# Literature Review: Disability-friendly kiosk interfaces

MotionInput 3.2 - COMP0016 Team 37

# Interactive Kiosks

# Interactive Kiosks

- Computer systems, commonly with a touchscreen, that combine specialized hardware and software

- Enable several unique tasks such as ordering, navigation and transactions[18]

- Provide many benefits such as self-service, improving customer experience, reducing staff workload, and managing a larger volume of customers[7]

# Kiosk Hardware

- Most are bespoke and there is a lack of standardization due to wide range of business requirements[7]

- Common customizations include screen size, orientation, and enclosure design and construction[17]

- Can also include additional hardware[9]:
  - Telephones
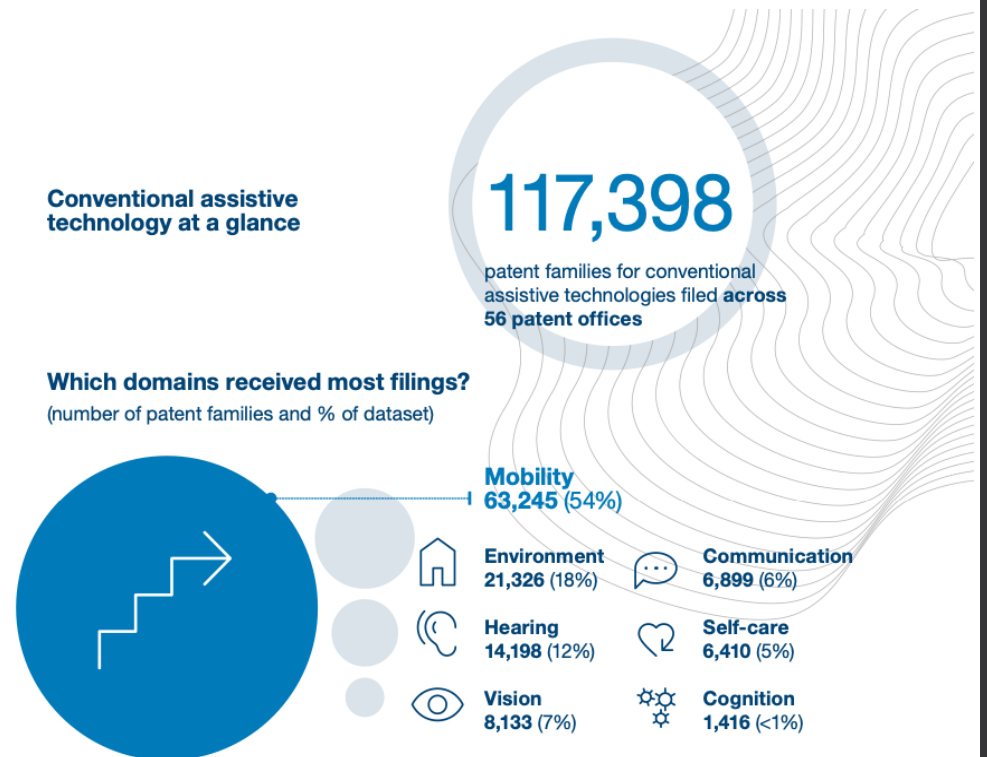  - Cameras
  - Payment Terminals
  - Thermal Cameras

# Kiosk Software

- Are usually standard websites running in sandboxed browsers or operating systems[5]

