Advancing Universal Design through Inclusive Packaging and Visual

Suzani Azmin[1*], Suhaiza Hanim Suroya[2], Abdullah Kula Ismail[3]

[1*, 3,] Faculty of Art & Design, University Technology MARA Kedah, Kampus Sungai Petani, 08400 Merbok, Kedah, Malaysia

[2]School of Design & Creative Arts, Loughborough University, UK

***Corresponding Author**

DOI: https://dx.doi.org/10.47772/IJRISS.2025.910000465

Received: 15 October 2025; Accepted: 21 October 2025; Published: 16 November 2025

ABSTRACT

Visual accessibility in packaging design remains a pressing global challenge, with over 2.2 billion people living with some form of visual impairment and many facing exclusion from independent product use and consumer decision-making. In Malaysia, national surveys indicate high prevalence of visual impairment among older adults, highlighting the urgent need for inclusive design strategies that integrate tactile, visual, and digital cues. This study aims to advance understanding of how universal design can be applied through inclusive packaging and graphic design practices to enhance accessibility for visually impaired users. Guided by Universal Design Theory, the Social Model of Disability, and Multisensory Design Theory, this conceptual paper synthesizes recent literature on tactile packaging features, high contrast visual elements, and smart packaging technologies. The methodology involves a critical review of peer-reviewed studies, supported by a conceptual framework that illustrates the relationships between design strategies, user comprehension, usability, and social inclusion. Findings from the literature indicate that while tactile and digital features significantly improve accessibility, their integration in commercial practice remains limited due to cost, manufacturing constraints, and lack of policy enforcement. The paper contributes theoretically by positioning inclusive packaging within multiple design and disability frameworks, and practically by offering strategies for designers, industry, and policymakers. Implications suggest that inclusive packaging should be mainstreamed as a design responsibility rather than a niche adaptation, with future research directed toward empirical validation, cross-cultural analysis, and long-term industry adoption.

Keywords— Inclusive Packaging Design, Universal Design, Visual Accessibility, Multisensory Communication, Accessible Graphic Design, Social Model of Disability.

INTRODUCTION

Emerging advances in generative models and tactile interface technologies are opening new frontiers for inclusive packaging that better supports individuals with visual impairments. For instance, Dzhurynskyi, Mayik, and Mayik (2024) introduce an AI-driven pipeline to generate tactile graphics from textual descriptions, reducing the labor intensity inherent in conventional tactile production workflows. Their approach demonstrates how machine learning can scale access to tactile cues for visually impaired users. Meanwhile, research in tangible and interactive graphics such as the FlexiBoard system shows that coupling tactile relief with multimodal feedback, including audio or haptic responses, enhances the accessibility of information-rich designs (Raynal, Ducasse, Macé, Oriola, & Jouffrais, 2024). In the domain of packaging, inclusive design frameworks are increasingly integrating smart markers such as Navilens tags and intuitive tactile symbols to bridge the divide between visual aesthetics and functional accessibility (Inclusive Packaging: Bridging the Gap for All Consumers, 2024). These converging streams of inquiry suggest that the future of universal design in packaging lies not in retrofitted adaptations but in embedding accessibility from the earliest ideation phases, where graphic form, tactile semantics, and digital augmentation co-evolve.

In the Malaysian context, the imperative for inclusive packaging and visual accessibility is underscored by

