

# **SAGE Research Methods Cases Part 1**

## **The Application of Concurrent or Sequential Mixed-Methods Research Designs and Their Methodological Implications: Investigating Tacit Knowledge, Its Use, and Application in Automotive Development**

### **Case**

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## Abstract

Mixed-methods research designs are a popular approach to research that can offer the advantages of both quantitative and qualitative data. However, using two types of data within one piece of research also presents challenges. To minimize these challenges and maximize the potential benefits, it is important for mixed-methods research projects to be well planned and thought out. This case study explores and discusses the use of concurrent and sequential mixed-methods research designs and the implications on the data collection and analysis processes, as well as the underpinning research philosophy. Specifically, this case study examines the use of a mixed-method research design in a study exploring the forms of tacit knowledge requested of employees in the automotive industry and how and why these forms of tacit knowledge are used. Understanding available options for data collection and their influence on the research process is essential to making an informed decision about whether to follow a concurrent or sequential mixed-methods research design.



## Learning Outcomes

By the end of this case study, students should be able to:

- Understand the benefits and challenges of undertaking mixed-methods research
- Explain the difference between concurrent and sequential mixed-method research designs
- Assess the methodological implications of applying a concurrent or sequential mixed-method research design
- Critically evaluate whether a concurrent or sequential mixed-method research design is most appropriate for a given research problem
- Critically justify the suitability of a concurrent or sequential mixed-method research design for achieving a research aim

## Project Overview and Context

The research sought to identify what forms of tacit knowledge are requested of employees working in product development within a multinational automotive company, and how and why these forms of tacit knowledge are used in the product development process, by using a sequential mixed-methods approach. A greater focus and emphasis has been placed on researching explicit knowledge within the knowledge literature compared to tacit knowledge ([Leonard & Sensiper, 1998](#)). This is despite the fact that tacit knowledge has been widely accepted and acknowledged to be essential for sustainable business success ([Jisr & Maamari, 2017](#)). This in part stems from tacit knowledge being based on an individual's intuition, beliefs, and insight, which come from their own experience ([Polanyi, 1966](#)), making the verbalization and identification of tacit knowledge challenging ([Fleck, 2014](#); [Seidler-de Alwis & Hartmann, 2008](#)). The research was considered important as the codification of tacit knowledge has been suggested as a potential way for Western automotive manufacturers to remain competitive in the face of growing global competition ([Machacek & Hess, 2019](#)).



## Section Summary

- Tacit knowledge is an under-researched area.
- Eliciting and verbalizing tacit knowledge in research can be tricky.
- The codification of tacit knowledge is important for automotive manufacturers to remain globally competitive.

## Mixed Methods Research Designs

To achieve the aim of the research in determining what types of tacit knowledge were most requested and how and why these were used in the automotive product development process, we determined that a mixed-methods approach was appropriate for the research. We determined that quantitative or qualitative research methods alone could not achieve the quantification of the types of tacit knowledge requested by the organization, while also achieving the depth of understanding as to how and why these forms of tacit knowledge were utilized and applied in the product development process ([Schmidt et al., 2021](#)). Quantitative data are an effective tool for seeking to measure a phenomenon and provide objectivity, which aligns well with the first part of the research determining the “what types of tacit knowledge” were most commonly requested but lacks the ability to explore and provide a detailed understanding as to “how and why” these types of tacit knowledge are used in the context being researched. Qualitative research, however, can provide detail, richness, and sensitivity to context ([Tharenou et al., 2007](#)), providing a more effective tool to understand the use and application of the tacit knowledge in practice. These considerations led to a mixed-methods research design being employed, where both quantitative and qualitative research were combined in a single research design ([Saunders et al., 2019](#)).