- Commonly recommended design guidelines[13]:
  - Main menu
  - Hierarchical menu structure
  - Limited menu nesting (< 3)
  - Separating functionality into panels
  - Dedicated navigation buttons (back, info, home)
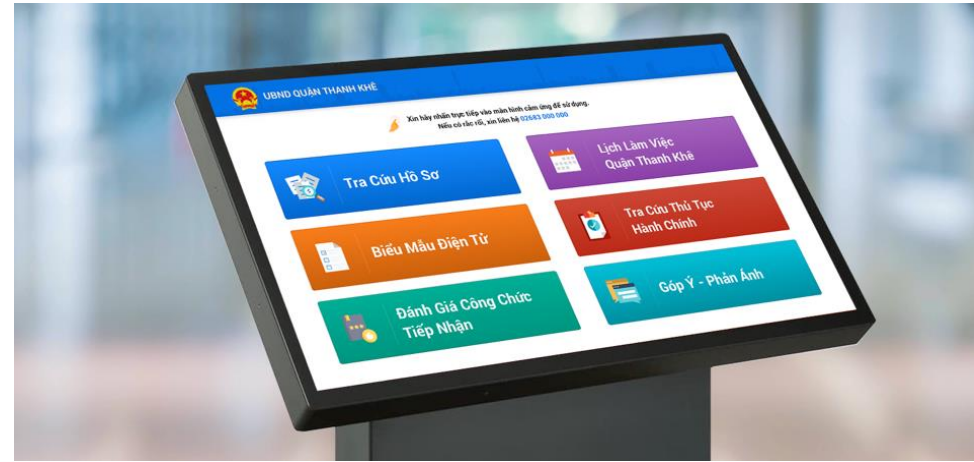
# Accessibility features in kiosks

- Still lacking in accessibility features and disproportionally focused on one type of disability[10]

- Common recommendations for improvement[13]:
  - Larger text and images
  - Avoiding small clickable zones
  - Color-blind adjustments
  - High contrast
  - Text-to-speech

**Conventional assistive technology at a glance**

117,398

patent families for conventional assistive technologies filed **across 56 patent offices**

**Which domains received most filings?**
(number of patent families and % of dataset)

**Mobility**
63,245 (54%)

**Environment**
21,326 (18%)

**Communication**
6,899 (6%)

**Hearing**
14,198 (12%)

**Self-care**
6,410 (5%)

**Vision**
8,133 (7%)

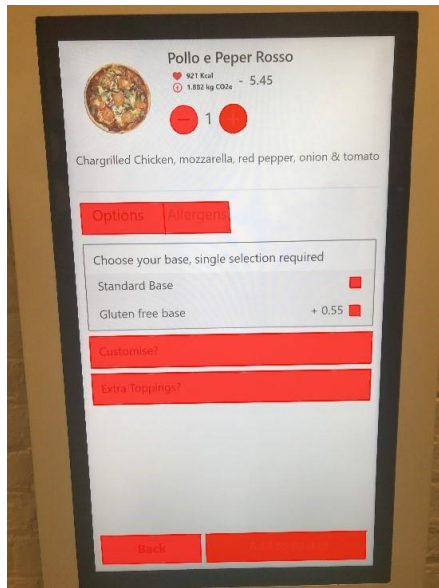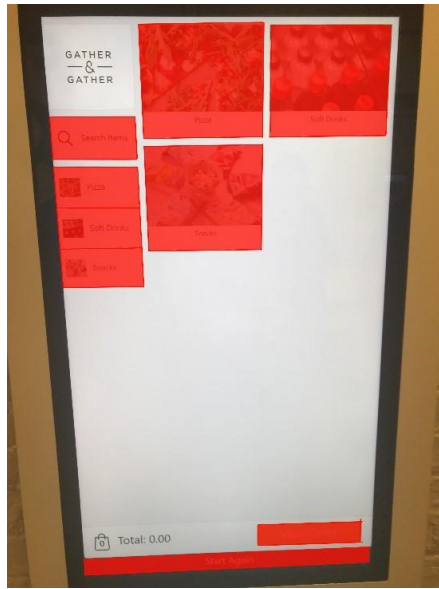**Cognition**
1,416 (<1%)

# Kiosk Software Development Tools

# Example: SiteKiosk[5]

- Focus on large, clickable elements

- Menus and pages connected in clear hierarchy (< 3 layers of nesting)

