale representative samples of internet users in Sweden. *Psych, 5*(1), 70.

Rotondi, T. (1989). The anonymity factor in questionnaires surveys. *Personnel Journal, February 1989,* 92-99.

Rubin, A. M. (1984). Ritualized and instrumental television viewing. *Journal of Communication, 34*(3), 67-77.

Ruel, E., Wagner, W., & Gillespie, B. (2016). *The practice of survey research*. SAGE Publications.

Russell, C. A. (2002), Investigating the effectiveness of product placements in television shows: The role of modality and plot connection congruence on brand memory and attitude. *Journal of Consumer Research, 29*(3), 306-318.

Rusu, V., Rusu, C., Botella, F., Quiñones, D., Bascur, C., & Rusu, V.Z. (2020). Customer eXperience: A bridge between service science and human-computer interaction. In: Ahram, T., Karwowski, W., Pickl, S., & Taiar, R. (eds.) *Human Systems Engineering and Design II. IHSED 2019. Advances in Intelligent Systems and Computing, vol. 1026*, pp. 385–390. Cham: Springer.

Rusu, V., Rusu, C., Matus, N., & Botella, F. (2023). Tourist experience challenges: A holistic approach. *Sustainability (Switzerland), 15*(17), Article 12765.

Rusu, V., Rusu, C., Matus, N., & Botella, F. (2023). Tourist experience challenges: A holistic approach. *Sustainability (Switzerland), 15*(17), Article 12765.

Sabiescu, A. G., David, S., van Zyl, I., & Cantoni, L. (2014). Emerging spaces in community-based participatory design. *Proceedings of the 13th Participatory Design Conference on Research Papers - PDC '14*.

Salazar, K. (2019, updated 2023). *User experience vs. customer experience: what's the difference?* https://www.nngroup.com/articles/ux-vs-cx/?fbclid=IwAR3_W0_DVf5UKcG_dT4mrajTRniZ8CNFC3RfxvM9vttwzyYqfk0PJtpES7s

Salmon, P. M., Stanton, N. A., & Walker, G. H. (2007). *Human factors methods: A practical guide for engineering and design.* Ashgate Publishing.

Salvendy, G. (2012). *Handbook of human factors and ergonomics* (4th ed.). John Wiley & Sons.

Sandelowski, M. (1995). Sample size in qualitative research. *Research in Nursing & Health, 18*, 179–183.

Sanders, L. (2008). An evolving map of design practice and design research. Interactions, XV.6, pp.13-17.

Sas, C., & Zhang, C. (2010). Do emotions matter in creative design?. In *Proceedings of the 8th ACM Conference on Designing Interactive Systems* (pp. 372-375). ACM.

Saunders, M., & Tosey, P. (2012). The layers of research design. *Rapport*, Winter 2012/2013, 58-59.

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students* (6th ed.). Pearson.

Schiffman, L. G, Hansen, H., & Kanuk, L. Lazar. (2012). *Consumer behaviour: A European outlook. 2nd ed.* Harlow, England: Pearson Financial Times / Prentice Hall.

Schimmack, U. (2019). A psychometric study of the NEO-PI-R. *Replicability-Index*. Retrieved from https://replicationindex.com/2019/08/23/a-psychometric-study-of-the-neo-pi-r/

Schyns, B., & von Collani, G. (2002). A new occupational self-efficacy scale and its relation to personality constructs and organizational variables. *European Journal of Work and Organizational Psychology, 11*(2), 219–241.

Scott, J. (1991). *Social network analysis: A handbook.* London: Sage Publications.

Seeger, J. D. (2018). Analytical approaches for post-authorization safety studies. In A. K. Ali, & A. G. Hartzema (Eds.), *Post-Authorization Safety Studies of Medicinal Products* (pp. 167–221). Academic Press.

Sethi, R., Smith, D. C., & Park, C. W. (2001). Cross-functional product development teams, creativity, and the innovativeness of new consumer products. *Journal of Marketing Research, 38* (February), 73–85.

Sharwood, S. (2017, Aug 3). Developing world hits 98.7 per cent mobile phone adoption – 200 million more to come online in 2017 as 30 million ditch the landline. *The Register*. Retrieved from https://www.theregister.co.uk/2017/08/03/itu_facts_and_figures_2017/

Shaw, C., & Ivens, J. (2002). *Building great customer experiences.* London: Palgrave.

Sheth, J. N., Newman, B. I., & Gross, B. L. (1991a). *Consumption values and market choices. Theory and applications*. Cincinnati, OH: South-Western Publishing Co.

Sheth, J. N., Newman, B. I., & Gross, B. L. (1991b). Why we buy what we buy: A theory of consumption values. *Journal of Business Research, 22*(2), 159–170.

Shiffler, R. E. (1988). Maximum Z Scores and Outliers. *The American Statistician, 42*(1), 79-80.

Shiv, B., & Huber, J. (2000). The impact of anticipating satisfaction on consumer choice. *Journal of Consumer Research, 27*(2), 202-216.

Shneiderman, B. (2004). Designing for fun: How can we design user interfaces to be more fun? *Interactions, 11*(5), 48-50.

Singh, A. (2013). *Managing emotion in design innovation*. Taylor and Francis Group.

Singh, N., Sinha, N., & Liébana-Cabanillas, F. J. (2020). Determining factors in the adoption and recommendation of mobile wallet services in India: Analysis of the effect of innovativeness, stress to use and social influence. *International Journal of Information Management, 50*, 191–205.

Siu, K. W. M. (2003). Users' creative responses and designers' roles. *Design Issues, 19*(2), 64–73.

Smith, R. A., & Biddle, S. H. (1999). Attitudes and exercise adherence: Test of the Theories of Reasoned Action and Planned Behaviour. Journal of Sports Sciences, 17(4), 269-281. doi:10.1080/026404199365993

Soltani, M., Jandaghi, G., & Shahraki, P.F. (2017). Co-Creation intention: Presenting a model of antecedents and its impact on attitude toward the product (case study in Shatel Company). *Iranian Journal of Management Studies, 10*, 143-174.

Sonderen, E. v., Sanderman, R., & Coyne, J. C. (2013). Ineffectiveness of reverse wording of questionnaire items: Let's learn from cows in the rain. *PLoS ONE 8*(7): e68967.

Song, W., Zhao, T., Huang, E., & Liu, W. (2022). How positive and negative emotions promote ritualistic consumption through different mechanisms. *Frontiers in Psychology, 13*, Article 901572.

Song, X., Jung, J., & Zhang, Y. (2021). Consumers' preference for user-designed versus designer-designed products: The moderating role of power distance belief. *Journal of Marketing Research, 58*(1), 163–181.

Soranzo, A., & Cooksey, D. (2015). Testing taxonomies: Beyond card sorting. *Bulletin of the American Society for Information Science and Technology (Online), 41*(5), 34-39.

Spangenberg, E. R., Voss, K. E., & Crowley, A. E. (1997). Measuring the hedonic and utilitarian dimensions of attitude: A generally applicable scale. *Advances in Consumer Research, 24*(1), 235-241.

Sparks, D. L., & Tucker, W. T. (1971). A multivariate analysis of personality and product use. Journal of Marketing Research (Pre-1986), 8(000001), p.67.

Sperber, A. (2004). Translation and Validation of Study Instruments for Cross-Cultural Research. *Gastroenterology, 126*, S124-8.

Spreng, R. A., MacKenzie, S. B., & Olshavsky, R. W. (1996). A reexamination of the determinants of consumer satisfaction. *Journal of Marketing, 60*(3), 15-32.

Sprott, D, Czellar, S., & Spangenberg, E. (2009), The importance of a general measure of brand engagement on market behavior: Development and validation of a scale. *Journal of Marketing Research*, 46(1), 92-104.

Stachl, C. et al. (2020). Predicting personality from patterns of behavior collected with smartphones. Proceedings of the National Academy of Sciences of the United States of America.

Stachl, C., Au, Q., Schoedel, R., Gosling, S.D., Harari, G.M., Buschek, D., Völkel, S.T., Schuwerk, T., Oldemeier, M., Ullmann, T., Hussmann, H., Bischl, B., & Bühner, M. (2020). Predicting personality from patterns of behavior collected with smartphones. *Proceedings of the National Academy of Sciences of the United States of America, 117*, 17680 - 17687.

Stachl, C., Hilbert, S., Au, Q., Buschek, D., De Luca, A., Bischl, B., Hussmann, H., & Buehner, M. (2017). Personality traits predict smartphone usage. *European Journal of Personality, 31*(6), pp.701–722.

Stahl, N. A., & King, J. R. (2020). Understanding and Using Trustworthiness in Qualitative Research. *Journal of Developmental Education, 44*(1), pp26-28.

Stanton, H., Back, K. W., & Litwak, E. (1956). Role-Playing in Survey Research. *American Journal of Sociology, 62*(2), 172–176.

Statista. (2023, September 25). *Smartphone market share in China by leading vendor from 2014 to 2022*. Retrieved from https://www.statista.com/statistics/528833/smartphone-market-share-in-china-by-vendor/

Statistica. (2016). *How to find relationship between variables, Multiple Regression*. Retrieved from http://www.statsoft.com/Textbook/MultipleRegression

Statistics Solutions. (2016). *Structural Equation Modeling*. Retrieved from http://www.statisticssolutions.com/structuralequationmodeling/

Stayman, D. M., Alden, D. L., & Smith, K. H. (1992). Some effects of schematic processing on consumer expectation and disconfirmation judgements. *Journal of Consumer Research, 19*(2), 240–255.

Stibe, A. & Oinas-Kukkonen, H. (2014). Designing persuasive systems for user engagement in collaborative interaction. *Proceedings of the European Conference on Information Systems (ECIS) 2014, Tel Aviv, Israel, 9-11 June*.

Stone, D. N. (1994). Overconfidence in Initial Self-Efficacy Judgments: Effects on Decision Processes and Performance. *Organizational Behavior and Human Decision Processes, 59*(3), 452-474.

Strategy Analytics. (2022, June 29). *Smartphone replacement cycle recovery halted in 2022*. Retrieved from https://www.strategyanalytics.com/strategy-analytics/blogs/devices/smartphones/smart-phones/2022/06/29/smartphone-replacement-cycle-recovery-halted-in-2022

Susanto, A., Chang, Y., & Ha, Y. (2016). Determinants of continuance intention to use the smartphone banking services. *Industrial Management Data Systems, 116*(3), 508-525.

Sweeney, J. C., & Soutar, G. N. (2001). Consumer perceived value: The development of a multiple item scale, *Journal of Retailing, 77*(2), 203-220.

Tahir, A. W., & Syed, W. A. (2015). Innovation Diffusion Theory: Review & scope in the study of adoption of smartphone in India. *Journal of General Management Research, 3*(2), 102-118.

Thomas, T. D., Singh, L., & Gaffar, K. (2013). The utility of the UTAUT model in explaining mobile learning adoption in higher education in Guyana. *International Journal of Education and Development using Information and Communication Technology, 9*(3), 71-87.

Thompson, D. V., Hamilton, R. W., & Rust, R. T. (2005). Feature fatigue: When product capabilities become too much of a good thing. *Journal of Marketing Research, 42*(November), 431-442.

Tilley, A. R. & Henry Dreyfuss Associates. (1993). *The measure of man and woman: Human factors in design*. Watson-Guptill.

Travis, J., & Bunde, J. (2022). Self-regulation in college: The influence of self-efficacy, need satisfaction, and stress on GPA, persistence, and satisfaction. Current Psychology, 41, 6185–6195.

Trochim, W. M. K. (2006). *Research methods knowledge base*. Retrieved from https://www.socialresearchmethods.net/kb/dedind.php

Uffen, J., Kaemmerer, N., & Breitner, M. H. (2013). Personality Traits and Cognitive Determinants — An Empirical Investigation of the Use of Smartphone Security Measures. Journal of Information Security, 2013(10), 203–212.

Utomo, D. S., Onggo, B. S., Eldridge, S., Daud, A. R., & Tejaningsih, S. (2020). Eliciting agents' behaviour using scenario-based questionnaire in agent-based dairy supply chain simulation. *Journal of Simulation, 16*(1), 58-72.

UX. (2020). What's a better term for "stupid" user?. Retrieved from https://ux.stackexchange.com/questions/134870/whats-a-better-term-for-stupid-user

UXHK. (2017). *UXHK 2017*. Retrieved from http://uxhongkong.com/

UXmatters. (2011). *User experience design in Asia*. Retrieved from http://www.uxmatters.com/mt/archives/2011/01/user-experience-design-in-asia.php

Uziel, L. (2010). Rethinking social desirability scales: From impression management to interpersonally oriented self-control. *Perspectives on Psychological Science, 5*(3), 243-262.

Van Ments, L., & Treur, J. (2021). Reflections on dynamics, adaptation and control: a cognitive architecture for mental models. *Cognitive System Research, 70,* 1–9.

van Ments, L., & Treur, J. (2022). Work together or fight together: Modeling adaptive cooperative and competitive metaphors as mental models for joint decision making. In J. Treur, & L. Van Ments (Eds.), *Mental models and their dynamics, adaptation and control: A self-modeling network modeling approach* (pp. 255-284). (Studies in Systems, Decision and Control; Vol. 394). Springer Nature Switzerland AG.

Vancouver, J. B. (2018). Self-Efficacy's Role in unifying self-regulation theories. *Advances in Motivation Science, 5*, 203–230.

Vancouver, J. B., Thompson, C. M., Tischner, E. C., & Putka, D. J. (2002). Two studies examining the negative effect of self-efficacy on performance. *Journal of Applied Psychology, 87*(3), 506-516.

Vane, M. (2017, August 5) Mobvoi's Ticwatch is a steal. *Man of Many.* Retrieved from https://manofmany.com/fashion/watches/mobvois-ticwatch-steal-kickstarter

Varnali, K. (2013). Personality Traits and Consumer Behavior in the Mobile Context. *International Journal of E-Services and Mobile Applications. 3*. 1-20.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences, 39*(2), 273-315.

Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences, 27*(3), 451-481.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management Science, 46*(2), 186–204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Venkatesh, V., Speier, C., & Morris, M.G. (2002). User Acceptance Enablers in Individual Decision Making About Technology: Toward an Integrated Model. *Decision Science, 33*, 297-316.

Venkatesh, V., Thong, J., & Xu, X. (2012). Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly, 36*(1), 157-178.

Visuri, A., Sarsenbayeva, Z., van Berkel, N., Goncalves, J., Rawassizadeh, R., Kostakos, V., & Ferreira, D. (2017). *Quantifying sources and types of smartwatch usage sessions. Proceedings.* CHI 2017.

Voss, K. E., Spangenberg, E. R., & Grohmann, B. (2003). Measuring the hedonic and utilitarian dimensions of consumer attitude. *Journal of Marketing Research, 40*(3), 310-320.

Voss, K., Spangenberg, E., & Grohmann, B. (2003). Measuring the hedonic and utilitarian dimensions of consumer attitude. Journal of Marketing Research - J MARKET RES-CHICAGO, 40, pp.310-320.

Wan, W. W. N., Luk, C., & Chow, C. W. C. (2014). Consumer responses to sexual advertising: The intersection of modernization, evolution, and international marketing. *Journal of International Business Studies, 45*(6), 751-782.

Wang, H., Liao, C., & Yang, L. (2013). What Affects Mobile Application Use? the Roles of Consumption Values. *International Journal of Marketing Studies, 5*, 11-22.

Wang, L. C., Baker, J., Wagner, J. A., & Wakefield, K. (2007). Can a retail web site be social? *Journal of Marketing, 71*(3), 143-157.

Wang, P., Zhou, P., Tan, C., & Zhang, P. (2017). Effect of self-efficacy in stereotype activation. *Social Behavior and Personality, 45*(3), 469-476.

Wang, Y. (2009). *The effects of website personalisation on user intention to return through cognitive beliefs and affective reactions.* Dissertation. University of Hong Kong.

Weinschenk, S. (2011). *100 things every designer needs to know about people*. CA: New Riders.

Weinschenk, S. (2016). *100 more things every designer needs to know about people*. CA: New Riders.

Weinstein, N. D. (1980). Unrealistic optimism about future life events. *Journal of Personality & Social Psychology, 39*, 806–820.

Westerman, S. J., Kaur, S., Dukes, C., & Blomfield, J. (2007). Creative industrial design and computer-based image retrieval: The role of aesthetics and affect. In *Proceedings of the 2nd International Conference on Affective Computing and Intelligent Interaction (ACII '07)* (pp. 618-629). Springer-Verlag, Berlin, Heidelberg.

Wheeler, S. C., & DeMarree, K. G. (2009). Multiple mechanisms of prime-to-behavior effects. *Social and Personality Psychology Compass, 3*, 566–581.

Williams, B. (2004). Bob Dick in conversation with Bob William: "In the pursuit of change and understanding". *Forum: Qualitative Social Research, 5*(3), Art. 34.

Winter, J. (2015). *What is user experience?* Retrieved from https://www.usertesting.com/blog/2015/08/13/what-is-user-experience/

Woelfel, C., Krzywinski, J., & Drechsel, F. (2013). Knowing, reasoning and visualizing in industrial design. *The Knowledge Engineering Review. 28*(3), 287-302.

World Bank. (2023). *Mobile cellular subscriptions (per 100 people).* Retrieved from https://data.worldbank.org/indicator/IT.CEL.SETS.P2

Worldometers. (2018, September 13). Current World Population. Retrieved from http://www.worldometers.info/world-population/

Wrigley, C. (2011). *Visceral hedonic rhetoric*. Dissertation. School of Design, Faculty of Built Environment and Engineering, Queensland University of Technology.

Wrigley, C. (2013). Design dialogue: The visceral hedonic rhetoric framework. *Design Issues*, *29*(2), 82-95.

Wrigley, C., Popovic, V., & Chamorro-Koc, M. (2009). *A methodological approach to visceral hedonic rhetoric.* In Proceedings of the International Association of Societies of Design Research Conference 2009, 18-22, September 2009, COEX, Seoul.

Wronski, P. & Klann, R. (2020). Accounting conservatism and national culture. *Brazilian Business Review, 17,* 344-361.

Wu, X., Siu, K. W. M., Bühring, J., & Villani, C. (2022). The relationship between creative self-efficacy, achievement motivation, and job burnout among designers in China's e-market. *Social Sciences, 11*(11), 509.

Wunsch, G. (2007). Confounding and control. *Demographic Research, 16,* 97-120.

Wunsch, H., Linde-Zwirble, W. T., & C. Angus, D. (2006). Methods to adjust for bias and confounding in critical care health services research involving observational data. *Journal of Critical Care, 21*(1), 1–7.

Xie, B., Zhou, J., & Wang, H. (2017). How influential are mental models on interaction performance? Exploring the gap between users' and designers' mental models through a new quantitative method. *Advances in Human-Computer Interaction, 2017,* 1-14.

Xu, F., & Du, J. T. (2018). Factors influencing users' satisfaction and loyalty to digital libraries in Chinese universities. *Computers in Human Behavior, 83*, 64–72.

Xu, R., Frey, R. M., Fleisch, E., & Ilic, A. (2016). Understanding the impact of personality traits on mobile app adoption – Insights from a large-scale field study. *Computers in Human Behavior, 62*(C), 244–256.

Xu, W. (2014). Enhanced ergonomics approaches for product design: A user experience ecosystem perspective and case studies. *Ergonomics, 57*(1), 34-51.

Yalcinkaya, G. (2008). A culture-based approach to understanding the adoption and diffusion of new products across countries. *International Marketing Review, 25*(2), 202-214.

Yang, K. S. (1993). Chinese social orientation: The social interactive perspective. In *The mind and behavior of the Chinese: Theory and methodology*, eds K. S. Yang and A. B. Yu. Taipei: Laureate Publishing Co. Ltd., 87–142.

Yates, J. S. (2004). Doing social science research. London: Sage Publications in association with the Open University Press.

You, H. C., & Chen, K. (2003). *A comparison of affordance concepts and product semantics*. Paper presented at the Asian Design Conference.

Youn, S. (2016). *Connecting through smartphones: Cognitive, social, emotional motivations, and the experience of value perceptions. Dissertation*. Purdue University.

Zaichkowsky, J. L. (1994). The personal involvement inventory: Reduction, revision, and application to advertising. Research Notes. *Journal of Advertising, 23*(4), 59-70.

Zamil, A. M. A., Ali, S., Akbar, M., Zubr, V., & Rasool, F. (2023). The consumer purchase intention toward hybrid electric car: A utilitarian-hedonic attitude approach. *Frontiers in Environmental Science*.

Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence. *The Journal of Marketing*, 2-22.

Zhang, D., Zhang, F., Liu, S., & Du, H. S. (2019). Impact of referral reward program on innovative customers' follow-up e-referral: The moderating role of creative self-efficacy. *Information Technology & People, 32*(3), 559-578.

Zhang, L., Wen, H., Li, D., Fu, Z., & Cui, S. (2010). E-learning adoption intention and its key influence factors based on innovation adoption theory. *Mathematical and Computer Modelling, 51,* 1428-1432.

Zhang, X., Wang, M., He, L., Jie, L., & Deng, J. (2019). The development and psychometric evaluation of the Chinese Big Five Personality Inventory-15. *PLoS ONE, 14*(8).

Zhou, J., Zuo, M., Yu, Y., & Chai, W. (2014). How fundamental and supplemental interactions affect users' knowledge sharing in virtual communities? A social cognitive perspective. *Internet Research, 24*(5), 566-586.

Zou, X. P. (2010). *Mapping team mental models with narrative simulations. Dissertation*. The Hong Kong Polytechnic University.

吴琼、谷丽萍。 (2020)。 简版人格量表在中国大型综合调查中的应用。 *调研世界, 2020年第5期*。 北京大学中国社会科学调查中心。

柯亞先、賴月圓、楊佩玲。 (2018)。 探討人格特質與出席率中介效果對英語學習成效之影響。 *教育理論實踐學刊, 第38期*。

APPENDICES

APPENDICES

Appendix 1: Considerations suggested in prior literature for improving / evaluating user experience

Author	Literature Title	Considerations	Sub-level considerations / Details	Focus
Brown (2009)	Change by design: How design thinking transforms organisations and inspires innovation	Multiple methods to accelerate innovation – most significant: drawing, prototyping and storytelling	Three phases of design thinking: inspiration, ideation, implementation Three intersecting constraints: feasibility, viability, desirability Four mental states: divergent thinking, convergent thinking, analysis and synthesis, identifying meaningful patterns	Product
Burke (2013)	Seeking simplicity in complexity: The relative value of ease of use (EOU) based product differentiation.	EOU x AIDA x WTP	EOU: ease of use AIDA: awareness, interest, desire, action WTP: willingness to pay	Product
Cila, Hekkert, & Visch (2014)	Digging for meaning: The effect of a designer's expertise and intention on depth of product metaphors	Two intentions of use of metaphors in products	Pragmatic intention Experiential intention	Product
Crilly, Moultrie, & Clarkson (2009)	Shaping things: Intended consumer response and other determinants of product form	Eight different types of intention that a designer may want to realise through a product	Instrumental: draw attention to the product, encourage recognition of the product type, support comprehension of a function Non-instrumental: generate attraction or desire, foster attribution of qualities, promote personal identification, stimulate emotion, provoke action	Product
Fokkinga & Desmet (2012)	Darker shades of joy: The role of negative emotion in rich product experiences	Four protective frames	Safety zone frame Detachment frame Control frame Perspective frame	Product experience
Hamaguchi (2017)	Manner of innovation	Cognitive model of value = iconic design + simple function + sharable story	Customer value = emotion + performance + meaning Innovation = something new + something doable + something controversial Human cognition has bias: increase the bias to think effectively; break the bias to think innovatively Break the bias by: visualise thinking pattern, break the pattern, force your thinking	System & product
Han & Hong (2003)	A systematic approach for coupling user satisfaction with product design	Conceptual structure of human interface: physical & logical components; individual, integration & interaction properties	Eight user satisfaction dimensions : Volume, shape, elegance, harmoniousness, simplicity, comfort, attractiveness, overall satisfaction	Product

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Holtzblatt (2015)	What makes things cool?	Seven concepts of cool	1. Accomplishment: the product helps people accomplish goals 2. Connection: the product provides social connection 3. Identity: the product adds to people's identity 4. Sensation: the product is pleasing to the senses (sight, sound, touch, etc.) 5. Direct into action: the product quickly gets people to where they want to go 6. The hassle factor: the product is hassle-free (no logins, no customisations, no wires) 7. The learning delta: the product is intuitive and requires no learning	Product
Lidwell, Holden, & Butler (2010)	Universal principles of design: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design	125 principles indexed under 5 categories	How can I influence the way a design is perceived? How can I help people learn from a design? How can I enhance the usability of a design? How can I increase the appeal of a design? How can I make better design decisions?	General design
Manoogian (2016)	Cognitive bias codex	188 human biases under 4 categories	Too much information, not enough meaning, need to act fast, what should we remember	General psychology
Mochimaru, Takahashi, Hatakenaka, & Horiuchi (2012)	Questionnaire survey of customer satisfaction for product categories towards certification of ergonomic quality in design	Evaluation factors: Basic level Detailed level Ordinal quality Attractive quality Product categorisation based on human functioning aspects: Home living Mobility life Healthy life Active communication	Detailed level: Safety – prevention of critical dangers, prevention of human errors, public health aspects Validity – durability, energy-saving & recycle, health maintenance, low physical loads Usability – fit for life-style, easy to understand, operatability, stability & dependability Style – pleasant in use, style design aspects, haptic impression, feel of materials Augmentability – universal design aspects, easy to maintain (varied weighting for different industry)	Product
Morville (2004)	UX Honeycomb	UX Honeycomb as a tool for defining priorities in developing and managing user experiences	UX values in the Honeycomb model: Useful, usable, desirable, findable, accessible, credible, valuable	Human computer interaction

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Appendix 1: Considerations suggested in prior literature for improving / evaluating user experience				
Author	Literature Title	Considerations	Sub-level considerations / Details	Focus
Nielsen (1995)	10 usability heuristics for user interface design	10 usability heuristics for user interface design	1. Visibility of system status 2. Match between system and the real world 3. User control and freedom 4. Consistency and standards 5. Error prevention 6. Recognition rather than recall 7. Flexibility and efficiency of use 8. Aesthetic and minimalist design 9. Help users recognise, diagnose, and recover from errors 10. Help and documentation	Human computer interaction
Norman (1988 & 2013)	The psychology of everyday things The design of everyday things	Action Cycle Three cognitive levels of user responses: visceral, behavioural, reflective	Seven design principles: discoverability, feedback, conceptual model, affordances, signifiers, mappings, constraints	Product
Oran (1991)	Apply psychology to product design	Basic principles of psychology (for improving high-tech products)	Provide feedback, minimise memory strain, make sequence obvious (e.g. smart spacing), match function to needs, identify groups (e.g. Gestalt psychology)	Product
Parrish (2006)	Design as storytelling	Learner empathy for instructional design Guidelines for design stories	Requires a shift from emphasising the technical problem-solving nature of ID to viewing design as more a process of composing a story of learner experience.	Instructional design
Shneiderman (2004)	Designing for fun: How can we design user interfaces to be more fun?	8 Golden Rules	1. Strive for consistency 2. Cater to universal usability 3. Offer informative feedback 4. Design dialogs to yield closure 5. Prevent errors 6. Permit easy reversal of actions 7. Support internal locus of control 8. Reduce short-term memory load	Human computer interaction

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Appendix 1: Considerations suggested in prior literature for improving / evaluating user experience				
Author	Literature Title	Considerations	Sub-level considerations / Details	Focus
Weinschenk (2011 & 2016)	100 things every designer needs to know about people 100 more things every designer needs to know about people	Four categories: Physio-psychological Cognitive Behavioural Social	Collections of real life examples or research studies on how psychological factors influenced user experiences under the four categories	General psychology
Woelfel, Krzywinski, & Drechsel (2013)	Knowing, reasoning and visualising in industrial design	A model (hierarchy) of user experience in industrial design (Anderson, 2006, cited in Woelfel, Krzywinski, & Drechsel, 2013)	Function (function and fit), reliability (availability and safety), use (ergonomics), convenience (intuitive use), pleasure (desire and delight), meaning (personal significance) Body of knowledge: procedural (knowing how) vs. declarative knowledge (knowing that)	Product
Wrigley (2011)	Visceral hedonic rhetoric	"Visceral hedonic rhetoric design tool" listing fourteen attributes and their relative strengths	The fourteen attributes ranked from the strongest: Colour, size, shape, intrigue, material, perceived usability, portability, perceived function, novelty, analogy, brand, quality, texture, gender	Product

APPENDICES

Appendix 2: References of laws and guidelines related to research and ethics
Guidelines from University of Wales Trinity Saint David
Research Ethics and Integrity Code of Practice 2017-2020 of UWTSD (University of Wales Trinity Saint David, 2017)
Code of Practice for Research Degrees 2018/19 of UWTSD (University of Wales Trinity Saint David, 2018)
Laws / Guidelines from Hong Kong SAR
Personal Data (Privacy) Ordinance (Cap. 486) of Hong Kong https://www.elegislation.gov.hk/hk/cap486 (Hong Kong Government, 2018)
Gambling Ordinance (Cap. 148) https://www.elegislation.gov.hk/hk/cap148 (Hong Kong Government, 2018)
The University of Hong Kong Human Research Ethics Committee **Operational Guidelines and Procedures** www.rss.hku.hk/HREC/guidelines.pdf (Human Research Ethics Committee, 2017)
The Hong Kong Polytechnic University Human Subjects Ethics Sub-Committee **Guidelines for Ethics Review of Research/Teaching Projects Involving Human Subjects** www.polyu.edu.hk/ro/publication/hsears/guide.pdf (Human Subjects Ethics Sub-Committee, 2012)
Laws / Guidelines from China
中华人民共和国个人信息保护法 http://www.npc.gov.cn/npc/c30834/202108/a8c4e3672c74491a80b53a172bb753fe.shtml (全国人民代表大会常务委员会, 2021)
Cybersecurity Law of the People's Republic of China http://www.lawinfochina.com/display.aspx?lib=law&id=22826# (Lawinfochina, 2021)
中国科学院 中国科学院监督与审计局 **中国科学院研究生科研活动行为规范** http://www.jianshen.cas.cn/kyddwyh/zdgf/201812/t20181219_4674318.htmlÒ0210511 (中国科学院监督与审计局, 2018)
International Association for Chinese Management Research (IACMR) IACMR Code of Ethics Committee **IACMR Code of Ethics** https://eng.iacmr.org/about-us/iacmr-code-of-ethics/ (IACMR Code of Ethics Committee, 2019)

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University of Nottingham (UK, China, Malaysia)
University Research Integrity and Research Ethics Committee (URIEC)
Code of Research Conduct and Research Ethics
https://www.nottingham.edu.cn/en/research-and-business/documents/ethics/code-of-research-conduct-and-research-ethics.pdf
(URIEC, 2020)

There are references made by the University of Nottingham Ningbo China's "Code of Research Conduct and Research Ethics" in Section 4 of Appendix B to the "Cybersecurity Law of the People's Republic of China" and "Regulation on Scientific Data" (URIEC, 2020, p. 35). The laws / regulations have been accessed at the links below:

中华人民共和国网络安全法
www.gov.cn/xinwen/2016-11/07/content_5129723.htm

中华人民共和国网络安全法 **Cybersecurity Law of the People's Republic of China**
www.lawinfochina.com/display.aspx?lib=law&id=22826

国务院办公厅关于印发科学数据管理办法的通知
www.gov.cn/zhengce/content/2018-04/02/content_5279272.htm

国务院办公厅关于印发科学数据管理办法的通知 **Notice of the General Office of the State Council on Issuing the Measures for the Management of Scientific Data**
www.lawinfochina.com/display.aspx?id=27873&lib=law

APPENDICES

Appendix 3a: Part One Mental Modelling – Brief and Consent Form (Draft in English)

UWTSD-DBA Research

Brief & Consent Form

Mental models of designer and non-designer users on product values and use experience: in the context of smart communication products

Dear Participant:

I am conducting a research study to understand and explain the possible differences between mental models of designers and non-designers, which determine their perception of product values, satisfaction and use intention. Product examples such as the smart phone/watch will be referred to in this research session.