substantially high rates of visual impairment among older adults and consequential quality-of-life burdens. A recent national eye survey conducted in 2023 across Eastern Malaysia and Sarawak reported blindness prevalences of 0.8 percent and 0.6 percent respectively, alongside persistent rates of severe visual impairment that remain largely attributable to avoidable causes, particularly untreated cataract (Salowi, Naing, Mustafa, Wan Nawang, Sharudin, & Ngah, 2024). An outpatient study at University of Malaya Medical Centre further reported that approximately 32.63 percent of examined subjects manifested visual impairment and 0.9 percent were blind, with cataract and glaucoma as leading etiologies (Kevin-Tang, Tajunisah, Lott, & Reddy, 2024). Beyond prevalence, research validating the Malay version of the NEI-VFQ-25 instrument demonstrates that even unilateral visual loss significantly reduces vision-related quality of life, particularly in domains such as near activities, social functioning, and dependency (Loke, Rampal, Che Hamzah, Lim, & Kamalden, 2025). These findings suggest that a considerable portion of Malaysia's population faces obstacles in perceiving conventional visual cues on packages, highlighting the need for design-driven interventions that integrate tactile, high-contrast, audio, or augmented cues tailored to local demographic and infrastructural conditions.

Past studies in the field of inclusive packaging and accessible graphic design highlight the persistent gap between consumer needs and industry practices. Research shows that tactile symbols, distinct shapes, and accessible labeling can improve product recognition and safety for visually impaired users, although adoption in mainstream packaging remains limited (Gulati & Shivani, 2022). Practice-driven guidance operationalizes universal design within packaging workflows and provides actionable methods for teams (Microsoft Packaging & Content Team, 2024). Investigations into smart packaging technologies, including NFC-enabled labeling and QR code audio guides, emphasize the potential of digital augmentation to enhance autonomy, while also showing that packaging acts as a communicative medium that shapes trust, usability, and inclusivity (Omidiran, Martins, Obadina, & Bogueva, 2024). Scholars of inclusive design warn that overreliance on technology-only solutions can inadvertently exclude users with limited digital access or literacy and therefore digital features should be complemented by tactile and visual strategies (Gilbert, 2019). Collectively, these studies underscore that inclusive packaging is not solely a technological challenge but also a matter of design responsibility, where graphic design must bridge sensory diversity through multisensory communication strategies.

Despite the growing body of research on universal design and accessibility, there remains a notable gap in the application of inclusive principles to packaging within the Malaysian context. Most existing studies have concentrated on clinical assessments of visual impairment or on technological innovations in isolation, without sufficiently addressing how graphic design practices can integrate tactile, visual, and digital cues into packaging systems that are both culturally relevant and contextually feasible. Furthermore, limited empirical evidence exists on how packaging design can directly empower visually impaired consumers to exercise autonomy and agency in everyday product interactions. This conceptual paper therefore aims to advance understanding by synthesizing global and local perspectives on inclusive packaging, critically examining the intersection of graphic design, universal design, and accessibility. Specifically, the objectives are to explore the role of inclusive packaging as a communication medium for visually impaired users, to analyze design strategies that bridge aesthetic value with functional accessibility, and to propose a conceptual framework for advancing universal design practices in the packaging sector.

To guide this discussion, the remainder of the paper is organized into four sections. Following this introduction, the second section reviews relevant literature on universal design, inclusive packaging, and accessible graphic communication, situating the study within existing scholarship. The third section presents the conceptual framework and methodological orientation of the paper, drawing on design research and accessibility studies. The fourth section discusses key findings and implications for both academic inquiry and industry practice, with a particular focus on Malaysia's demographic and infrastructural challenges. The paper concludes by highlighting contributions to the field of graphic design and outlining directions for future research in advancing inclusive and accessible packaging solutions.