- Include predefined templates to encourage recommended design patterns

- Allow users to import structured file formats (JSON) and generate menu hierarchy
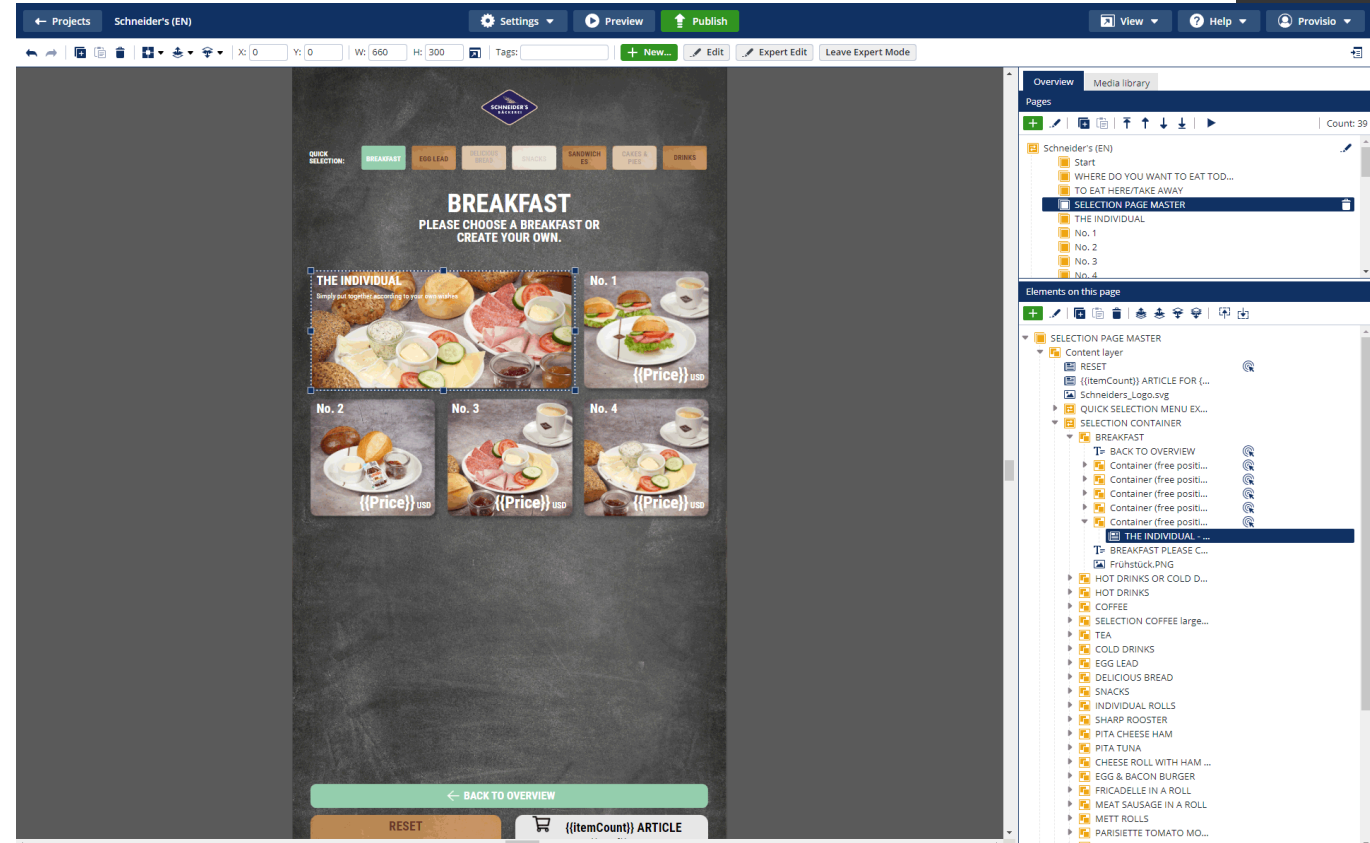
# Evaluation of real-life examples

# UCL Pizza





- Used for ordering. Multiple layers of sub-menus, with many options on each page

