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“Augmented Reality (AR) for Enhancing Food Choices in Supermarkets”

Target Groups:

- Primary Target: Adults aged 18-40 years, residing in urban areas with access to smartphones and regular visits to supermarkets (Flegal et al., 2012).
- Secondary Target: Families with children and low-income populations are likely to find it hard to make informed food choices as they may be the most deficient in nutrition knowledge (Mozaffarian et al., 2013).

Public Concern:

- Obesity, diabetes, and cardiovascular diseases are increasing worldwide. A poor diet is one of the major contributors to these conditions (Swinburn et al., 2011).
- Almost 40% of adults in the U.S. are obese, many of whom have no idea about the nutritional quality of the foods they buy (CDC, 2021).

Aim and Content of the Activity

- ▶ **Aim:** To empower young adults to make healthier food choices in supermarkets by providing real-time nutritional information and healthier alternatives through an AR mobile app.
- ▶ **Objectives:** Increase awareness about hidden ingredients (e.g., sugar, salt). Encourage healthier purchasing decisions. Reduce obesity and related health risks. Support behaviour changes at the point of purchase.
- ▶ **Content:** AR scanning: Scan grocery products to display nutritional content. Alternative suggestions: Healthier product recommendations.
- ▶ Recipe ideas: Based on scanned products.
- ▶ Health rating system: Colour-cod nutritional scores.



Slide 3: Chosen Digital Health Technology Technology: Mobile Augmented Reality (AR) Application.

- ▶ **Features:** Barcode scanning with real-time nutritional data.
- ▶ Visual overlay of healthier options.
- ▶ Ingredient explanations (e.g., "High in hidden sugars").
- ▶ Recipe suggestions using healthy ingredients.
- ▶ User data dashboard to track healthy choices.



1. Justification

- Challenges of Growing Public Health: More than 42% of U.S. adults are obese; poor diet is a leading driver of obesity, diabetes, and heart disease (CDC, 2021; Swinburn et al., 2011).
- Scant Knowledge About Nutrition: Interpreting food labels and making informed food choices is a challenge experienced by many adults, particularly low-income families (Mozaffarian et al., 2013).
- Limitations of Conventional Methods: Public health campaigns seldom hit people at the point of purchase, where food choices are made.
- AR: Immediate, Customized Assistance: Augmented Reality apps can:
 - Scan foods so you can get nutritional data at a glance
 - Propose healthier swaps
 - Imagine long-range health effects
 - Personalize to user preferences and goals (McKinsey and Company, 2019; Rimmer et al., 2013)
 - Following national guidelines: Assists in reducing processed food and increasing fruit/vegetable consumption and is thus in support of WHO and U.S. Dietary Guidelines (WHO, 2020; CDC, 2021)
 - Tech-Ready Demographic: AR has the potential to engage a high usage population, that is, USA Urban adults aged 18–40, who are high smartphone users.



National Guidelines and Statistics

National Guidelines and Statistics

- National Guidelines:
 - The World Health Organization (WHO) recommends limiting the consumption of foods that are rich in fat, sugar and salt (WHO, 2020).
 - The U.S. Dietary Guidelines emphasize increasing fruit, vegetable, and wholegrain intake while limiting added sugars and sodium (CDC, 2021).
- Statistics:
 - As stated in the CDC (2021), since the 1970s, the rate of obesity within the population in the U.S. has more than doubled, and over 42% of Americans fall into the category of obesity.
 - Research indicates that only 1 in 10 adults meet the recommended fruit and vegetable intake (CDC, 2020).
 - A third of adult's population in the United States are hypertensive, and this has a greatly attributable cause of poor diet (Flegal et al., 2012).



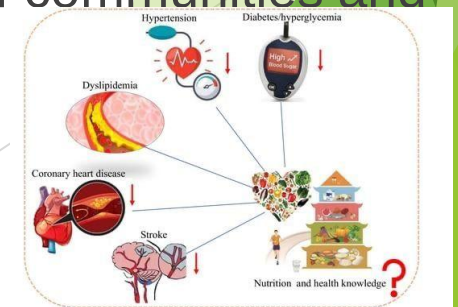
Dietary Guidelines for Americans, 2020-2025

Outcomes in the Event of Non-action

- Physical Consequences: Chronic illness like as diabetes, heart disease, and hypertension, are often linked with poor eating habits(Mozaffarian et al., 2013).
- Life-long consequences include a decreased quality of life, disability, and early death (Swinburn et al., 2011).
- Economic Burden: In the United States, obesity accounts for \$147 billion in healthcare cost each year (CDC, 2018). These costs include direct medical expenses tied to hospital visits, surgeries, and the management of chronic diseases.