Debate exists in the research-methods literature as to the value of mixed-methods research designs, with proponents of mixed-methods arguing that using both quantitative and qualitative data can potentially increase the validity, generalizability, and depth of the results. While sceptics suggest contradictions between the underpinning philosophy and methods regularly arise with mixed-methods research designs ([Easterby-Smith et al., 2018](#)). This can lead to a lack of clarity and focus within research, with good intentions of including more data becoming detrimental, and as such, projects employing mixed-methods becoming “as clear as mud” ([Lowe, 2010](#)). However, proponents of mixed-methods research posit bringing different types of data together can strengthen research by offering multiple perspectives that can increase validity and generalizability.

When proceeding with a mixed-methods research design, there are two important considerations to ensure the quality and fit of the research design proposed in achieving the research aim. These are the dominance of the methods within the research design and the sequencing of the methods ([Easterby-Smith et al., 2018](#)). The dominance of the methods relates to whether objectivity or subjectivity is more important in the research, whereas the sequencing relates to whether one data collection method precedes the other, and if so, which one. A myriad of different mixed-methods research designs exist in the literature, for example, [Tashakkori and Teddlie \(2003\)](#) outline and discuss around 35 different potential mixed-methods designs with varying levels of complexity. This case study does not seek to explore all the different designs, but rather focus on the sequencing of the methods within mixed-methods research and the implications for the underpinning methodology and philosophy.



## Section Summary

- Mixing methods in a research design can add additional depth to a research project.
- Clarity is needed as to how and why the data collected with mixed methods will be applied and analysed to achieve the research aim.

## Research Practicalities

Tacit knowledge is a challenging phenomenon to research given its tacit nature, which means that it cannot be easily communicated as it is implicit or implied. To overcome this challenge, a previously tested and validated framework was employed in this work. The framework adopted was by [Haldin-Herrgard \(2003\)](#), and it identifies 92 epitomes of tacit knowledge. These epitomes are vocabulary that are used to refer to tacit knowledge and, therefore, allow the verbalization of tacit knowledge in conversation or the written form. In order to identify what forms of tacit knowledge were requested in the automotive organization being researched, a sample of job role descriptions included within job adverts were screened to identify how frequently each epitome was used. This allowed for the measuring and quantification of the forms of tacit knowledge being requested of the workforce. This was a time-consuming process, and conceptual equivalency had to be ensured as the language of the original epitomes and the job adverts were different. However, it would likely have been challenging for interviewees to identify the forms of tacit knowledge they used given the implicit nature of tacit knowledge.

Having identified which of the epitomes and thus the forms of tacit knowledge that were requested most in the job adverts, the second stage of the research sought to understand in more detail how and why these forms of tacit knowledge were used in the specific context of the organization being researched. Interviews were chosen to collect subjective accounts of how and why forms of tacit knowledge were used by individuals in their job role. The interview questions were built around the most frequently requested form of tacit knowledge identified in the first stage of the research. This helped to bound and structure the interviews, as otherwise, the discussion of tacit knowledge could become very wide and hard to focus and analyse. The discussion of epitomes of tacit knowledge helped to guide the interview discussion and make discussing tacit knowledge less challenging. Structuring the interviewees around specific epitomes helped interviewees talk more explicitly.

The research was of a potentially sensitive nature as tacit knowledge used within organizations can help to achieve a business and competitive advantage. In addition, employees may feel reluctant to discuss their work and interactions with colleagues if the information was openly disclosed. As a result, the organization and interviewees all gave informed consent to be part of the research, were assured of confidentiality, and were briefed on the research and its purpose before the data collection process started. The data collected were saved in a secure format and location and the job descriptions and interview participants were all anonymized within the research.



### Section Summary

- Job role descriptions were used to identify the forms of tacit knowledge most frequently requested.
- Interviews were chosen to allow participants to discuss how they used the most frequently requested forms of tacit knowledge in their job role.
- Epitomes of tacit knowledge were used to overcome the challenge of discussing tacit knowledge which is implicit rather than explicit.