- Elements are large, clearly distinguishable, and easily clickable

- Navigation buttons (home, back, info) and menu panels are present

- Interaction with each element is limited to just tapping it

- Illustrates design of kiosks being guided by responsiveness and simplicity

# Tesco Supermarket

- Includes additional hardware (barcode scanners, weighing scales) but largely similar to previous example

- Menu items must be validated by scanning and weighing

- Prominent staff assistance feature for unauthorized tasks (removing items, re-weighing, adding bags)

- Staff assistance is also required for legal reasons (purchasing alcohol, cigarettes, other prohibited items)
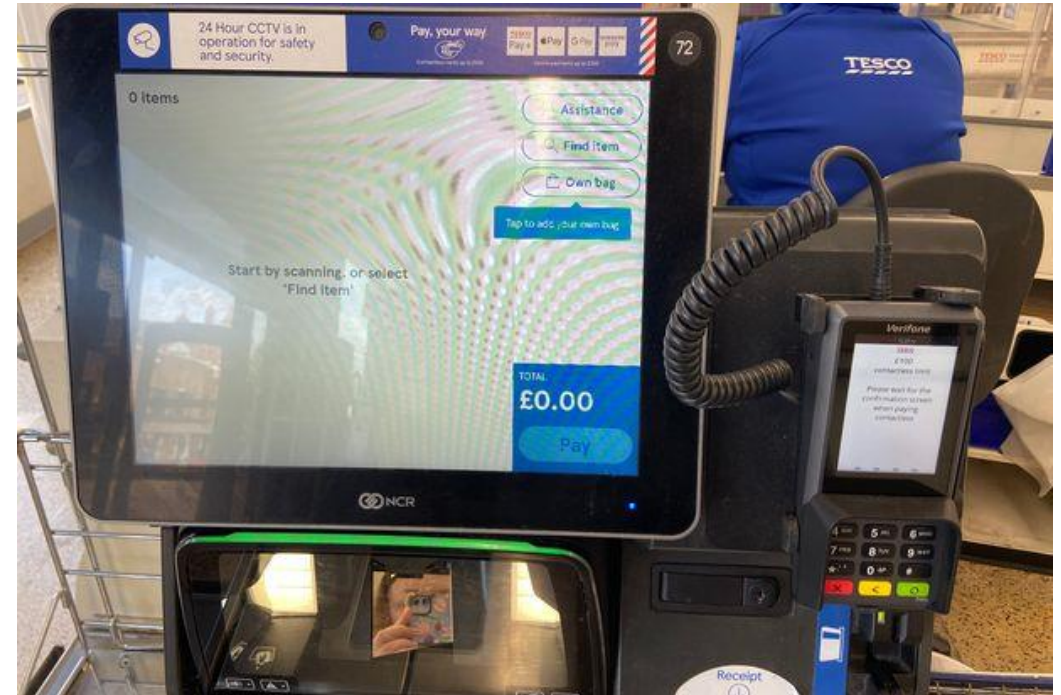
# McDonalds

- Extremely similar to UCL Pizza kiosk since it serves the same purpose (ordering food)

- However, the user interface is more complicated (smaller elements, a lot more scrolling involved, automated suggestions etc.)