In the UK, the total cost of obesity- related illnesses is estimated at around£27 billion annually (Public Health England, 2017).

- Social Consequences: There is usually social stigmatization surrounding obesity, which can include low self-esteem and depression (Rimmer et al., 2013).o Investments in public health to address such issues would significantly impact the well-being of communities and diminish health inequalities within them (Havas et al., 2004)



Source: Shanshan Wang et al.,2023

Selected Health Promotion Intervention

- Health Promotion Intervention: Augmented Reality (AR)App: A mobile application that utilizes AR to scan food items and provide nutritional values to the user in real time (McKinsey and Company, 2019).
- Major Features: Scanning food labels reveals healthier alternatives (Rimmer et al., 2013). Ingredients are highlighted with a thorough explanation, e.g., "This product has excessive amounts of sugar" (Mozaffar Ian et al., 2013).
- Suggests healthier recipe alternatives based on long-term health impact of food choices (e.g., visualizing weight gain or health risks associated with unhealthy foods) (Rimmer et al., 2013).
- Rationale: AR engages with immediate feedback, thus proving much more effective than other traditional campaigns (Swinburn et al., 2011). It comes up under the device that efficiently accesses population size, mostly youth tech-savvy individuals (McKinsey and Company, 2019).



source: Snigdha Kacker 2021

The Reason AR Stands out as a Solution



Source:Pini V. et al.,2023

- Engagement and Interaction:

- AR allows the user to interact with the products within their purchasing environment (supermarkets), thus providing spontaneous, personalized interaction (Mozaffar Ian et al., 2013).

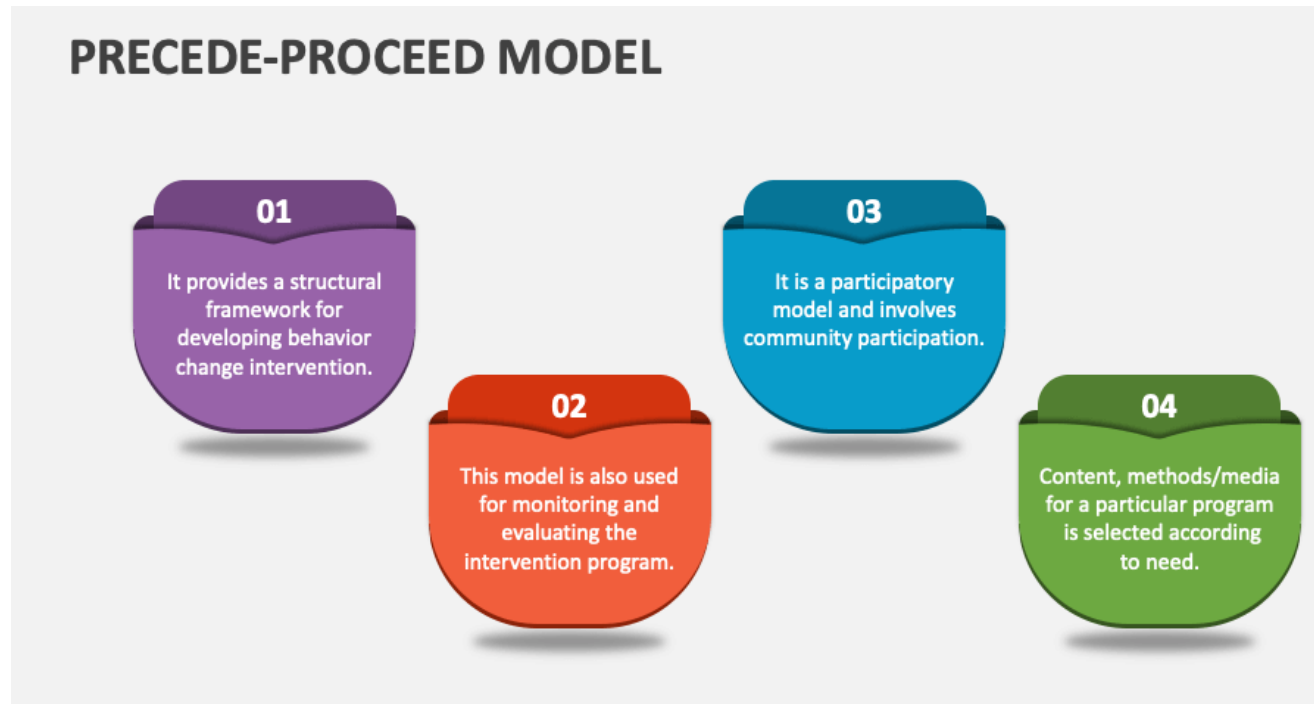
Visual Appeal: AR captivated interest and enlivened learning with graphics and animations, thereby enhancing retention in nutrition (Swinburn et al., 2011).