## Sequencing of Methods Within Mixed-Methods Research Design in Action

Mixed-methods research designs can either follow a concurrent or sequential data collection process. This is a decision that the researcher should make based on achieving their research aim, answering their research questions and the purpose of mixing methods. The decision made has far-reaching implications for the research project as it influences and affects the methodological and philosophical underpinnings of the research, the data collection and analysis process, and the presentation of the research. The difference between concurrent and sequential mixed-methods research designs will now be discussed, along with their benefits and suitability in practice.

Concurrent mixed-methods research design involves collecting both quantitative and qualitative data at roughly the same time. Therefore, the collection of quantitative and qualitative data are independent from each other, and one type of data are not informing the collection of the other type of data. This has obvious time benefits as both types of data are collected at the same time, potentially allowing the research to complete the data collection sooner. An example of such an approach would be to collect both quantitative data through Likert scales and qualitative data through open questions within a single questionnaire about a potential new product at the same time. Concurrent designs are effective when seeking to triangulate data to determine and demonstrate congruence between both quantitative and qualitative findings. Triangulation can be achieved by identifying whether the two types of data support the same results and conclusions. Triangulation can be used to reduce the risk of chance associations and bias, as studies using only one method are more vulnerable to errors ([Wilson, 2014](#)). Research that utilizes different types of data can provide cross data validity checks and thus can help to demonstrate validity, and potentially extend generalizability. Concurrent mixed-methods designs can be particularly efficacious for research focused on evaluation, where multiple data points and streams can be reviewed to come to an overall result and conclusion. For example, [Bell \(2016\)](#) used a concurrent mixed-methods research design to evaluate the effectiveness of research methods training, by analyzing both quantitative grades and qualitative accounts of researcher's preparedness to conduct research, to come to an overall assessment.

However, with all mixed-method research designs, it is important to consider how the data will be collected and how it will be integrated into the data process to inform the results to avoid a situation where data are collected and there is a lack of clarity regarding its value and purpose.

Sequential mixed-methods research designs have two distinct stages of data collection which occur one after the other. One of the benefits of such an approach is that it allows time for the first set of data to be analyzed and can, therefore, inform the later stage. The researcher can make the decision whether the first stage will involve quantitative or qualitative research, depending on the aim of the research project. If the project seeks to quantify or test a concept and then explore it further, it is likely that first stage will be quantitative, and the second stage will be qualitative. While, if the project seeks to explore a phenomenon to develop an understanding before testing or quantifying it, it is likely that the first stage will involve qualitative data followed by the collection of quantitative data. Such research designs are particularly useful if the research seeks to use the results of the first stage to inform the second stage of data collection. Therefore, if the purpose of adopting mixed methods is to add additional depth to support knowledge and theory development, sequential methods can be well suited to the task. Concurrent mixed-methods research designs do not allow for the evolution of the topic and understanding through the research process, which limits the potential development of knowledge and theory during the research process. In the context of researching what forms of tacit knowledge are requested of employees working in product development within a multinational automotive company and "how and why" these forms of tacit knowledge are used in the product development process, there is a clear need to first determine what forms of tacit knowledge are requested of employees before exploring the application of the tacit knowledge further. This led the research to be undertaken in two stages, thus adopting a sequential mixed-methods approach. The first stage sought to quantify the most frequently requested forms of tacit knowledge. This was achieved through employing manifest content analysis to internal job descriptions to highlight the epitomes of tacit knowledge to identify the most frequently requested forms of tacit knowledge. Then, the second stage of the research focused specifically on how and why the most frequently requested forms of tacit knowledge are applied in practice. This deeper exploration was conducted using semi-structured interviews to collect qualitative data to support the collection of richer and more context-specific data.

It is worth noting that in terms of triangulation, sequential designs are not as effective for triangulating data as the findings from the first stage might influence the second stage, or the phenomenon and its context might have changed between the two phases of data collection, thus influencing the findings ([Onwuegbuzie & Collins, 2007](#)).

In the process of developing an appropriate mixed-methods research design, it is important that the researcher reviews the aim of their research to assess whether a concurrent or sequential mixed-methods research design is more appropriate. Both concurrent and sequential mixed-methods research designs have strengths and weaknesses, and it is important that the strengths are aligned with what the research seeks

to achieve. The decision as to whether a concurrent or sequential mixed-methods research design is chosen has methodological and philosophical implications, which will now be explored in further detail.



