

Research Article

# Smart Lavabo

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**Abstract:** *Smart Lavabo is an innovative product design developed through research based on unintended human behaviour (UHB) in daily activities. In design ideation activities, empirical studies have found that designers and researchers pay less attention to UHB than creativity and intention. However, scholars agree that UHB has value and potential that designers can explore using the right strategies. Every day, humans interact with products and use them beyond their original function unintentionally, either for convenience or for a specific purpose. For instance, there are individuals who use the washbasin as a tool and facility to "bath their babies.". Through the survey conducted, factors such as psychology, environment, economy, and product characteristics were identified to affect people. In addition, users often face issues such as the lack of baby-friendly facilities and the inability to support appropriate functions when needed, especially in R&R areas, hotels, shopping malls, and hospitals. To address this weakness, the concept of unintended behaviour design (UBD) was developed using the hermeneutic circle model to assist designers in creating new product concepts. The method used in the production of this project includes four phases: idea development, concept development, digitisation, and the modelling process. The concept of UBD increases the parameters of the designer's design thinking by benefiting the consumer, the hygiene industry, the tourism sector, and human well-being. The discovery of the innovative product concept clearly provides comfort to users and reduces the risk to their babies when using the Smart Lavabo.*

**Keywords:** Unintended human behavior, Product design, Hermeneutic circle

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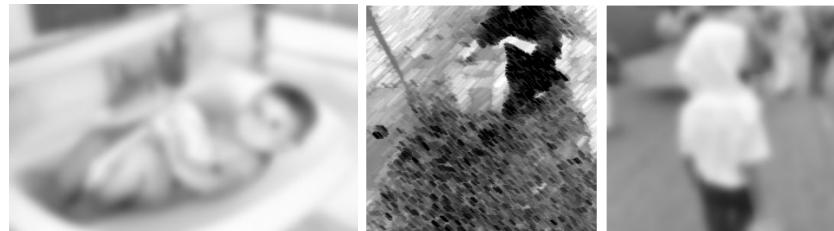
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## 1. INTRODUCTION

People interact and communicate with various products for diverse objectives, from everyday use to mainstream objects. For instance, individuals ingeniously use plastic bags to cover their heads during rainy days when umbrellas are unavailable; use Coca-Cola drinks as detergents. The term "unintended human behaviour" (UHB) is used in the field of psychology to describe the phenomena that occurs when individuals utilise a product in a manner that is not in accordance with the designer's intended purpose (Hirschman, 1980; Wongkitrungrueng, 2018; Hassan, et al., 2022). According to Meriam Webster, unintended means not planned as a purpose or goal, or not deliberate or intended. In design fields, Suri (2005) used the phrase "thoughtless act" to describe the unintentional use of products in regular tasks. Products' unintended uses did not originate with the designers; they were innovations that helped people overcome difficulties and find meaning (Norman, 1988). Literature analysis reveals that UHB arises from numerous primary psychological, environmental, economic, and product aspects (Hassan, et al., 2022).

Comprehending human interpretation, analysing human behaviour, and investigating experiences might yield superior concepts and beneficial solutions to individuals' needs. A prior study highlighted specific unintended behaviours to the user's attention via a survey (Figure 1). In the poll, the respondents selected five representations of UHB, for instance, "bathing baby using a wash basin". The washbasin is primarily intended for the cleansing of hands and faces. Nonetheless, it is utilised not alone for its intended purpose but also outside its original context (Hassan, et al., 2023). This is regarded as a commonplace occurrence wherein non-designers unintendedly participate in the development of new functionalities by utilizing existing items in novel ways (Kim, et al., 2021).

Our findings indicate that the factors influencing behaviour encompass the impracticality of portable baby bathtubs for vacation use, the unwelcoming nature of public wash basins for infants, maternal back pain considerations during the postpartum period, cost efficiency, time constraints, the pursuit of task simplification, social influences, personal experiences, and product affordances. The project empirically engaged thirty designers in product design across multiple stages of activities such: verbal protocol, design protocol, and design syntactic analysis. Research locations are being done ethically in Perak, Kedah, Penang, Kuala Lumpur, Negeri Sembilan, and Selangor. Smart Lavabo is a product design concept that emerged from an unintended behavioural design (UBD) framework (Hassan, et al., 2024). The goal of the innovation is to enhance the functionality of the product while adhering to the strictest safety regulations, ensuring that both babies and parents experience the desired comfort and usability. The objective is achieved through prototype development strategies, as mentioned in the methodology section.

