DESIGN FOR SENTIMENT-ANCY: CONCEPTUAL FRAMEWORK TO IMPROVE USER'S WELL-BEING THROUGH FOSTERING EMOTIONAL ATTACHMENT IN THE USER EXPERIENCE WITH THEIR ASSISTIVE DEVICES

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ABSTRACT
This study investigates how the ageing population interact with objects, what kind of bond individuals form using their assistive devices, and what methods are applied during the product design process to help improve the user experience leading to a long-term product relationship? This research aims to conduct a longitudinal study involving/discussing the interplay between end-user, designer and product. By developing an evaluation tool with which to describe and analyse the bond people form with their assistive devices and integrate the human emotions as a factor during the development of the product design process. The focus will be on the assistive technology market, namely, the aid-for-daily-living market targeting the seniors in the UK, to increase the quality of wellbeing. Findings will enable a better understanding of the real issues of the product experience relating to individuals' interaction throughout the product performance, establishing awareness of the emotional effects of fostering the product attachment, and help product developers and future designers create a connection between users and their assistive devices. The research concludes by discussing the implications of these findings for professionals and academics to identify new areas that can stimulate new /or developed design directions. The result of this paper will define plans for further investigation as part of a current PhD research project. Framework and evaluation tools are currently being developed and will soon follow this publication.

Keywords: Experience design, interaction design, emotional attachment, social science, assistive technology, inclusive design, user-centred design

1 INTRODUCTION
Ageing or impairments should not restrict people's lifestyle, so why should people with less ability be excluded from a simple routine task when the tools and technology exist in the marketplace to overcome these obstacles [7]. Having an impairment in our society today has many implications, as many cases of individuals being overlooked and missing a great deal of attention in some areas. The societal stigma of being viewed as a disability due to weakness in the abilities, whether visual, hearing or mobility impaired, excludes individuals from taking part in basic life activities, thus restricting them from equal access to social, leisure and routine-al activities. Over time, we all get older, and we are subjected to experience age-related changes of physical, sensory, or cognitive decline. Opportunities and services for the ageing population across the globe are growing fast, and this change touches every aspect of our life, extending from career living to health. There is an extensive investment in research to understand how and why we age as well as the undergoing developments in independent living [2]. Yet, there is little attention and limited understanding has been paid to the "missing market": assistive devices [3]. Assistive technology (AT); has a significant role in improving people's life quality, especially for individuals who are challenging age-related changes or with special needs. According to the Assistive Technology Act 1998, AT is defined as; any item, piece of equipment, product or service used to perform activities and compensate for functional decline [10]. It can vary in the shape of a mobility aid such as a wheelchair, a walking stick, accessibility aid such as bathroom bars, ramps, or performance aids such as dressing or feeding tools (which will be explored more comprehensively later in the literature). It has

been claimed that AT is meant to fulfil user needs, enhance life quality, decrease disability and promote equal social status. Despite all the advantages, concerns have been documented since the 1970s about individuals' responses towards the technology. There are still some barriers that cause users to reject or abandon this technology. AT is considered a medical device often designed based on the medical model of disability or ageing whilst ignoring the social model. It follows an inclusive design approach that mainly focuses on usability and functional aspects, neglecting user-product interaction in terms of desirability and meaning [3].

2 LITERATURE REVIEW

There are numerous arguments addressed by several researchers [28], [20], [19], [17], [12], these arguments show that users' cultural background, emotions and psychological needs can affect their perception and expectations of products; still, manufacturers and designers have been trying to standardize this perception. Standardizing User-experience-design (UX) helps in the short term; however, it ties the future of UX innovation to the standard/traditional value [20]. And the drawback of standardizing the design for a large variety of user segmentation can cause danger of complication and ambiguity, which may frustrate users rather than facilitate the desired experience [21].

2.1 Ageing and assistive technology (AT)

The demographic of the ageing population across the whole world continues to increase as part of a global phenomenon. According to the latest statistics in 2018 from the office of national statistics, there are 11.9 million resident's over-65 in the UK, representing 18.2% of the total population. This is predicted to increase to 20.7% of the total population between 2018 and 2028 [8]. This increase highlights the importance of assistive technology as an essential tool to maintain independence and live regular life independently. Ageing is a natural part of the human experience, and as we all are going to age with a sort of physical changes or functional decline, inevitable these changes touch every aspect of our lives. We are entitled to continue to be integrated into society without any limitation, wondering how we will live now with all the challenges related to ageing and how we expect to live in the future? This fact highlights the importance of AT as a fundamental life aid to empower the individual's abilities, enabling continued independence in daily functioning. Individuals who use assistive devices in the home form a complex bond, either by accepting or abandoning their devices regardless of the reason, as they end up in the closet or under the bed or damaged, broken or lost. Although AT is valued for improving daily life and supporting older people with functional decline and/or impairments, many AT devices and services are abandoned after experiencing their use [9]. The process underlying the decision to adopt or reject any given AT is a complex process that requires further exploration in examining how individuals perceive AT and react to the user experience in daily life. Several theoretical models have been developed to explain technology adaptation; however, these studies emphasize the functional and instrumental nature of such acceptance and have not captured all the aspects of cognition and behaviours [4]. The exclusive perspective on designing products and services centred around age or impairments relates ageing to deficiency and incapability. The target users usually reject products and services designed based on the medical model, which may stigmatise them and reduce self-esteem [3]. The acceptance of ATs by older users is essential in both industry and research. Despite the benefits of using AT, the need for AT is still lagging in terms of the utilization rate and has not yet translated into a willingness to use it [4].