The emergence of the profession of "designers" in the 20th century was supposed to bridge the gaps between producers and users, facilitating businesses to produce products which satisfy users' needs and are valued by the users. The designers are believed to be able to design products which communicate their values and uses, or affordances, to users. Unfortunately, this is not always the case. Unsatisfactory market and product performance yielded from "well-designed" products implies that the majority of the potential customers/users may not perceive and/or interact with the product as the designer does. It is hence worth looking into the root of their different perceptions – the possible different "mental models" which are the conceptual models in people's minds of how things work (Norman, 1988; 2013). Such understanding may help designers and producers to design and produce products which give users better experiences and values.

This research study is part of a Doctor of Business Administration programme in the University of Wales Trinity Saint David, UK. The information sought in this interview will be treated as confidential and will be used only for the purpose of academic research.

The session takes 1 hour and you will be invited to tell us how you will use a smart phone/watch through:

- mapping the features, uses, consequences, values, and goals; and
- sharing with us your views.

Your cooperation is critical to the successful completion of this research project. Thank you very much for your time and assistance.

Please note that:

- *The research session will be video/audio recorded to facilitate transcription and analysis.*
- *You have the right to withdraw at any time.*
- *The researcher can be contacted at CCresearch@yeah.net*

Consent from Respondent

(The participant is 18 years of age or above.)

I understand the purpose of the research session stated above and agree to participate in the research.

Name:	Signature:	Date:

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Appendix 3b: Part One Mental Modelling – Brief and Consent Form (Implemented version in Chinese)

参加者编号：

UWTSD-DBA调研访问
简介及同意声明

设计师和非设计师用户关于产品价值及应用的心智模型（mental model）：智能通信产品

尊敬的参加者：

本人正进行一项研究，以了解设计师和非设计师的心智模型之间可能存在的差异，这些差异决定了他们对产品价值、满意度及预期应用的看法。本访问会参照智能手机/手表等产品作为示例。

专业"设计师"于20世纪的出现，作为生产者和使用者之间的桥梁，帮助企业生产能满足使用者需要、受用户重视的产品；我们相信设计师设计的产品，应能向用户传达其价值和用途。现实情况却并非总是如此，不少"精心设计"的产品，在市场上表现不佳，意味着部分潜在客户或用户对产品的理解和互动可能未如设计师预期一般。因此，值得研究他们不同看法的根源 —— 可能存在的不同"心智模型"，这些模型是人们心目中关于事物如何运作的概念模型（Norman，1988；2013）。对"心智模型"的理解，将有助设计师和生产商设计和生产为使用者提供更佳体验和价值的产品。

这项研究是英国 University of Wales Trinity Saint David 工商管理博士课程的一部分，本访问所得的资料将被视为机密，及仅作为学术研究用途。

访问约需时 1 小时，透过以下环节，我们将邀请你分享你会如何使用你的智能手机/手表：

- 功能、应用、感知价值/效果和用户目标的配对
- 与我们分享你的观点

你的参与对于这个研究项目的顺利完成至关重要，非常感谢你的时间及支持。

请注意：

- *访问过程将会进行录像或录音，以便记录和分析。*
- *你有权随时退出。*
- *你可透过以下方式联系研究人员：CCresearch@yeah.net*

参加者同意声明

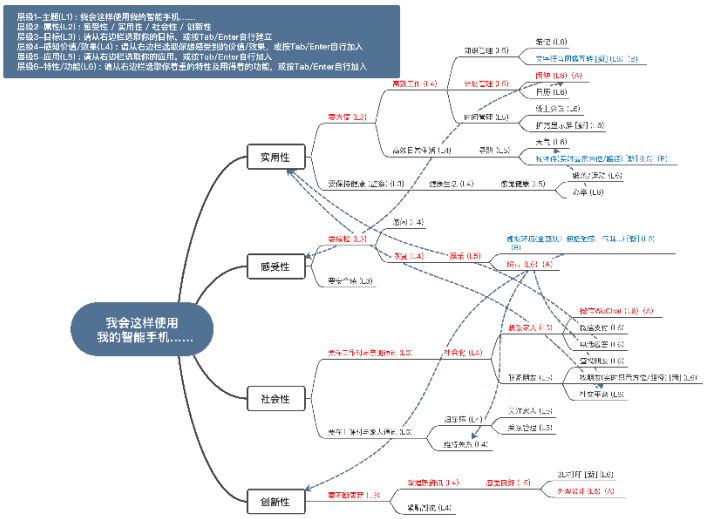
（参加者须为十八岁或以上人士）

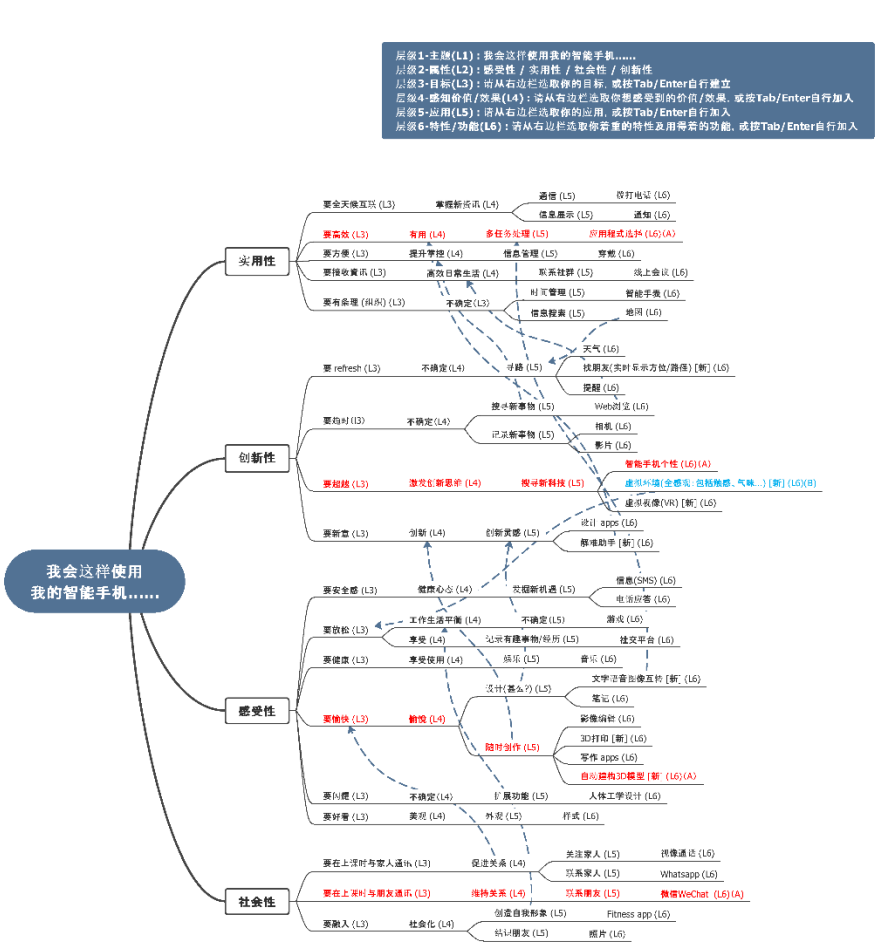
我理解上述调研访问的目的，并同意参与。

姓名：	签名：	日期：

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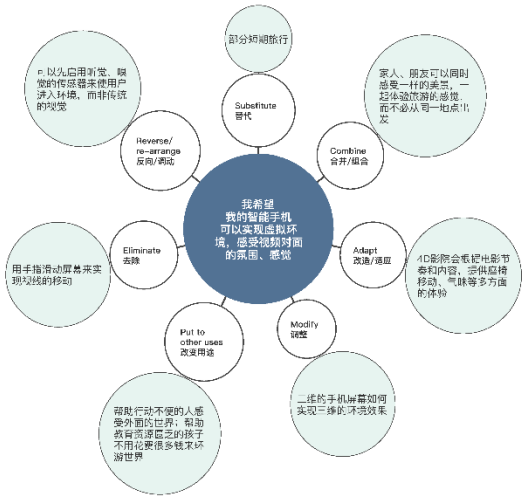
Appendix 4a: Part One Mental Modelling – Samples of participant-constructed mental models – Model A

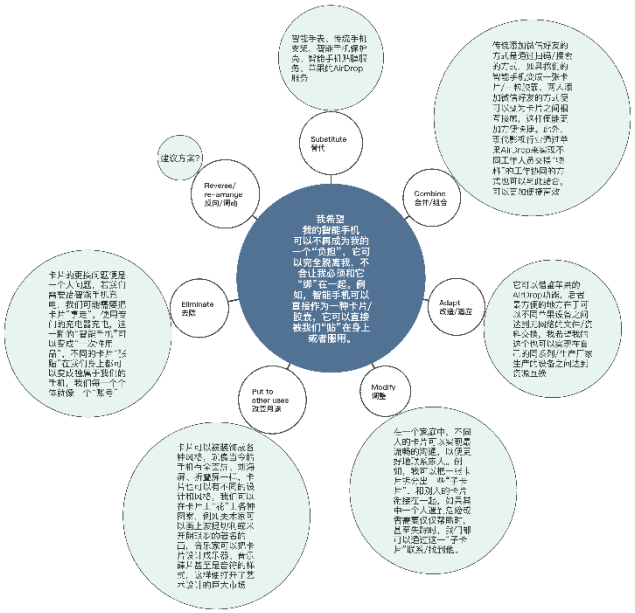




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Appendix 4b: Part One Mental Modelling – Samples of participant-constructed mental models – Model B





APPENDICES

Appendix 5a: Part Two Survey – Pilot 1 Questionnaire (Draft in English)

UWTSD-DBA Research

Mental models of designer and non-designer users on product values and adoption: in the context of smart communication products

Respondent No.: ☐
Date: ☐

Thank you for your participation and completion of the metal modelling session. The following questionnaire is to further understand your use experience related to the concerned product(s). The collected information will be used only for the purpose of academic research. Thanks again for your support!

	User expertise
UE1	**How familiar do you consider yourself with smartphones?** *(please choose and/or provide your answers)* ☐ Very familiar ☐ Familiar ☐ Quite familiar ☐ Not quite familiar ☐ Not familiar at all ☐ Others / Supplements – please provide below: _____
UE2	**How long have you been using smartphones?** *(please choose and/or provide your answers)* ☐ 5 or more years ☐ 3 to less than 5 years ☐ 1 to less than 3 years ☐ Less than 1 year ☐ Never ☐ Others / Supplements – please provide below: _____
UE3	**How long have you been using the current smartphone?** *(please choose and/or provide your answers)* ☐ 4 or more years ☐ 2 to less than 4 years ☐ 1 to less than 2 years ☐ 6 to less than 12 months ☐ Less than 6 months ☐ Others / Supplements – please provide below: _____

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UE4	**How often do you use a smartphone?** *(please choose and/or provide your answers)* ☐ All the time ☐ Many times in an hour ☐ Many times a day ☐ A few times a day ☐ Less frequent than the above ☐ Others / Supplements – please provide below: _____
UE5	**How often do you use computer?** *(please choose and/or provide your answers)* ☐ 5 or more hours a day ☐ 2 to less than 5 hours a day ☐ 1 to less than 2 hours a day ☐ A few hours a week ☐ Less frequent than the above ☐ Others / Supplements – please provide below: _____
UE6	**What is the brand and model of your current smartphone?**
UE7	**Why do you choose this model?**
UE8	**Why do you choose this brand?**
	User experience
UX1	**Among the functions of your smartphone, you often use:** *(please choose and/or provide your answers)* ☐ All the functions ☐ Most of the functions ☐ Some of the functions ☐ A small part of the functions ☐ Only a few functions ☐ Others / Supplements – please provide below: _____
UX1a	**What function(s) do you use most?**
UX1b	**What function(s) do you use least?**

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UX2	**How many extra applications have you added to your smartphone?** *(please choose and/or provide your answers)* ☐ More than 100 ☐ 71 to 100 ☐ 51 to 70 ☐ 31 to 50 ☐ 11 to 30 ☐ 1 to 10 ☐ None ☐ Others / Supplements – please provide below: _____
UX2a	**What application(s) do you use most?**
UX2b	**What application(s) do you use least?**
UX3	**To what extent are you satisfied with your smartphone?** *(please choose and/or provide your answers)* ☐ Very satisfied ☐ Satisfied ☐ Somewhat satisfied ☐ Neutral ☐ Somewhat unsatisfied ☐ Unsatisfied ☐ Very unsatisfied
UX3a	**What do you most satisfied with?**
UX3b	**What do you least satisfied with?**
UX4	**What do you wish your smartphone can do?**
UX5	**To what extent do you agree on the followings:**

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
User Innovativeness							
Measurement items for "user innovativeness", adapted from Goldsmith and Hofacker (1991), and Pagani (2007)							
If I heard a new smartphone was available I would be interested enough to adopt it.	☐	☐	☐	☐	☐	☐	☐
If I heard a new smartphone application was available I would be interested enough to adopt it.	☐	☐	☐	☐	☐	☐	☐
Compared to my friends I make little use of smartphones / smartphone applications.	☐	☐	☐	☐	☐	☐	☐
I would consider adopting a new smartphone / smartphone application, even if I had not tried it.	☐	☐	☐	☐	☐	☐	☐
In general, I am the last in my circle of friends to know the names of new smartphones / smartphone applications, and ways to access their information.	☐	☐	☐	☐	☐	☐	☐
I know more about new smartphones / smartphone applications than other people do.	☐	☐	☐	☐	☐	☐	☐
I adopt a new smartphone / smartphone applications because of the advantages it offers me.	☐	☐	☐	☐	☐	☐	☐
Before adopting a new smartphone / smartphone application I think about the benefits introduced by the innovation.	☐	☐	☐	☐	☐	☐	☐
Perceived Utilitarian Values							
Measurement items for "perceived utilitarian value" for the product, with reference to Sheth et al. (1991), "system usability scale" of Brooke (1996), and Venkatesh, Speier & Morris (2002)							
I find this smartphone easy to use.	☐	☐	☐	☐	☐	☐	☐
This smartphone helps me solve a lot of problems.	☐	☐	☐	☐	☐	☐	☐
This smartphone helps me do my tasks efficiently.	☐	☐	☐	☐	☐	☐	☐
This smartphone performs consistently.	☐	☐	☐	☐	☐	☐	☐
This smartphone offers value for money.	☐	☐	☐	☐	☐	☐	☐
I needed to learn a lot before I can use this smartphone completely.	☐	☐	☐	☐	☐	☐	☐
My interaction with this smartphone is clear and understandable.	☐	☐	☐	☐	☐	☐	☐
I will find it easy to get this smartphone to do what I want it to do.	☐	☐	☐	☐	☐	☐	☐
Perceived Hedonic Values							
Measurement items for "perceived hedonic value" for the product, with reference to Sheth et al. (1991), PERVAL of Sweeney and Soutar (2001), and Mishra (2016)							
Using this smartphone is uninteresting.	☐	☐	☐	☐	☐	☐	☐
Using this smartphone makes me feel good.	☐	☐	☐	☐	☐	☐	☐
Using this smartphone give me pleasure.	☐	☐	☐	☐	☐	☐	☐
Using this smartphone makes me feel relaxed.	☐	☐	☐	☐	☐	☐	☐
Using this smartphone is an enjoyment.	☐	☐	☐	☐	☐	☐	☐
Using this smartphone matches my personality.	☐	☐	☐	☐	☐	☐	☐

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Perceived Social Values							
Measurement items for "perceived social value" for the product, with reference to Sheth et al. (1991), PERVAL of Sweeney and Soutar (2001), and Wang et al. (2007)							
Using this smartphone makes a good impression on other people.	☐	☐	☐	☐	☐	☐	☐
Using this smartphone improves the way I am perceived.	☐	☐	☐	☐	☐	☐	☐
I find connection with this smartphone. (SI)	☐	☐	☐	☐	☐	☐	☐
Using this smartphone give me talking points in social life. (SR)	☐	☐	☐	☐	☐	☐	☐
Owning this smartphone makes me feel differently about myself. (SI)	☐	☐	☐	☐	☐	☐	☐
Using this smartphone makes me stand out among my friends. (SR)	☐	☐	☐	☐	☐	☐	☐
This smartphone does not relate to me. (SI)	☐	☐	☐	☐	☐	☐	☐
Perceived Innovative Values							
Measurement items for "perceived innovative value" for the product, adapted from Im & Workman (2004)							
The smartphone I'm using is novel.	☐	☐	☐	☐	☐	☐	☐
The smartphone I'm using is un-innovative.	☐	☐	☐	☐	☐	☐	☐
The smartphone I'm using is un-imaginative.	☐	☐	☐	☐	☐	☐	☐
The smartphone I'm using is different from the ordinary.	☐	☐	☐	☐	☐	☐	☐
The smartphone I'm using has surprising features.	☐	☐	☐	☐	☐	☐	☐
Perceived Satisfaction							
Measurement items for "perceived satisfaction", with reference to "satisfaction scales" of Oliver and Swan (1989) and Spreng, MacKenzie and Olshavsky (1996), and scale for measuring "anticipated satisfaction" of Shiv and Huber (2000)							
I feel good using this smartphone.	☐	☐	☐	☐	☐	☐	☐
I feel frustrated using this smartphone.	☐	☐	☐	☐	☐	☐	☐
I feel pleased using this smartphone.	☐	☐	☐	☐	☐	☐	☐
I feel satisfied using this smartphone.	☐	☐	☐	☐	☐	☐	☐
Intended Continuous Use							
Measurement items for "intended continuous use", modified from "continuance intention scale" of Bhattacherjee (2001)							
I intend to continue using this smartphone in the next half year.	☐	☐	☐	☐	☐	☐	☐
I predict that I would continue using this smartphone in a year.	☐	☐	☐	☐	☐	☐	☐
I expect my use of smartphone to continue in the future.	☐	☐	☐	☐	☐	☐	☐
I would use this smartphone without hesitation to satisfy my needs.	☐	☐	☐	☐	☐	☐	☐
I will not continue using this smartphone.	☐	☐	☐	☐	☐	☐	☐

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	User Background *The questions in this section are for classification purpose only (the information cannot and will not be used to identify individuals).*
UB1	**Occupation: (***You may choose more than one answer if appropriate)* ☐ Student ☐ Working ☐ Housewife ☐ Retired ☐ Others: please specify _____
UB2	**Area of work / study:** *(You may choose more than one answer if appropriate)* ☐ Business ☐ Catering ☐ Clerical ☐ Construction ☐ Consultant ☐ Design ☐ Education ☐ Finance ☐ IT ☐ Manufacturing ☐ Medical ☐ Product R&D ☐ Retail ☐ Service ☐ Others: please specify _____
UB3	**If you have indicated that your occupation involves design in the above question, please check your design field below:** ☐ Not applicable for me ☐ Fashion Design ☐ Multimedia Design ☐ Product Design ☐ Spatial Design ☐ Visual Communication Design ☐ Others – please specify: _____
UB4	**Highest education:** ☐ Primary school or below ☐ Secondary school ☐ Matriculation / pre-college ☐ University / tertiary ☐ Post-graduate ☐ Others – please specify: _____
UB5	**Please specify major area(s) of your pre-college / university / tertiary / post-graduate education:** *(you may tick more than one box if appropriate)* ☐ Arts ☐ Business ☐ Design ☐ Education ☐ Engineering ☐ IT ☐ Medical

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	☐ Science ☐ Tourism / Hospitality ☐ Social Science ☐ Others – please specify: _____
UB6	**City of origin:** Please specify: _____
	City I currently stay for study / work: Please specify: _____
UB7	**Gender :** ☐ Male ☐ Female ☐ Others
UB8	**Marital status:** ☐ Single ☐ Married ☐ Divorced / Separated ☐ Others – please specify: _____
UB9	**Age:** ☐ 18 – 20 ☐ 21 – 25 ☐ 26 – 35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 – 65 ☐ 66 or above

THANK YOU VERY MUCH FOR YOUR PARTICIPATION.

Your comments are valuable. Please give your other comments below, if any:

_____

The researcher can be contacted for enquiry at: *CCresearch@yeah.net*

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Appendix 5b: Part Two Survey – Pilot 1 Questionnaire (Implemented version in Chinese)

UWTSD-DBA 调研访问

设计师和非设计师用户关于产品价值及预期应用的心智模型（mental model）：智能通信产品

多谢您的参与及完成配对环节，以下的问题为进一步了解用家使用相关产品的体验，所得资料仅用于学术研究分析。再次感谢你支持!

参加者编号: _____ （此编号用以连结配对环节完成的 mindmap 配合分析。如果忘记或不肯定参加者编号，可以填上参与配对环节的日期及时间，以资识辩，谢谢！） *

A. 用家使用经验

1. 您认为自己对智能手机有多熟悉? *

- ○ 非常熟悉
- ○ 熟悉
- ○ 有点熟悉
- ○ 不太熟悉
- ○ 一点也不熟悉
- ○ 其他: _____

2. 您使用智能手机多久了? *

- ○ 5年或以上
- ○ 3至5年以内
- ○ 1至3年以内
- ○ 少于1年
- ○ 从不
- ○ 其他: _____

3. 您使用当前的智能手机多久了? *

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- ○ 4年或以上
- ○ 2至4年以内
- ○ 1至2年以内
- ○ 6至12个月以内
- ○ 少于6个月
- ○ 其他: _____

4. 您多经常使用智能手机? *

- ○ 不间断使用
- ○ 一小时内多次
- ○ 一天很多次
- ○ 一天几次
- ○ 少于上述频率
- ○ 其他: _____

5. 您是否有同时使用智能手表? *

- ○ 经常使用
- ○ 有时使用
- ○ 间中使用
- ○ 现时没有使用，未来可能會用
- ○ 现时没有使用，也不打算使用
- ○ 其他: _____

6. 您多经常使用电脑? *

- ○ 每天5小时或以上
- ○ 每天2至5小时以内
- ○ 每天1至2小时以内
- ○ 每周几个小时
- ○ 少于上述频率
- ○ 其他: _____

7. 您当前的智能手机品牌、型号、及售价是?

品牌: _____

型号: _____

售价: _____ *

(若不肯定售价，请提供大约售价就可以了，谢谢分享！)

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7a. 您为什么选择这个品牌? *

please enter

7b. 您为什么选择这个型号? *

please enter

8. 在智能手机的功能中，您经常使用: *

- ○ 所有功能
- ○ 大部分功能
- ○ 一些功能
- ○ 一小部分功能
- ○ 只有几个功能
- ○ 其他: _____

8a. 在各类智能手机功能中，您 "最常使用" 至 "最少使用" 的排序是? *

(请将全部选项排序)

Drag the right option or click to the left to sort

1		游戏类
2		娱乐类
3		创作类
4		拍摄类
5		社交类
6		通信类
7		资讯类
8		工具类
9		教育类
10		运动/健康管理类
11		金融/理财类

8b. 除上述 8a 所列，还有沒有其他功能类别是您经常使用的? *

- ○ 沒有了
- ○ 还有: _____

8c. 您在智能手机中添加了多少额外的软件（应用程序/APP）？ *

- ○ 超过100个
- ○ 71至100个
- ○ 51至70个
- ○ 31至50个
- ○ 11至30个
- ○ 1至10个
- ○ 无
- ○ 其他: _____

8d. 在您的智能手机内，您最常使用的几个软件/功能是?

1: _____
2: _____
3: _____
4: _____
5: _____ *

(请分享不少于3个您最常使用的软件/功能，谢谢分享！)

8e. 在您的智能手机内，您最少使用的几个软件/功能是?