- Real-time Feedback: The Person will know almost instantly the nutritional value of the products and also receive feedback for healthier alternatives (CDC, 2021).
- Real-time delivery of feedback in a decision-making context (supermarkets) is expected to increase the likelihood of making healthier choices (McKinsey and Company, 2019).
- Behavioral Change: Evidence shows that long-term behavior changes can be achieved through interactive tools like AR: having appealing and easily accessible healthy options can thus influence consumer behavior(Rimmer et al., 2013).

2. Application

"Utilizing PRECEDE-PROCEED in the Deployment of AR for the Healthier Food Choices"

- The PRECEDE-PROCEED framework, developed by Green and colleagues, outlines a structured method for planning, executing, and assessing health promotion initiatives. It consists of two key elements: PRECEDE, which stands for predisposing, reinforcing, and enabling factors within educational assessments; and PROCEED, which emphasises policy, regulatory, and organisational factors relevant to environmental and educational development (Green et al., 2005).



PRECEDE Model

- Predisposing factors- Lack of perception or knowledge concerning healthy food options and nutrition consumed by consumers(Bartholomew et al., 2016).
- Unhealthy diets or habits that tend to be influenced by advertising and peer activities, such as a preference for processed food (Rimer & Glanz, 2005). Reinforcing Factors- Peer and family influence reinforcing poor unhealthy eating patterns (Green et al., 2005) Media advertising promoting unhealthy food choices as fast food ads (McLeroy et al., 2003).
- Enabling Factors- Access to smartphones and mobile technology(Albrecht et al., 2014) Availability of healthier options in supermarkets(Smedley & Syme, 2000).



PROCEED Model

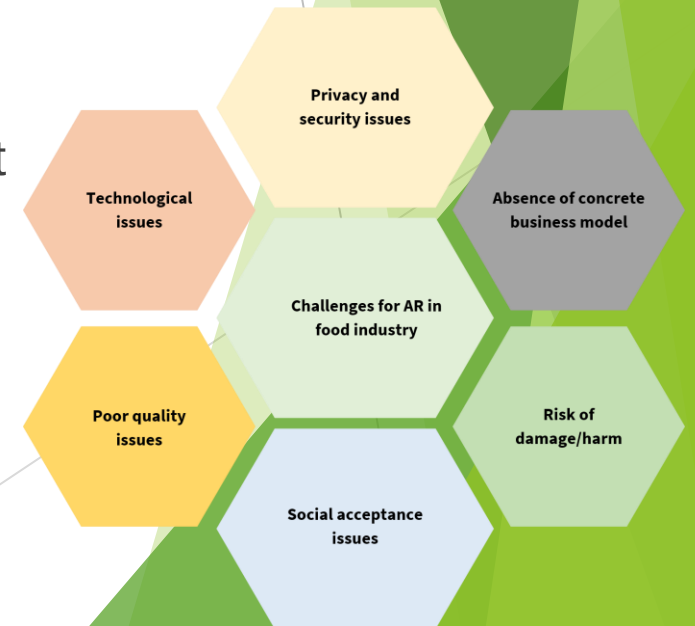
- Policy Development develops partnerships with supermarkets and public health organizations and involves app developers(Albrecht et al., 2016).
- manufacturers product labels are very clear and transparent (Bartholomew et al., 2007).

- Regulatory Conditions:

Data privacy concerning user data should be collected and stored in line with current regulations such as GDPR (Green et al., 2005).o Set standards for accuracy with which nutritional information is displayed within the App (Bartholomew et al., 2016).

- Organizational Development:

Engage health professionals(nutritionists, dieticians) to develop the app's educational content (Rimer & Glanz,2005).o Provide training for supermarket employees to promote the app among customers (Smedley & Syme, 2000).