2.2 User experience (UX)

Product design and User-experience-design (UX) emphasize the role of product function and usability in creating an effective/compelling user experience and increasing the product life span. However, the coming arguments have been agreed that product usability is not the only factor that impacts the user experience. In fact, many products have been abandoned or replaced because they fail to keep an emotional and psychological bond with their users. Forlizzi and Battarbee [28] debated emotion as the heart of any UX and the essential component of product interaction; emotion can be shaped by two standpoints: psychology and design, where emotion plays a crucial motive in what users experience to understand and interact with a product. Diehl & Christiaans [24] claimed that users' psychological and sociocultural backgrounds were denied in the design process, where the market drive is built for consumption. In a long-term study, Roto [20] noticed that when users give feedback, they tend not only to explain the utility and usability of the system but also social and emotional aspects. Also, Hassenzahl

[19] questioned; why someone owns and uses a particular product? Then argued that utility and usability should relate to potential tasks that acquire an evaluation of pleasure (hedonics) that focus on the Self. Mahlke [22] defined usability as a traditional quality to measure one aspect of UX and reach the ideal UX; it should involve three qualities: instrumental interaction, non-instrumental perception, and emotional user reaction. Fenko and Schifferstein [17] advised UX theoretical models' design direction to take integrative processes that combine all sensory properties of products and emotional and cognitive contents to get an effective product interaction. Inconsistent with the previous studies, Partala and Saari [12] reported a high emotional experience in product use, as emotion plays a dominant role in UX. Other fields categorize UX approaches into three groups: one direction takes the user as a perspective, others attempt to understand experience through the product, and a tertiary group defines user experience as an interaction between user and product. However, Forlizzi and Battarbee [28] have argued that an interaction-centred view is the most practical approach for understanding how a user can experience a product. Hassenzahl and Tractinsky [25] took a brief look at three prominent perspectives, as each view contributes to understanding users' interactions. Nevertheless, none of these perspectives fully captures UX as the UX perspective took a severe shift, from designing for pleasure rather than for the absence of pain. This perspective is based on creating an outstanding quality experience rather than merely preventing usability problems and can happen by aiming for experiential and emotional user-experience beyond the functionality. Focusing on the positive aspects mirrors a new trend in psychology which has been argued to deal with human strengths and promote well-being rather than aiming at human weaknesses and healing [25], adapted from; [37]. Existing literature from Hassenzahl [25], Chen [4] and Yoon et al. [1] all conclude their discussion that the current design approach adopts "problem-driven", "absence of pain", and "curing disease" to avoid/reduce negative emotion rather than implementing positive emotions and pleasurable experience. Hassenzahl [25] explained how the new future direction in psychology contributes to the quality of life and promotes positivity by designing, on the contrary, for pleasure (Hedonic) rather than preventing function and usability problems. Hancock et al. [26] pointed out that it is essential to consider both directions by promoting positive, pleasurable experiences and avoiding frustration, pain, and stress associated with product usage. According to Ko, Ramirez, and Ward [11], users need to obtain pleasing and satisfactory interactions to become attached to their possessions; this pleasure can be fulfilled by the four key elements of pleasure experience (physiological, sociological, psychological, and ideological).

2.3 Emotional attachment

In the late 19th to early 20th century, architect Sullivan's concept of "form follows function" [15] was dominant. Based on the idea that the shape of an object or building should be designed to follow mostly its purpose and function, not its aesthetic appeal. On the other hand, Don Norman [27], the inventor of the term "user experience" and the founder of "Emotional Design", argued that attractive things work better in creating the experience because a pleasantly appealing design creates a positive emotional response in the brain and thus improves human cognitive abilities, which is reflecting positively on the user-experience.