- Kiosk hardware is also less accommodating. The touchscreen is extremely tall (73 cm) and is significantly raised off the ground, making it inaccessible to most children and wheelchair users
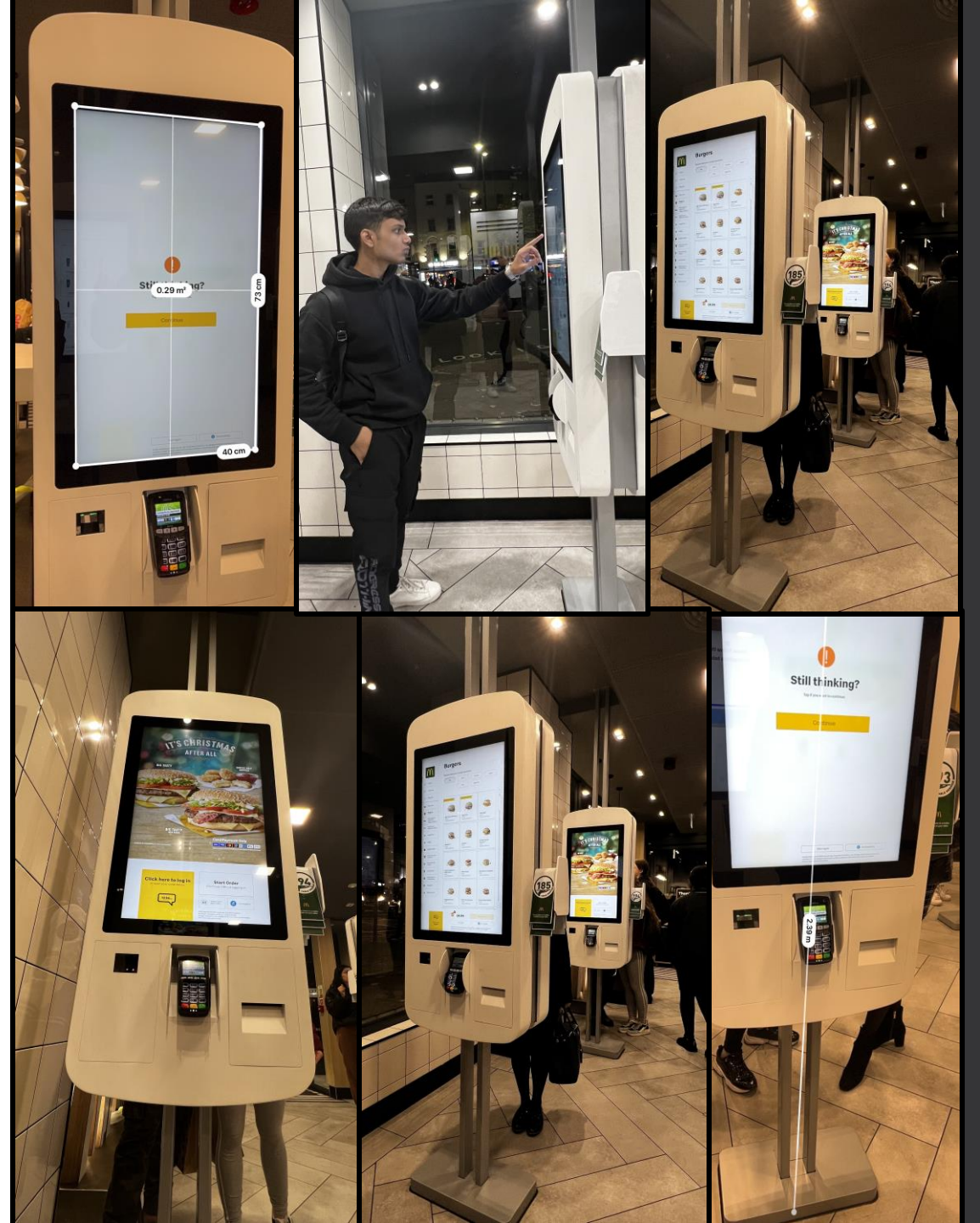
# Improving accessibility

- Existing kiosk design principles (large elements, single taps) make them amenable to alternative modes of input

- Existing software allow mappings between hand, eye and face gestures to mouse input[19][20]

- A lot of complications (distinguishing start and end of gestures, smooth scrolling, when to map clicks) have been ironed out with increased research into the field[4]