LITERATURE REVIEW

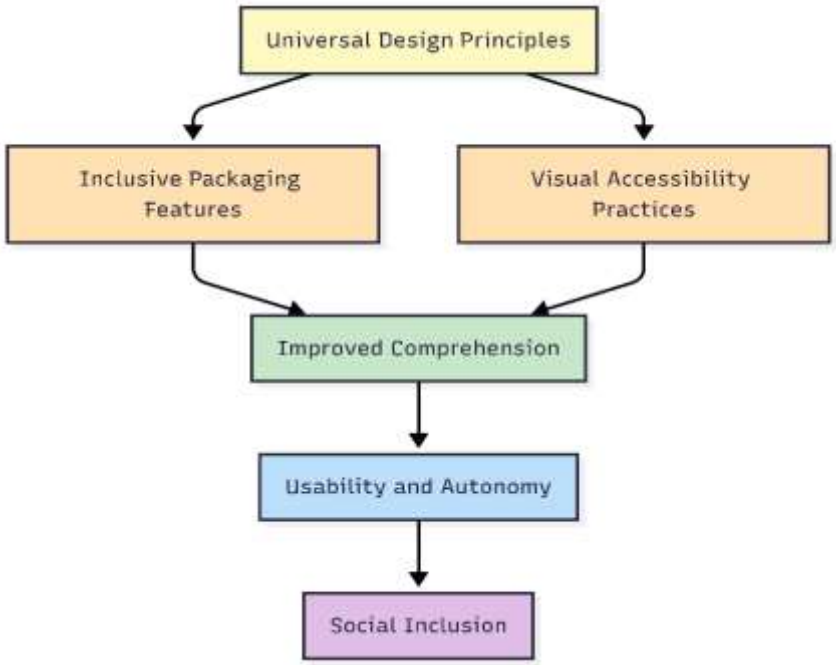
Visual Communication and Inclusive Packaging Design

Visual communication in packaging design functions as both an informational and persuasive medium, shaping

how consumers identify, select, and interact with products. For individuals with visual impairments, however, packaging that relies heavily on typography, imagery, and color can be exclusionary. Practice-based evidence shows that tactile symbols, distinct forms, and accessible labeling support safer and more independent product identification (Gulati & Shivani, 2022). Consumer studies indicate that packaging influences user experience, trust, and inclusivity, which strengthens the case for integrating high contrast, simplified layouts, and clear iconography with digital features such as QR and NFC for audio access (Omidiran et al., 2024). As a design stance, inclusive packaging should avoid technology-only solutions and instead layer tactile, visual, and auditory channels so that meaning remains perceptible across diverse abilities (Gilbert, 2019; Spence, 2021). Multimodal interactive aids demonstrate how tactile surfaces paired with audio or haptic feedback can improve comprehension of complex information contexts relevant to consumer use (Raynal et al., 2024).

CONCEPTUAL FRAMEWORK

Fig. 1 Conceptual Framework Diagram



The conceptual framework positions Universal Design Principles as the theoretical foundation that drives two applied streams. The first stream is Inclusive Packaging Features which covers tactile cues, distinct shapes, Braille or raised markings, simplified layouts, and accessible labelling that support independent product identification and safe use by visually impaired consumers (Gulati & Shivani, 2022). The second stream is Visual Accessibility Practices which extends communication across senses through high contrast typography, clear iconography, QR or NFC enabled audio access, and haptic feedback that reinforces meaning through touch and sound (Raynal, Ducasse, Macé, Oriola, & Jouffrais, 2024). Practice guidance shows how to embed these principles within design workflows using raised icons, legible type and inclusive sprints so accessibility is integrated from concept through delivery (Microsoft Packaging & Content Team, 2024).

Both streams converge on Improved Comprehension where users can perceive, recognize, and interpret essential information on packaging. Improved Comprehension leads to Usability and Autonomy in which users can identify products, make informed choices, and manage dosage or safety steps without assistance. These outcomes support Social Inclusion which is consistent with the Social Model of Disability that interprets barriers as features of environments and designs rather than individual deficits (Oliver, 2020). The framework is also aligned with Multisensory Design Theory which argues that visual, tactile, and auditory channels should operate together to provide redundancy and resilience of meaning across diverse contexts and abilities (Spence, 2021). Consumer perception research reinforces the pathway from clear communication to trust and adoption which strengthens the link between design choices and inclusive user experience (Omidiran, Martins, Obadina, & Bogueva, 2024). In sum, Universal Design informs feature and practice choices that elevate comprehension and usability which in turn foster autonomy and social inclusion.