## Section Summary

- Consideration should be given to the sequencing of mixed methods in a mixed-methods research design.
- Concurrent mixed-methods research designs involve collecting both quantitative and qualitative data at roughly the same time.
- Sequential mixed-methods research designs collect one form of data first, which informs the following stage of data collection.
- Concurrent mixed-methods research designs can be particularly efficacious in evaluation research.

## Methodological Implications of Concurrent and Sequential Mixed Methods Research Designs

Data collection decisions have implications for the research philosophy underpinning a research project. The decision as to whether to employ a concurrent or sequential mixed-methods research design also has methodological and philosophical implications, which will now be discussed in this section. Different approaches to undertaking research have implications for the underpinning research methodology and philosophy, as different approaches can be more effectively supported by different research philosophies and philosophical standpoints. Positivism and interpretivism are often considered to be the mainstream opposing philosophical standpoints, which align with the ends of the philosophical spectrum. Positivism applies principles of natural science and emphasizes highly structured data collection to facilitate replication to support law like generalizations ([Saunders et al., 2019](#)). Positivism posits the use of objective and structured data to break the world around us into testable components, seeking to find generalizable casual relationships. This view of the world, or paradigm, appreciates the objectivity and structured nature of quantitative data, however, fails to readily recognize the value of qualitative data, as this is often unstructured and challenging to test to produce law link generalizations. Therefore, positivism does not readily support the use of mixed methods as it fails to recognize the value that qualitative data can bring to research. Interpretivism asserts that natural science assumptions and methods of research are not appropriate for social investigation, as the social world is not governed by regularities that hold law-like properties ([Ritchie & Lewis, 2003](#)). Researchers need to understand the context and subjective reality of participants to understand the meaning behind their views and answers ([Saunders et al., 2019](#)). Therefore, the interpretivist philosophy does not value such structured data, but rather seeks depth within datasets to elicit subjectivity in relation to context and specific situations. This means that the interpretivist view of the world does not value quantitative data, as it commonly fails to offer the situational context and depth to understand subjectivity. Interpretivism advocates qualitative data and does not readily acknowledge the value of including quantitative data in a mixed-methods research design. Rather than seeking to apply a research philosophy that does not value part of the data within the research design, other research philosophies are more sympathetic to the use of mixed-methods research. Two such research philosophies are pragmatism and realism, which will now be discussed in more detail.

The pragmatist research philosophy posits that it possible to work with variations in your epistemology, ontology, and axiology ([Saunders et al., 2019](#)). Pragmatists seek to use data that fits the research aim and problem, and as such, it is a suitable philosophy for those who seek to promote the combining of methods ([Morgan, 2007](#)). Pragmatism has three central tenets that are an emphasis on actionable knowledge, acknowledgement of the linkage to experience, and research being an experiential process ([Kelly & Cordeiro, 2020](#)). A pragmatic standpoint encourages bringing data together from multiple data points to support researchers to come to actionable results and conclusions, through recognizing research participants experience. This makes pragmatism a particularly useful philosophy to underpin research that

evaluates and assesses performance within an organization or process ([Kelly & Cordeiro, 2020](#)), which aligns well with the potential application benefits of concurrent mixed methods research. Pragmatism has commonly been employed within research seeking practical and actional benefits, while not considering its philosophical aspects ([Morgan, 2014](#)). Therefore, it is important to link the use of pragmatism to more than solely seeking practical benefits and conclusions, which are a common goal and expectation within business and management research.