- However, direct implementation with kiosks still raises some questions (determining staff input vs customer input, non-standard distance and height)
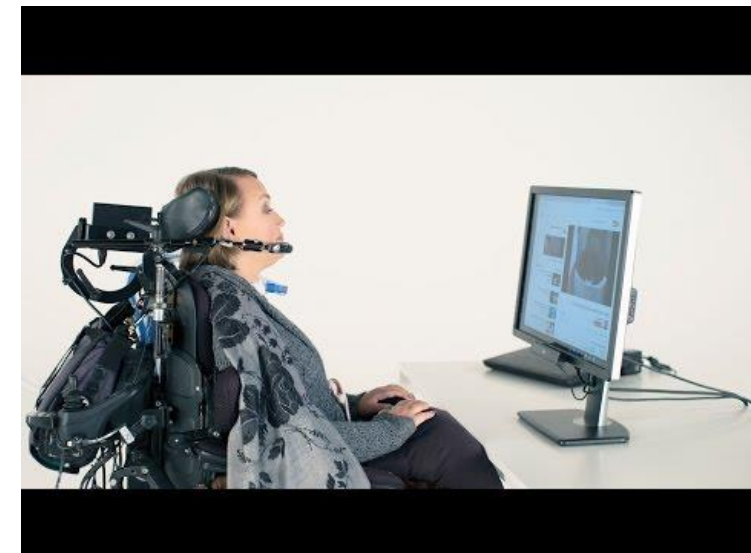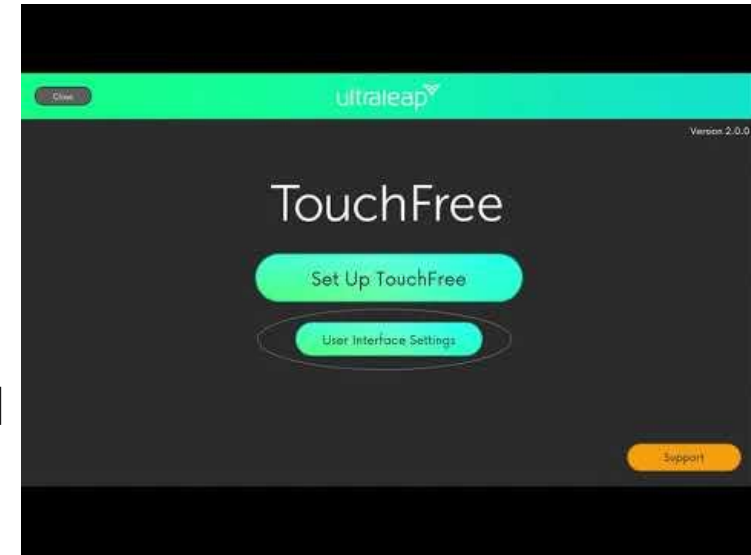
# References

1. Cerritos, O.K.I.O.K.I. 13845 A.B. and p: 562 924 2644, C. 90703 p: 800 927 8063 (no date) 'Covid-19 Kiosk - Temperature Screening & Self-Service | Olea Kiosks Inc.', *OLEA*. Available at: https://www.olea.com/back-to-business-covid-19-solutions/ (Accessed: 5 December 2022).

2. Chang, H.-L. and Yang, C.-H. (2008) 'Do airline self-service check-in kiosks meet the needs of passengers?', *Tourism Management*, 29(5), pp. 980–993. Available at: https://doi.org/10.1016/j.tourman.2007.12.002.

3. Djado, K. *et al.* (2014) 'Gesture interface for an interactive kiosk', in *Proceedings of the 13th ACM SIGGRAPH International Conference on Virtual-Reality Continuum and its Applications in Industry*. New York, NY, USA: Association for Computing Machinery (VRCAI '14), pp. 165–170. Available at: https://doi.org/10.1145/2670473.2670487.

4. Ertugrul, E., Li, P. and Sheng, B. (2020) 'On attaining user-friendly hand gesture interfaces to control existing GUIs', *Virtual Reality & Intelligent Hardware*, 2(2), pp. 153–161. Available at: https://doi.org/10.1016/j.vrih.2020.02.001.