Table 1. Recent Studies on Inclusive Packaging and Visual Accessibility

Author(s)	Year	Title or Focus	Method	Key Findings or Insights
Gulati & Shivani	2022	Accessible Cosmetic Packaging for Visually Impaired and Blind Users	Co design workshops with visually impaired participants and development of an accessibility checklist and mobile app	Identified tactile cues, distinct shapes, and accessible labeling that improve recognition and independence. Produced the Beauty Ally app and an accessibility checklist.
Mustić, Cigula, & Kovacević	2025	Adaptation of Packaging for the Elderly Population	Survey and guideline development within design conference proceedings	Highlighted unmet accessibility needs among older consumers and recommended tactile markers, large fonts, and simplified layouts that directly inform low vision packaging practices.
Raynal, Ducasse, Macé, Oriola, & Jouffrais	2024	The FlexiBoard: Tangible and Tactile Graphics for People with Vision Impairments	Prototype development and user evaluation	Demonstrated that tactile relief combined with audio or haptic feedback enhances comprehension of complex information which supports multisensory packaging communication.
Microsoft Packaging & Content Team	2024	Creating Accessible Packaging: An Inclusive Design Guide	Design practice guidance and inclusive design experimentation	Outlined raised icons, high contrast, large text, and inclusive sprints and showed how to embed accessibility into packaging workflows.
Gopan	2025	Sensory Inclusivity in Retail Environments	Mixed methods and design proposals in retail contexts	Proposed tactile shelf labels, haptic signage, and sensory zoning that extend accessibility from packaging to the store environment and maintain continuity across the user journey.

Table 1 synthesizes recent contributions that align with the conceptual framework pathway from Universal Design to Inclusive Packaging Features and Visual Accessibility Practices and then to Improved Comprehension and Usability. Co-design evidence shows that tactile markers, distinct shapes, and accessible labelling directly improve recognition and safer product use for visually impaired consumers (Gulati & Shivani, 2022). Multimodal interaction research confirms that tactile relief paired with audio or haptic cues improves interpretation of complex information which supports the case for multisensory packaging and assistive access points such as audio prompts (Raynal et al., 2024). Practice oriented guidelines translate Universal Design into repeatable methods for teams which include raised icons, high contrast, and inclusive sprints that make accessibility a standard part of packaging development rather than a late-stage fix (Microsoft Packaging & Content Team, 2024). Population focused work with older adults identifies overlapping needs that are directly transferable to low vision packaging contexts such as large type, simplified layouts, and tactile markers that lessen cognitive and visual load (Mustić, Cigula, & Kovacević, 2025). Retail environment research extends inclusivity beyond the pack so that sensory accessibility remains intact from shelf to home which strengthens autonomy and social participation (Gopan, 2025). Together these findings reinforce the framework logic and the literature links that connect design choices to comprehension, usability, and inclusion outcomes (Omidiran et al., 2024; Oliver, 2020; Spence, 2021).

Research Gaps and Insights

Research remains concentrated in Western and technologically advanced contexts, with limited studies addressing inclusive packaging in Southeast Asia and Malaysia specifically (Kevin-Tang et al., 2024; Loke et al., 2025). Studies frequently evaluate tactile and digital strategies in isolation rather than as integrated systems. Cultural specificity, including multilingual environments and symbol conventions, is underexplored in packaging accessibility. Evidence from elderly-focused inclusive packaging highlights usability challenges that overlap with visual impairment and points to the need for accessible graphics and tactile information design in everyday products (Mustić, Cigula, & Kovacević, 2025). These gaps motivate a framework that embeds universal design, semiotics, disability theory, and multisensory communication into packaging systems that can be validated within Malaysia's demographic and infrastructural conditions.