1: _____
2: _____
3: _____
4: _____
5: _____ *

(请分享不少于3个您最常使用的软件/功能，谢谢分享！)

9. 您对您的智能手机有多大程度满意?*

- ○ 非常满意
- ○ 满意
- ○ 有点满意
- ○ 中性
- ○ 有点不满意
- ○ 不满意
- ○ 非常不满意

9a. 您最满意您的智能手机是那方面? *

please enter

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9b. 您最不满意您的智能手机是那方面? *

please enter

10. 您希望您的智能手机能做什么（现时未做到的）? *

please enter

11. 假设您要设计一个新的智能手机，您会如何优化用家的使用体验? *

(例如：加入新设计 / 功能 / 特色 XXXXX，或改善现有设计 / 功能 XXXX, 或其他方面 .....)

please enter

B. 用家体验

您有多同意以下陈述（有关用家）? * Measurement items for "user innovativeness", adapted from Goldsmith and Hofacker (1991), and Pagani (2007)

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
如果我听说有一个新的智能手机面世，我会有兴趣了解它。	○	○	○	○	○	○	○
如果我听说有一个新的智能手机面世，我会有兴趣采用它。	○	○	○	○	○	○	○
即使我没有体验过，我会考虑采用一个新面世的智能手机。	○	○	○	○	○	○	○
与我的朋友相比，我很少使用智能手机。	○	○	○	○	○	○	○
总的来说，我是我的朋友圈中最后一个知道有新智能手机面世。	○	○	○	○	○	○	○
我比其他人更了解新面世的智能手机。	○	○	○	○	○	○	○
在采用新面世的智能手机之前，我会考虑新产品带来的好处。	○	○	○	○	○	○	○
如果我听说有一个新的智能手机软件面世，我会有兴趣了解它。	○	○	○	○	○	○	○
如果我听说有一个新的智能手机软件面世，我会有兴趣采用它。	○	○	○	○	○	○	○

APPENDICES

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
即使我没有体验过，我会考虑采用一个新面世的智能手机软件。	○	○	○	○	○	○	○
与我的朋友相比，我很少使用智能手机软件。	○	○	○	○	○	○	○
总的来说，我是我的朋友圈中最后一个知道有新智能手机软件面世。	○	○	○	○	○	○	○
我比其他人更了解新面世的智能手机软件。	○	○	○	○	○	○	○
在采用新面世的智能手机软件之前，我会考虑新产品带来的好处。	○	○	○	○	○	○	○

您有多同意以下陈述（有关这产品于您的创新价值）？ * Measurement items for "perceived innovative value" for the product, adapted from Im & Workman (2004)

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
我使用的智能手机是新颖的。	○	○	○	○	○	○	○
我使用的智能手机与一般智能手机不同。	○	○	○	○	○	○	○
我使用的智能手机有令人惊喜的功能。	○	○	○	○	○	○	○
我使用的智能手机没有创意。	○	○	○	○	○	○	○
这個智能手机的使用給了我想象空间。	○	○	○	○	○	○	○

您有多同意以下陈述（有关这产品于您的感受价值）？ * Measurement items for "perceived hedonic value" for the product, with reference to Sheth et al. (1991), PERVAL of Sweeney and Soutar (2001), and Mishra (2016)

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
使用这个智能手机是没趣的。	○	○	○	○	○	○	○
使用这个智能手机让我感觉很好。	○	○	○	○	○	○	○
使用这个智能手机让我感觉愉快。	○	○	○	○	○	○	○
使用这个智能手机让我感觉轻松。	○	○	○	○	○	○	○
使用这个智能手机是一种享受。	○	○	○	○	○	○	○

APPENDICES

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
使用这个智能手机符合我的个性。	○	○	○	○	○	○	○

您有多同意以下陈述（有关这产品于您的社会价值）？ *

Measurement items for "perceived social value" for the product, with reference to Sheth et al. (1991), PERVAL of Sweeney and Soutar (2001), and Wang et al. (2007)

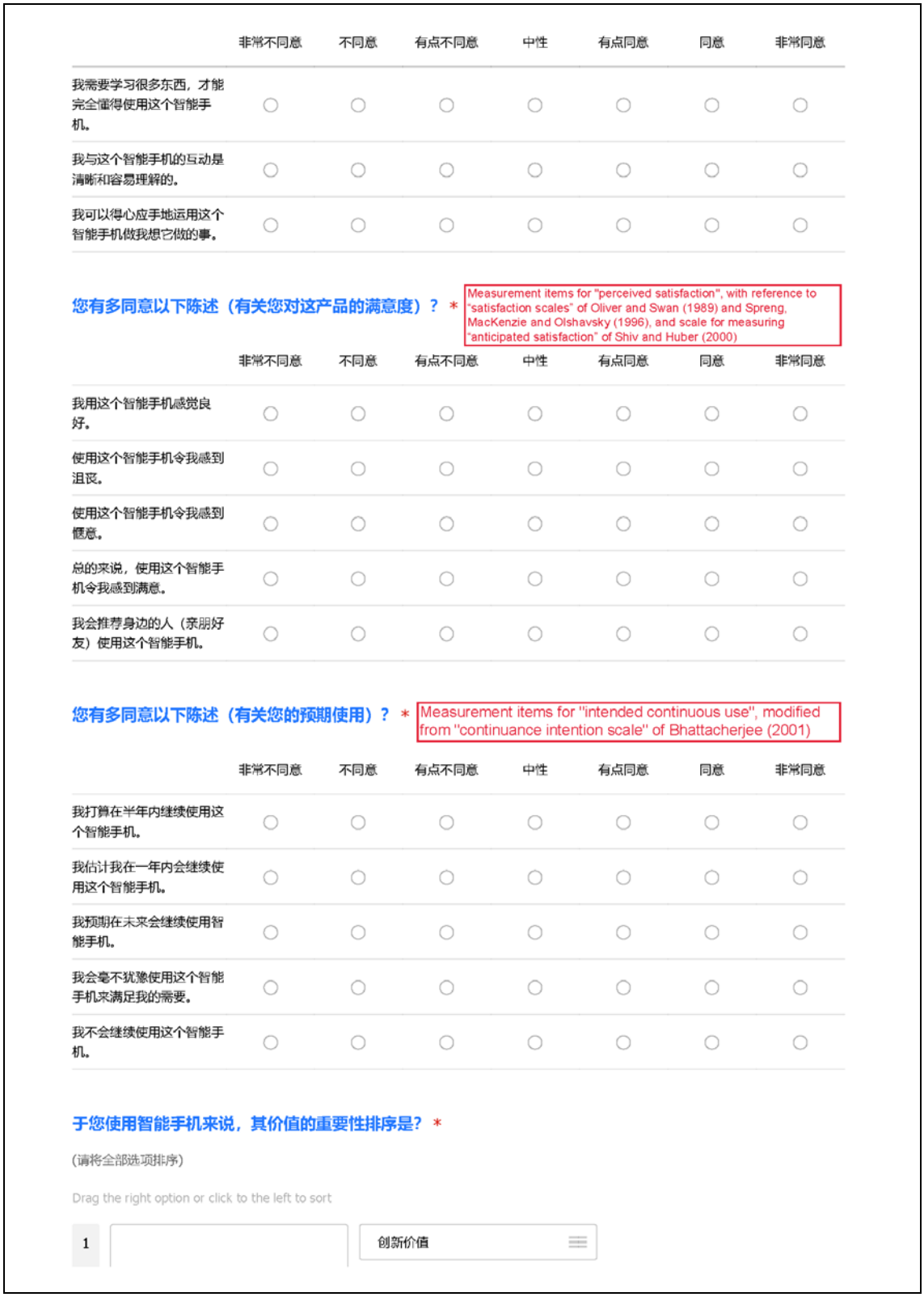
	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
使用这个智能手机可增强我与其他人的联系。	○	○	○	○	○	○	○
使用这个智能手机给其他人留下好印象。	○	○	○	○	○	○	○
使用这个智能手机可以改善别人对我的观感。	○	○	○	○	○	○	○
我觉得这个智能手机与我息息相关。	○	○	○	○	○	○	○
使用这个智能手机让我在社交生活中多了话题。	○	○	○	○	○	○	○
拥有这个智能手机让我对自己的感觉不同。	○	○	○	○	○	○	○
使用这个智能手机让我在朋友中脱颖而出。	○	○	○	○	○	○	○
这个智能手机与我无关。	○	○	○	○	○	○	○

您有多同意以下陈述（有关这产品于您的实用价值）？

Measurement items for "perceived utilitarian value" for the product, with reference to Sheth et al. (1991), "system usability scale" of Brooke (1996), and Venkatesh, Speier & Morris (2002)

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
我觉得这个智能手机易于使用。	○	○	○	○	○	○	○
这个智能手机帮助我解决了很多问题。	○	○	○	○	○	○	○
这个智能手机帮助我高效完成任务。	○	○	○	○	○	○	○
这个智能手机帮助我有效地管理我的工作/学习。	○	○	○	○	○	○	○
这个智能手机帮助我有效地管理我的健康。	○	○	○	○	○	○	○
这个智能手机帮助我有效地管理我的生活。	○	○	○	○	○	○	○
这个智能手机性能表现稳定。	○	○	○	○	○	○	○
这个智能手机物有所值。	○	○	○	○	○	○	○

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	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
我需要学习很多东西，才能完全懂得使用这个智能手机。	○	○	○	○	○	○	○
我与这个智能手机的互动是清晰和容易理解的。	○	○	○	○	○	○	○
我可以得心应手地运用这个智能手机做我想它做的事。	○	○	○	○	○	○	○

您有多同意以下陈述（有关您对这产品的满意度）？ *

Measurement items for "perceived satisfaction", with reference to "satisfaction scales" of Oliver and Swan (1989) and Spreng, MacKenzie and Olshavsky (1996), and scale for measuring "anticipated satisfaction" of Shiv and Huber (2000)

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
我用这个智能手机感觉良好。	○	○	○	○	○	○	○
使用这个智能手机令我感到沮丧。	○	○	○	○	○	○	○
使用这个智能手机令我感到惬意。	○	○	○	○	○	○	○
总的来说，使用这个智能手机令我感到满意。	○	○	○	○	○	○	○
我会推荐身边的人（亲朋好友）使用这个智能手机。	○	○	○	○	○	○	○

您有多同意以下陈述（有关您的预期使用）？ *

Measurement items for "intended continuous use", modified from "continuance intention scale" of Bhattacherjee (2001)

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
我打算在半年内继续使用这个智能手机。	○	○	○	○	○	○	○
我估计我在一年内会继续使用这个智能手机。	○	○	○	○	○	○	○
我预期在未来会继续使用智能手机。	○	○	○	○	○	○	○
我会毫不犹豫使用这个智能手机来满足我的需要。	○	○	○	○	○	○	○
我不会继续使用这个智能手机。	○	○	○	○	○	○	○

于您使用智能手机来说，其价值的重要性排序是？ *

(请将全部选项排序)

Drag the right option or click to the left to sort

1 | 创新价值

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2 感受价值

3 社会价值

4 实用价值

C. 用家背景

1. 您现时是： *

- ○ 学生
- ○ 在职
- ○ 家庭主妇
- ○ 退休
- ○ 其他: _____

2. 工作/学习领域： （如有需要，您可以选择多个答案） * Checkboxes

- ☐ 商业
- ☐ 饮食业
- ☐ 旅游业
- ☐ 文书
- ☐ 设计
- ☐ 建筑
- ☐ 教育
- ☐ 顾问
- ☐ 资讯科技
- ☐ 制造业
- ☐ 产品研发
- ☐ 医疗
- ☐ 金融
- ☐ 零售
- ☐ 服务
- ☐ 其他: _____

3. 如果您的职业或学习涉及上述问题中的 "设计" 范畴，请在以下选择设计领域： *

- ○ 不适用
- ○ 时装设计
- ○ 多媒体设计
- ○ 产品设计

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- ○ 空间设计
- ○ 视觉通信设计
- ○ 其他: _____

4. 最高学历（包括现时在学课程）： *

- ○ 初中或以下
- ○ 高中/中专
- ○ 大专/高职
- ○ 大学本科
- ○ 硕士或以上
- ○ 其他: _____

4a. 您修读以上＂最高学历＂的年份是: _____ 年至 _____ 年*

（请以公历填写年份，例如：2018年至2022年，谢谢！）

5. 请指明您的大专/高职/大学本科/研究生等专项教育的主要领域: （如有需要，您可以选择多个答案） *

Checkboxes

- ☐ 语文
- ☐ 艺术
- ☐ 商务
- ☐ 设计
- ☐ 建筑
- ☐ 教育
- ☐ 工程
- ☐ 资讯科技
- ☐ 医疗
- ☐ 科学
- ☐ 旅游/酒店
- ☐ 社会科学
- ☐ 其他: _____

6. 居住地

您的原居城市: _____

您目前逗留学习/工作的城市: _____ *

7. 性别: *

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男性
女性
其他

8. 婚姻状况： *

单身
已婚
离婚/分居
其他：_____

9. 年龄： *

18-20岁
21-25岁
26-35岁
36-45岁
46-55岁
56-65岁
66岁或以上

非常感谢您的参与!

您的意见很有宝贵；如有其他意见，请提供：

please enter

您可以联系研究人员查询有关本调研项目: CCresearch@yeah.net -- 您也可以在下面留下您的微信或电邮地址，以便跟进或了解有关研究的更多内容：_____

Submit

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The system is provided by Tencent Questionnaire
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APPENDICES

Appendix 5c: Part Two Survey – Pilot 2 Questionnaire (Implemented version in Chinese)

设计师与用家看产品价值：智能手机

从设计师及用家的角度看产品价值及预期应用：智能通信产品

这项研究，为理解设计师和用家如何看产品价值及预期应用，其間可能存在的不同角度及背後的原因，例如经验、背境、或性格特徵等影响。对这潜在差异的理解，将有助设计师和生产商设计和生产为用家提供更佳体验和价值的产品。本问卷会参照智能通信产品 (例如智能手机) 作为示例。
这项研究是英国 University of Wales Trinity Saint David 工商管理博士课程的一部分，本问卷所收集的资料将被视为机密，及仅作为学术研究用途。你的参与对于这个研究项目的顺利完成至关重要，非常感谢你的时间及支持。
註:
(1) 估计完成整份问卷，约需時20分钟，谢谢您的耐心认真作答。
(2) 经系统审定为认真作答的答卷，于问卷回收结束後，会以小小微信红包致谢。
(3) 请勿重覆作答，由同一账户重覆递交的答卷，将被视作无效。
谢谢!

邀请编号: _____ （若曾收到邀请信息，请填上信息内的邀请编号，谢谢！）

A. 使用经验

1. 您认为自己对智能手机有多熟悉? *

- ○ 非常熟悉
- ○ 熟悉
- ○ 有点熟悉
- ○ 不太熟悉
- ○ 一点也不熟悉
- ○ 其他: _____

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2. 您使用智能手机多久了？ *

- ◯ 5年或以上
- ◯ 3至5年以内
- ◯ 1至3年以内
- ◯ 少于1年
- ◯ 从不
- ◯ 其他: _____

3. 您使用当前的智能手机多久了？ *

- ◯ 4年或以上
- ◯ 2至4年以内
- ◯ 1至2年以内
- ◯ 6至12个月以内
- ◯ 少于6个月
- ◯ 其他: _____

4. 您多经常使用智能手机？ *

- ◯ 不间断使用
- ◯ 一小时内多次
- ◯ 一天很多次
- ◯ 一天几次
- ◯ 少于上述频率
- ◯ 其他: _____

APPENDICES

5. 您是否有同时使用智能手表？ *

- ◯ 经常使用
- ◯ 有时使用
- ◯ 间中使用
- ◯ 现时没有使用，未来可能會用
- ◯ 现时没有使用，也不打算使用
- ◯ 其他：_____

6. 您多经常使用电脑？ *

- ◯ 每天5小时或以上
- ◯ 每天2至5小时以内
- ◯ 每天1至2小时以内
- ◯ 每周几个小时
- ◯ 少于上述频率
- ◯ 其他：_____

7. 您当前的智能手机品牌、型号、及售价是?

品牌：_____

型号：_____

售价：_____ *

(若不肯定售价，请提供大约售价就可以了，谢谢分享！)

7a. 您为什么选择这个品牌？ *

7b. 您为什么选择这个型号？ *

APPENDICES

8. 在智能手机的功能中，您经常使用： *

- ◯ 所有功能
- ◯ 大部分功能
- ◯ 一些功能
- ◯ 一小部分功能
- ◯ 只有几个功能
- ◯ 其他：_____

8a. 在各类智能手机功能中，您 "最常使用" 至 "最少使用" 的排序是？ *

(请将全部选项排序)

Tips:请将右侧的内容填至左侧，进行排序

1		游戏类
2		娱乐类
3		创作类
4		拍摄类
5		社交类
6		通信类
7		资讯类
8		工具类
9		教育类
10		运动/健康管理类
11		金融/理财类
12		购物类

8b. 除上述 8a 所列，还有没有其他功能类别是您经常使用的？ *

- ◯ 没有了
- ◯ 还有：_____

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8c. 您在智能手机中添加了多少额外的软件（应用程序/APP）？ *

- ◯ 超过100个
- ◯ 71至100个
- ◯ 51至70个
- ◯ 31至50个
- ◯ 11至30个
- ◯ 1至10个
- ◯ 无
- ◯ 其他: _____

8d. 在您的智能手机内，您最常使用的几个软件/功能是?

1: _____
2: _____
3: _____
4: _____
5: _____ *

(请分享不少于3个您最常使用的软件/功能，谢谢分享！)

8e. 在您的智能手机内，您最少使用的几个软件/功能是?

1: _____
2: _____
3: _____
4: _____
5: _____ *

(请分享不少于3个您最常使用的软件/功能，谢谢分享！)

APPENDICES

9. 您对您的智能手机有多大程度满意? *

- ◯ 非常满意
- ◯ 满意
- ◯ 有点满意
- ◯ 中性
- ◯ 有点不满意
- ◯ 不满意
- ◯ 非常不满意

9a. 您最满意您的智能手机是那方面? *

9b. 您最不满意您的智能手机是那方面? *

10. 您希望您的智能手机能做什么（现时未做到的）? *

11. 您认为一个理想的智能手机，其价值的重要性排序是? *

创新价值：价值源自产品的创意、新颖性、或带来的想象空间/探索可能
感受价值：价值源于产品使用体验的正面感觉或唤起的情感状态
社会价值：源自社群的相关价值，例如增进沟通、朋友的欣赏认同、或群体归属感等
实用价值：源自产品功能和实用性能的价值

Tips:请将右侧的内容填至左侧，进行排序

1		创新价值
2		感受价值
3		社会价值
4		实用价值

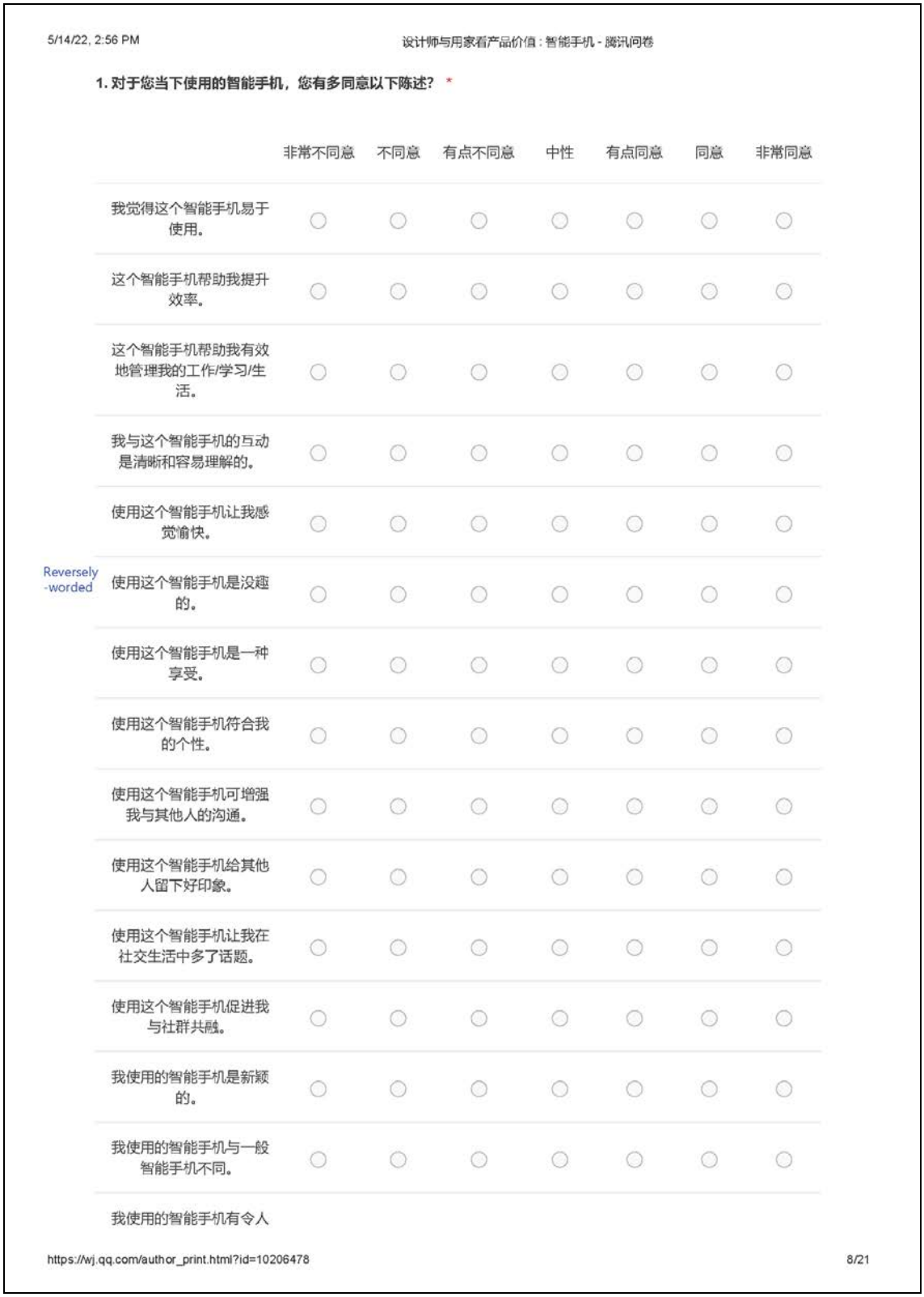
APPENDICES

B. 设计及使用体验

在这环节中，您会：

1. 首先，就实用价值、感受价值、社会价值、创新价值几方面评价您当下使用的智能手机；
2. 然後，以设计师的角度为您的目标用户群构思一个新智能手机；
3. & 4. 再分别站在设计师及用家的角度，评价您构思的新智能手。

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5/14/22, 2:56 PM 设计师与用家看产品价值：智能手机 - 腾讯问卷

1. 对于您当下使用的智能手机，您有多同意以下陈述？ *

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
我觉得这个智能手机易于使用。	○	○	○	○	○	○	○
这个智能手机帮助我提升效率。	○	○	○	○	○	○	○
这个智能手机帮助我有效地管理我的工作/学习/生活。	○	○	○	○	○	○	○
我与这个智能手机的互动是清晰和容易理解的。	○	○	○	○	○	○	○
使用这个智能手机让我感觉愉快。	○	○	○	○	○	○	○
Reversely-worded 使用这个智能手机是没趣的。	○	○	○	○	○	○	○
使用这个智能手机是一种享受。	○	○	○	○	○	○	○
使用这个智能手机符合我的个性。	○	○	○	○	○	○	○
使用这个智能手机可增强我与其他人的沟通。	○	○	○	○	○	○	○
使用这个智能手机给其他人留下好印象。	○	○	○	○	○	○	○
使用这个智能手机让我在社交生活中多了话题。	○	○	○	○	○	○	○
使用这个智能手机促进我与社群共融。	○	○	○	○	○	○	○
我使用的智能手机是新颖的。	○	○	○	○	○	○	○
我使用的智能手机与一般智能手机不同。	○	○	○	○	○	○	○
我使用的智能手机有令人							

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惊喜的功能。	○	○	○	○	○	○	○
这個智能手机的使用給了我想象空间。	○	○	○	○	○	○	○
使用这个智能手机令我感到惬意。	○	○	○	○	○	○	○
总的来说，使用这个智能手机令我感到满意。	○	○	○	○	○	○	○
我预期会继续使用这个智能手机。	○	○	○	○	○	○	○
我会毫不犹豫使用这个智能手机来满足我的需要。	○	○	○	○	○	○	○

APPENDICES

2. 现在，您将以设计师的角度为您的目标用户群设计一个新智能手机，您会把它设计成为： *

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
人机合一。	○	○	○	○	○	○	○
解难助手。	○	○	○	○	○	○	○
创作助手。	○	○	○	○	○	○	○
虚拟朋友/家人。	○	○	○	○	○	○	○
提升人机互动。	○	○	○	○	○	○	○
提升人与人互动。	○	○	○	○	○	○	○
提升安全感。	○	○	○	○	○	○	○
提升健康生活。	○	○	○	○	○	○	○
传达全感观 (视像、气味、氛围...) 信息。	○	○	○	○	○	○	○
拍摄3D影像, 用作立体投射。	○	○	○	○	○	○	○
自动建構3D模型。	○	○	○	○	○	○	○
优化物件搜寻及追踪功能 (例如停泊于公众停车場的汽车、遗失的物件)。	○	○	○	○	○	○	○
优化人物搜寻 (例如在人群中导向相约见面的朋友)。	○	○	○	○	○	○	○
优化出行使用 (如改良定位、导航、路线记录/拍摄)。	○	○	○	○	○	○	○
个性化功能 (例如自動搜集及过滤使用者关注的信息)。	○	○	○	○	○	○	○

APPENDICES

2. 现在，您将以设计师的角度为您的目标用户群设计一个新智能手机，您会把它设计成为： *

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
人机合一。	○	○	○	○	○	○	○
解难助手。	○	○	○	○	○	○	○
创作助手。	○	○	○	○	○	○	○
虚拟朋友/家人。	○	○	○	○	○	○	○
提升人机互动。	○	○	○	○	○	○	○
提升人与人互动。	○	○	○	○	○	○	○
提升安全感。	○	○	○	○	○	○	○
提升健康生活。	○	○	○	○	○	○	○
传达全感观 (视像、气味、氛围...) 信息。	○	○	○	○	○	○	○
拍摄3D影像, 用作立体投射。	○	○	○	○	○	○	○
自动建構3D模型。	○	○	○	○	○	○	○
优化物件搜寻及追踪功能 (例如停泊于公众停车場的汽车、遗失的物件)。	○	○	○	○	○	○	○
优化人物搜寻 (例如在人群中导向相约见面的朋友)。	○	○	○	○	○	○	○
优化出行使用 (如改良定位、导航、路线记录/拍摄)。	○	○	○	○	○	○	○
个性化功能 (例如自動搜集及过滤使用者关注的信息)。	○	○	○	○	○	○	○

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3. 对于您在以上第2题建构的新智能电话，您作为设计师，有多同意以下陈述？ *

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
这个智能手机会易于使用。	○	○	○	○	○	○	○
这个智能手机会帮助用家提升效率。	○	○	○	○	○	○	○
这个智能手机会帮助用家有效地管理他/她的工作/学习/生活。	○	○	○	○	○	○	○
用家与这个智能手机的互动会是清晰和容易理解的。	○	○	○	○	○	○	○
使用这个智能手机会让用家感觉愉快。	○	○	○	○	○	○	○
Reversely -worded 使用这个智能手机会是没趣的。	○	○	○	○	○	○	○
使用这个智能手机会是一种享受。	○	○	○	○	○	○	○
使用这个智能手机会符合用家的个性。	○	○	○	○	○	○	○
使用这个智能手机会增强用家与其他人的沟通。	○	○	○	○	○	○	○
使用这个智能手机会给其他人留下好印象。	○	○	○	○	○	○	○
使用这个智能手机会让用家在社交生活中多了话题。	○	○	○	○	○	○	○
使用这个智能手机会促进用家与社群共融。	○	○	○	○	○	○	○
这个智能手机是新颖的。	○	○	○	○	○	○	○
这个智能手机与一般智能手机不同。	○	○	○	○	○	○	○

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5/14/22, 2:56 PM 设计师与用家看产品价值：智能手机 - 腾讯问卷

3. 对于您在以上第2题建构的新智能电话，您作为设计师，有多同意以下陈述？ *

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
这个智能手机会易于使用。	○	○	○	○	○	○	○
这个智能手机会帮助用家提升效率。	○	○	○	○	○	○	○
这个智能手机会帮助用家有效地管理他/她的工作/学习/生活。	○	○	○	○	○	○	○
用家与这个智能手机的互动会是清晰和容易理解的。	○	○	○	○	○	○	○
使用这个智能手机会让用家感觉愉快。	○	○	○	○	○	○	○
Reversely -worded 使用这个智能手机会是没趣的。	○	○	○	○	○	○	○
使用这个智能手机会是一种享受。	○	○	○	○	○	○	○
使用这个智能手机会符合用家的个性。	○	○	○	○	○	○	○
使用这个智能手机会增强用家与其他人的沟通。	○	○	○	○	○	○	○
使用这个智能手机会给其他人留下好印象。	○	○	○	○	○	○	○
使用这个智能手机会让用家在社交生活中多了话题。	○	○	○	○	○	○	○
使用这个智能手机会促进用家与社群共融。	○	○	○	○	○	○	○
这个智能手机是新颖的。	○	○	○	○	○	○	○
这个智能手机与一般智能手机不同。	○	○	○	○	○	○	○

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5/14/22, 2:56 PM 设计师与用家看产品价值：智能手机 - 腾讯问卷

4. 对于您在以上第2题建构的新智能电话，假设您是用家，您有多同意以下陈述？ *

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
这个智能手机会易于使用。	○	○	○	○	○	○	○
这个智能手机会帮助我提升效率。	○	○	○	○	○	○	○
这个智能手机会帮助我有效地管理我的工作/学习/生活。	○	○	○	○	○	○	○
我与这个智能手机的互动会是清晰和容易理解的。	○	○	○	○	○	○	○
使用这个智能手机会让我感觉愉快。	○	○	○	○	○	○	○
Reversely-worded 使用这个智能手机会是没趣的。	○	○	○	○	○	○	○
使用这个智能手机会是一种享受。	○	○	○	○	○	○	○
使用这个智能手机会符合我的个性。	○	○	○	○	○	○	○
使用这个智能手机会增强我与其他人的沟通。	○	○	○	○	○	○	○
使用这个智能手机会给其他人留下好印象。	○	○	○	○	○	○	○
使用这个智能手机会让我在社交生活中多了话题。	○	○	○	○	○	○	○
使用这个智能手机会促进我与社群共融。	○	○	○	○	○	○	○
这个智能手机是新颖的。	○	○	○	○	○	○	○
这个智能手机与一般智能手机不同。	○	○	○	○	○	○	○
这个智能手机有令人惊喜的功能。							

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这个智能手机的使用会带給我想象空间。	○	○	○	○	○	○	○
使用这个智能手机会令我感到惬意。	○	○	○	○	○	○	○
总的来说，这个智能手机会令我感到满意。	○	○	○	○	○	○	○
我预期会使用这个智能手机。	○	○	○	○	○	○	○
我会毫不犹豫使用这个智能手机来满足我的需要。	○	○	○	○	○	○	○

C. 受访者背景

1. 您现时是： *

- ○ 学生
- ○ 在职
- ○ 家庭主妇
- ○ 退休
- ○ 暂无职业
- ○ 其他：_____

APPENDICES

2. 工作/学习领域：（如有需要，您可以选择多个答案） *

- [ ] 商业
- [ ] 旅游业
- [ ] 饮食业
- [ ] 文书
- [ ] 设计
- [ ] 建筑
- [ ] 教育
- [ ] 顾问
- [ ] 法律
- [ ] 资讯科技
- [ ] 制造业
- [ ] 产品研发
- [ ] 医疗
- [ ] 金融
- [ ] 物流
- [ ] 零售
- [ ] 服务
- [ ] 政府/公共事务
- [ ] 其他：_____

APPENDICES

3. 如果您的职业或学习涉及上述问题中的"设计"范畴，请在以下选择设计领域： *

- ◯ 我的职业或学习不涉及设计
- ◯ 服装设计
- ◯ 多媒体设计
- ◯ 产品设计
- ◯ 空间设计
- ◯ 视觉通信设计
- ◯ 其他设计领域：_____

4. 最高学历（包括现时在学课程）： *

- ◯ 初中或以下
- ◯ 高中/中专/技校
- ◯ 大专/高职
- ◯ 大学本科
- ◯ 硕士或以上
- ◯ 其他：_____

4a. 您修读以上＂最高学历＂的年份是：_____年至_____年 *

（请以公历填写年份，例如：2018年至2022年，谢谢！）

APPENDICES

4b. 请指明您的大专/高职/大学本科/研究生等专项教育的主要领域：（如有需要，您可以选择多个答案） *

- [ ] 语文
- [ ] 艺术
- [ ] 商务
- [ ] 设计
- [ ] 建筑
- [ ] 教育
- [ ] 法律
- [ ] 工程
- [ ] 资讯科技
- [ ] 医疗
- [ ] 科学
- [ ] 旅游/酒店
- [ ] 社会科学
- [ ] 其他：_____

4c. 您现时或最後就读的大专/高职/大学是？ *

城市	学校	如就读院校未有列出，请在此提供：

5. 居住地

您的原居城市：_____

您目前逗留学习/工作的城市：_____ *

6. 性别： *

- ○ 男性
- ○ 女性
- ○ 其他

APPENDICES

7. 婚姻状况： *

- ◯ 单身
- ◯ 已婚
- ◯ 离婚/分居
- ◯ 其他：_____

8. 年龄： *

- ◯ 18-20岁
- ◯ 21-25岁
- ◯ 26-35岁
- ◯ 36-45岁
- ◯ 46-55岁
- ◯ 56-65岁
- ◯ 66岁或以上

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9. 您有多同意以下陈述？ 我认为我..... *

		非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
	做事严谨认真。	○	○	○	○	○	○	○
	爱说话。	○	○	○	○	○	○	○
Reversely -worded	有时对别人粗鲁、不客气。	○	○	○	○	○	○	○
	具有独创性，会产生新点子。	○	○	○	○	○	○	○
	经常会担心。	○	○	○	○	○	○	○
	天性比较宽容。	○	○	○	○	○	○	○
Reversely -worded	往往很懒惰。	○	○	○	○	○	○	○
	开朗、善社交。	○	○	○	○	○	○	○
	重视艺术和审美的体验。	○	○	○	○	○	○	○
	容易紧张。	○	○	○	○	○	○	○
	做事有效率。	○	○	○	○	○	○	○
Reversely -worded	含蓄、保守。	○	○	○	○	○	○	○
	为他人着想、对几乎每一个人都和蔼。	○	○	○	○	○	○	○
	想象力丰富。	○	○	○	○	○	○	○
Reversely -worded	懂得放松，能很好地应付压力。	○	○	○	○	○	○	○

APPENDICES

10. 您有多同意以下陈述？ *

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
如果我听说有一个新的智能手机面世，我会有兴趣了解它。	○	○	○	○	○	○	○
如果我听说有一个新的智能手机面世，我会有兴趣采用它。	○	○	○	○	○	○	○
即使我没有体验过，我会考虑采用一个新面世的智能手机。	○	○	○	○	○	○	○
Reversely-worded 总的来说，我是我的朋友圈中最后一个知道有新智能手机面世。	○	○	○	○	○	○	○

非常感谢您的参与!