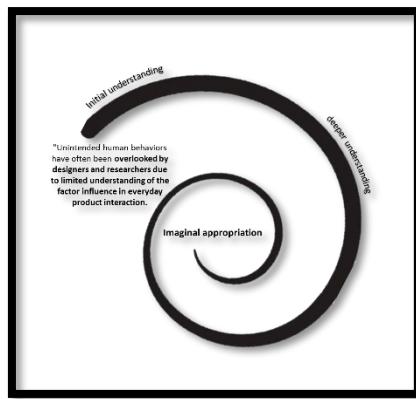


**Figure 1.** unintended use of product contexts. (the images were blurred for publication purposes)

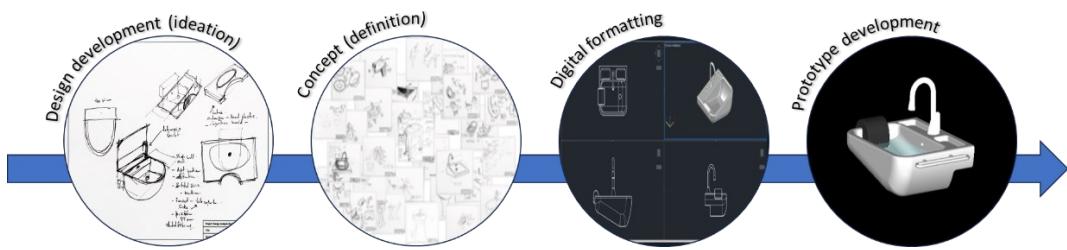
## 2. METHOD & MATERIAL

Based on the UBD concept, innovation projects are developed in four phases of development starting from: initial idea generation, concept determination, design digitization, and prototyping. The concept of Unintended Behaviour Design (UBD) was developed using the hermeneutic circle model to assist designers in creating new product concepts (Figure 2). The first phase requires the selection of ideas based on the protocol design activities carried out during the initial research. For this project, several design criteria have been proposed by the designer have been evaluated and set as guidelines. The next phase involves the determination of the design concept which consists of form fitting activities, determination of materials, technical aspects, and presentation. The third phase of design involves the use of the AutoCAD application to interpret the two-dimensional view into three dimensions. The final phase is to translate the 2D digital design to 3D through a 3D printer application (Flash forge Adventurer 4) as a method of producing innovation project prototypes (Figure 3). The project also collaborated with several industries in the development of early prototypes.

Original Smart Lavabo was created from ceramic (basin), polish chrome (telescopic swivel pull-out faucet), memory foam (portable pillow), and dot grip (silicone). For prototype purpose, the smart lavabo using polylactic acid (PLA).



**Figure 2.** Hermeneutic circle approach used in the research

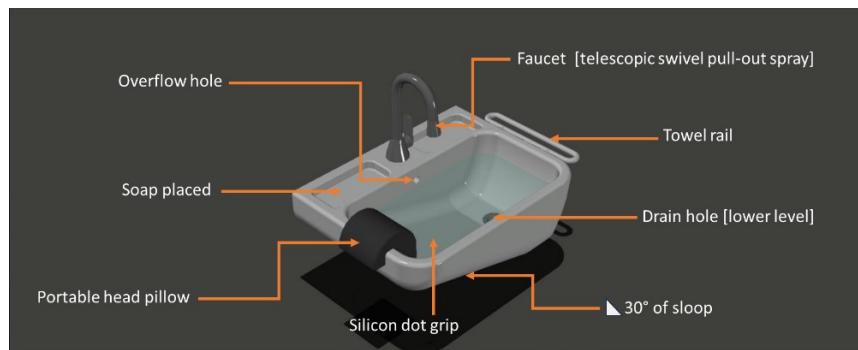


**Figure 3.** Four phases of Smart Lavabo product concept and prototype development

### 3. FINDINGS

Smart-Lavabo takes the original basin's qualities and improves to meet the demands of baby bathers. The design was human-centred and safe and comfortable. The basin's major part is ceramic, which is durable, washable, and practical. The height of this basin makes it highly practical for parents and carers to manage bathing activities. The product concept helps lower the risk of back pain. The basin's 'foetal' shape supports the baby's back and position during bathing, ensuring comfort. The steepness of the design at 30° and the drain hole location limit the possibility of 'drowning'. Telescopic swivel pull-out spray features improved user comfort and utility of the tap design. The upgraded portable 'pillow' feature, composed of memory foam, supports the baby's head and increases safety. In addition, a soft silicone dot grip on the basin interior can decrease baby bathing slippage. To prevent mobility when bathing the baby, a towel rack is supplied.

Compared to portable baby bathtubs, Smart-Lavabo offers non-toxic materials, a novel form, a telescopic swivel pull-out faucet, safety features, and dimensions. We believed that the Smart Lavabo would provide the features users need and be affordable for all.



**Figure 3.** The novelty of Smart Lavabo concept

#### 4. DISCUSSION

Smart Lavabo aims to assess the application of the UBD concept in design activity. By using the UBD concept, every suggestion and new element inspired by design experts during the initial research protocol design session is considered for generating new ideation. The results of this research have an impact on (i) enhancing product design potential through UHB ideas, (ii) reducing the risk of product misuse, and (iii) providing safety and comfort for users to interact with the product according to their daily needs. The creation of this concept product provides users with special features based on new functional improvements without compromising its main function. In addition, it integrates enhanced safety features, is ergonomic, and uses safe materials. This product is recommended to be installed in areas such as R&R, shopping malls, hospitals, hotels, airports, and residences. Therefore, we consider these findings to be highly reliable after a thorough evaluation by the participants involved in the research and design development. This project supports 3 national policies through SDG 9, The Twelfth Malaysia Plan, and National Science, Technology, and Innovation Policy (DSTIN) 2021-2030. This project has been awarded a gold award at the Johor International Innovation, Invention Competition, and Symposium in October 2024. The creation of Smart Lavabo through unintended human behaviour research was also published in the Scopus indexed proceeding. The prototyping was also submitted for copyright application to MyIPO for intellectual property purpose.

#### 5. CONCLUSION

Design research has grown acquainted with the phenomenon of everyday design, which has garnered respect in the design field through diverse definitions of design concepts. Adjustments, exposures, and rules for UBD must be implemented and broadened for product design practitioners to ensure that this initiative benefits all stakeholders. Designers gain advantages from UBD's design idea via the Smart Lavabo product concept. This also creates chances for the sanitaryware business to diversify its product offerings. Ultimately, the implementation of this invention enables customers to fulfil their needs without incurring risks.

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