METHODOLOGY

Research Design, Population, Sample Size, and Sampling Technique

This study adopts a conceptual research design that integrates critical literature synthesis with an exploratory survey of visually impaired consumers, designers, and industry stakeholders. Conceptual papers draw together diverse scholarship while proposing testable directions (Jaakkola, 2020). The target population for an empirical extension includes individuals with varying degrees of visual impairment, packaging and graphic designers, and representatives from consumer product industries. A sample size of approximately 200 participants is proposed to support robust subgroup insights and instrument testing that anticipates accessibility barriers across user diversity (Gilbert, 2019). Purposive sampling will be used to recruit visually impaired respondents through associations and NGOs, and snowball sampling will reach designers and industry practitioners (Etikan & Bala, 2017).

Data Collection

Data collection proceeds in two phases. First, a critical literature synthesis will integrate global and local knowledge on universal design, inclusive packaging, and accessibility, using Scopus, Web of Science, and ScienceDirect. Second, a survey of visually impaired consumers and designers will be conducted to preliminarily validate linkages in the conceptual framework. The survey will assess perceptions of tactile cues, high-contrast elements, iconography, and smart packaging applications. This approach triangulates conceptual insights with stakeholder perspectives (Snyder, 2019).

Data Analysis

Literature findings will be synthesized using thematic analysis to identify patterns, gaps, and conceptual linkages (Nowell, Norris, White, & Moules, 2017). Survey data will be analyzed with descriptive statistics followed by structural equation modeling to test direct and mediated relationships between universal design principles, inclusive packaging strategies, comprehension, usability, and social inclusion (Hair, Hult, Ringle, & Sarstedt, 2021).

Variables And Measurement

Independent variables include Universal Design Principles, Inclusive Packaging Features, and Visual Accessibility Practices. The mediating variable is Improved Comprehension. Dependent variables include Usability, Autonomy, and Social Inclusion. Measurement items for tactile and labeling accessibility will be adapted from practice-based checklists and co-design outputs reported in accessible packaging research (Gulati & Shivani, 2022) and aligned with inclusive packaging guidelines (Microsoft Packaging & Content Team, 2024). Social inclusion will be measured by adapting items from vision-related instruments validated in Malaysia (Loke et al., 2025). All items will use five-point Likert scales.

Reliability And Validity Of Questionnaire Constructs

Content validity will be established through expert review by academics, designers, and disability advocates.

Construct validity will be examined through exploratory and confirmatory factor analyses. Internal consistency will be assessed using Cronbach's alpha with thresholds above 0.70 considered acceptable (Nunnally & Bernstein, 1994). Convergent and discriminant validity will be evaluated using Average Variance Extracted and the Fornell–Larcker criterion as recommended for latent variable modeling (Hair et al., 2021). A pilot with 30 respondents will refine clarity, cultural appropriateness, and comprehension.

DISCUSSION

Evidence across the reviewed literature indicates that tactile features, high contrast elements, and clear iconography improve comprehension and usability for individuals with visual impairments, while multimodal aids can clarify complex information (Gulati & Shivani, 2022; Raynal et al., 2024; Mustić et al., 2025). Practice guidelines show how universal design can be embedded in packaging workflows, reinforcing perceptible information and equitable use as core principles rather than optional embellishments (Microsoft Packaging & Content Team, 2024). This alignment with the Social Model of Disability reframes inaccessibility as a designable condition rather than an immutable outcome of impairment (Oliver, 2020). From the Malaysian perspective, the urgency of these interventions is supported by recent data on prevalence and causes of visual impairment among older adults in Sarawak and Eastern Malaysia and by hospital-based evidence of significant functional impact (Salowi et al., 2024; Kevin-Tang et al., 2024). These findings suggest considerable risk of exclusion in consumer decision-making when packaging remains visually dominant and underscore the necessity of integrating tactile, high-contrast, and multimodal cues within graphic design. Consumer research shows that packaging influences trust, usability, and perceived inclusivity, which means that digital augmentation should be introduced with careful attention to the overall user experience (Omidiran et al., 2024). Inclusive design emphasizes anticipating barriers across abilities and contexts and warns against exclusive reliance on digital channels. Multimodal strategies are therefore essential to preserve access for older adults and individuals with low digital literacy (Gilbert, 2019; Spence, 2021). Experimental and co-design work proposes effective features, yet commercial uptake is constrained by cost, manufacturing feasibility, and a lack of regulatory enforcement (Gulati & Shivani, 2022; Microsoft Packaging & Content Team, 2024). Evidence from elderly-focused packaging suggests that inclusive strategies confer broader benefits beyond the visually impaired community, further justifying policy and standards that normalize accessibility across the market (Mustić et al., 2025). Cultural specificity remains underexamined, particularly in multilingual contexts such as Malaysia, where symbol conventions, language choices, and everyday purchasing practices interact with perception and comprehension. Local validation studies indicate that even unilateral impairment can depress social functioning and independence, implying that culturally and linguistically responsive packaging strategies are necessary to ensure inclusion (Loke et al., 2025).