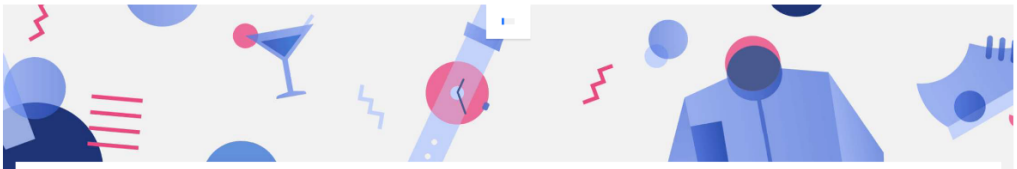
您的意见很宝贵；如有其他意见，请提供：

您可以联系研究人员查询有关本调研项目: CCresearch@yeah.net -- 您也可以在下面留下您的微信或电邮地址，以便跟进或了解有关研究的更多内容：_____

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APPENDICES

Appendix 5d: Part Two Survey – Final Questionnaire (Implemented version in Chinese)



设计师与用家看产品价值：智能手机

从设计师及用家的角度看产品价值及预期应用：智能通信产品

这项研究，为理解设计师和用家如何看产品价值及预期应用，其间可能存在的不同角度及背後的原因，例如经验、背境、或性格特徵等影响。对这潜在差异的理解，将有助设计师和生产商设计和生产为用家提供更佳体验和价值的产品。本问卷会参照智能通信产品 (例如:智能手机) 作为示例。

这项研究是英国 University of Wales Trinity Saint David 工商管理博士课程的一部分，本问卷所收集的资料将被视为机密，及仅作为学术研究用途。您的参与对于这个研究项目的顺利完成至关重要，非常感谢您的时间及支持。

註:
估计完成整份问卷，约需時20分钟，谢谢您的耐心认真作答；于问卷回收结束後，会以小小微信红包聊表谢意。
您可以联系研究人员查询有关本调研项目: CCresearch@yeah.net
为配合学术研究要求及调研问卷前设，请勿重覆作答。

谢谢您!

邀请码: _____ （请填上邀请信息内的邀请码，谢谢！）

A. 使用经验

* 1. 您认为自己对智能手机有多熟悉?

- 非常熟悉
- 熟悉
- 有点熟悉
- 不太熟悉
- 一点也不熟悉
- 其他: _____

* 2. 您使用智能手机多久了?

- 10年或以上
- 5至10年以内
- 3至5年以内
- 1至3年以内
- 少于1年

CChan 微信

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- ○ 从不
- ○ 其他：_____

* 3. 您使用当前的智能手机多久了?

- ○ 4年或以上
- ○ 2至4年以内
- ○ 1至2年以内
- ○ 6至12个月以内
- ○ 少于6个月
- ○ 其他：_____

* 4. 您多经常使用智能手机?

- ○ 不间断使用
- ○ 一小时内多次
- ○ 一天很多次
- ○ 一天几次
- ○ 少于上述频率
- ○ 其他：_____

* 5. 您是否有同时使用智能手表?

- ○ 经常使用
- ○ 有时使用
- ○ 间中使用
- ○ 现时没有使用，未来可能會用
- ○ 现时没有使用，也不打算使用
- ○ 其他：_____

* 6. 您多经常使用电脑?

- ○ 每天5小时或以上
- ○ 每天2至5小时以内
- ○ 每天1至2小时以内
- ○ 每周几个小时
- ○ 少于上述频率
- ○ 其他：_____

* 7. 您当前的智能手机品牌、型号、及售价是?

品牌：_____
型号：_____
售价：_____

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(若不肯定售价，请提供大约售价就可以了，谢谢分享！)

* 7a. 您为什么选择这个品牌?

please enter

* 7b. 您为什么选择这个型号?

please enter

* 8. 在智能手机的功能中，您经常使用:

- 所有功能
- 大部分功能
- 一些功能
- 一小部分功能
- 只有几个功能
- 其他: _____

* 8a. 在各类智能手机功能中，您「最常使用」至「最少使用」的排序是?

(请将全部选项排序)

Drag the right option or click to the left to sort

游戏类
娱乐类
创作类
拍摄类
社交类
通信类
资讯类
工具类
教育类
自我提升类
运动/健康类
金融/理财类
购物类

* 8b. 除上述 8a 所列，还有没有其他功能类别是您经常使用的?

- 没有了
- 还有: _____

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* 8c. 您在智能手机中添加了多少额外的软件（应用程 \PP）？

- 超过100个
- 71至100个
- 51至70个
- 31至50个
- 11至30个
- 1至10个
- 无
- 其他：_____

* 8d. 在您的智能手机内，您最常使用的几个软件 / 功能是?

1：_____
2：_____
3：_____
4：_____
5：_____

(请分享不少于3个您最常使用的软件/功能，谢谢分享！)

* 8e. 在您的智能手机内，您最少使用的几个软件 / 功能是?

1：_____
2：_____
3：_____
4：_____
5：_____

(请分享不少于3个您最常使用的软件/功能，谢谢分享！)

* 9. 您对您的智能手机有多大程度满意?

- 非常满意
- 满意
- 有点满意
- 中性
- 有点不满意
- 不满意
- 非常不满意

* 9a. 您最满意您的智能手机是那方面?

please enter

* 9b. 您最不满意您的智能手机是那方面?

please enter

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* 10. 您希望您的智能手机能做什么（现时未做到的）

please enter

* 11. 您认为一个理想的智能手机，其价值的重要性排序是?

创新价值： 价值源自产品的创意、新颖性、或带来的想象空间/探索可能
感受价值： 价值源于产品使用体验的正面感觉或唤起的情感状态
社会价值： 源自社群的相关价值，例如增进沟通、朋友的欣赏认同、或群体归属感等
实用价值： 源自产品功能和实用性能的价值

Drag the right option or click to the left to sort

	创新价值
	感受价值
	社会价值
	实用价值

B. 设计及使用体验

在这环节中，您会：

1. 首先，就实用价值、感受价值、社会价值、创新价值几方面评价您当下使用的智能手机；
2. 然後，透过衡量一系列设计取向的优次，为您自己建构一个适合［您］的新智能手机；
3. 再从设计师的角度出发，为您的目标用户群构思一个适合［他 / 她］的新智能手机。

* 1. 对于您当下使用的智能手机，您有多同意以下陈述?

（注意：请仔细阅读并回答每个项目，项目中包含正向及反向措辞。）

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
我觉得这个智能手机易于使用。	○	○	○	○	○	○	○
这个智能手机帮助我解决很多问题。	○	○	○	○	○	○	○
这个智能手机帮助我有效地处理我的工作 / 学习 / 生活事项。	○	○	○	○	○	○	○
我与这个智能手机的互动是清晰和容易理解的。	○	○	○	○	○	○	○
使用这个智能手机让我感觉愉快。	○	○	○	○	○	○	○
使用这个智能手机带给我乐趣。	○	○	○	○	○	○	○
我享受使用这个智能手机。	○	○	○	○	○	○	○
使用这个智能手机是没趣的。	○	○	○	○	○	○	○
这个智能手机配合我的个性。	○	○	○	○	○	○	○
使用这个智能手机可增强我与其他人的沟通。	○	○	○	○	○	○	○

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	非常不同意	不同意	有点	中性	有点同意	同意	非常同意
使用这个智能手机给其他人留下好印象。	○	○	○	○	○	○	○
使用这个智能手机让我在社交生活中多了话题。	○	○	○	○	○	○	○
使用这个智能手机促进我与社群共融。	○	○	○	○	○	○	○
我使用的智能手机是新颖的。	○	○	○	○	○	○	○
我使用的智能手机与一般智能手机不同。	○	○	○	○	○	○	○
我使用的智能手机有令人惊喜的功能。	○	○	○	○	○	○	○
这個智能手机的使用給了我想象空间。	○	○	○	○	○	○	○
使用这个智能手机令我感到惬意。	○	○	○	○	○	○	○
总的来说，使用这个智能手机令我感到满意。	○	○	○	○	○	○	○
我预期会继续使用这个智能手机。	○	○	○	○	○	○	○
我会毫不犹豫使用这个智能手机来满足我的需要。	○	○	○	○	○	○	○

* **2. 您认为一个适合［您］的新智能手机，设计取向的优次是:**

（1 代表这个设计取向对您并不重要，属低优先级； 5 代表这个设计取向对您非常重要，属高优先级。）

	1 不重要	2	3	4	5 非常重要
+ 提升实用价值:	○	○	○	○	○
例如：解难助手	○	○	○	○	○
例如：提升人机互动	○	○	○	○	○
例如：优化物件搜寻及追踪功能 (例如停泊于公众停车場的汽车、遗失的物件)	○	○	○	○	○
例如：优化出行使用 (如改良定位、导航、路线记录/拍摄)	○	○	○	○	○
例如：拍摄全息影像, 或自动建构3D模型, 用作全息投影	○	○	○	○	○
+ 提升感受价值:	○	○	○	○	○
例如：提升安全感	○	○	○	○	○
例如：提升掌控感	○	○	○	○	○

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	1 不重要	2	3	4	5 非常重要
例如：传达全感观 (视像、气味、氛围...) 信息	○	○	○	○	○
例如：个性化外观 (例如因应使用者心情或所在情境而变化)	○	○	○	○	○
例如：人性化交互（例如AI辅助辨悉及回应使用者身心需要)	○	○	○	○	○
+ 提升社会价值:	○	○	○	○	○
例如：提升人与人互动 - 家人之间	○	○	○	○	○
例如：提升人与人互动 - 朋友之间	○	○	○	○	○
例如：提升人与人互动 - 社群之间	○	○	○	○	○
例如：成为虚拟朋友	○	○	○	○	○
例如：成为虚拟家人	○	○	○	○	○
例如：优化人物搜寻 (例如在人群中导向相约或没相约的朋友)	○	○	○	○	○
例如：个性化互联 (例如自動搜寻 / 过滤 / 分享 / 回应使用者关注的信息)	○	○	○	○	○
+ 提升创新价值:	○	○	○	○	○
例如：人机合一	○	○	○	○	○
例如：创作助手	○	○	○	○	○
例如：个人化行业助手	○	○	○	○	○
例如：个性化组合 (例如并装结構, 可因应使用者选择 / 需要 / 科技提升而灵活組合)	○	○	○	○	○
例如：自由建构 / 分享，育成个人化 / 组群联动使用环境（功能、交互、外观、信息.....可自主调节或由AI辅助调节)	○	○	○	○	○
+ 优化整体价值:	○	○	○	○	○
例如：提升生活素质 (well-being)	○	○	○	○	○
例如：环保，可持续使用	○	○	○	○	○
例如：对人及非人生态友善	○	○	○	○	○
例如：以人为本	○	○	○	○	○

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* 2a. 对于您在以上第2题选择了设计取向，建构的适[illegible]的新智能手机，您有多同意以下陈述?

（注意：请仔细阅读并回答每个项目，项目中包含正向及反向措辞。）

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
这个智能手机会易于使用。	○	○	○	○	○	○	○
这个智能手机会帮助我解决很多问题。	○	○	○	○	○	○	○
这个智能手机会帮助我有效地处理我的工作 / 学习 / 生活事项。	○	○	○	○	○	○	○
我与这个智能手机的互动会是清晰和容易理解的。	○	○	○	○	○	○	○
使用这个智能手机会让我感觉愉快。	○	○	○	○	○	○	○
使用这个智能手机会带给我乐趣。	○	○	○	○	○	○	○
我会享受使用这个智能手机。	○	○	○	○	○	○	○
使用这个智能手机会是没趣的。	○	○	○	○	○	○	○
这个智能手机可以配合我的个性。	○	○	○	○	○	○	○
使用这个智能手机会增强我与其他人的沟通。	○	○	○	○	○	○	○
使用这个智能手机会给其他人留下好印象。	○	○	○	○	○	○	○
使用这个智能手机会让我在社交生活中多了话题。	○	○	○	○	○	○	○
使用这个智能手机会促进我与社群共融。	○	○	○	○	○	○	○
这个智能手机是新颖的。	○	○	○	○	○	○	○
这个智能手机与一般智能手机不同。	○	○	○	○	○	○	○
这个智能手机有令人惊喜的功能。	○	○	○	○	○	○	○
这个智能手机的使用会带給我想象空间。	○	○	○	○	○	○	○
使用这个智能手机会令我感到惬意。	○	○	○	○	○	○	○
总的来说，这个智能手机会令我感到满意。	○	○	○	○	○	○	○
我预期会使用这个智能手机。	○	○	○	○	○	○	○
我会毫不犹豫使用这个智能手机来满足我的需要。	○	○	○	○	○	○	○

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* **3. 现在，请您以设计师的角度为［与您本身年龄层］、 不同］的目标用户群构思一个新智能手机，系统会跟据您的年龄层及性别连接至您的目标用户群。**

［我］本身是：

- ○ 18-25岁男性
- ○ 18-25岁女性
- ○ 26-40岁男性
- ◉ 26-40岁女性
- ○ 41-55岁男性
- ○ 41-55岁女性
- ○ 56岁或以上男性
- ○ 56岁或以上女性

Note:

When the respondent indicated in question 3 (of Section B) the age-sex group he/she belonged to, the questionnaire would automatically lead the respondent to question 3a, 3b, 3c or 3d to "design" for a target user group different in age and sex from the respondent.

While question 3a is shown below, the alternative questions 3b, 3c and 3d are attached at the end of the questionnaire for reference.

*



3a. 请您以设计师的角度为您的目标用户群［18-25岁男性］构思一个适合［他］的新智能手机，您的设计取向优次是:

（1 代表这个设计取向对［他］并不重要，属低优先级； 5 代表这个设计取向对［他］非常重要，属高优先级。）

	1 不重要	2	3	4	5 非常重要
+ 提升实用价值:	○	○	○	○	○
例如：解难助手	○	○	○	○	○
例如：提升人机互动	○	○	○	○	○
例如：优化物件搜寻及追踪功能 (例如停泊于公众停车場的汽车、遗失的物件)	○	○	○	○	○
例如：优化出行使用 (如改良定位、导航、路线记录/拍摄)	○	○	○	○	○
例如：拍摄全息影像, 或自动建构3D模型, 用作全息投影	○	○	○	○	○
+ 提升感要价值:	○	○	○	○	○
例如：提升安全感	○	○	○	○	○
例如：提升掌控感	○	○	○	○	○
例如：传达全感观 (视像、气味、氛围...) 信息	○	○	○	○	○
例如：个性化外观 (例如因应使用者心情或所在情境而变化)	○	○	○	○	○

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	1 不重要	2	3	4	5 非常重要
例如：人性化交互（例如AI辅助辨悉及回应使用者身心需要）	○	○	○	○	○
+ 提升社会价值：	○	○	○	○	○
例如：提升人与人互动 - 家人之间	○	○	○	○	○
例如：提升人与人互动 - 朋友之间	○	○	○	○	○
例如：提升人与人互动 - 社群之间	○	○	○	○	○
例如：成为虚拟朋友	○	○	○	○	○
例如：成为虚拟家人	○	○	○	○	○
例如：优化人物搜寻 (例如在人群中导向相约或没相约的朋友)	○	○	○	○	○
例如：个性化互联 (例如自動搜寻 / 过滤 / 分享 / 回应使用者关注的信息)	○	○	○	○	○
+ 提升创新价值：	○	○	○	○	○
例如：人机合一	○	○	○	○	○
例如：创作助手	○	○	○	○	○
例如：个人化行业助手	○	○	○	○	○
例如：个性化组合 (例如并装结構, 可因应使用者选择 / 需要 / 科技提升而灵活組合)	○	○	○	○	○
例如：自由建构 / 分享，育成个人化 / 组群联动使用环境（功能、交互、外观、信息.....可自主调节或由AI辅助调节）	○	○	○	○	○
+ 优化整体价值：	○	○	○	○	○
例如：提升生活素质 (well-being)	○	○	○	○	○
例如：环保，可持续使用	○	○	○	○	○
例如：对人及非人生态友善	○	○	○	○	○
例如：以人为本	○	○	○	○	○

* **4. 接以上第2及3题，如果您会加入其他设计取向 / 概念，这(些)取向 / 概念是?**

用于适合【我】的新智能手机：_____

用于适合我的［目标用户群］的新智能手机：_____

(如没有其他设计取向 / 概念，请填上「没有」。)

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C. 受访者背景

* 1. 您有多同意以下陈述?

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
如果我听说有一个新的智能手机面世，我会有兴趣了解它。	○	○	○	○	○	○	○
如果我听说有一个新的智能手机面世，我会有兴趣采用它。	○	○	○	○	○	○	○
即使我没有体验过，我会考虑采用一个新面世的智能手机。	○	○	○	○	○	○	○
总的来说，我比我的朋友早知道有新智能手机面世。	○	○	○	○	○	○	○

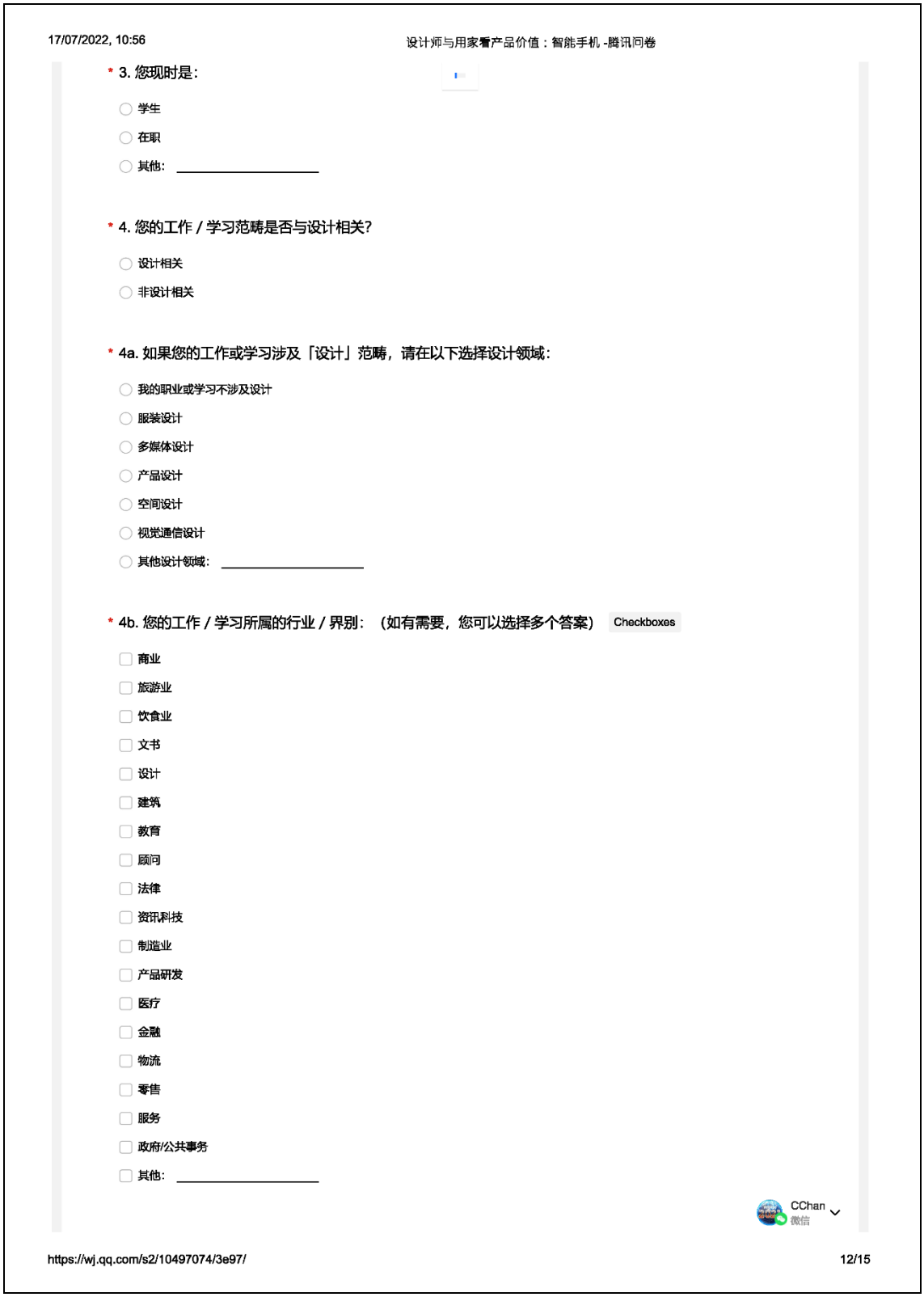
* 2. 您有多同意以下陈述? 我认为我.....

（注意：请仔细阅读并回答每个项目，项目中包含正向及反向措辞。）

	非常不同意	不同意	有点不同意	中性	有点同意	同意	非常同意
做事严谨认真。	○	○	○	○	○	○	○
爱说话。	○	○	○	○	○	○	○
常常对人客气、有礼貌。	○	○	○	○	○	○	○
具有独创性，会产生新点子。	○	○	○	○	○	○	○
经常会担心。	○	○	○	○	○	○	○
天性比较宽容。	○	○	○	○	○	○	○
做事很勤奋。	○	○	○	○	○	○	○
往往很懒惰。	○	○	○	○	○	○	○
开朗、善社交。	○	○	○	○	○	○	○
勇于冒险、突破常规。	○	○	○	○	○	○	○
容易紧张。	○	○	○	○	○	○	○
做事有效率。	○	○	○	○	○	○	○
直率、外向。	○	○	○	○	○	○	○
为他人着想、对几乎每一个人都和蔼。	○	○	○	○	○	○	○
想象力丰富。	○	○	○	○	○	○	○
常常感到内心不踏实。	○	○	○	○	○	○	○

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17/07/2022, 10:56 设计师与用家看产品价值：智能手机 -腾讯问卷

* 3. 您现时是：

- 学生
- 在职
- 其他：_____

* 4. 您的工作 / 学习范畴是否与设计相关?

- 设计相关
- 非设计相关

* 4a. 如果您的工作或学习涉及「设计」范畴，请在以下选择设计领域：

- 我的职业或学习不涉及设计
- 服装设计
- 多媒体设计
- 产品设计
- 空间设计
- 视觉通信设计
- 其他设计领域：_____

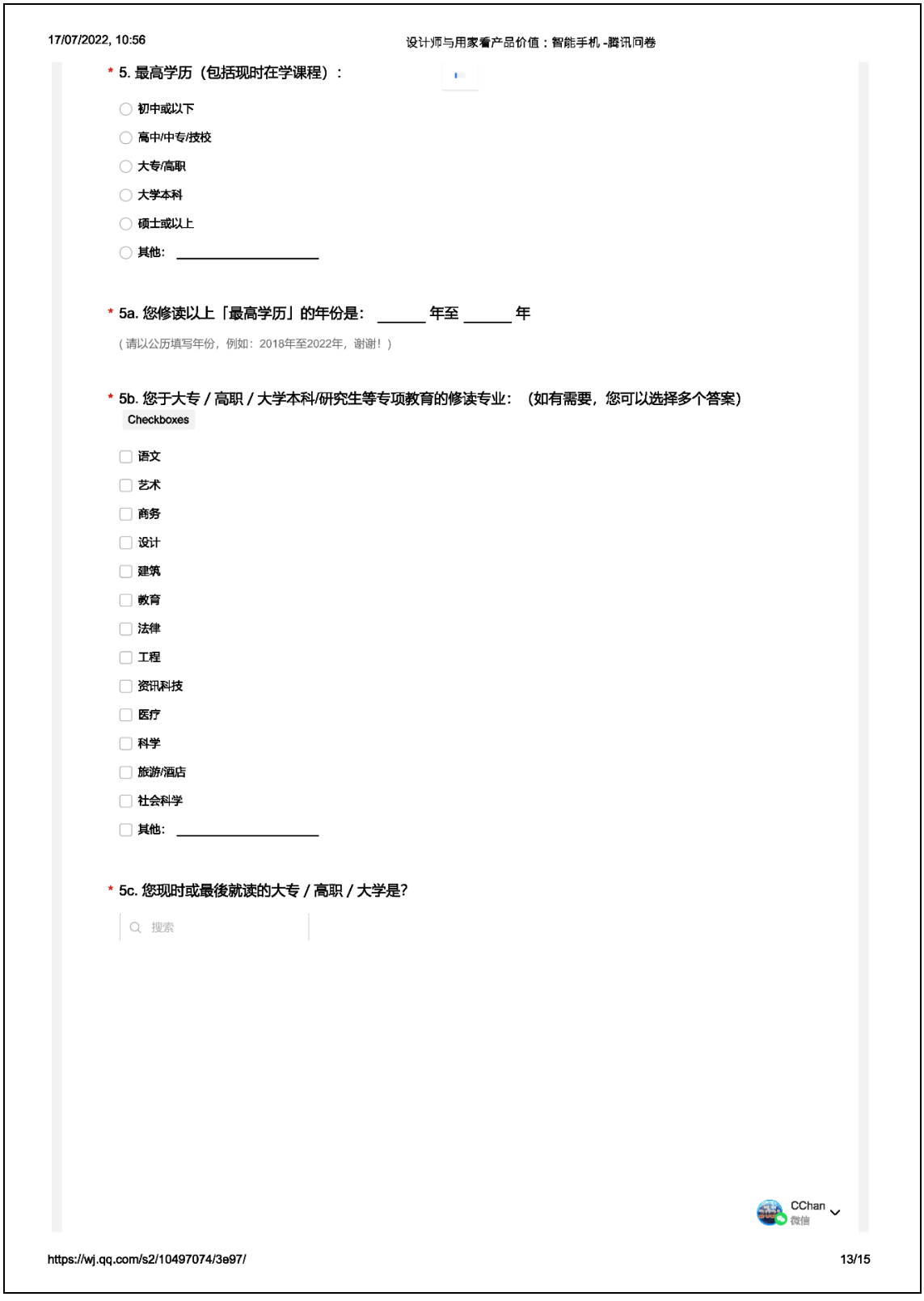
* 4b. 您的工作 / 学习所属的行业 / 界别：（如有需要，您可以选择多个答案） Checkboxes

- [ ] 商业
- [ ] 旅游业
- [ ] 饮食业
- [ ] 文书
- [ ] 设计
- [ ] 建筑
- [ ] 教育
- [ ] 顾问
- [ ] 法律
- [ ] 资讯科技
- [ ] 制造业
- [ ] 产品研发
- [ ] 医疗
- [ ] 金融
- [ ] 物流
- [ ] 零售
- [ ] 服务
- [ ] 政府/公共事务
- [ ] 其他：_____

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https://wj.qq.com/s2/10497074/3e97/ 12/15

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17/07/2022, 10:56 设计师与用家看产品价值：智能手机 -腾讯问卷

* 5. 最高学历（包括现时在学课程）：

- 初中或以下
- 高中/中专/技校
- 大专/高职
- 大学本科
- 硕士或以上
- 其他：_____

* 5a. 您修读以上「最高学历」的年份是：_____ 年至 _____ 年

（请以公历填写年份，例如：2018年至2022年，谢谢！）

* 5b. 您于大专 / 高职 / 大学本科/研究生等专项教育的修读专业：（如有需要，您可以选择多个答案）

Checkboxes

- 语文
- 艺术
- 商务
- 设计
- 建筑
- 教育
- 法律
- 工程
- 资讯科技
- 医疗
- 科学
- 旅游/酒店
- 社会科学
- 其他：_____

* 5c. 您现时或最後就读的大专 / 高职 / 大学是?