Realism is like pragmatism in its willingness to accept and advocate the use of mixed-methods research designs. However, pragmatism and realism have different starting and end points ([Allmark & Machaczek, 2018](#)), as realism seeks to understand the world through an external and objective reality and how this influences people's social interpretations and behaviors, which might not be perceptible to participants ([Saunders et al., 2019](#)). This encourages realists to try and seek some degree of objectivity while acknowledging the needs and benefits of qualitative research to explore social interactions, interpretations, and behaviors, which need an element of subjective questioning and probing to elicit. Such an underpinning to research acknowledges the distinctive value and contribution of quantitative methods to provide objectivity and generalizability and qualitative methods to provide depth and context to the results. This makes realism particularly suitable to underpin sequential mixed-methods research where each stage of the research has a specific purpose within the overall research design.

When researching the forms of tacit knowledge requested of employees and “how and why” these forms of tacit knowledge are used, it was decided that the most effective underpinning research philosophy was realism. It was suitable as the research was seeking a degree of objectivity in the first stage to understand and quantify the tacit knowledge that was requested: While the second stage of the research employed the collection of qualitative data as the research recognized the need for subjective data collected through semi-structured interviews to explore participants behaviors and work interactions. Therefore, overall while the research sought some degree of objectivity, it still recognized the need to collect employee qualitative data for the component of the research where it was more effective.



## Section Summary

- The decision as to whether to use concurrent or sequential mixed methods has potential methodological implications.
- Both the realist and pragmatic research philosophies value the use and application of mixed methods.

## Practical Lessons Learned

While mixed-methods research designs can be attractive due to the collection of more data on a particular research phenomenon, they are not a panacea. More data are not always better, particularly if it does not have a clear purpose and adds little value to the overall project. Issues can surface around the quality of the data collection and analysis as the researcher must become an expert in both quantitative and qualitative methods, providing the reader thorough details of the data collection, analysis process, and the results in the same word limit, while achieving the level of rigor to satisfy both quantitative and qualitative researchers in the marking and peer-review process ([Lowe, 2010](#)). It has been argued that the differentiation of quantitative and qualitative research methods is a crude dichotomy and omits many potentially useful possibilities ([Wood & Welch, 2010](#)), and researchers should, therefore, not become too preoccupied with the methods used and how they are classified, but rather focus on what data are available to them and how it can be used to achieve a research aim and answer the research questions.

In the case of our research, time was given to determine what type of data would be most effectively able to answer each of the research questions. An existing framework has already been developed to identify tacit knowledge through 92 so-called epitomes of tacit knowledge, which are pieces of vocabulary that can be used to identify tacit knowledge ([Haldin-Herrgard, 2003](#)). Adopting a sequential mixed-methods approach,

a quantitative analysis of job descriptions enabled the research to first identify the main groupings of tacit knowledge in a specific department. This was a necessary first stage to identify the most important types of tacit knowledge requested in our specific context. The research then adopted a qualitative approach to elicit finer detail to answer why it was important through interviews and thematic analysis. The initial quantitative stage allowed the research to focus down on the main groupings and the subsequent qualitative stage to focus on the smaller individual details. This sequential mixed-method approach led to results that may be generalizable to similar businesses where essential tacit knowledge is under threat due to the streamlining of operations to maintain competitiveness in the marketplace. Deciding how the data will be used in advance of data collection saved a significant amount of time and provided operational clarity. Undertaking a sequential mixed-methods approach also allowed the data collection and analysis to be broken down into chunks, as the first stage involving the quantitative data collection and analysis was completed first, before moving onto the qualitative second stage. Having decided upon adopting a sequential mixed-methods research design, we needed to be reflexive to consider what the methodological and philosophical implications would be. We decided that a realist philosophy was most appropriate as the first stage sought to measure and identify objectively the forms of tacit knowledge request, but we still valued the depth and context that qualitative data could provide to understand how and why these forms of tacit knowledge are used in the automotive industry.

What becomes apparent from the experience of adopting mixed methods is the importance and need to think carefully about the value each method offers and how it will be integrated into the overall research design in order to achieve the research aim. This should be the initial focal point when considering developing a mixed-methods research project. Decisions regarding the value, purpose, and contribution of each method will help to inform decisions as to whether a concurrent or sequential mixed-methods research design is most suitable. In this research case, a sequential mixed-method design was most suitable with the quantitative stage being undertaken first and the second qualitative stage following on and building on the findings of the first stage. These decisions will inform the most suitable research philosophy to underpin the research.