Using the Planning Model

- Needs Assessment:
 - Conduct surveys or focus groups to assess the target group's food choices, preferences, and technology literacy(Albrecht et al., 2016).
 - Obtain baseline data on current patterns of diet and health outcomes, rates of obesity, and incidence of chronic diseases (Bartholomew et al., 2007).
 - Strategy Development's Customize the features of the AR app to tackle identified dietary problems from the assessments (Glanz & Bishop, 2010).o Include specific culturally relevant foods and recipes based on the demographic of the target group (Bartholomew et al.,2007).
- Evaluation:

Assessment of the effectiveness of the app using parameters such as app usage incidence, changes in food purchasing patterns, and changes in diet-related health outcomes (Albrecht et al., 2014).

Evaluation and feedback

- Use in-app surveys and feedback mechanisms to gather data from customers about their experience with the app (Ref. Green et al. 2005).
- Monitor user engagement (i.e., number of scans, time using the app) (Ref. Bartholomew et al. 2016).
- Health Outcome Monitoring:
Monitor the long-term changes in consumer behaviours (i.e., healthier food options) and health indicators (i.e., weight loss, improved blood sugar levels) (Smedley and Syme 2000).



BARRIERS

Introduction

- ▶ While the Augmented Reality (AR) health promotion intervention has the potential to have a positive effect on diet behavior, there is a requirement to critically assess the potential barriers to its delivery, implementation, and sustainability in the long term. The identification of these challenges is essential to informing strategies for their mitigation (Paramita et al., 2025).



Sources: Anna Wilmot, 2017

1. Potential Stakeholders to Support Impl



Supermarkets and Retailers

Prospective partners for promoting the app through in-store promotion, inclusion in loyalty programs, and QR codes (Swann, 2017).

Healthcare Providers.

Doctors, dietitians, and health professionals who can prescribe the app for patients and advocate for its usage for improved food choices (NHS, n.d.).

Government Health Agencies

Organizations that can bring about the adoption of the app through health campaigns and programs (WHO Europe, 2022).

Technology Developers

Software firms and companies that will develop and maintain the AR app, ensuring that it is technically feasible and has a smooth user experience

Scholarly Institutions and Researchers

Researchers who are able to conduct tests and analyses regarding the effectiveness and impact of the app on food habits (Bauer et al., 2020).



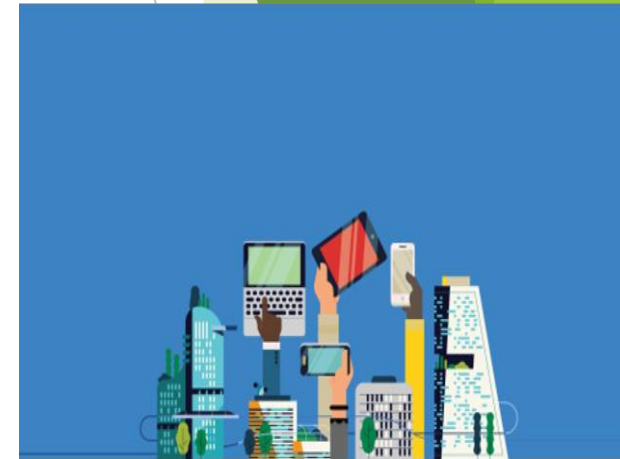
Source : Christopher Kenneally,2023

2. Potential Barriers to Effective Implementation and Delivery:

Technological Barriers

Digital Divide: Partial smartphone or stable internet connectivity in certain groups, potentially excluding vulnerable populations (van Dijk, 2020; JHU Public Health, 2025).

- Compatibility Issues: AR features might be unavailable in older smartphones, limiting the accessibility of the app
- Technical Failures: Slow app speed, scanning problems, or inaccurate food identification can demotivate users, decreasing usage (Bertolini et al., 2021).
- Development Cost: High initial and ongoing costs for app development, upkeep, and data security (Idea Link, 2024).



Source: Brookings Institution

Behavioral and Social Barriers

- ▶ Resistance to Change: Users may resist altering established eating habits due to convenience, emotional attachment to food, or social pressures (MD Anderson Cancer Center, n.d.).
- ▶ App Fatigue: The growing number of digital health tools may lead to user fatigue, reducing engagement and retention (HETT Show, 2025).
- ▶ Privacy Concerns: A few consumers may hesitate to share private information (e.g., diet or location) due to concerns around privacy (Kodjin, 2023; Brown University, 2023).



Commercial Barriers

- ▶ Supermarket Collusion: Retailers would rather not support better-for-you choices, especially if it impacts sales of high-margin or processed food products (NatCen, 2025).



Sources; Ian Quinn, 2023

Lobbying of the Food Industry: The food processing industry can counteract health promotion interventions that negatively affect their sales, such as in the UK's Sugar Tax campaign (Food Foundation, 2025).