搜索

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如就读院校未有列出, 请在此提供:
院校: _____
城市: _____

* 6. 居住地
您的原居城市: _____
您目前逗留学习 / 工作的城市: _____

* 7. 性别:

- 男性
- 女性
- 其他

* 8. 婚姻状况:

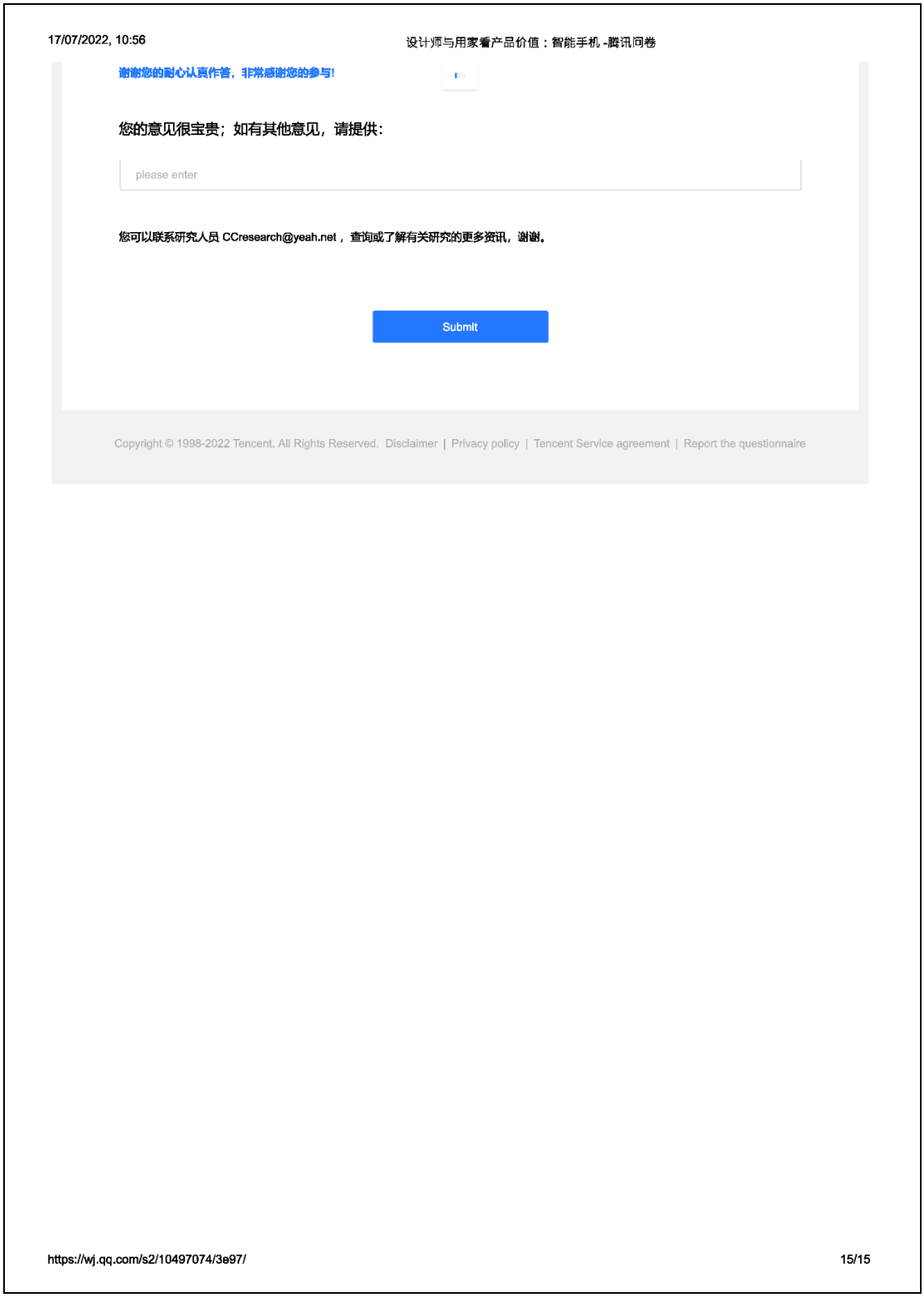
- 未婚
- 在婚 / 同居
- 离婚 / 分居
- 丧偶
- 其他: _____

* 9. 年龄:

- 18-20岁
- 21-25岁
- 26-35岁
- 36-45岁
- 46-55岁
- 56-65岁
- 66岁或以上

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谢谢您的耐心认真作答，非常感谢您的参与!

您的意见很宝贵；如有其他意见，请提供：

please enter

您可以联系研究人员 CCresearch@yeah.net ， 查询或了解有关研究的更多资讯，谢谢。

Submit

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APPENDICES

Note:

When the respondent indicated in question 3 (of Section B) the age-sex group he/she belonged to, the questionnaire would automatically lead the respondent to question 3a, 3b, 3c or 3d to "design" for a target user group different in age and sex from the respondent.

While question 3a is shown in the questionnaire above, the alternative questions 3b, 3c and 3d are attached on the following pages for reference.

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* **3. 现在，请您以设计师的角度为［与您本身年龄层］、 不同］的目标用户群构思一个新智能手机，系统会跟据您的年龄层及性别连接至您的目标用户群。**

［我］本身是：

- ○ 18-25岁男性
- ○ 18-25岁女性
- ◉ 26-40岁男性
- ○ 26-40岁女性
- ○ 41-55岁男性
- ○ 41-55岁女性
- ○ 56岁或以上男性
- ○ 56岁或以上女性

*



3b. 请您以设计师的角度为您的目标用户群［18-25岁女性］构思一个适合［她］的新智能手机，您的设计取向优次是:

（1 代表这个设计取向对［她］并不重要，属低优先级； 5 代表这个设计取向对［她］非常重要，属高优先级。）

	1 不重要	2	3	4	5 非常重要
+ 提升实用价值:	○	○	○	○	○
例如：解难助手	○	○	○	○	○
例如：提升人机互动	○	○	○	○	○
例如：优化物件搜寻及追踪功能 (例如停泊于公众停车場的汽车、遗失的物件)	○	○	○	○	○
例如：优化出行使用 (如改良定位、导航、路线记录/拍摄)	○	○	○	○	○
例如：拍摄全息影像, 或自动建构3D模型, 用作全息投影	○	○	○	○	○
+ 提升感受价值:	○	○	○	○	○
例如：提升安全感	○	○	○	○	○
例如：提升掌控感	○	○	○	○	○
例如：传达全感观 (视像、气味、氛围...) 信息	○	○	○	○	○
例如：个性化外观 (例如因应使用者心情或所在情境而变化)	○	○	○	○	○

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	1 不重要	2	3	4	5 非常重要
例如：人性化交互（例如AI辅助辨悉及回应使用者身心需要）	○	○	○	○	○
+ 提升社会价值：	○	○	○	○	○
例如：提升人与人互动 - 家人之间	○	○	○	○	○
例如：提升人与人互动 - 朋友之间	○	○	○	○	○
例如：提升人与人互动 - 社群之间	○	○	○	○	○
例如：成为虚拟朋友	○	○	○	○	○
例如：成为虚拟家人	○	○	○	○	○
例如：优化人物搜寻 (例如在人群中导向相约或没相约的朋友)	○	○	○	○	○
例如：个性化互联 (例如自動搜寻 / 过滤 / 分享 / 回应使用者关注的信息)	○	○	○	○	○
+ 提升创新价值：	○	○	○	○	○
例如：人机合一	○	○	○	○	○
例如：创作助手	○	○	○	○	○
例如：个人化行业助手	○	○	○	○	○
例如：个性化组合 (例如并装结構, 可因应使用者选择 / 需要 / 科技提升而灵活組合)	○	○	○	○	○
例如：自由建构 / 分享，育成个人化 / 组群联动使用环境（功能、交互、外观、信息.....可自主调节或由AI辅助调节）	○	○	○	○	○
+ 优化整体价值：	○	○	○	○	○
例如：提升生活素质 (well-being)	○	○	○	○	○
例如：环保，可持续使用	○	○	○	○	○
例如：对人及非人生态友善	○	○	○	○	○
例如：以人为本	○	○	○	○	○

APPENDICES

* **3. 现在，请您以设计师的角度为［与您本身年龄层］，　不同］的目标用户群构思一个新智能手机，系统会跟据您的年龄层及性别连接至您的目标用户群。**

［我］本身是：

- ○ 18-25岁男性
- ◉ 18-25岁女性
- ○ 26-40岁男性
- ○ 26-40岁女性
- ○ 41-55岁男性
- ○ 41-55岁女性
- ○ 56岁或以上男性
- ○ 56岁或以上女性

*



3c. 请您以设计师的角度为您的目标用户群［26-40岁男性］构思一个适合［他］的新智能手机，您的设计取向优次是:

（1 代表这个设计取向对［他］并不重要，属低优先级； 5 代表这个设计取向对［他］非常重要，属高优先级。）

	1 不重要	2	3	4	5 非常重要
+ 提升实用价值:	○	○	○	○	○
例如：解难助手	○	○	○	○	○
例如：提升人机互动	○	○	○	○	○
例如：优化物件搜寻及追踪功能 (例如停泊于公众停车場的汽车、遗失的物件)	○	○	○	○	○
例如：优化出行使用 (如改良定位、导航、路线记录/拍摄)	○	○	○	○	○
例如：拍摄全息影像, 或自动建构3D模型, 用作全息投影	○	○	○	○	○
+ 提升感要价值:	○	○	○	○	○
例如：提升安全感	○	○	○	○	○
例如：提升掌控感	○	○	○	○	○
例如：传达全感观 (视像、气味、氛围...) 信息	○	○	○	○	○
例如：个性化外观 (例如因应使用者心情或所在情境而变化)	○	○	○	○	○

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	1 不重要	2	3	4	5 非常重要
例如：人性化交互（例如AI辅助辨悉及回应使用者身心需要）	○	○	○	○	○
+ 提升社会价值：	○	○	○	○	○
例如：提升人与人互动 - 家人之间	○	○	○	○	○
例如：提升人与人互动 - 朋友之间	○	○	○	○	○
例如：提升人与人互动 - 社群之间	○	○	○	○	○
例如：成为虚拟朋友	○	○	○	○	○
例如：成为虚拟家人	○	○	○	○	○
例如：优化人物搜寻 (例如在人群中导向相约或没相约的朋友)	○	○	○	○	○
例如：个性化互联 (例如自動搜寻 / 过滤 / 分享 / 回应使用者关注的信息)	○	○	○	○	○
+ 提升创新价值：	○	○	○	○	○
例如：人机合一	○	○	○	○	○
例如：创作助手	○	○	○	○	○
例如：个人化行业助手	○	○	○	○	○
例如：个性化组合 (例如并装结構, 可因应使用者选择 / 需要 / 科技提升而灵活组合)	○	○	○	○	○
例如：自由建构 / 分享，育成个人化 / 组群联动使用环境（功能、交互、外观、信息.....可自主调节或由AI辅助调节）	○	○	○	○	○
+ 优化整体价值：	○	○	○	○	○
例如：提升生活素质 (well-being)	○	○	○	○	○
例如：环保，可持续使用	○	○	○	○	○
例如：对人及非人生态友善	○	○	○	○	○
例如：以人为本	○	○	○	○	○

APPENDICES

* **3. 现在，请您以设计师的角度为［与您本身年龄层］、 不同］的目标用户群构思一个新智能手机，系统会跟据您的年龄层及性别连接至您的目标用户群。**

［我］本身是：

- (●) 18-25岁男性
- ( ) 18-25岁女性
- ( ) 26-40岁男性
- ( ) 26-40岁女性
- ( ) 41-55岁男性
- ( ) 41-55岁女性
- ( ) 56岁或以上男性
- ( ) 56岁或以上女性

*



3d. 请您以设计师的角度为您的目标用户群［26-40岁女性］构思一个适合［她］的新智能手机，您的设计取向优次是:

（1 代表这个设计取向对［她］并不重要，属低优先级； 5 代表这个设计取向对［她］非常重要，属高优先级。）

	1 不重要	2	3	4	5 非常重要
+ 提升实用价值:	○	○	○	○	○
例如：解难助手	○	○	○	○	○
例如：提升人机互动	○	○	○	○	○
例如：优化物件搜寻及追踪功能 (例如停泊于公众停车場的汽车、遗失的物件)	○	○	○	○	○
例如：优化出行使用 (如改良定位、导航、路线记录/拍摄)	○	○	○	○	○
例如：拍摄全息影像, 或自动建构3D模型, 用作全息投影	○	○	○	○	○
+ 提升感受价值:	○	○	○	○	○
例如：提升安全感	○	○	○	○	○
例如：提升掌控感	○	○	○	○	○
例如：传达全感观 (视像、气味、氛围...) 信息	○	○	○	○	○
例如：个性化外观 (例如因应使用者心情或所在情境而变化)	○	○	○	○	○

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	1 不重要	2	3	4	5 非常重要
例如：人性化交互（例如AI辅助辨悉及回应使用者身心需要）	○	○	○	○	○
+ 提升社会价值：	○	○	○	○	○
例如：提升人与人互动 - 家人之间	○	○	○	○	○
例如：提升人与人互动 - 朋友之间	○	○	○	○	○
例如：提升人与人互动 - 社群之间	○	○	○	○	○
例如：成为虚拟朋友	○	○	○	○	○
例如：成为虚拟家人	○	○	○	○	○
例如：优化人物搜寻 (例如在人群中导向相约或没相约的朋友)	○	○	○	○	○
例如：个性化互联 (例如自動搜寻 / 过滤 / 分享 / 回应使用者关注的信息)	○	○	○	○	○
+ 提升创新价值：	○	○	○	○	○
例如：人机合一	○	○	○	○	○
例如：创作助手	○	○	○	○	○
例如：个人化行业助手	○	○	○	○	○
例如：个性化组合 (例如并装结構, 可因应使用者选择 / 需要 / 科技提升而灵活組合)	○	○	○	○	○
例如：自由建构 / 分享，育成个人化 / 组群联动使用环境（功能、交互、外观、信息.....可自主调节或由AI辅助调节）	○	○	○	○	○
+ 优化整体价值：	○	○	○	○	○
例如：提升生活素质 (well-being)	○	○	○	○	○
例如：环保，可持续使用	○	○	○	○	○
例如：对人及非人生态友善	○	○	○	○	○
例如：以人为本	○	○	○	○	○

APPENDICES

Appendix 6a: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived Utilitarian Value

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.753	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. 对于您当下使用的智能手机，您有多同意以下陈述？:我觉得这个智能手机易于使用。	18.12	4.538	.463	.753
1. 对于您当下使用的智能手机，您有多同意以下陈述？:这个智能手机帮助我解决很多问题。	17.98	4.568	.672	.634
1. 对于您当下使用的智能手机，您有多同意以下陈述？:这个智能手机帮助我有效地处理我的工作／学习／生活事项。	18.00	4.687	.604	.667
1. 对于您当下使用的智能手机，您有多同意以下陈述？:我与这个智能手机的互动是清晰和容易理解的。	18.12	4.823	.490	.727

APPENDICES

Appendix 6b: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived Hedonic Value (before modification)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.798	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. 对于您当下使用的智能手机，您有多同意以下陈述？:使用这个智能手机让我感觉愉快。	17.28	5.807	.690	.711
1. 对于您当下使用的智能手机，您有多同意以下陈述？:使用这个智能手机带给我乐趣。	17.20	6.072	.683	.719
1. 对于您当下使用的智能手机，您有多同意以下陈述？:我享受使用这个智能手机。	17.31	5.748	.662	.722
1. 对于您当下使用的智能手机，您有多同意以下陈述？:这个智能手机配合我的个性。	17.98	5.806	.460	.840

APPENDICES

Appendix 6c: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived Hedonic Value (modified with 4th item migrated to Perceived Social Value)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.846	.847	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Perceived Hedonic Value 1 (for respondent-proposed new smartphone) - 使用这个智能手机会让我感觉愉快。	12.12	2.743	.742	.555	.759
Perceived Hedonic Value 2 (for respondent-proposed new smartphone) - 使用这个智能手机会带给我乐趣。	12.14	2.700	.721	.532	.778

Perceived Hedonic Value 3 (for respondent-proposed new smartphone) - 我会享受使用这个智能手机。	12.17	2.739	.678	.461	.820

APPENDICES

Appendix 6d: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived Social Value (before modification)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.797	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. 对于您当下使用的智能手机，您有多同意以下陈述？:使用这个智能手机可增强我与其他人的沟通。	14.84	11.776	.503	.793
1. 对于您当下使用的智能手机，您有多同意以下陈述？:使用这个智能手机给其他人留下好印象。	15.71	10.561	.549	.774
1. 对于您当下使用的智能手机，您有多同意以下陈述？:使用这个智能手机让我在社交生活中多了话题。	15.50	9.159	.705	.694
1. 对于您当下使用的智能手机，您有多同意以下陈述？:使用这个智能手机促进我与社群共融。	15.49	9.182	.687	.704

APPENDICES

Appendix 6e: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived Social Value (modified with 5th item migrated from Perceived Hedonic Value)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.876	.876	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Perceived Social Value 1 (for respondent-proposed new smartphone) - 使用这个智能手机会增强我与其他人的沟通。	20.97	18.213	.691	.480	.854
Perceived Social Value 2 (for respondent-proposed new smartphone) - 使用这个智能手机会给其他人留下好印象。	21.45	17.015	.695	.487	.852

Perceived Social Value 3 (for respondent-proposed new smartphone) - 使用这个智能手机会让我在社交生活中多了话题。	21.26	16.159	.782	.658	.830
Perceived Social Value 4 (for respondent-proposed new smartphone) - 使用这个智能手机会促进我与社群共融。	21.28	16.767	.752	.629	.838
Perceived Social Value 5 (for respondent-proposed new smartphone) (Migrated from Perceived Hedonic Values) - 这个智能手机可以配合我的个性。	21.15	18.325	.615	.386	.870

APPENDICES

Appendix 6f: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived Innovative Value

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.808	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. 对于您当下使用的智能手机，您有多同意以下陈述？:我使用的智能手机是新颖的。	13.81	12.280	.572	.785
1. 对于您当下使用的智能手机，您有多同意以下陈述？:我使用的智能手机与一般智能手机不同。	14.53	12.145	.582	.781
1. 对于您当下使用的智能手机，您有多同意以下陈述？:我使用的智能手机有令人惊喜的功能。	13.78	11.815	.711	.719
1. 对于您当下使用的智能手机，您有多同意以下陈述？:这個智能手机的使用給了我想象空间。	13.80	12.392	.642	.752

APPENDICES

Appendix 6g: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived Satisfaction

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.658	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. 对于您当下使用的智能手机，您有多同意以下陈述？:使用这个智能手机令我感到惬意。	5.85	.760	.513	.
1. 对于您当下使用的智能手机，您有多同意以下陈述？:总的来说，使用这个智能手机令我感到满意。	5.34	1.395	.513	.

APPENDICES

Appendix 6h: Part Two Survey (full-scale) – Cronbach's Alpha Test – Intention of Continuous Use

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.715	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. 对于您当下使用的智能手机，您有多同意以下陈述？:我预期会继续使用这个智能手机。	5.55	1.289	.562	.
1. 对于您当下使用的智能手机，您有多同意以下陈述？:我会毫不犹豫使用这个智能手机来满足我的需要。	5.85	.974	.562	.

APPENDICES

Appendix 7a: Part Two Survey (full-scale) – Cronbach's Alpha Test – Individual Innovativeness (Individual's characteristics)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.818	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. 您有多同意以下陈述？:如果我听说有一个新的智能手机面世，我会有兴趣了解它。	14.87	12.121	.564	.804
1. 您有多同意以下陈述？:如果我听说有一个新的智能手机面世，我会有兴趣采用它。	15.34	10.615	.746	.725
1. 您有多同意以下陈述？:即使我没有体验过，我会考虑采用一个新面世的智能手机。	15.53	10.315	.633	.776
1. 您有多同意以下陈述？:总的来说，我比我的朋友早知道有新智能手机面世。	15.68	10.248	.634	.776

APPENDICES

Appendix 7b: Part Two Survey (full-scale) – Cronbach's Alpha Test – Personality Trait – Openness to experience (Individual's characteristics)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.773	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. 您有多同意以下陈述？ 我认为我.....:具有独创性，会产生新点子。	10.21	4.784	.639	.664
2. 您有多同意以下陈述？ 我认为我.....:勇于冒险、突破常规。	10.60	4.108	.606	.709
2. 您有多同意以下陈述？ 我认为我.....:想象力丰富。	10.14	5.011	.594	.712

APPENDICES

Appendix 7c: Part Two Survey (full-scale) – Cronbach's Alpha Test – Personality Trait – Neuroticism (Individual's characteristics)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.770	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. 您有多同意以下陈述？ 我认为我.....:经常会担心。	9.13	7.330	.606	.690
2. 您有多同意以下陈述？ 我认为我.....:容易紧张。	9.29	7.249	.605	.691
2. 您有多同意以下陈述？ 我认为我.....:常常感到内心不踏实。	9.62	6.561	.606	.692

APPENDICES

Appendix 7d: Part Two Survey (full-scale) – Cronbach's Alpha Test – Personality Trait – Extraversion (Individual's characteristics)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.860	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. 您有多同意以下陈述？ 我认为我.....:爱说话。	9.75	7.242	.707	.830
2. 您有多同意以下陈述？ 我认为我.....:开朗、善社交。	9.71	7.032	.764	.778
2. 您有多同意以下陈述？ 我认为我.....:直率、外向。	9.79	6.903	.737	.803

APPENDICES

Appendix 7e: Part Two Survey (full-scale) – Cronbach's Alpha Test – Personality Trait – Agreeableness (Individual's characteristics)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.638	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. 您有多同意以下陈述？ 我认为我.....:常常对人客气、有礼貌。	10.98	3.450	.469	.528
2. 您有多同意以下陈述？ 我认为我.....:天性比较宽容。	11.34	2.972	.445	.543
2. 您有多同意以下陈述？ 我认为我.....:为他人着想、对几乎每一个人都和蔼。	11.58	2.755	.444	.552

APPENDICES

Appendix 7f: Part Two Survey (full-scale) – Cronbach's Alpha Test – Personality Trait – Conscientiousness (Individual's characteristics)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.701	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. 您有多同意以下陈述？ 我认为我.....:做事严谨认真。	10.62	4.130	.476	.660
2. 您有多同意以下陈述？ 我认为我.....:做事很勤奋。	10.91	3.368	.536	.589
2. 您有多同意以下陈述？ 我认为我.....:做事有效率。	10.89	3.646	.547	.572

APPENDICES

Appendix 8a: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived importance of enhancements in smartphone (for own self) – Utilitarian Value

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.683	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: + 提升实用价值：	20.21	9.748	.337	.666
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：解难助手	20.81	8.562	.418	.641
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：提升人机互动	20.93	8.176	.417	.643

2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：优化物件搜寻及追踪功能(例如停泊于公众停车場的汽车、遗失的物件)	20.59	8.501	.466	.625
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：优化出行使用 (如改良定位、导航、路线记录/拍摄)	20.39	8.847	.494	.621
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：拍摄全息影像， 或自动建构3D模型， 用作全息投影	20.91	8.179	.382	.658

APPENDICES

Appendix 8b: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived importance of enhancements in smartphone (for own self) – Hedonic Value

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.758	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: + 提升感受价值：	19.82	11.192	.432	.740
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：提升安全感	19.75	10.932	.463	.733
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：提升掌控感	19.93	10.508	.539	.715
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：传达全感观 (视像、气味、氛围...) 信息	20.34	9.428	.554	.708

2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：个性化外观 (例如因应使用者心情或所在情境而变化)	20.28	9.656	.517	.720
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：人性化交互（例如AI辅助辨悉及回应使用者身心需要）	20.19	10.030	.506	.722

APPENDICES

Appendix 8c: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived importance of enhancements in smartphone (for own self) – Social Value

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.841	8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: + 提升社会价值：	24.37	27.331	.533	.827
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：提升人与人互动－家人之间	24.17	27.215	.588	.821
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：提升人与人互动－朋友之间	24.14	27.156	.627	.818
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：提升人与人互动－社群之间	24.28	26.417	.665	.812

2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：成为虚拟朋友	25.20	25.464	.568	.824
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：成为虚拟家人	25.46	25.160	.580	.823
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：优化人物搜寻 (例如在人群中导向相约或没相约的朋友)	24.74	26.114	.543	.827
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：个性化互联(例如自動搜寻／过滤／分享／回应使用者关注的信息)	24.53	26.845	.532	.828

APPENDICES

Appendix 8d: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived importance of enhancements in smartphone (for own self) – Innovative Value

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.852	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: + 提升创新价值：	18.14	15.641	.526	.846
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：人机合一	18.68	14.105	.545	.849
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：创作助手	18.50	13.969	.676	.819
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：个人化行业助手	18.45	13.924	.705	.814

2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：个性化组合 (例如并装结構， 可因应使用者选择／需要／科技提升而灵活組合)	18.43	14.225	.712	.814
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：自由建构／分享，育成个人化／组群联动使用环境（功能、交互、外观、信息.....可自主调节或由AI辅助调节）	18.49	14.197	.680	.819

APPENDICES

Appendix 8e: Part Two Survey (full-scale) – Cronbach's Alpha Test – Perceived importance of enhancements in smartphone (for own self) – Overall Value

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	791	100.0
	Excluded[a]	0	.0
	Total	791	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.819	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: + 优化整体价值：	16.38	7.283	.562	.797
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：提升生活素质 (well-being)	16.47	7.183	.585	.790
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：环保，可持续使用	16.35	6.902	.613	.783
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：对人及非人生态友善	16.43	6.725	.677	.762
2. 您认为一个适合〔您〕的新智能手机，设计取向的优次是: 例如：以人为本	16.18	7.194	.614	.782