## Section Summary

- More data are not always better unless there is a clear understanding as to how it can be used to add value to a research project.
- How the different types of data collected will be used should be clearly thought out and planned before data collection to save time later.
- The value, purpose, and contribution of each method should help to inform the decision whether to follow a concurrent or sequential mixed methods research design.

## Conclusions

Mixed-methods research designs have the potential to be a powerful research design. However, they might not be an easy option. The effectiveness of a piece of research is not solely assessed on the amount of data or the number of data types. A range of additional points is commonly considered when assessing the quality and effectiveness of a research project including, the quality of the data, the depth of analysis, the relevance of the sample, the validity and rigor checks put in place, and the suitability of the data analysis in achieving the research aim and answering the research questions. All these points need to be taken into consideration when developing a mixed-methods research project.

Before making a concrete decision to move forward with collecting mixed-methods data, careful consideration needs to be given as to how the data collection will be analyzed to achieve the research aim and research questions set. In the case of our research, we used the first stage of data collection to inform the second stage of data collection, so adopting a sequential mixed-methods design was most appropriate. This influenced the research process as the quantitative data had to be collected and analyzed before the second stage of data collection could be undertaken. While this might have been more time consuming, as the data were collected in a stop start nature, it helped to break the research project into manageable chunks.

When evaluating the suitability of a mixed-methods research design, it is important to carefully think about the data collection and analysis process and the implications for the underpinning research methodology and philosophy. This is a reflexive process where the researcher needs to ensure alignment between the most effective methods and research design and the most appropriate research philosophy to underpin this.

In summary, this case study explores and discusses the importance of deciding on whether a concurrent or sequential mixed-methods research design will be adopted. This decision should be made relatively early in the research process before data are collected as it will have implications on the data collection and analysis process, as well as the underpinning research philosophy. Understanding the options available and their influence on the research process is essential to make an informed decision.



## Section Summary

- Mixed methods research designs are not an easy option.
- The quality and effectiveness of a piece of research is not commonly evaluated by the number of methods and data types used.
- When assessing the suitability of a mixed-methods research design, it is important to consider the data collection and analysis process and the implications for the underpinning research methodology and philosophy.



## Classroom Discussion Questions

1. Having read this case study how have your views toward mixed methods research changed?
2. What are the methodological and research process implications for adopting a concurrent or a sequential mixed-methods research design?
3. Why is a concurrent mixed-methods research design commonly seen as advantageous for triangulation?
4. Identify a research aim which you think would be suitable to be achieved through the application of either concurrent or sequential mixed-methods research designs and justify why.



## Multiple Choice Quiz Questions

1. Which of the following best describes a sequential mixed-methods research design?

- ☐ a. A mix of qualitative and quantitative data are collected at the same point in time.

Incorrect Answer

Feedback: This is not the correct answer. The correct answer is B.

- ☐ b. Qualitative data is collected first, which informs the next stage of quantitative data collection.

Correct Answer

Feedback: Well done, correct answer.

- ☐ c. Only quantitative data are collected.

Incorrect Answer

Feedback: This is not the correct answer. The correct answer is B.

2. What should drive the use of a mixed-methods research design?

- ☐ a. The appropriateness of achieving the research aim.

Correct Answer

Feedback: Well done, correct answer.

- ☐ b. The desire to have more than one type of data.

Incorrect Answer

Feedback: This is not the correct answer. The correct answer is A.

- ☐ c. The joy of statistics.

Incorrect Answer

Feedback: This is not the correct answer. The correct answer is A.

3. Which type of mixed methods is most suitable for triangulation?

- ☐ a. Concurrent

Correct Answer

Feedback: Well done, correct answer.

- ☐ b. Sequential

Incorrect Answer

Feedback: This is not the correct answer. The correct answer is A.

## Further Reading

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