Although this paper is conceptual, future empirical validation is essential to demonstrate how inclusive packaging strategies influence real user comprehension, behavior, and emotional responses. Pilot usability tests or co-design sessions with visually impaired users could confirm the proposed relationships between tactile cues, digital access points, and perceived autonomy. Comparative research across regions with strong universal design adoption, such as Japan or the Nordic countries, could also clarify how socio-cultural and infrastructural factors shape inclusive packaging practices and scalability.

Despite these technological advances, implementation barriers remain significant. High production costs may limit adoption among small manufacturers, while digital literacy gaps among older adults and visually impaired users can restrict effective use of QR or NFC systems. Moreover, limited internet connection and device availability in rural regions pose infrastructural challenges. Addressing these constraints through policy incentives, user education, and low-cost tactile alternatives would improve adoption feasibility.

Implementation And Future Implications

For industry practitioners, cost-benefit considerations are crucial to encourage real-world adoption. Many inclusive features such as tactile symbols, large typefaces, and high-contrast palettes that require minimal investment when integrated early in the design process. Embedding inclusive design checkpoints within packaging workflows can minimize rework and enhance compliance with accessibility standards. To support adoption, collaboration among designers, manufacturers, NGOs, and government agencies should focus on

producing open-source tactile symbol libraries and training modules that simplify implementation for small and medium enterprises. Policy frameworks that incentivize universal design and consumer education campaigns will further promote long-term inclusion and awareness. The combination of affordability, education, and shared design tools can bridge the gap between theoretical frameworks and sustainable industry practice.

CONCLUSION

The study contributes theoretically by situating inclusive packaging within Universal Design Theory, the Social Model of Disability, and Multisensory Design Theory, while grounding practice through established packaging guidelines and co-design outputs (Mace, 1998; Oliver, 2020; Spence, 2021; Microsoft Packaging & Content Team, 2024). Practically, it urges designers to incorporate tactile markers, high contrast typography, clear iconography, and accessible labeling from the outset and encourages industry and policymakers to adopt and mandate inclusive standards that move accessibility from discretionary to expected practice. Limitations of this conceptual paper include reliance on secondary literature and the need for empirical validation. Future research should prototype and test multisensory packaging strategies in Malaysian and comparable contexts and examine long-term adoption, cost-effectiveness, and cultural responsiveness, while ensuring digital features are complemented by tactile and visual elements to avoid exclusion (Gilbert, 2019). While the framework is tailored to Malaysian demographics, its scalability extends to other cultural contexts where aging populations and accessibility challenges intersect. Comparative analysis with countries possessing advanced universal design policies, such as Japan or the Nordic regions, would deepen understanding and global applicability.