APPENDICES

Appendix 9a: Part Two Survey (full-scale) – Factor Analysis – Correlation Matrix

Correlation Matrix

		Perceived Utilitarian Value 1 (for respondent's current smartphone) - 我觉得这个智能手机易于使用。	Perceived Utilitarian Value 2 (for respondent's current smartphone) - 这个智能手机帮助我解决很多问题。	Perceived Utilitarian Value 3 (for respondent's current smartphone) - 这个智能手机帮助我有效地处理我的工作／学习／生活事项。	Perceived Utilitarian Value 4 (for respondent's current smartphone) - 我与这个智能手机的互动是清晰和容易理解的。	Perceived Hedonic Value 1 (for respondent's current smartphone) - 使用这个智能手机让我感觉愉快。	Perceived Hedonic Value 2 (for respondent's current smartphone) - 使用这个智能手机带给我乐趣。	Perceived Hedonic Value 3 (for respondent's current smartphone) - 我享受使用这个智能手机。	Perceived Social Value 1 (for respondent's current smartphone) - 使用这个智能手机可增强我与其他人的沟通。	Perceived Social Value 2 (for respondent's current smartphone) - 使用这个智能手机给其他人留下好印象。	Perceived Social Value 3 (for respondent's current smartphone) - 使用这个智能手机让我在社交生活中多了话题。	Perceived Social Value 4 (for respondent's current smartphone) - 使用这个智能手机促进我与社群共融。	Perceived Social Value 5 (for respondent's current smartphone) - 这个智能手机配合我的个性。	Perceived Innovative Value 1 (for respondent's current smartphone) - 我使用的智能手机是新颖的。	Perceived Innovative Value 2 (for respondent's current smartphone) - 我使用的智能手机与一般智能手机不同。	Perceived Innovative Value 3 (for respondent's current smartphone) - 我使用的智能手机有令人惊喜的功能。	Perceived Innovative Value 4 (for respondent's current smartphone) - 这個智能手机的使用給了我想象空间。
Correlation	Perceived Utilitarian Value 1 (for respondent's current smartphone) - 我觉得这个智能手机易于使用。	1.000	.503	.351	.293	.389	.333	.330	.183	.150	.061	.045	.274	.143	.020	.126	.145
	Perceived Utilitarian Value 2 (for respondent's current smartphone) - 这个智能手机帮助我解决很多问题。	.503	1.000	.604	.436	.509	.490	.417	.301	.189	.137	.155	.321	.216	.127	.247	.239
	Perceived Utilitarian Value 3 (for respondent's current smartphone) - 这个智能手机帮助我有效地处理我的工作／学习／生活事项。	.351	.604	1.000	.482	.460	.468	.450	.239	.166	.155	.182	.310	.222	.138	.219	.223
	Perceived Utilitarian Value 4 (for respondent's current smartphone) - 我与这个智能手机的互动是清晰和容易理解的。	.293	.436	.482	1.000	.509	.453	.417	.258	.168	.143	.185	.322	.214	.113	.191	.210
	Perceived Hedonic Value 1 (for respondent's current smartphone) - 使用这个智能手机让我感觉愉快。	.389	.509	.460	.509	1.000	.688	.604	.327	.242	.231	.197	.410	.242	.155	.270	.296
	Perceived Hedonic Value 2 (for respondent's current smartphone) - 使用这个智能手机带给我乐趣。	.333	.490	.468	.453	.688	1.000	.625	.341	.234	.208	.194	.377	.235	.085	.252	.251
	Perceived Hedonic Value 3 (for respondent's current smartphone) - 我享受使用这个智能手机。	.330	.417	.450	.417	.604	.625	1.000	.303	.283	.271	.232	.413	.308	.187	.292	.369
	Perceived Social Value 1 (for respondent's current smartphone) - 使用这个智能手机可增强我与其他人的沟通。	.183	.301	.239	.258	.327	.341	.303	1.000	.397	.430	.441	.394	.321	.129	.209	.274
	Perceived Social Value 2 (for respondent's current smartphone) - 使用这个智能手机给其他人留下好印象。	.150	.189	.166	.168	.242	.234	.283	.397	1.000	.503	.462	.422	.455	.393	.369	.413
	Perceived Social Value 3 (for respondent's current smartphone) - 使用这个智能手机让我在社交生活中多了话题。	.061	.137	.155	.143	.231	.208	.271	.430	.503	1.000	.712	.351	.470	.306	.378	.443
	Perceived Social Value 4 (for respondent's current smartphone) - 使用这个智能手机促进我与社群共融。	.045	.155	.182	.185	.197	.194	.232	.441	.462	.712	1.000	.329	.466	.286	.289	.390
	Perceived Social Value 5 (for respondent's current smartphone) - 这个智能手机配合我的个性。	.274	.321	.310	.322	.410	.377	.413	.394	.422	.351	.329	1.000	.381	.262	.334	.364
	Perceived Innovative Value 1 (for respondent's current smartphone) - 我使用的智能手机是新颖的。	.143	.216	.222	.214	.242	.235	.308	.321	.455	.470	.466	.381	1.000	.478	.498	.461
	Perceived Innovative Value 2 (for respondent's current smartphone) - 我使用的智能手机与一般智能手机不同。	.020	.127	.138	.113	.155	.085	.187	.129	.393	.306	.286	.262	.478	1.000	.536	.443
	Perceived Innovative Value 3 (for respondent's current smartphone) - 我使用的智能手机有令人惊喜的功能。	.126	.247	.219	.191	.270	.252	.292	.209	.369	.378	.289	.334	.498	.536	1.000	.684
	Perceived Innovative Value 4 (for respondent's current smartphone) - 这個智能手机的使用給了我想象空间。	.145	.239	.223	.210	.296	.251	.369	.274	.413	.443	.390	.364	.461	.443	.684	1.000
Sig. (1-tailed)	Perceived Utilitarian Value 1 (for respondent's current smartphone) - 我觉得这个智能手机易于使用。		.000	.000	.000	.000	.000	.000	.000	.000	.043	.105	.000	.000	.291	.000	.000
	Perceived Utilitarian Value 2 (for respondent's current smartphone) - 这个智能手机帮助我解决很多问题。	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	Perceived Utilitarian Value 3 (for respondent's current smartphone) - 这个智能手机帮助我有效地处理我的工作／学习／生活事项。	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	Perceived Utilitarian Value 4 (for respondent's current smartphone) - 我与这个智能手机的互动是清晰和容易理解的。	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.000
	Perceived Hedonic Value 1 (for respondent's current smartphone) - 使用这个智能手机让我感觉愉快。	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	Perceived Hedonic Value 2 (for respondent's current smartphone) - 使用这个智能手机带给我乐趣。	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.008	.000	.000
	Perceived Hedonic Value 3 (for respondent's current smartphone) - 我享受使用这个智能手机。	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000
	Perceived Social Value 1 (for respondent's current smartphone) - 使用这个智能手机可增强我与其他人的沟通。	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000
	Perceived Social Value 2 (for respondent's current smartphone) - 使用这个智能手机给其他人留下好印象。	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000
	Perceived Social Value 3 (for respondent's current smartphone) - 使用这个智能手机让我在社交生活中多了话题。	.043	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000
	Perceived Social Value 4 (for respondent's current smartphone) - 使用这个智能手机促进我与社群共融。	.105	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000
	Perceived Social Value 5 (for respondent's current smartphone) - 这个智能手机配合我的个性。	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000
	Perceived Innovative Value 1 (for respondent's current smartphone) - 我使用的智能手机是新颖的。	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000
	Perceived Innovative Value 2 (for respondent's current smartphone) - 我使用的智能手机与一般智能手机不同。	.291	.000	.000	.001	.000	.008	.000	.000	.000	.000	.000	.000	.000		.000	.000
	Perceived Innovative Value 3 (for respondent's current smartphone) - 我使用的智能手机有令人惊喜的功能。	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000
	Perceived Innovative Value 4 (for respondent's current smartphone) - 这個智能手机的使用給了我想象空间。	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	

APPENDICES

Appendix 9b: Part Two Survey (full-scale) – Factor Analysis – Total Variance Explained

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.844	36.526	36.526	5.844	36.526	36.526	4.021	25.130	25.130
2	2.413	15.083	51.609	2.413	15.083	51.609	2.802	17.515	42.645
3	1.226	7.665	59.273	1.226	7.665	59.273	2.661	16.628	59.273
4	.841	5.253	64.527						
5	.757	4.732	69.258						
6	.669	4.179	73.438						
7	.598	3.740	77.178						
8	.563	3.521	80.699						
9	.533	3.330	84.029						
10	.514	3.211	87.239						
11	.452	2.826	90.066						
12	.412	2.576	92.642						
13	.335	2.092	94.734						
14	.304	1.901	96.635						
15	.292	1.827	98.462						
16	.246	1.538	100.000						

Extraction Method: Principal Component Analysis.

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Appendix 10a: Part Two Survey (full-scale) – Multiple Linear Regression – Impact of Perceived Values on Perceived Satisfaction

Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.667[a]	.445	.442	.66938	.445	157.329	4	786	.000

a. Predictors: (Constant), Perceived Innovative Value - for smartphone currently used by respondent, Perceived Utilitarian Value - for smartphone currently used by respondent, Perceived Social Value (Modified) - for smartphone currently used by respondent, Perceived Hedonic Value (Modified) - for smartphone currently used by respondent

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	281.976	4	70.494	157.329	.000[b]
	Residual	352.181	786	.448		
	Total	634.157	790			

a. Dependent Variable: Perceived Satisfaction - for smartphone currently used by respondent

b. Predictors: (Constant), Perceived Innovative Value - for smartphone currently used by respondent, Perceived Utilitarian Value - for smartphone currently used by respondent, Perceived Social Value (Modified) - for smartphone currently used by respondent, Perceived Hedonic Value (Modified) - for smartphone currently used by respondent

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.816	.222		3.679	.000
	Perceived Utilitarian Value - for smartphone currently used by respondent	.168	.046	.130	3.696	.000
	Perceived Hedonic Value (Modified) - for smartphone currently used by respondent	.376	.041	.337	9.164	.000

	Perceived Social Value (Modified) - for smartphone currently used by respondent	.065	.032	.069	2.004	.045
	Perceived Innovative Value - for smartphone currently used by respondent	.254	.026	.319	9.617	.000

a. Dependent Variable: Perceived Satisfaction - for smartphone currently used by respondent

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Appendix 10b: Part Two Survey (full-scale) – Multiple Linear Regression – Impact of Perceived Values and Perceived Satisfaction on Intention of Continuous Use

Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.653[a]	.426	.422	.71322	.426	116.502	5	785	.000

a. Predictors: (Constant), Perceived Satisfaction - for smartphone currently used by respondent, Perceived Social Value (Modified) - for smartphone currently used by respondent, Perceived Utilitarian Value - for smartphone currently used by respondent, Perceived Innovative Value - for smartphone currently used by respondent, Perceived Hedonic Value (Modified) - for smartphone currently used by respondent

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	296.312	5	59.262	116.502	.000[b]
	Residual	399.315	785	.509		
	Total	695.627	790			

a. Dependent Variable: Intention of continuous use - for smartphone currently used by respondent

b. Predictors: (Constant), Perceived Satisfaction - for smartphone currently used by respondent, Perceived Social Value (Modified) - for smartphone currently used by respondent, Perceived Utilitarian Value - for smartphone currently used by respondent, Perceived Innovative Value - for smartphone currently used by respondent, Perceived Hedonic Value (Modified) - for smartphone currently used by respondent

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.621	.238		2.607	.009
	Perceived Utilitarian Value - for smartphone currently used by respondent	.198	.049	.146	4.046	.000

	Perceived Hedonic Value (Modified) - for smartphone currently used by respondent	.186	.046	.159	4.049	.000
	Perceived Social Value (Modified) - for smartphone currently used by respondent	.045	.034	.046	1.303	.193
	Perceived Innovative Value - for smartphone currently used by respondent	.074	.030	.089	2.503	.013
	Perceived Satisfaction - for smartphone currently used by respondent	.391	.038	.373	10.287	.000

a. Dependent Variable: Intention of continuous use - for smartphone currently used by respondent

APPENDICES

Appendix 11a: Part Two Survey (full-scale) – Multiple Linear Regressions – Influence of Individual's Characteristics on Perceived Product Values (for the smartphone currently used by respondent)

Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Percentile

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method

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1	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)[b]	.	Enter

a. Dependent Variable: Perceived Utilitarian Value - for smartphone currently used by respondent

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.322[a]	.103	.097	.65698	.103	15.072	6	784	.000

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a. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.034	6	6.506	15.072	.000[b]
	Residual	338.397	784	.432		
	Total	377.431	790			

a. Dependent Variable: Perceived Utilitarian Value - for smartphone currently used by respondent

b. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.340	.202		21.481	.000
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.053	.025	.081	2.115	.035
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.063	.032	.093	1.972	.049
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.011	.019	-.019	-.558	.577
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	-.034	.024	-.063	-1.443	.149

	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.158	.035	.184	4.487	.000
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.074	.035	.097	2.136	.033

a. Dependent Variable: Perceived Utilitarian Value - for smartphone currently used by respondent

Bootstrap for Coefficients

Model		B	Bootstrap[a] Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval Lower	Upper
1	(Constant)	4.340	-.008	.252	.000	3.840	4.827
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.053	.000	.024	.029	.007	.100
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.063	.000	.033	.050	.000	.128
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.011	.000	.018	.550	-.045	.024
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	-.034	6.828E-5	.024	.166	-.082	.013
	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.158	.000	.036	.000	.088	.231
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.074	.001	.038	.052	-.001	.149

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

APPENDICES

Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Percentile

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method

APPENDICES

1	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)[b]	.	Enter

a. Dependent Variable: Perceived Hedonic Value (Modified) - for smartphone currently used by respondent

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.314[a]	.099	.092	.76549	.099	14.285	6	784	.000

APPENDICES

a. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50.223	6	8.370	14.285	.000[b]
	Residual	459.403	784	.586		
	Total	509.626	790			

a. Dependent Variable: Perceived Hedonic Value (Modified) - for smartphone currently used by respondent

b. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.167	.235		17.702	.000
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.024	.029	.032	.818	.414
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.075	.037	.095	2.006	.045
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.026	.022	-.040	-1.164	.245
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	-.023	.028	-.037	-.851	.395

	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.222	.041	.222	5.388	.000
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.055	.041	.062	1.362	.174

a. Dependent Variable: Perceived Hedonic Value (Modified) - for smartphone currently used by respondent

Bootstrap for Coefficients

Model		Bootstrap[a]					
		B	Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval Lower	95% Confidence Interval Upper
1	(Constant)	4.167	-.002	.280	.000	3.618	4.713
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.024	.000	.029	.408	-.035	.080
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.075	.000	.040	.057	-.004	.151
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.026	1.037E-5	.020	.203	-.065	.014
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	-.023	.000	.031	.438	-.084	.038
	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.222	.001	.043	.000	.138	.307
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.055	.001	.046	.234	-.034	.148

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

APPENDICES

Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Percentile

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method

APPENDICES

1	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)[b]	.	Enter

a. Dependent Variable: Perceived Social Value (Modified) - for smartphone currently used by respondent

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.484[a]	.235	.229	.83903	.235	40.034	6	784	.000

APPENDICES

a. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	169.095	6	28.182	40.034	.000[b]
	Residual	551.912	784	.704		
	Total	721.007	790			

a. Dependent Variable: Perceived Social Value (Modified) - for smartphone currently used by respondent

b. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.958	.258		7.590	.000
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.177	.032	.197	5.552	.000
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.086	.041	.092	2.107	.035
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.006	.024	-.007	-.228	.820
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	.096	.030	.129	3.177	.002

	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.085	.045	.072	1.893	.059
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.171	.044	.161	3.848	.000

a. Dependent Variable: Perceived Social Value (Modified) - for smartphone currently used by respondent

Bootstrap for Coefficients

Model		B	Bootstrap[a] Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval Lower	Upper
1	(Constant)	1.958	-.006	.257	.000	1.445	2.455
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.177	.000	.032	.000	.113	.240
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.086	.001	.048	.070	-.008	.181
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.006	.000	.022	.816	-.049	.038
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	.096	.000	.035	.007	.026	.165
	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.085	-9.478E-5	.048	.072	-.008	.180
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.171	.000	.050	.000	.074	.269

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

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Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Percentile

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method

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1	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)[b]	.	Enter

a. Dependent Variable: Perceived Innovative Value - for smartphone currently used by respondent

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.445[a]	.198	.192	1.01280	.198	32.305	6	784	.000

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a. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	198.821	6	33.137	32.305	.000[b]
	Residual	804.199	784	1.026		
	Total	1003.020	790			

a. Dependent Variable: Perceived Innovative Value - for smartphone currently used by respondent

b. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.337	.311		4.293	.000
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.238	.038	.225	6.194	.000
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.126	.050	.114	2.536	.011
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.010	.029	-.011	-.343	.731
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	.080	.036	.091	2.193	.029

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	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.050	.054	.035	.911	.363
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.154	.054	.123	2.872	.004

a. Dependent Variable: Perceived Innovative Value - for smartphone currently used by respondent

Bootstrap for Coefficients

Model		B	Bootstrap[a] Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval Lower	Upper
1	(Constant)	1.337	-.002	.324	.000	.701	1.987
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.238	-.001	.039	.000	.161	.313
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.126	.001	.052	.018	.024	.228
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.010	.000	.029	.730	-.068	.047
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	.080	.001	.036	.026	.009	.151
	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.050	.001	.059	.402	-.064	.163
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.154	-.001	.056	.005	.039	.258

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

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Appendix 11b: Part Two Survey (full-scale) – Multiple Linear Regressions – Influence of Individual's Characteristics on Perceived Product Values (for the new smartphone with respondent's preferred enhancements)

Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Percentile

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method

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1	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)[b]	.	Enter

a. Dependent Variable: Perceived Utilitarian Value - for new smartphone with user's preferred enhancements

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.382[a]	.146	.139	.68729	.146	22.331	6	784	.000

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a. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63.291	6	10.549	22.331	.000[b]
	Residual	370.340	784	.472		
	Total	433.631	790			

a. Dependent Variable: Perceived Utilitarian Value - for new smartphone with user's preferred enhancements

b. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.977	.211		18.816	.000
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.081	.026	.117	3.104	.002
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.059	.034	.081	1.741	.082
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.020	.020	-.035	-1.031	.303
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	-.052	.025	-.089	-2.087	.037

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	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.211	.037	.229	5.708	.000
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.098	.036	.119	2.694	.007

a. Dependent Variable: Perceived Utilitarian Value - for new smartphone with user's preferred enhancements

Bootstrap for Coefficients

Model		B	Bootstrap[a] Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval Lower	Upper
1	(Constant)	3.977	-.005	.243	.000	3.490	4.448
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.081	.000	.027	.002	.029	.133
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.059	2.824E-5	.036	.105	-.010	.130
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.020	.000	.018	.267	-.056	.016
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	-.052	1.065E-5	.026	.049	-.104	-.001
	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.211	.001	.042	.000	.128	.293
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.098	.000	.041	.015	.020	.179

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

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Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Percentile

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method

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1	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)[b]	.	Enter

a. Dependent Variable: Perceived Hedonic Value (Modified) - for new smartphone with user's preferred enhancements

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.371[a]	.138	.131	.74161	.138	20.912	6	784	.000

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a. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	69.007	6	11.501	20.912	.000[b]
	Residual	431.187	784	.550		
	Total	500.194	790			

a. Dependent Variable: Perceived Hedonic Value (Modified) - for new smartphone with user's preferred enhancements

b. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.824	.228		16.766	.000
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.079	.028	.105	2.787	.005
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.080	.036	.102	2.198	.028
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.012	.021	-.019	-.555	.579
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	-.039	.027	-.063	-1.461	.144

	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.240	.040	.242	6.010	.000
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.060	.039	.068	1.533	.126

a. Dependent Variable: Perceived Hedonic Value (Modified) - for new smartphone with user's preferred enhancements

Bootstrap for Coefficients

Model			Bootstrap[a]				
						95% Confidence Interval	
		B	Bias	Std. Error	Sig. (2-tailed)	Lower	Upper
1	(Constant)	3.824	-.002	.246	.000	3.349	4.305
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.079	-.001	.029	.007	.020	.137
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.080	-.001	.039	.037	.005	.154
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	-.012	.000	.020	.547	-.051	.028
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	-.039	.000	.029	.185	-.098	.018
	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.240	4.870E-5	.042	.000	.157	.320
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.060	.001	.043	.162	-.022	.145

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

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Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Percentile

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method

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1	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)[b]	.	Enter

a. Dependent Variable: Perceived Social Value (Modified) - for new smartphone with user's preferred enhancements

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.518[a]	.268	.262	.87935	.268	47.862	6	784	.000

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a. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	222.058	6	37.010	47.862	.000[b]
	Residual	606.227	784	.773		
	Total	828.284	790			

a. Dependent Variable: Perceived Social Value (Modified) - for new smartphone with user's preferred enhancements

b. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.381	.270		5.106	.000
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.234	.033	.244	7.011	.000
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.144	.043	.144	3.360	.001
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	.023	.025	.029	.917	.359
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	.079	.032	.099	2.488	.013

	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.198	.047	.155	4.180	.000
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.069	.047	.060	1.478	.140

a. Dependent Variable: Perceived Social Value (Modified) - for new smartphone with user's preferred enhancements

Bootstrap for Coefficients

Model		B	Bootstrap[a] Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval Lower	Upper
1	(Constant)	1.381	-.002	.279	.000	.836	1.932
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.234	.001	.034	.000	.169	.303
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.144	.000	.050	.005	.041	.244
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	.023	.000	.024	.338	-.025	.071
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	.079	7.141E-5	.039	.043	.002	.153
	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.198	.000	.053	.000	.094	.296
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	.069	.000	.053	.196	-.036	.173

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

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Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Percentile

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method

APPENDICES

1	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)[b]	.	Enter

a. Dependent Variable: Perceived Innovative Value - for new smartphone with user's preferred enhancements

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.454[a]	.206	.200	.98616	.206	33.963	6	784	.000

APPENDICES

a. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	198.178	6	33.030	33.963	.000[b]
	Residual	762.447	784	.973		
	Total	960.625	790			

a. Dependent Variable: Perceived Innovative Value - for new smartphone with user's preferred enhancements

b. Predictors: (Constant), Designer/User Characteristic - Conscientiousness (Big Five Personality Traits), Designer/User Characteristic - Neuroticism (Big Five Personality Traits), Designer/User Characteristic - Innovativeness (in respect of smartphone), Designer/User Characteristic - Extraversion (Big Five Personality Traits), Designer/User Characteristic - Agreeableness (Big Five Personality Traits), Designer/User Characteristic - Openness (Big Five Personality Traits)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.599	.303		5.272	.000
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.251	.037	.242	6.696	.000
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.224	.048	.207	4.641	.000
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	.056	.028	.064	1.968	.049
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	.033	.035	.038	.929	.353

	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.171	.053	.125	3.235	.001
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	-.033	.052	-.027	-.635	.525

a. Dependent Variable: Perceived Innovative Value - for new smartphone with user's preferred enhancements

Bootstrap for Coefficients

Model			Bootstrap[a]				
						95% Confidence Interval	
		B	Bias	Std. Error	Sig. (2-tailed)	Lower	Upper
1	(Constant)	1.599	-.002	.309	.000	.983	2.207
	Designer/User Characteristic - Innovativeness (in respect of smartphone)	.251	3.718E-5	.039	.000	.175	.328
	Designer/User Characteristic - Openness (Big Five Personality Traits)	.224	.000	.052	.000	.120	.323
	Designer/User Characteristic - Neuroticism (Big Five Personality Traits)	.056	.000	.028	.045	.002	.111
	Designer/User Characteristic - Extraversion (Big Five Personality Traits)	.033	.000	.038	.385	-.041	.109
	Designer/User Characteristic - Agreeableness (Big Five Personality Traits)	.171	.001	.055	.002	.062	.281
	Designer/User Characteristic - Conscientiousness (Big Five Personality Traits)	-.033	-.001	.053	.544	-.137	.071

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

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Appendix 12a: Part Two Survey (full-scale) – Mediation test to assess the mediating role of perceived hedonic value, perceived social value, and perceived satisfaction in the relations between perceived utilitarian value and intention of continuous use

Matrix

```
Model  : 80
    Y  : IntCU_Cu
    X  : PerUti_C
   M1  : PerHe2_C
   M2  : PerSo2_C
   M3  : PerSat_C

Sample Size:  791


OUTCOME VARIABLE:
 PerHe2_C

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .6508      .4236      .3723   579.7735     1.0000   789.0000      .0000

Model
             coeff         se          t          p       LLCI       ULCI
constant     1.4417      .1903     7.5775      .0000     1.0682     1.8151
PerUti_C      .7563      .0314    24.0785      .0000      .6946      .8179

**************************************************************************
OUTCOME VARIABLE:
 PerSo2_C

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .3320      .1102      .8131    97.7485     1.0000   789.0000      .0000

Model
             coeff         se          t          p       LLCI       ULCI
constant     2.3964      .2812     8.5235      .0000     1.8445     2.9483
PerUti_C      .4589      .0464     9.8868      .0000      .3678      .5500

**************************************************************************
OUTCOME VARIABLE:
 PerSat_C

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .6159      .3793      .5002   160.3093     3.0000   787.0000      .0000

Model
             coeff         se          t          p       LLCI       ULCI
constant      .8682      .2342     3.7078      .0002      .4086     1.3278
PerUti_C      .1847      .0481     3.8405      .0001      .0903      .2791
PerHe2_C      .4115      .0432     9.5249      .0000      .3267      .4963
PerSo2_C      .2234      .0292     7.6432      .0000      .1660      .2808

**************************************************************************
OUTCOME VARIABLE:
 IntCU_Cu
```

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```
Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .6491      .4214      .5121   143.1037     4.0000   786.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant      .6097      .2390     2.5511      .0109      .1405     1.0788
PerUti_C      .1972      .0491     4.0140      .0001      .1007      .2936
PerHe2_C      .1840      .0462     3.9854      .0001      .0934      .2746
PerSo2_C      .0845      .0307     2.7567      .0060      .0243      .1447
PerSat_C      .4218      .0361    11.6948      .0000      .3510      .4926

************************** TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
 IntCU_Cu

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .4622      .2136      .6933   214.3490     1.0000   789.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     1.9197      .2596     7.3944      .0000     1.4101     2.4294
PerUti_C      .6275      .0429    14.6407      .0000      .5434      .7116

************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
     Effect         se          t          p       LLCI       ULCI
      .6275      .0429    14.6407      .0000      .5434      .7116

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI
      .1972      .0491     4.0140      .0001      .1007      .2936

Indirect effect(s) of X on Y:
          Effect     BootSE   BootLLCI   BootULCI
TOTAL      .4303      .0471      .3431      .5266
Ind1       .1391      .0419      .0584      .2219
Ind2       .0388      .0154      .0097      .0705
Ind3       .0779      .0242      .0332      .1280
Ind4       .1313      .0210      .0925      .1754
Ind5       .0432      .0094      .0266      .0636

Indirect effect key:
Ind1 PerUti_C    ->    PerHe2_C    ->    IntCU_Cu
Ind2 PerUti_C    ->    PerSo2_C    ->    IntCU_Cu
Ind3 PerUti_C    ->    PerSat_C    ->    IntCU_Cu
Ind4 PerUti_C    ->    PerHe2_C    ->    PerSat_C    ->    IntCU_Cu
Ind5 PerUti_C    ->    PerSo2_C    ->    PerSat_C    ->    IntCU_Cu

*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

WARNING: Variables names longer than eight characters can produce incorrect output
when some variables in the data file have the same first eight characters. Shorter
variable names are recommended. By using this output, you are accepting all risk
```

```
and consequences of interpreting or reporting results that may be incorrect.

------ END MATRIX -----
```

APPENDICES

Appendix 12b: Part Two Survey (full-scale) – Mediation test to assess the mediating role of perceived hedonic value, perceived social value, and perceived satisfaction in the relations between perceived innovative value and intention of continuous use

Matrix

```
Warning # 14324
MATRIX cannot do split-file processing in interactive mode.  Run the job in
batch mode or process each split-file group separately.
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 80
    Y  : IntCU_Cu
    X  : PerInn_C
   M1  : PerHe2_C
   M2  : PerSo2_C
   M3  : PerSat_C

Sample
Size:  791

**************************************************************************
OUTCOME VARIABLE:
 PerHe2_C

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .3522      .1241      .5658   111.7459     1.0000   789.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     4.8229      .1139    42.3580      .0000     4.5994     5.0464
PerInn_C      .2511      .0238    10.5710      .0000      .2044      .2977

**************************************************************************
OUTCOME VARIABLE:
 PerSo2_C

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .5867      .3442      .5993   414.0875     1.0000   789.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.8401      .1172    24.2366      .0000     2.6101     3.0702
PerInn_C      .4974      .0244    20.3491      .0000      .4494      .5454

**************************************************************************
OUTCOME VARIABLE:
 PerSat_C
```

APPENDICES

```
Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .6595      .4350      .4553   201.9718     3.0000   787.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     1.2455      .1902     6.5474      .0000      .8721     1.6189
PerInn_C      .2572      .0266     9.6842      .0000      .2051      .3094
PerHe2_C      .4658      .0334    13.9492      .0000      .4003      .5313
PerSo2_C      .0702      .0324     2.1648      .0307      .0065      .1339

**************************************************************************
OUTCOME VARIABLE:
 IntCU_Cu

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .6434      .4140      .5186   138.8213     4.0000   786.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     1.1018      .2085     5.2847      .0000      .6926     1.5111
PerInn_C      .0735      .0300     2.4490      .0145      .0146      .1323
PerHe2_C      .2824      .0398     7.0947      .0000      .2043      .3605
PerSo2_C      .0501      .0347     1.4425      .1496     -.0181      .1183
PerSat_C      .4111      .0380    10.8043      .0000      .3364      .4857

************************** TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
 IntCU_Cu

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .4052      .1642      .7369   154.9887     1.0000   789.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     4.1235      .1299    31.7331      .0000     3.8684     4.3786
PerInn_C      .3374      .0271    12.4494      .0000      .2842      .3906

************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
     Effect         se          t          p       LLCI       ULCI
      .3374      .0271    12.4494      .0000      .2842      .3906

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI
      .0735      .0300     2.4490      .0145      .0146      .1323

Indirect effect(s) of X on Y:
          Effect     BootSE   BootLLCI   BootULCI
TOTAL      .2640      .0260      .2145      .3156
Ind1       .0709      .0134      .0464      .0989
Ind2       .0249      .0184     -.0120      .0610
Ind3       .1057      .0172      .0750      .1415
Ind4       .0481      .0081      .0334      .0649
Ind5       .0144      .0078      .0002      .0308

Indirect effect key:
Ind1 PerInn_C     ->     PerHe2_C     ->     IntCU_Cu
```

```
Ind2 PerInn_C    ->    PerSo2_C    ->    IntCU_Cu
Ind3 PerInn_C    ->    PerSat_C    ->    IntCU_Cu
Ind4 PerInn_C    ->    PerHe2_C    ->    PerSat_C    ->    IntCU_Cu
Ind5 PerInn_C    ->    PerSo2_C    ->    PerSat_C    ->    IntCU_Cu

************************ ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

WARNING: Variables names longer than eight characters can produce incorrect
output
when some variables in the data file have the same first eight characters.
Shorter
variable names are recommended. By using this output, you are accepting all
risk
and consequences of interpreting or reporting results that may be incorrect.