Practical and Organizational Barriers

Resource Limitations: Sustaining the app in the long term requires adequate funding, qualified personnel, and facilities for continuous evaluation and updates (MDPI, 2025).

Staff Training: Supermarket employees will need training to assist customers with the app, which will cost operation costs (Coursebox AI, n.d.)



3. Legal and Ethical Issues:



Data Protection and GDPR Compliance

- ▶ The intervention must be GDPR compliant to protect user privacy, e.g., informed consent, secure data storage, and transparency of data use (GDPR.eu, n.d.; European Data Protection Supervisor, n.d.).

Informed Consent and Transparency

- ▶ It is ethically obliged to inform users how their data is going to be used, especially in relation to potential commercial interest (WHO SMART Trust, n.d.)

Digital Inequality

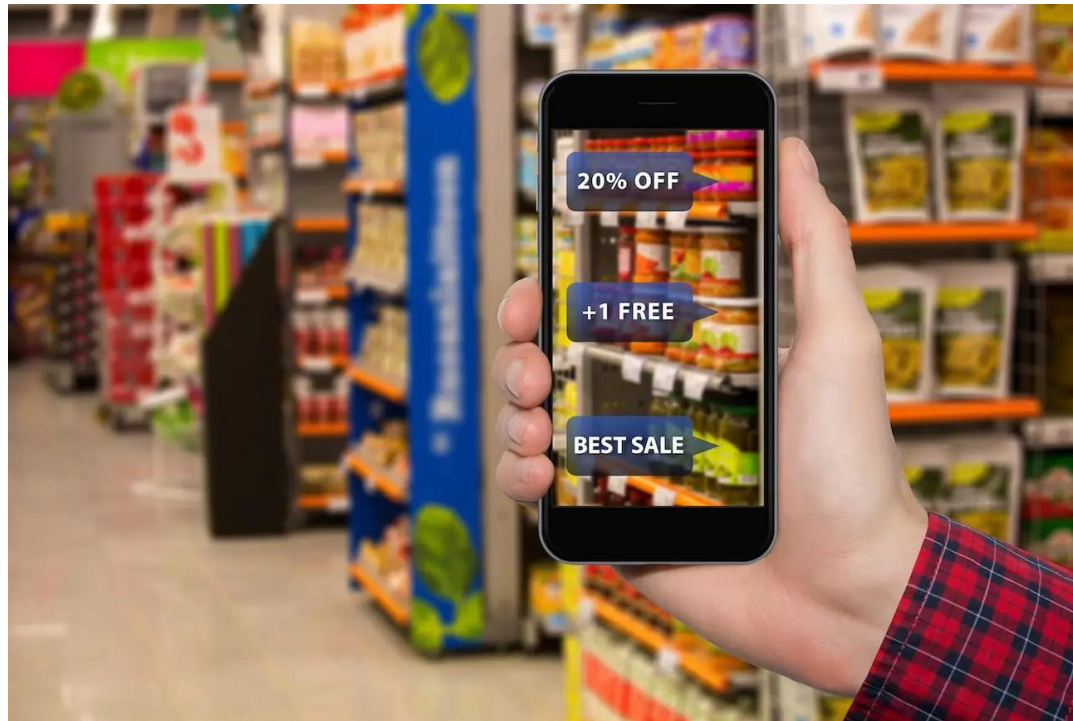
- ▶ There is a risk of worsening health disparities if the app is predominantly for those who are digitally literate, have higher incomes, or are younger and thus leave behind disadvantaged groups (WHO Europe, 2022; PMC, 2022).

4. Benefits: Potential Benefits and Implications

"Potential Benefits of AR Intervention For Healthier Food Choices and Their Implications".

Overview :

- This part of the discussion will address the possible benefits of the Augmented Reality (AR) intervention in improving food choices, how it would affect individuals and public health, and its implications on different levels of policy, research, and education (Bauman et al.,2012; Kahn et al., 2019).