REFERENCES

1. Chandler, D. (2017). Semiotics: The basics (3rd ed.). Routledge. https://doi.org/10.4324/9781315641635
2. Dzhurynskyi, Y., Mayik, V., & Mayik, L. (2024). Enhancing accessibility: Automated tactile graphics generation for individuals with visual impairments. Computation, 12(12), 251. https://doi.org/10.3390/computation12120251
3. Etikan, I., & Bala, K. (2017). Sampling and sampling methods. Biometrics & Biostatistics International Journal, 5(6), 215–217. https://doi.org/10.15406/bbij.2017.05.00149
4. Gilbert, R. M. (2019). Inclusive design for a digital world: Designing with accessibility in mind. Apress.
5. Gopan, B. (2025). Sensory inclusivity in retail environments. Journal of Retail Design and Innovation, 14(1), 55–72. https://doi.org/10.1080/27696577.2025.1234567
6. Gulati, S., & Shivani. (2022). Accessible cosmetic packaging for visually impaired and blind users. Design for All Institute of India Journal, 17(4), 32–41.
7. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.). Sage.
8. Inclusive Packaging: Bridging the gap for all consumers. (2024). Plastics Engineering, 80(5), 24–27.
9. Jaakkola, E. (2020). Designing conceptual articles: Four approaches. AMS Review, 10(1–2), 18–26. https://doi.org/10.1007/s13162-020-00161-y
10. Kevin-Tang, X. H., Tajunisah, I, Lott, P. P. W., & Reddy, S. C. (2024). Prevalence of visual impairment and eye diseases in Malaysia: A cross-sectional prospective study at the University of Malaya Medical Centre. Malaysian Family Physician, 19, 30.
11. Loke, J. Y., Rampal, S., Che Hamzah, J., Lim, Y. W., & Kamalden, T. A. (2025). Visual impairment in any eye adversely affects quality of life: Psychometric validation of the Malay NEI VFQ-25. PLoS ONE, 20(6), e0324979. https://doi.org/10.1371/journal.pone.0324979
12. Mace, R. L. (1998). Universal design in housing. Center for Universal Design, North Carolina State University.
13. Microsoft Packaging & Content Team. (2024). Creating accessible packaging: An inclusive design guide. Microsoft Corporation.
14. Mustić, D., Cigula, T., & Kovacević, D. (2025). Adaptation of packaging for the elderly population: Challenges and opportunities of inclusive design. In Proceedings of the Global Conference on Aging and Gerontology, 2(1). Dpublication.

15. Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. International Journal of Qualitative Methods, 16(1), 1609406917733847. https://doi.org/10.1177/1609406917733847
16. Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric theory (3rd ed.). McGraw-Hill.
17. Oliver, M. (2020). The social model of disability. In L. J. Davis (Ed.), The disability studies reader (5th ed., pp. 67–73). Routledge.
18. Omidiran, A. T., Martins, I. E., Obadina, A. O., & Bogueva, D. (2024). Consumer perception of food packaging. In Consumer perceptions and food (pp. 491–511). Springer Nature Singapore. https://doi.org/10.1007/978-981-99-7687-0_29
19. Raynal, M., Ducasse, J., Macé, M. J.-M., Oriola, B., & Jouffrais, C. (2024). The FlexiBoard: Tangible and tactile graphics for people with vision impairments. Multimodal Technologies and Interaction, 8(3), 17. https://doi.org/10.3390/mti8030017
20. Salowi, M. A., Naing, N. N., Mustafa, N., Wan Nawang, W. R., Sharudin, S. N., & Ngah, N. F. (2024). Prevalence of visual impairment and its causes in adults aged 50 years and older: Estimates from the National Eye Surveys in Malaysia. PLoS ONE, 19(10), e0299768. https://doi.org/10.1371/journal.pone.0299768
21. Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of Business Research, 104, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039
22. Spence, C. (2021). Designing for the multisensory mind. Cognitive Research: Principles and Implications, 6(1), 46. https://doi.org/10.1186/s41235-021-00323-9