------ END MATRIX -----
```

APPENDICES

Appendix 13a: Part Two Survey (full-scale) – Moderation test to assess the moderating role of designer / nondesigner on the causal relation from perceived hedonic value to intention of continuous use via perceived satisfaction

Matrix

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 59
    Y  : IntCU_Cu
    X  : PerHe2_C
    M  : PerSat_C
    W  : De_NDe_F

Sample
Size:  791

**************************************************************************
OUTCOME VARIABLE:
 PerSat_C

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .5693      .3240      .5447   125.7610     3.0000   787.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     3.6113      .7105     5.0826      .0000     2.2166     5.0061
PerHe2_C      .3477      .1186     2.9306      .0035      .1148      .5806
De_NDe_F    -1.0853      .4142    -2.6202      .0090    -1.8984     -.2722
Int_1         .1712      .0689     2.4848      .0132      .0360      .3065

Product terms key:
 Int_1    :        PerHe2_C x        De_NDe_F

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0053     6.1745     1.0000   787.0000      .0132
----------
    Focal predict: PerHe2_C (X)
          Mod var: De_NDe_F (W)

Conditional effects of the focal predictor at values of the moderator(s):

   De_NDe_F     Effect         se          t          p       LLCI       ULCI
     1.0000      .5189      .0558     9.3058      .0000      .4095      .6284
     2.0000      .6901      .0405    17.0493      .0000      .6107      .7696

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.
```

```
DATA LIST FREE/
   PerHe2_C   De_NDe_F   PerSat_C   .
BEGIN DATA.
     5.3333     1.0000     5.2936
     6.0000     1.0000     5.6396
     7.0000     1.0000     6.1585
     5.3333     2.0000     5.1215
     6.0000     2.0000     5.5816
     7.0000     2.0000     6.2717
END DATA.
GRAPH/SCATTERPLOT=
 PerHe2_C WITH     PerSat_C BY       De_NDe_F .

************************************************************************
OUTCOME VARIABLE:
 IntCU_Cu

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .6373      .4062      .5262   107.3920     5.0000   785.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.0907      .7718     2.7089      .0069      .5757     3.6058
PerHe2_C      .2986      .1372     2.1757      .0299      .0292      .5680
PerSat_C      .3523      .1345     2.6181      .0090      .0881      .6164
De_NDe_F     -.5151      .4421    -1.1650      .2444    -1.3829      .3528
Int_1         .0085      .0808      .1058      .9158     -.1500      .1671
Int_2         .0665      .0764      .8698      .3847     -.0836      .2165

Product terms key:
 Int_1    :        PerHe2_C x        De_NDe_F
 Int_2    :        PerSat_C x        De_NDe_F

Test(s) of highest order unconditional interaction(s):
       R2-chng           F        df1        df2          p
X*W      .0000       .0112     1.0000   785.0000      .9158
M*W      .0006       .7565     1.0000   785.0000      .3847
----------
    Focal predict: PerHe2_C (X)
          Mod var: De_NDe_F (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerHe2_C   De_NDe_F   IntCU_Cu   .
BEGIN DATA.
     5.3333     1.0000     5.5579
     6.0000     1.0000     5.7627
     7.0000     1.0000     6.0699
     5.3333     2.0000     5.4606
     6.0000     2.0000     5.6711
     7.0000     2.0000     5.9868
END DATA.
GRAPH/SCATTERPLOT=
 PerHe2_C WITH     IntCU_Cu BY       De_NDe_F .
----------
    Focal predict: PerSat_C (M)
          Mod var: De_NDe_F (W)

Data for visualizing the conditional effect of the focal predictor:
```

APPENDICES

```
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerSat_C   De_NDe_F   IntCU_Cu   .
BEGIN DATA.
     4.5000     1.0000     5.3007
     6.0000     1.0000     5.9289
     6.5000     1.0000     6.1382
     4.5000     2.0000     5.1360
     6.0000     2.0000     5.8639
     6.5000     2.0000     6.1065
END DATA.
GRAPH/SCATTERPLOT=
 PerSat_C WITH     IntCU_Cu BY       De_NDe_F .

****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Conditional direct effect(s) of X on Y:
   De_NDe_F     Effect         se          t          p       LLCI       ULCI
     1.0000      .3072      .0641     4.7942      .0000      .1814      .4329
     2.0000      .3157      .0492     6.4193      .0000      .2192      .4122

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 PerHe2_C    ->    PerSat_C    ->    IntCU_Cu

   De_NDe_F     Effect     BootSE   BootLLCI   BootULCI
     1.0000      .2173      .0475      .1275      .3137
     2.0000      .3349      .0384      .2619      .4104

Index of moderated mediation (difference between conditional indirect effects):
              Index     BootSE   BootLLCI   BootULCI
De_NDe_F      .1176      .0606     -.0043      .2386
```

→ Moderator's influence on the Mediation effect is not significant as zero is included between the CIs, but the Moderator may still have moderating effect on the causal relations.

```
********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

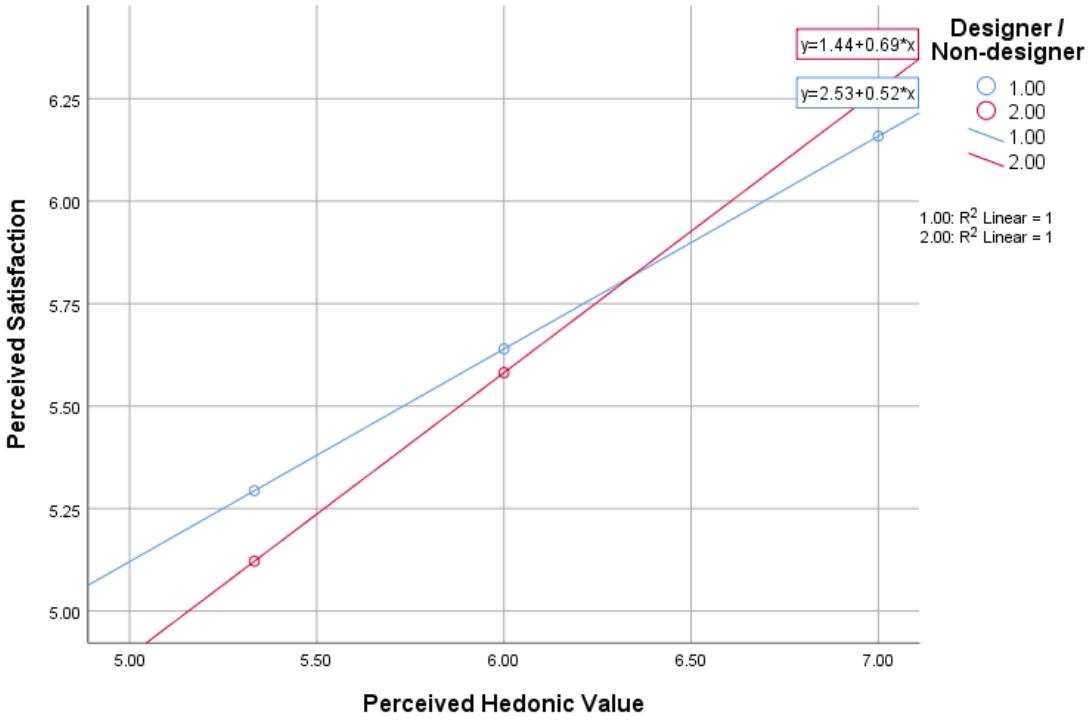
Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

WARNING: Variables names longer than eight characters can produce incorrect output
when some variables in the data file have the same first eight characters. Shorter
variable names are recommended. By using this output, you are accepting all risk
and consequences of interpreting or reporting results that may be incorrect.

------ END MATRIX -----
```

APPENDICES

Graph



APPENDICES

Appendix 13b: Part Two Survey (full-scale) – Moderation test to assess the moderating role of individual innovativeness on the causal relation from perceived hedonic value to intention of continuous use via perceived satisfaction

Matrix

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 59
    Y  : IntCU_Cu
    X  : PerHe2_C
    M  : PerSat_C
    W  : DU_Innov

Sample
Size:  791

**************************************************************************
OUTCOME VARIABLE:
 PerSat_C

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .5939      .3527      .5216   142.9237     3.0000   787.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant    -2.1498      .9394    -2.2884      .0224    -3.9938    -.3057
PerHe2_C     1.1852      .1568     7.5601      .0000     .8775     1.4929
DU_Innov      .8294      .1857     4.4670      .0000     .4650     1.1939
Int_1        -.1169      .0307    -3.8019      .0002    -.1772     -.0565

Product terms key:
 Int_1    :        PerHe2_C x        DU_Innov

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0119     14.4547     1.0000   787.0000      .0002
----------
    Focal predict: PerHe2_C (X)
          Mod var: DU_Innov (W)

Conditional effects of the focal predictor at values of the moderator(s):

   DU_Innov     Effect         se          t          p       LLCI       ULCI
     4.0000      .7177      .0444    16.1515      .0000      .6305      .8049
     5.0000      .6008      .0324    18.5528      .0000      .5373      .6644
     6.2500      .4548      .0505     9.0067      .0000      .3556      .5539

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.
```

APPENDICES

```
DATA LIST FREE/
   PerHe2_C   DU_Innov   PerSat_C   .
BEGIN DATA.
     5.3333     4.0000     4.9958
     6.0000     4.0000     5.4743
     7.0000     4.0000     6.1920
     5.3333     5.0000     5.2019
     6.0000     5.0000     5.6025
     7.0000     5.0000     6.2033
     5.3333     6.2500     5.4596
     6.0000     6.2500     5.7627
     7.0000     6.2500     6.2175
END DATA.
GRAPH/SCATTERPLOT=
 PerHe2_C WITH     PerSat_C BY       DU_Innov .

************************************************************************
OUTCOME VARIABLE:
 IntCU_Cu

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .6404      .4101      .5227   109.1678     5.0000   785.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant      .8250      .9746      .8466      .3975    -1.0880     2.7381
PerHe2_C      .4202      .1912     2.1979      .0283      .0449      .7955
PerSat_C      .3526      .1570     2.2460      .0250      .0444      .6607
DU_Innov      .1020      .1954      .5219      .6019     -.2816      .4855
Int_1        -.0222      .0363     -.6110      .5414     -.0935      .0491
Int_2         .0187      .0297      .6303      .5287     -.0396      .0771

Product terms key:
 Int_1    :        PerHe2_C x        DU_Innov
 Int_2    :        PerSat_C x        DU_Innov

Test(s) of highest order unconditional interaction(s):
       R2-chng           F        df1        df2          p
X*W      .0003      .3733     1.0000   785.0000      .5414
M*W      .0003      .3973     1.0000   785.0000      .5287
----------
    Focal predict: PerHe2_C (X)
          Mod var: DU_Innov (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerHe2_C   DU_Innov   IntCU_Cu   .
BEGIN DATA.
     5.3333     4.0000     5.3935
     6.0000     4.0000     5.6145
     7.0000     4.0000     5.9458
     5.3333     5.0000     5.4820
     6.0000     5.0000     5.6881
     7.0000     5.0000     5.9973
     5.3333     6.2500     5.5926
     6.0000     6.2500     5.7802
     7.0000     6.2500     6.0616
END DATA.
GRAPH/SCATTERPLOT=
```

```
 PerHe2_C WITH     IntCU_Cu BY       DU_Innov .
----------
    Focal predict: PerSat_C (M)
          Mod var: DU_Innov (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerSat_C   DU_Innov   IntCU_Cu   .
BEGIN DATA.
     4.5000     4.0000     5.1427
     6.0000     4.0000     5.7840
     6.5000     4.0000     5.9977
     4.5000     5.0000     5.1959
     6.0000     5.0000     5.8653
     6.5000     5.0000     6.0884
     4.5000     6.2500     5.2625
     6.0000     6.2500     5.9670
     6.5000     6.2500     6.2018
END DATA.
GRAPH/SCATTERPLOT=
 PerSat_C WITH     IntCU_Cu BY       DU_Innov .

****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Conditional direct effect(s) of X on Y:
   DU_Innov     Effect         se          t          p       LLCI       ULCI
     4.0000      .3314      .0572     5.7973      .0000      .2192      .4436
     5.0000      .3092      .0394     7.8528      .0000      .2319      .3865
     6.2500      .2814      .0558     5.0396      .0000      .1718      .3910

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 PerHe2_C    ->    PerSat_C    ->    IntCU_Cu

   DU_Innov     Effect     BootSE   BootLLCI   BootULCI
     4.0000      .3068      .0482      .2066      .3982
     5.0000      .2681      .0302      .2088      .3282
     6.2500      .2136      .0380      .1466      .2959
---

********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

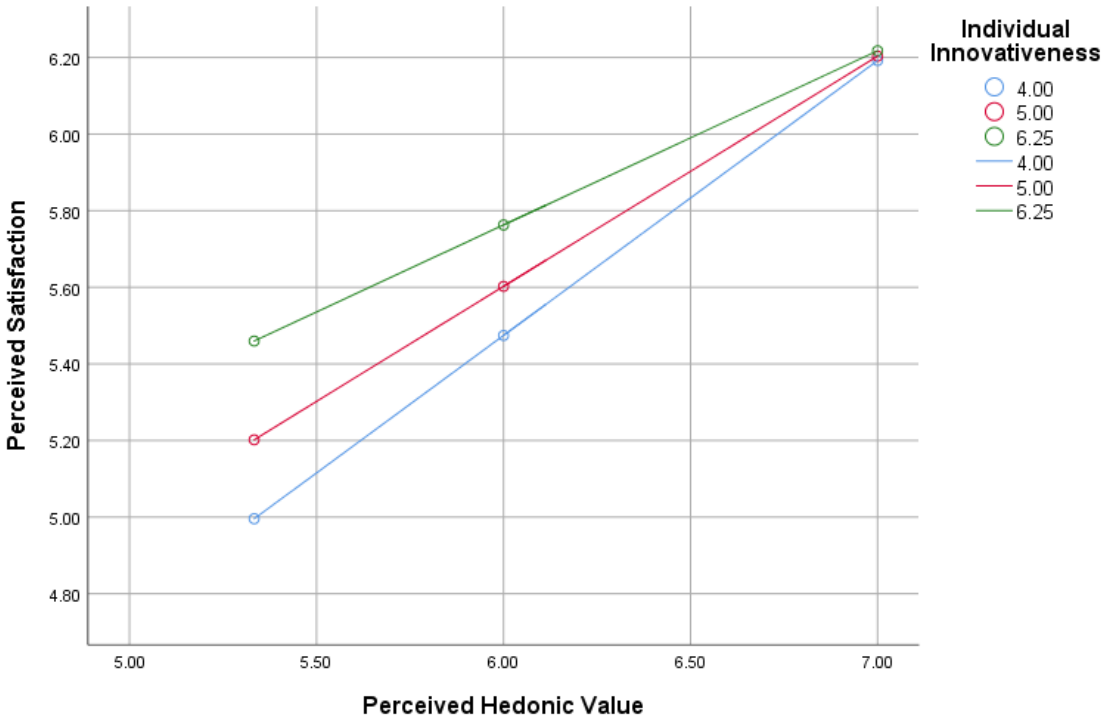
Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

W values in conditional tables are the 16th, 50th, and 84th percentiles.

WARNING: Variables names longer than eight characters can produce incorrect output
when some variables in the data file have the same first eight characters. Shorter
variable names are recommended. By using this output, you are accepting all risk
and consequences of interpreting or reporting results that may be incorrect.

------ END MATRIX -----
```

Graph


Individual Innovativeness
4.00
5.00
6.25
4.00
5.00
6.25
Perceived Satisfaction
6.20
6.00
5.80
5.60
5.40
5.20
5.00
4.80
5.00
5.50
6.00
6.50
7.00
Perceived Hedonic Value

APPENDICES

Appendix 13c: Part Two Survey (full-scale) – Moderation test to assess the moderating role of individual innovativeness on the causal relation from perceived utilitarian value to intention of continuous use via perceived satisfaction

Matrix

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 59
    Y  : IntCU_Cu
    X  : PerUti_C
    M  : PerSat_C
    W  : DU_Innov

Sample
Size:  791

**************************************************************************
OUTCOME VARIABLE:
 PerSat_C

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .4946      .2446      .6087    84.9546     3.0000   787.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant    -1.7714     1.1072    -1.5999      .1100    -3.9449      .4020
PerUti_C     1.1187      .1845     6.0643      .0000      .7566     1.4809
DU_Innov      .8076      .2201     3.6689      .0003      .3755     1.2398
Int_1        -.1130      .0363    -3.1104      .0019     -.1843     -.0417

Product terms key:
 Int_1    :        PerUti_C x        DU_Innov

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0093     9.6747     1.0000   787.0000      .0019
----------
    Focal predict: PerUti_C (X)
          Mod var: DU_Innov (W)

Conditional effects of the focal predictor at values of the moderator(s):

   DU_Innov     Effect         se          t          p       LLCI       ULCI
     4.0000      .6668      .0536    12.4389      .0000      .5615      .7720
     5.0000      .5538      .0410    13.5025      .0000      .4733      .6343
     6.2500      .4125      .0625     6.6018      .0000      .2899      .5352

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.
```

APPENDICES

```
DATA LIST FREE/
   PerUti_C   DU_Innov   PerSat_C   .
BEGIN DATA.
     5.5000     4.0000     5.1263
     6.0000     4.0000     5.4597
     6.7500     4.0000     5.9598
     5.5000     5.0000     5.3125
     6.0000     5.0000     5.5894
     6.7500     5.0000     6.0047
     5.5000     6.2500     5.5452
     6.0000     6.2500     5.7515
     6.7500     6.2500     6.0609
END DATA.
GRAPH/SCATTERPLOT=
 PerUti_C WITH     PerSat_C BY       DU_Innov .

************************************************************************
OUTCOME VARIABLE:
 IntCU_Cu

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .6363      .4049      .5274   106.8072     5.0000   785.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     1.3691     1.0617     1.2895      .1976     -.7150     3.4532
PerUti_C      .2148      .1993     1.0777      .2815     -.1764      .6060
PerSat_C      .4875      .1503     3.2429      .0012      .1924      .7825
DU_Innov     -.0712      .2136     -.3334      .7390     -.4905      .3481
Int_1         .0195      .0384      .5073      .6121     -.0559      .0948
Int_2         .0023      .0288      .0812      .9353     -.0542      .0589

Product terms key:
 Int_1    :        PerUti_C x        DU_Innov
 Int_2    :        PerSat_C x        DU_Innov

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0002      .2573     1.0000   785.0000      .6121
M*W      .0000      .0066     1.0000   785.0000      .9353
----------
    Focal predict: PerUti_C (X)
          Mod var: DU_Innov (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerUti_C   DU_Innov   IntCU_Cu   .
BEGIN DATA.
     5.5000     4.0000     5.4750
     6.0000     4.0000     5.6213
     6.7500     4.0000     5.8408
     5.5000     5.0000     5.5239
     6.0000     5.0000     5.6800
     6.7500     5.0000     5.9140
     5.5000     6.2500     5.5851
     6.0000     6.2500     5.7533
     6.7500     6.2500     6.0056
END DATA.
GRAPH/SCATTERPLOT=
```

```
 PerUti_C WITH     IntCU_Cu BY       DU_Innov .
----------
    Focal predict: PerSat_C (M)
          Mod var: DU_Innov (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerSat_C   DU_Innov   IntCU_Cu   .
BEGIN DATA.
     4.5000     4.0000     5.0811
     6.0000     4.0000     5.8263
     6.5000     4.0000     6.0747
     4.5000     5.0000     5.1375
     6.0000     5.0000     5.8863
     6.5000     5.0000     6.1358
     4.5000     6.2500     5.2081
     6.0000     6.2500     5.9612
     6.5000     6.2500     6.2123
END DATA.
GRAPH/SCATTERPLOT=
 PerSat_C WITH     IntCU_Cu BY       DU_Innov .

****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Conditional direct effect(s) of X on Y:
   DU_Innov     Effect         se          t          p       LLCI       ULCI
     4.0000      .2926      .0593     4.9360      .0000      .1763      .4090
     5.0000      .3121      .0427     7.3071      .0000      .2283      .3959
     6.2500      .3364      .0621     5.4211      .0000      .2146      .4582

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 PerUti_C    ->    PerSat_C    ->    IntCU_Cu

   DU_Innov     Effect     BootSE   BootLLCI   BootULCI
     4.0000      .3313      .0471      .2421      .4292
     5.0000      .2764      .0330      .2148      .3438
     6.2500      .2071      .0455      .1264      .3052
---

********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

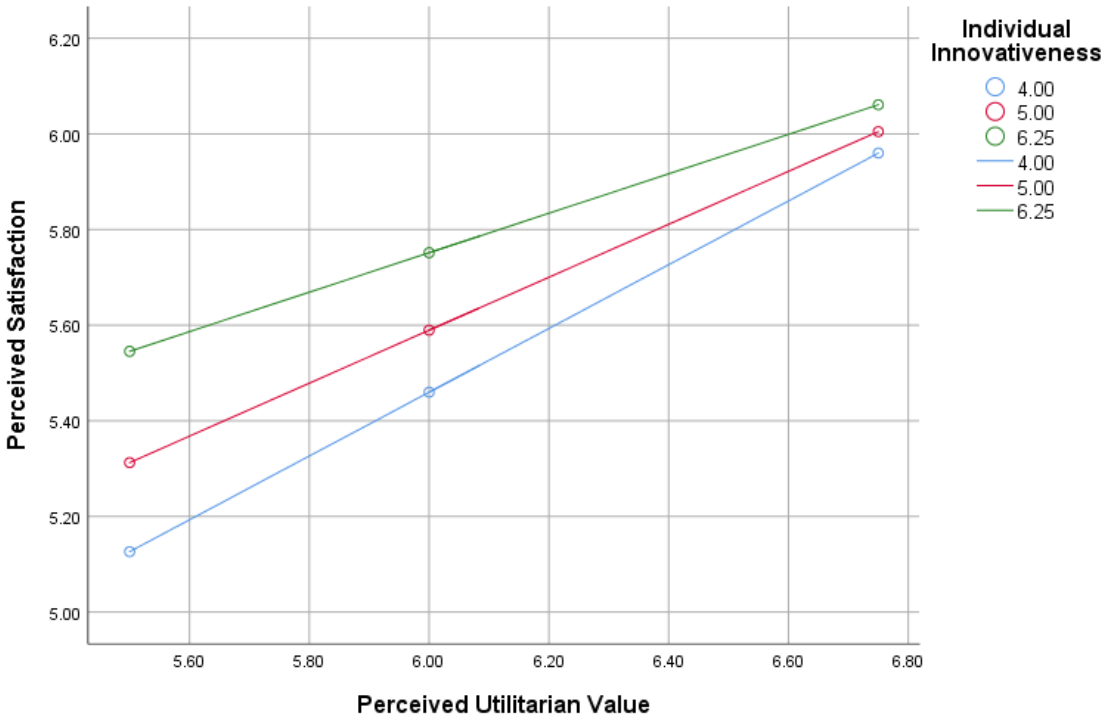
W values in conditional tables are the 16th, 50th, and 84th percentiles.

WARNING: Variables names longer than eight characters can produce incorrect output
when some variables in the data file have the same first eight characters. Shorter
variable names are recommended. By using this output, you are accepting all risk
and consequences of interpreting or reporting results that may be incorrect.

------ END MATRIX -----
```

APPENDICES

Graph



APPENDICES

Appendix 13d: Part Two Survey (full-scale) – Moderation test to assess the moderating role of individual neuroticism on the causal relation from perceived utilitarian value to intention of continuous use via perceived satisfaction

Matrix

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 59
    Y  : IntCU_Cu
    X  : PerUti_C
    M  : PerSat_C
    W  : DU_Neuro

Sample
Size:  791

**************************************************************************
OUTCOME VARIABLE:
 PerSat_C

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .4665      .2176      .6304    72.9661     3.0000   787.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant      .0386     1.0151      .0380      .9697    -1.9541     2.0313
PerUti_C      .9264      .1645     5.6307      .0000      .6034     1.2493
DU_Neuro      .4206      .2113     1.9905      .0469      .0058      .8354
Int_1        -.0705      .0342    -2.0588      .0398     -.1376     -.0033

Product terms key:
 Int_1    :        PerUti_C x        DU_Neuro

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0042     4.2389     1.0000   787.0000      .0398
----------
    Focal predict: PerUti_C (X)
          Mod var: DU_Neuro (W)

Conditional effects of the focal predictor at values of the moderator(s):

   DU_Neuro     Effect         se          t          p       LLCI       ULCI
     3.3333      .6915      .0610    11.3353      .0000      .5718      .8113
     4.6667      .5976      .0409    14.6202      .0000      .5173      .6778
     6.0000      .5036      .0615     8.1873      .0000      .3829      .6244

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.
```

APPENDICES

```
DATA LIST FREE/
   PerUti_C   DU_Neuro   PerSat_C   .
BEGIN DATA.
     5.5000     3.3333     5.2439
     6.0000     3.3333     5.5897
     6.7500     3.3333     6.1083
     5.5000     4.6667     5.2881
     6.0000     4.6667     5.5868
     6.7500     4.6667     6.0350
     5.5000     6.0000     5.3322
     6.0000     6.0000     5.5840
     6.7500     6.0000     5.9617
END DATA.
GRAPH/SCATTERPLOT=
 PerUti_C WITH     PerSat_C BY       DU_Neuro .

************************************************************************
OUTCOME VARIABLE:
 IntCU_Cu

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .6334      .4012      .5306   105.1837     5.0000   785.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     1.6546      .9655     1.7136      .0870     -.2408     3.5499
PerUti_C      .2600      .1715     1.5158      .1300     -.0767      .5966
PerSat_C      .4573      .1290     3.5442      .0004      .2040      .7105
DU_Neuro     -.1628      .2024     -.8042      .4215     -.5600      .2345
Int_1         .0137      .0349      .3908      .6960     -.0549      .0822
Int_2         .0112      .0260      .4332      .6650     -.0397      .0622

Product terms key:
 Int_1    :        PerUti_C x        DU_Neuro
 Int_2    :        PerSat_C x        DU_Neuro

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0001      .1527     1.0000   785.0000      .6960
M*W      .0001      .1876     1.0000   785.0000      .6650
----------
    Focal predict: PerUti_C (X)
          Mod var: DU_Neuro (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerUti_C   DU_Neuro   IntCU_Cu   .
BEGIN DATA.
     5.5000     3.3333     5.5617
     6.0000     3.3333     5.7144
     6.7500     3.3333     5.9435
     5.5000     4.6667     5.5287
     6.0000     4.6667     5.6906
     6.7500     4.6667     5.9333
     5.5000     6.0000     5.4958
     6.0000     6.0000     5.6667
     6.7500     6.0000     5.9232
END DATA.
GRAPH/SCATTERPLOT=
```

```
 PerUti_C WITH     IntCU_Cu BY       DU_Neuro .
----------
    Focal predict: PerSat_C (M)
          Mod var: DU_Neuro (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerSat_C   DU_Neuro   IntCU_Cu   .
BEGIN DATA.
     4.5000     3.3333     5.1767
     6.0000     3.3333     5.9188
     6.5000     3.3333     6.1662
     4.5000     4.6667     5.1367
     6.0000     4.6667     5.9013
     6.5000     4.6667     6.1562
     4.5000     6.0000     5.0968
     6.0000     6.0000     5.8839
     6.5000     6.0000     6.1462
END DATA.
GRAPH/SCATTERPLOT=
 PerSat_C WITH     IntCU_Cu BY       DU_Neuro .

****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Conditional direct effect(s) of X on Y:
   DU_Neuro     Effect         se          t          p       LLCI       ULCI
     3.3333      .3055      .0654     4.6731      .0000      .1772      .4338
     4.6667      .3237      .0426     7.6041      .0000      .2401      .4072
     6.0000      .3419      .0607     5.6276      .0000      .2226      .4611

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 PerUti_C    ->    PerSat_C    ->    IntCU_Cu

   DU_Neuro     Effect     BootSE   BootLLCI   BootULCI
     3.3333      .3421      .0596      .2398      .4718
     4.6667      .3046      .0339      .2418      .3745
     6.0000      .2643      .0465      .1780      .3599
---

********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

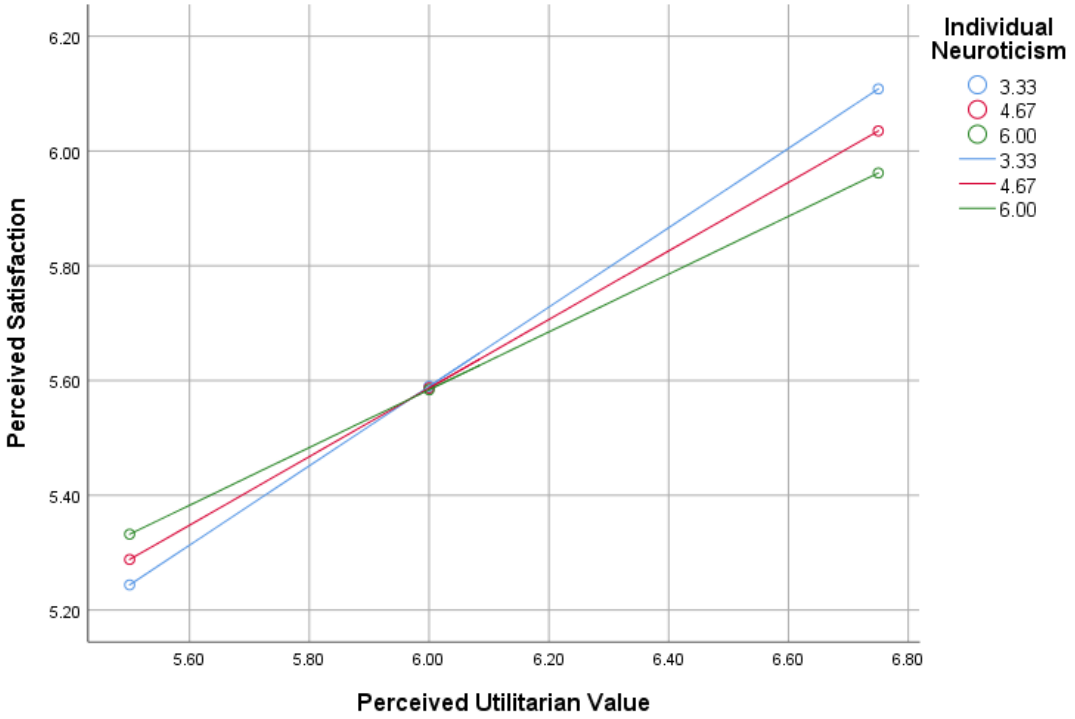
W values in conditional tables are the 16th, 50th, and 84th percentiles.

WARNING: Variables names longer than eight characters can produce incorrect output
when some variables in the data file have the same first eight characters. Shorter
variable names are recommended. By using this output, you are accepting all risk
and consequences of interpreting or reporting results that may be incorrect.