Target Population Possible Benefits

- Improved Health Outcomes:
- Better Awareness of Nutrition Content: Users will gain a better understanding of nutritional labels, which will enable them to make healthier food choices based on ingredient transparency (Mettler & Winter, 2017).
- Behavioural Changes in Food Purchases: When used together with other change strategies, placing health-related offerings within the environment allows the app to encourage fruit, vegetable, and low-sugar-or-fat product purchase decisions (Vasilenko et al., 2014).
- Healthier Diet Choices: Less consumption of ultra-processed food brings about a more balanced diet, therefore reducing chronic illness such as obesity, diabetes, and health disease (Beck et al., 2015).
- Convenience & Engagement:
- Real-time feedback: AR technology provides a real-time, easy feedback about food that can further positively affect purchasing behaviour in supermarkets (Davidson et al., 2018).
- Personalized Recommendations: The application customizes the suggestions based on individual preferences, increasing the odds that they will be engaged in the healthier ones (Leete et al., 2017).
- User Engagement: Interactive technology like AR seems to be an engaging technology that usually motivates high interaction or participation from the user, leading to prolonged behavior change (Kahn et al., 2019).

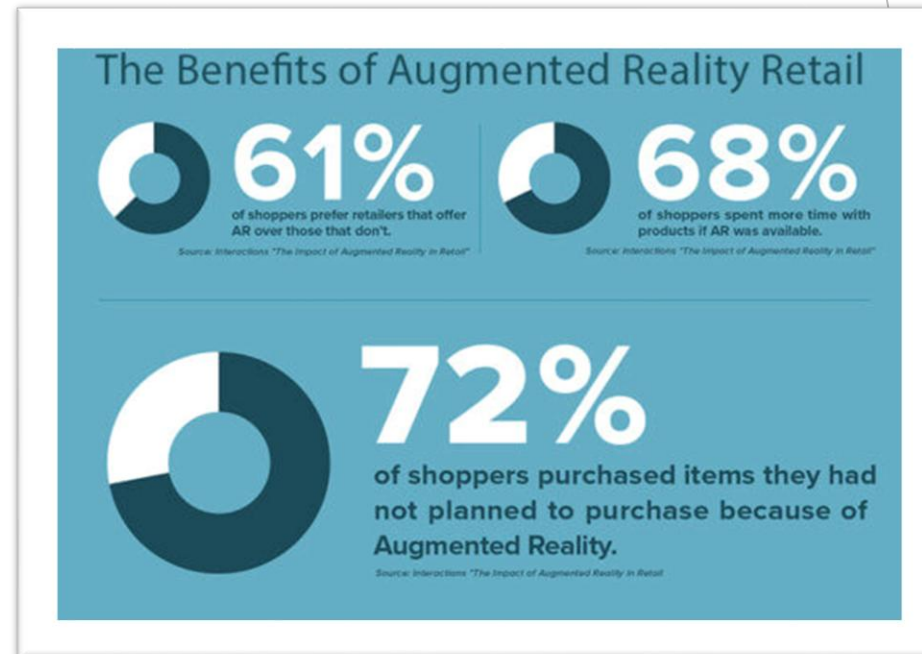
Benefits to Supermarkets and Retailers

- Increased Sales of Healthier Products:

Supermarkets will start experiencing a trend toward improved sales of healthy products as consumers will now be conditioned by the use of the app to choose healthier ones (Bauman et al., 2012).

- Improved Brand Image:

Health-focused interventions like the AR app can help supermarkets place themselves as the leader in promoting healthy eating and consumer well-being (Stone et al., 2017).



Implication for policies and research

Influencing public health policies:

- The mention of public health policies above may have an impact on the successful outcome of an intervention warrant investment by health policymakers into digital health interventions aimed at reducing chronic disease burden (NICE, 2019).
- The governments could liaise with food retailers and technology developers to secure support for rolling out similar programs equitably across the nation (Boulos et al., 2016).
- Advancing Public Health Research:
 - AR apps can be a research tool in consumer behavior, dietary patterns, and health outcomes assessed in real-time (Davidson et al., 2018).
 - It may enhance the literature on how technology, especially AR, plays a role in public health (Kahn et al., 2019).
 - Opportunities for Scale-Up: The intervention could be scaled up into different environments aside from supermarkets, such as schools, workplaces, and even healthcare settings, thereby integrating a wider public health strategy (Boulos et al., 2016).



Educational Implications

- Nutrition Education:
- The application has the potential of being promoted as an educational tool in schools, universities, and even community centers to provide people with knowledge about healthy eating practices and nutrition (Boulos et al., 2016).
- Awareness Campaigns: Partnerships could be formed between government organizations, supermarket chains, and other organizations in their effort to conduct awareness campaigns aimed toward healthier food choice using this app, especially among communities with high rates of diet-related diseases (Beck et al., 2015).
- Support for Health Professionals:• Health providers would recommend the application to their patients to use it in the management of their chronic diseases like diabetes or hypertension, supporting their efforts in making healthier food choices (Stone et al., 2017).



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