5. *Get the No.1 Kiosk Software | SiteKiosk™* (no date). Available at: https://www.sitekiosk.com/sitekiosk/ (Accessed: 5 December 2022).

6. Ida, M. *et al.* (2004) 'A noise-robust speech input interface for information kiosk terminals', *Electronics and Communications in Japan (Part II: Electronics)*, 87(12), pp. 51–61. Available at: https://doi.org/10.1002/ecjb.20135.

7. *Interactive Kiosk Solutions and Technology* (no date) *Intel*. Available at: https://www.intel.com/content/www/uk/en/internet-of-things/iot-solutions/kiosk/interactive-and-digital-kiosks.html (Accessed: 5 December 2022).

8. Jones, R. (2009) 'The role of health Kiosks in 2009: Literature and informant review', *International Journal of Environmental Research and Public Health*, 6(6), pp. 1818–1855. Available at: https://doi.org/10.3390/ijerph6061818.

9. Karpov, A.A. and Ronzhin, A.L. (2009) 'Information enquiry kiosk with multimodal user interface', *Pattern Recognition and Image Analysis*, 19(3), pp. 546–558. Available at: https://doi.org/10.1134/S1054661809030225.

10. Lyu, Y. *et al.* (2015) 'Designing and optimizing a healthcare kiosk for the community', *Applied Ergonomics*, 47, pp. 157–169. Available at: https://doi.org/10.1016/j.apergo.2014.08.018.

11. Magazine, S. (no date) *How do military aircraft helmets track where a pilot is looking?*, *Smithsonian Magazine*. Available at: https://www.smithsonianmag.com/air-space-magazine/how-do-military-aircraft-helmets-track-where-a-pilot-is-looking-20246887/ (Accessed: 6 December 2022).

12. Maguire, M. (2001) 'Methods to support human-centred design', *International Journal of Human Computer Studies*, 55(4), pp. 587–634. Available at: https://doi.org/10.1006/ijhc.2001.0503.

13. Maguire, M.C. (1999) 'A review of user-interface design guidelines for public information kiosk systems', *International Journal of Human-Computer Studies*, 50(3), pp. 263–286. Available at: https://doi.org/10.1006/ijhc.1998.0243.

14. Onibere, E.A. *et al.* (2001) 'Human-computer interface design issues for a multi-cultural and multi-lingual English speaking country - Botswana', *Interacting with Computers*, 13(4), pp. 497–512. Available at: https://doi.org/10.1016/S0953-5438(00)00052-7.

15. Rehg, J.M., Loughlin, M. and Waters, K. (1997) 'Vision for a smart kiosk', in *Proceedings of IEEE Computer Society Conference on Computer Vision and Pattern Recognition. Proceedings of IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, pp. 690–696. Available at: https://doi.org/10.1109/CVPR.1997.609401.

16. Sandnes, F.E. *et al.* (2010) 'User interface design for public kiosks: An evaluation of the taiwan high speed rail ticket vending machine', *Journal of Information Science and Engineering*, 26(1), pp. 307–321.

17. *Selecting the right touch screen to maximize results* (2010) *www.kioskmarketplace.com*. Available at: https://www.kioskmarketplace.com/blogs/selecting-the-right-touch-screen-to-maximize-results/ (Accessed: 5 December 2022).

18. Wang, Y.-S. and Shih, Y.-W. (2009) 'Why do people use information kiosks? A validation of the Unified Theory of Acceptance and Use of Technology', *Government Information Quarterly*, 26(1), pp. 158–165. Available at: https://doi.org/10.1016/j.giq.2008.07.001.

19. *How Tobii Dynavox eye tracking works* (2016). Available at: https://www.youtube.com/watch?v=Y7_f-pR8SBY (Accessed: 7 December 2022).

20. *Interactive Kiosk Software: Set up TouchFree 2.0 | Ultraleap* (2021). Available at: https://www.youtube.com/watch?v=_utTJ96NM48 (Accessed: 7 December 2022).