------ END MATRIX -----
```

APPENDICES

Graph



APPENDICES

Appendix 13e: Part Two Survey (full-scale) – Moderation test to assess the moderating role of individual extraversion on the causal relation from perceived hedonic value to intention of continuous use via perceived satisfaction

Matrix

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 59
    Y  : IntCU_Cu
    X  : PerHe2_C
    M  : PerSat_C
    W  : DU_Extra

Sample
Size:  791

**************************************************************************
OUTCOME VARIABLE:
 PerSat_C

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .5754      .3310      .5390   129.8152     3.0000   787.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     -.3544      .7335     -.4832      .6291    -1.7943     1.0855
PerHe2_C      .9437      .1208     7.8090      .0000      .7065     1.1809
DU_Extra      .4861      .1535     3.1667      .0016      .1848      .7874
Int_1        -.0706      .0251    -2.8173      .0050     -.1198     -.0214

Product terms key:
 Int_1    :        PerHe2_C x        DU_Extra

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0067     7.9372     1.0000   787.0000      .0050
----------
    Focal predict: PerHe2_C (X)
          Mod var: DU_Extra (W)

Conditional effects of the focal predictor at values of the moderator(s):

   DU_Extra     Effect         se          t          p       LLCI       ULCI
     3.6667      .6848      .0409    16.7365      .0000      .6045      .7651
     5.0000      .5907      .0340    17.3499      .0000      .5238      .6575
     6.3333      .4965      .0536     9.2580      .0000      .3913      .6018

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.
```

APPENDICES

```
DATA LIST FREE/
   PerHe2_C   DU_Extra   PerSat_C   .
BEGIN DATA.
     5.3333     3.6667     5.0802
     6.0000     3.6667     5.5367
     7.0000     3.6667     6.2216
     5.3333     5.0000     5.2263
     6.0000     5.0000     5.6201
     7.0000     5.0000     6.2107
     5.3333     6.3333     5.3724
     6.0000     6.3333     5.7034
     7.0000     6.3333     6.1999
END DATA.
GRAPH/SCATTERPLOT=
 PerHe2_C WITH     PerSat_C BY       DU_Extra .

************************************************************************
OUTCOME VARIABLE:
 IntCU_Cu

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .6392      .4086      .5240   108.4815     5.0000   785.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.9723      .7625     3.8982      .0001     1.4756     4.4690
PerHe2_C      .2503      .1490     1.6807      .0932     -.0420      .5427
PerSat_C      .2243      .1363     1.6456      .1002     -.0433      .4920
DU_Extra     -.3833      .1612    -2.3771      .0177     -.6998     -.0668
Int_1         .0150      .0296      .5085      .6113     -.0430      .0731
Int_2         .0508      .0265     1.9163      .0557     -.0012      .1028

Product terms key:
 Int_1    :        PerHe2_C x        DU_Extra
 Int_2    :        PerSat_C x        DU_Extra

Test(s) of highest order unconditional interaction(s):
       R2-chng           F        df1        df2          p
X*W      .0002      .2585     1.0000   785.0000      .6113
M*W      .0028     3.6722     1.0000   785.0000      .0557
----------
    Focal predict: PerHe2_C (X)
          Mod var: DU_Extra (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerHe2_C   DU_Extra   IntCU_Cu   .
BEGIN DATA.
     5.3333     3.6667     5.4940
     6.0000     3.6667     5.6976
     7.0000     3.6667     6.0031
     5.3333     5.0000     5.4688
     6.0000     5.0000     5.6858
     7.0000     5.0000     6.0113
     5.3333     6.3333     5.4436
     6.0000     6.3333     5.6740
     7.0000     6.3333     6.0195
END DATA.
GRAPH/SCATTERPLOT=
```

```
 PerHe2_C WITH     IntCU_Cu BY       DU_Extra .
----------
    Focal predict: PerSat_C (M)
          Mod var: DU_Extra (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerSat_C   DU_Extra   IntCU_Cu   .
BEGIN DATA.
     4.5000     3.6667     5.2447
     6.0000     3.6667     5.8605
     6.5000     3.6667     6.0657
     4.5000     5.0000     5.1584
     6.0000     5.0000     5.8757
     6.5000     5.0000     6.1148
     4.5000     6.3333     5.0721
     6.0000     6.3333     5.8909
     6.5000     6.3333     6.1639
END DATA.
GRAPH/SCATTERPLOT=
 PerSat_C WITH     IntCU_Cu BY       DU_Extra .

****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Conditional direct effect(s) of X on Y:
   DU_Extra     Effect         se          t          p       LLCI       ULCI
     3.6667      .3055      .0528     5.7824      .0000      .2018      .4092
     5.0000      .3255      .0396     8.2270      .0000      .2478      .4032
     6.3333      .3456      .0587     5.8845      .0000      .2303      .4608

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 PerHe2_C    ->    PerSat_C    ->    IntCU_Cu

   DU_Extra     Effect     BootSE   BootLLCI   BootULCI
     3.6667      .2811      .0453      .1962      .3779
     5.0000      .2824      .0300      .2260      .3437
     6.3333      .2710      .0455      .1886      .3676
---

*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

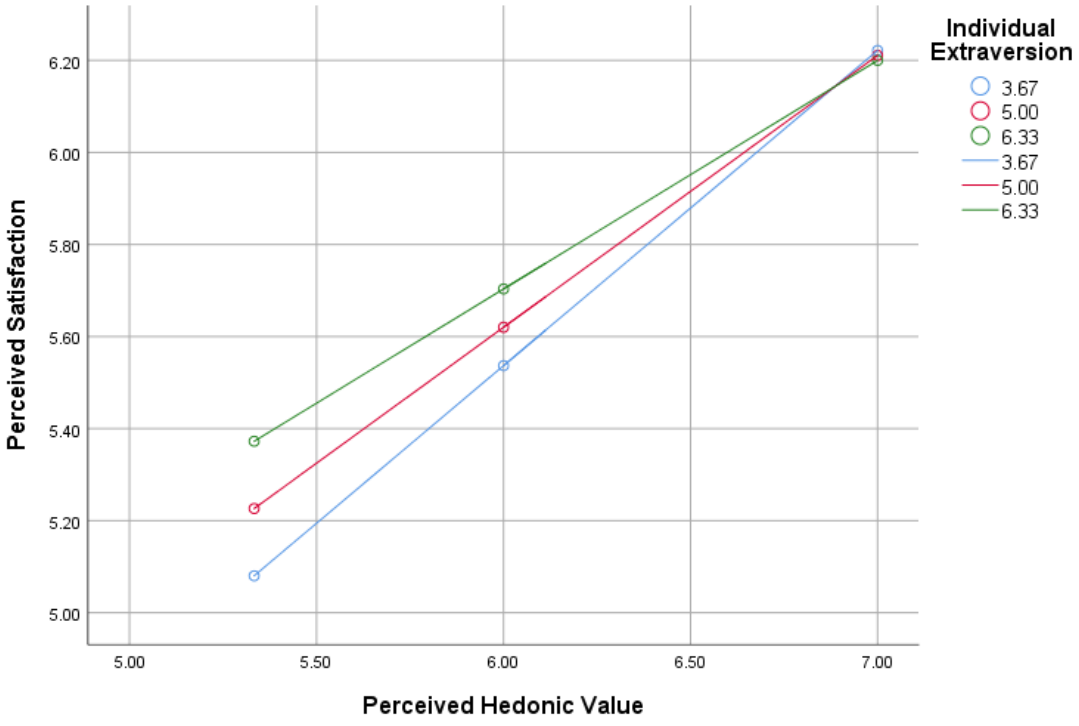
W values in conditional tables are the 16th, 50th, and 84th percentiles.

WARNING: Variables names longer than eight characters can produce incorrect output
when some variables in the data file have the same first eight characters. Shorter
variable names are recommended. By using this output, you are accepting all risk
and consequences of interpreting or reporting results that may be incorrect.

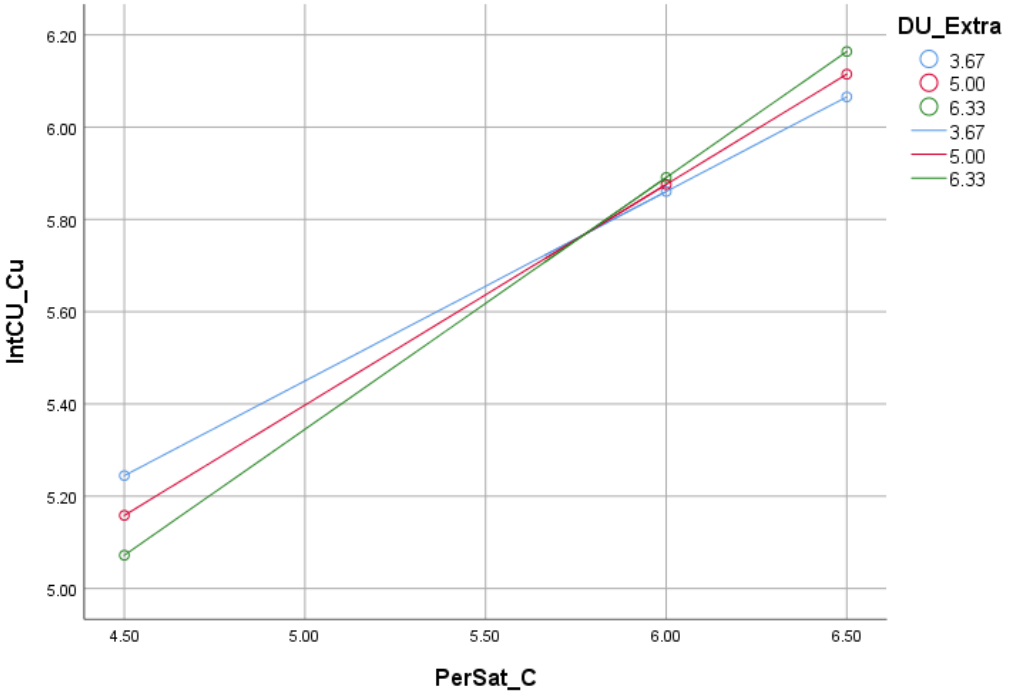
------ END MATRIX -----
```

APPENDICES

Graph - significant moderating effect with $p < .05$ ($p = .005$)



Graph - marginal moderating effect with $p < .10$ ($p = .056$)



APPENDICES

Appendix 13f: Part Two Survey (full-scale) – Moderation test to assess the moderating role of individual openness to experience on the causal relation from perceived hedonic value to intention of continuous use via perceived satisfaction

Matrix

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 59
    Y  : IntCU_Cu
    X  : PerHe2_C
    M  : PerSat_C
    W  : DU_Openn

Sample
Size:  791

**************************************************************************
OUTCOME VARIABLE:
 PerSat_C

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .5731      .3284      .5412   128.2879     3.0000   787.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant      .1114      .9459      .1178      .9062    -1.7453     1.9681
PerHe2_C      .8431      .1571     5.3652      .0000      .5346     1.1515
DU_Openn      .3749      .1902     1.9703      .0492      .0014      .7483
Int_1        -.0482      .0313    -1.5428      .1233     -.1096      .0131

Product terms key:
 Int_1    :        PerHe2_C x        DU_Openn

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0020     2.3802     1.0000   787.0000      .1233
----------
    Focal predict: PerHe2_C (X)
          Mod var: DU_Openn (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerHe2_C   DU_Openn   PerSat_C   .
BEGIN DATA.
     5.3333     4.0000     5.0781
     6.0000     4.0000     5.5116
     7.0000     4.0000     6.1617
     5.3333     5.0000     5.1958
     6.0000     5.0000     5.5970
```

```
     7.0000     5.0000     6.1989
     5.3333     6.3333     5.3526
     6.0000     6.3333     5.7110
     7.0000     6.3333     6.2485
END DATA.
GRAPH/SCATTERPLOT=
 PerHe2_C WITH     PerSat_C BY       DU_Openn .

************************************************************************
OUTCOME VARIABLE:
 IntCU_Cu

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .6402      .4099      .5230   109.0388     5.0000   785.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.1327      .9865     2.1618      .0309      .1961     4.0692
PerHe2_C     -.1364      .1884     -.7241      .4692     -.5062      .2334
PerSat_C      .7413      .1736     4.2704      .0000      .4005     1.0820
DU_Openn     -.1739      .1989     -.8743      .3822     -.5644      .2166
Int_1         .0860      .0365     2.3543      .0188      .0143      .1576
Int_2        -.0531      .0328    -1.6184      .1060     -.1176      .0113

Product terms key:
 Int_1    :        PerHe2_C x        DU_Openn
 Int_2    :        PerSat_C x        DU_Openn

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0042     5.5430     1.0000   785.0000      .0188
M*W      .0020     2.6193     1.0000   785.0000      .1060
----------
    Focal predict: PerHe2_C (X)
          Mod var: DU_Openn (W)

Conditional effects of the focal predictor at values of the moderator(s):

   DU_Openn     Effect         se          t          p       LLCI       ULCI
     4.0000      .2075      .0549     3.7817      .0002      .0998      .3151
     5.0000      .2934      .0394     7.4384      .0000      .2160      .3709
     6.3333      .4080      .0614     6.6488      .0000      .2876      .5285

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerHe2_C   DU_Openn   IntCU_Cu   .
BEGIN DATA.
     5.3333     4.0000     5.5036
     6.0000     4.0000     5.6419
     7.0000     4.0000     5.8494
     5.3333     5.0000     5.4909
     6.0000     5.0000     5.6865
     7.0000     5.0000     5.9799
     5.3333     6.3333     5.4738
     6.0000     6.3333     5.7458
     7.0000     6.3333     6.1539
END DATA.
GRAPH/SCATTERPLOT=
 PerHe2_C WITH     IntCU_Cu BY       DU_Openn .
```

```
----------
    Focal predict: PerSat_C (M)
          Mod var: DU_Openn (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

DATA LIST FREE/
   PerSat_C   DU_Openn   IntCU_Cu   .
BEGIN DATA.
     4.5000     4.0000     5.0598
     6.0000     4.0000     5.8530
     6.5000     4.0000     6.1174
     4.5000     5.0000     5.1621
     6.0000     5.0000     5.8756
     6.5000     5.0000     6.1134
     4.5000     6.3333     5.2984
     6.0000     6.3333     5.9057
     6.5000     6.3333     6.1081
END DATA.
GRAPH/SCATTERPLOT=
 PerSat_C WITH     IntCU_Cu BY       DU_Openn .

****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Conditional direct effect(s) of X on Y:
   DU_Openn     Effect         se          t          p       LLCI       ULCI
     4.0000      .2075      .0549     3.7817      .0002      .0998      .3151
     5.0000      .2934      .0394     7.4384      .0000      .2160      .3709
     6.3333      .4080      .0614     6.6488      .0000      .2876      .5285

Conditional indirect effects of X on Y:

INDIRECT EFFECT:
 PerHe2_C    ->    PerSat_C    ->    IntCU_Cu

   DU_Openn     Effect     BootSE   BootLLCI   BootULCI
     4.0000      .3438      .0462      .2583      .4393
     5.0000      .2863      .0295      .2307      .3456
     6.3333      .2176      .0405      .1445      .3022
---

********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

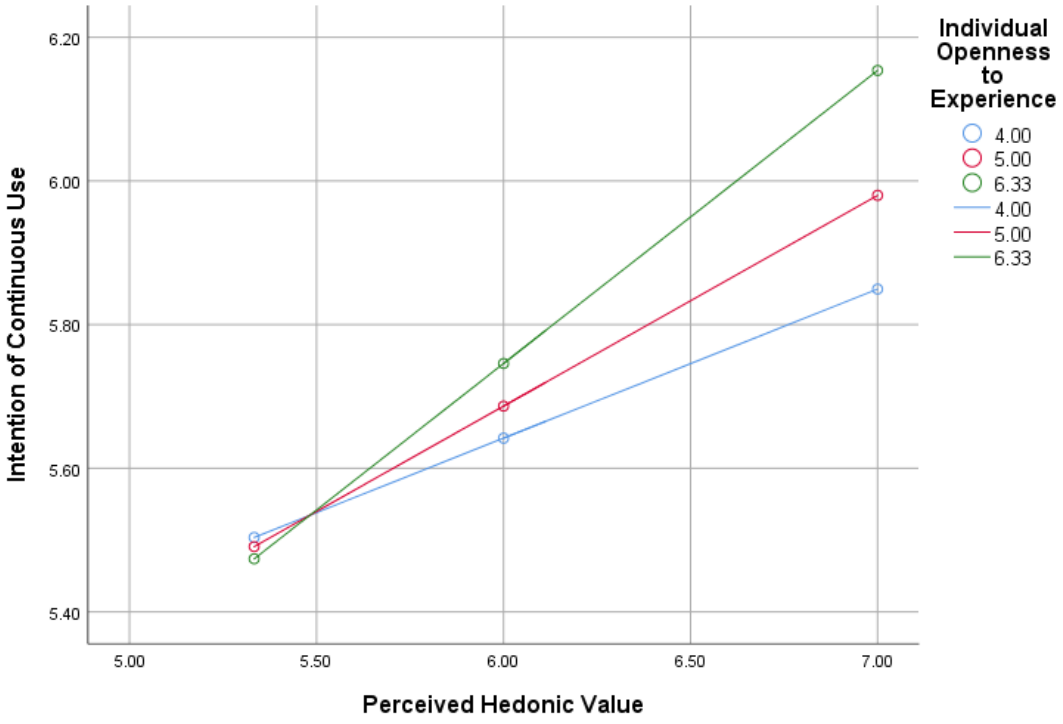
W values in conditional tables are the 16th, 50th, and 84th percentiles.

WARNING: Variables names longer than eight characters can produce incorrect output
when some variables in the data file have the same first eight characters. Shorter
variable names are recommended. By using this output, you are accepting all risk
and consequences of interpreting or reporting results that may be incorrect.

------ END MATRIX -----
```

APPENDICES

Graph



APPENDICES

Appendix 14: Part Two Survey (full-scale) – Independent Samples T-tests comparing Designer Group vs Nondesigner Group – in perceived importance of design options for enhancing utilitarian, hedonic, social, innovative, and overall values of new smartphone

T-Test

Note for table of Group Statistics:

Red texts: denotes items with observable mean-score difference (0.1 or more) between the designer and nondesigner groups

Red texts with yellow highlights: denotes items with statistics referred to in the chapters, with observable mean-score difference (0.1 or more) between the designer and nondesigner groups

Blue texts with blue highlights: denotes items with statistics referred to in the chapters, with no observable mean-score difference (less than 0.1) between the designer and nondesigner groups

Group Statistics

	Designers vs Nondesigners	N	Mean	Std. Deviation	Std. Error Mean
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: + 提升实用价值：	Designers	232	4.51	.762	.050
	Nondesigners	559	4.57	.684	.029
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：解难助手	Designers	232	3.86	1.023	.067
	Nondesigners	559	3.99	.899	.038
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：提升人机互动	Designers	232	4.00	1.013	.066
	Nondesigners	559	3.77	1.045	.044
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：优化物件搜寻及追踪功能 (例如停泊于公众停车場的汽车、遗失的物件)	Designers	232	4.17	.903	.059
	Nondesigners	559	4.18	.894	.038
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：优化出行使用 (如改良定位、导航、路线记录/拍摄)	Designers	232	4.39	.765	.050
	Nondesigners	559	4.38	.784	.033
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：拍摄全息影像， 或自动建构3D模型，用作全息投影	Designers	232	3.88	1.098	.072
	Nondesigners	559	3.85	1.084	.046
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: + 提升感受价值：	Designers	232	4.33	.766	.050
	Nondesigners	559	4.21	.809	.034
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：提升安全感	Designers	232	4.37	.795	.052
	Nondesigners	559	4.29	.836	.035
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：提升掌控感	Designers	232	4.17	.854	.056
	Nondesigners	559	4.12	.831	.035
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：传达全感观 (视像、气味、氛围...) 信息	Designers	232	3.73	1.108	.073
	Nondesigners	559	3.72	1.035	.044
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：个性化外观 (例如因应使用者心情或所在情境而变化)	Designers	232	3.79	1.065	.070
	Nondesigners	559	3.79	1.046	.044
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：人性化交互（例如AI辅助辨悉及回应使用者身心需要）	Designers	232	3.98	1.004	.066
	Nondesigners	559	3.83	.969	.041
2. 您认为一个适合［您］的新智能	Designers	232	3.75	1.031	.068

手机，设计取向的优次是: + 提升社会价值：	Nondesigners	559	3.77	.967	.041
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：提升人与人互动－家人之间	Designers	232	3.91	.990	.065
	Nondesigners	559	3.97	.907	.038
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：提升人与人互动－朋友之间	Designers	232	3.99	.923	.061
	Nondesigners	559	3.99	.883	.037
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：提升人与人互动－社群之间	Designers	232	3.86	.953	.063
	Nondesigners	559	3.84	.947	.040
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：成为虚拟朋友	Designers	232	3.02	1.239	.081
	Nondesigners	559	2.88	1.185	.050
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：成为虚拟家人	Designers	232	2.74	1.291	.085
	Nondesigners	559	2.64	1.199	.051
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：优化人物搜寻 (例如在人群中导向相约或没相约的朋友)	Designers	232	3.52	1.128	.074
	Nondesigners	559	3.33	1.151	.049
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：个性化互联(例如自動搜寻 / 过滤 / 分享 / 回应使用者关注的信息)	Designers	232	3.69	1.043	.068
	Nondesigners	559	3.56	1.062	.045
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: + 提升创新价值：	Designers	232	4.03	.852	.056
	Nondesigners	559	3.98	.888	.038
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：人机合一	Designers	232	3.57	1.160	.076
	Nondesigners	559	3.41	1.126	.048
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：创作助手	Designers	232	3.78	.989	.065
	Nondesigners	559	3.58	1.007	.043
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：个人化行业助手	Designers	232	3.80	1.005	.066
	Nondesigners	559	3.64	.970	.041
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：个性化组合 (例如并装结構， 可因应使用者选择 / 需要 / 科技提升而灵活組合)	Designers	232	3.68	.950	.062
	Nondesigners	559	3.73	.917	.039
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：自由建构 / 分享，育成个人化 / 组群联动使用环境（功能、交互、外观、信息.....可自主调节或由AI辅助调节）	Designers	232	3.68	.977	.064
	Nondesigners	559	3.64	.957	.040
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: + 优化整体价值：	Designers	232	4.06	.858	.056
	Nondesigners	559	4.08	.837	.035
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：提升生活素质 (well-being)	Designers	232	3.98	.829	.054
	Nondesigners	559	3.99	.853	.036
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：环保，可持续使用	Designers	232	4.03	.948	.062
	Nondesigners	559	4.14	.861	.036
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：对人及非人生态友善	Designers	232	4.02	.878	.058
	Nondesigners	559	4.02	.871	.037
2. 您认为一个适合［您］的新智能手机，设计取向的优次是: 例如：以人为本	Designers	232	4.26	.844	.055
	Nondesigners	559	4.28	.805	.034

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Note for table of Independent Samples Test:

Red texts: denotes items with statistically significant difference between the designer and nondesigner groups

Red texts with yellow highlights: denotes items with statistics referred to in the chapters, with statistically significant difference between the designer and nondesigner groups

Blue texts with blue highlights: denotes items with statistics referred to in the chapters, with no statistically significant difference between the designer and nondesigner groups

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: + 提升实用价值：	Equal variances assumed	6.257	.013	-1.077	789	.282	-.060	.055	-.168	.049
	Equal variances not assumed			-1.031	393.178	.303	-.060	.058	-.173	.054
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：解难助手	Equal variances assumed	7.926	.005	-1.812	789	.070	-.133	.073	-.276	.011
	Equal variances not assumed			-1.718	386.483	.087	-.133	.077	-.284	.019
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：提升人机互动	Equal variances assumed	6.378	.012	2.928	789	.004	.237	.081	.078	.396
	Equal variances not assumed			2.966	444.419	.003	.237	.080	.080	.394
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：优化物件搜寻及追踪功能 (例如停泊于公众停车場的汽车、遗失的物件)	Equal variances assumed	.014	.907	-.231	789	.818	-.016	.070	-.154	.121
	Equal variances not assumed			-.230	427.789	.818	-.016	.070	-.154	.122
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：优化出行使用 (如改良定位、导航、路线记录/拍摄)	Equal variances assumed	.185	.667	.202	789	.840	.012	.061	-.107	.132
	Equal variances not assumed			.204	441.775	.839	.012	.060	-.106	.131
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：拍摄全息影像， 或自动建构3D模型， 用作全息投影	Equal variances assumed	.404	.525	.348	789	.728	.030	.085	-.137	.196
	Equal variances not assumed			.346	426.598	.729	.030	.085	-.138	.198
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: + 提升感受价值：	Equal variances assumed	.177	.674	2.028	789	.043	.126	.062	.004	.248
	Equal variances not assumed			2.075	454.327	.039	.126	.061	.007	.246
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：提升安全感	Equal variances assumed	.948	.331	1.245	789	.213	.080	.064	-.046	.207
	Equal variances not assumed			1.272	452.573	.204	.080	.063	-.044	.204
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：提升掌控感	Equal variances assumed	.600	.439	.792	789	.429	.052	.065	-.077	.180
	Equal variances not assumed			.783	421.377	.434	.052	.066	-.078	.182
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：传达全感观 (视像、气味、氛围...) 信息	Equal variances assumed	2.681	.102	.187	789	.852	.015	.083	-.147	.177
	Equal variances not assumed			.182	406.513	.856	.015	.085	-.151	.182
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：个性化外观 (例如因应使用者心情或所在情境而变化)	Equal variances assumed	.012	.912	.095	789	.925	.008	.082	-.153	.169
	Equal variances not assumed			.094	424.668	.925	.008	.083	-.155	.170
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：人性化交互 (例如AI辅助辨悉及回应使用者身心需要)	Equal variances assumed	.255	.614	1.987	789	.047	.152	.077	.002	.302
	Equal variances not assumed			1.958	418.301	.051	.152	.078	-.001	.305
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: + 提升社会价值：	Equal variances assumed	1.350	.246	-.203	789	.839	-.016	.077	-.167	.136
	Equal variances not assumed			-.198	408.163	.843	-.016	.079	-.171	.140
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：提升人与人互动 - 家人之间	Equal variances assumed	4.253	.040	-.816	789	.415	-.059	.073	-.202	.083
	Equal variances not assumed			-.787	399.816	.432	-.059	.075	-.208	.089
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：提升人与人互动 - 朋友之间	Equal variances assumed	.590	.443	-.057	789	.955	-.004	.070	-.141	.133
	Equal variances not assumed			-.056	414.824	.955	-.004	.071	-.144	.136

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2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：提升人与人互动，社群之间	Equal variances assumed	.305	.581	.287	789	.774	.021	.074	-.124	.167
	Equal variances not assumed			.287	429.638	.775	.021	.074	-.125	.167
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：成为虚拟朋友	Equal variances assumed	1.211	.271	1.508	789	.132	.141	.094	-.043	.326
	Equal variances not assumed			1.480	414.650	.140	.141	.096	-.046	.329
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：成为虚拟家人	Equal variances assumed	2.831	.093	.990	789	.322	.095	.096	-.093	.283
	Equal variances not assumed			.960	404.605	.337	.095	.099	-.099	.289
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：优化人物搜寻 (例如在人群中导向相约或没相约的朋友)	Equal variances assumed	.482	.488	2.145	789	.032	.192	.089	.016	.367
	Equal variances not assumed			2.163	439.638	.031	.192	.089	.017	.366
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：个性化互联(例如自動搜寻 / 过滤 / 分享 / 回应使用者关注的信息)	Equal variances assumed	.181	.670	1.624	789	.105	.134	.083	-.028	.296
	Equal variances not assumed			1.637	439.066	.102	.134	.082	-.027	.295
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: + 提升创新价值：	Equal variances assumed	.461	.497	.764	789	.445	.052	.069	-.082	.187
	Equal variances not assumed			.777	448.363	.437	.052	.067	-.080	.185
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：人机合一	Equal variances assumed	.504	.478	1.816	789	.070	.161	.089	-.013	.335
	Equal variances not assumed			1.794	420.218	.074	.161	.090	-.015	.338
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：创作助手	Equal variances assumed	2.496	.115	2.563	789	.011	.201	.078	.047	.354
	Equal variances not assumed			2.583	439.184	.010	.201	.078	.048	.353
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：个人化行业助手	Equal variances assumed	.095	.758	2.074	789	.038	.159	.077	.008	.309
	Equal variances not assumed			2.043	418.132	.042	.159	.078	.006	.312
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：个性化组合 (例如并装结構，可因应使用者选择 / 需要 / 科技提升而灵活組合)	Equal variances assumed	1.163	.281	-.625	789	.532	-.045	.072	-.187	.097
	Equal variances not assumed			-.616	418.336	.538	-.045	.073	-.190	.099
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：自由建构 / 分享，育成个人化 / 组群联动使用环境 (功能、交互、外观、信息.....可自主调节或由AI辅助调节)	Equal variances assumed	.057	.812	.587	789	.557	.044	.075	-.103	.192
	Equal variances not assumed			.583	423.956	.560	.044	.076	-.105	.193
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: + 优化整体价值：	Equal variances assumed	.010	.919	-.214	789	.831	-.014	.066	-.143	.115
	Equal variances not assumed			-.211	422.082	.833	-.014	.067	-.145	.117
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：提升生活素质 (well-being)	Equal variances assumed	.822	.365	-.110	789	.913	-.007	.066	-.137	.122
	Equal variances not assumed			-.111	442.942	.912	-.007	.065	-.136	.121
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：环保，可持续使用	Equal variances assumed	.025	.875	-1.464	789	.144	-.101	.069	-.238	.035
	Equal variances not assumed			-1.407	396.882	.160	-.101	.072	-.243	.040
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：对人及非人生态友善	Equal variances assumed	.005	.945	.017	789	.987	.001	.068	-.133	.135
	Equal variances not assumed			.017	428.574	.987	.001	.068	-.133	.136
2. 您认为一个适合 [您] 的新智能手机，设计取向的优次是: 例如：以人为本	Equal variances assumed	.029	.864	-.265	789	.791	-.017	.064	-.142	.108
	Equal variances not assumed			-.259	413.995	.795	-.017	.065	-.145	.111

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