Desmet and Hekkert [21] argued that "product experience" refers to three aspects of interaction; that trigger certain emotions upon using a specific product. These emotions can be shaped by the user's characteristics (physical actions, cognitive processes, and emotions), the product's specifications, and human behaviours, in addition to the context. Each of these components has its own ability to affect the relationship between the user and the physical item (product) at every stage, beginning from when the users make the purchase and ending up owning it. They conclude by the three components of the user-experience design process: aesthetics, meaning, and emotional response, to be designed satisfactorily. Accordingly, discussing Norman's work [27], "Human Action Cycle" from a social science perspective, and incorporating it into the "Product Creation Process" [20] from a product design perspective will lead this research to a narrative perspective for the attachment experience. This cycle starts firstly by observing a product and then getting attracted to its aesthetic appeal/novelty, whether it is colour, shape or material. Then, attach a specific meaning to it, according to a place, memory, association, or familiarity. Afterwards, engagement with it according to the type of emotion this product triggers, which depends on its use, whether negative or positive.

(Product) is the external stimulus that provokes an internal response (emotions), processed by the brain to shape the physical action (attachment). Emotion is the cognitive system that plays an essential part in every decision-making process; emotions influence our actions and control our thoughts in shaping our

memories [5]. On the other hand, attachment is driven by a behavioural system common among all mammals and humans, which is programmed to keep infants close to their caregiver, in reference to John Bowlby's evolutionary theory. Emotional attachment happens when emotional actions accrue to form a bond with other humans, a pet, or an object which has the characteristics of social relationships, which consists of; (physical presence, autonomy, and ability to adapt and communicate) [16]. Product emotional attachment; is an emotional bond that a consumer experiences with a significant object [29]. Researchers suggested that in order to design meaningful products, it requires collaborating with various disciplines, taking into consideration human needs, emotions, capabilities, and values as new areas when designing AT. Referring to a recent study by Chen [4] shows positive emotions along with negative emotions play an important role directly or indirectly in AT usage. Emotional bonds develop over a period of time, so only through a comprehensive understanding of emotional relationships, designers can create products that bring positive emotional responses during ownership. Fayazi and Frankel [3] indicate that there is an opportunity in the market for AT to be designed to not only alleviate the stigma associated with devices but also sustain long-term-product attachment. Likewise, Chen [4] claimed that supporting older individuals in pursuit of well-being through AT is by combining theories on technology acceptance, constructs in emotional experience, and theory on psychology. He also emphasized that not focusing on product usability only, but also on psychological needs and positive experience must be considered from design and development to the implementation processes. Nevertheless, emotional, and psychological concerns for the ageing population should be reflected as a critical factor in the process of AT design and development [4].

Optimizing the product-owning period through strengthening emotional bonding between users and their possessions, has been found to be effective in postponing the psychological abandoning of a product. In this regard, several design strategies have been proposed to trigger emotional attachment toward products; this has been studied through concepts like "emotionally durable design" [23] and "product attachment" [18]. Design practitioners and researchers have identified product-emotional attachment as a design strategy for postponing premature product disposal. However, limited research has been conducted to support this strategy for promoting sustainable consumption [11]. In order to influence users' behaviour toward the product through the design and development process, designers need to consider the emotional attachment between users and their possessions. Such strategies have been suggested to avoid or postpone product abandonment [4].

3 DISCUSSION AND FOLLOW-UP STUDY

Addressing human needs is a fundamental mission for a successful design; human needs and interaction are the core concepts designers tend to follow when starting any invention or making even minor design developments. Lupton [15] defined people from a design perspective; people are the gear that makes any design function, where people can be classified as users, customers, vendors, and designers. Users play the primary role in the design process and the product's use thereafter. So, what force can drive a particular design? Forces can range from the economic interest of firms and manufacturers to the personal belief of the designer, or a request by a client, and can also relate to the most common way for a manufacturer, or simply because this is how things have always been. Fayazi and Frankel [3] argued that advanced technology often drives design innovations rather than sensitivity to human needs, abilities, motivation, and cultural values.

User-experiences with their assistive devices can elicit significant emotional responses to form the product bond; however, existing products do not meet the criteria to form a healthy emotional attachment and most users struggle to achieve a long-term product relationship. Further exploration and in-depth study are required on this subject, as some barriers that cause users to reject or abandon their assistive devices remain not fully captured. Ultimately, findings indicate that emotional experiences have not been examined in the context of ATs acceptance by older people, which is mainly left unexplored [14], [13]. Existing methods, approaches, perspectives, and the underlying theories cannot deliver the new change required in UX; however, some researchers point out empirical studies are needed to link all the experience attributes [30]. Longitudinal research needs to be performed to get tangible facts to create the user-product bond. As Mugge et al. [18] believed, the more consumers could act as co-designers of their product, the more effort they will invest in the product; thus, the more likely to create a stronger emotional bond. The focus on user-centred design has inspired a shift from behaviour and cognition only to human involvement; this shift means building an effective user experience where various disciplines are involved. Social science offers a clear basis for experimental theories that can structure

some of the discussion in the design education and design process, so the multidisciplinary approaches of; product design user experience will be incorporated along with ideas from social science, particularly "attachment theory." This will positively incorporate a combined design, social and health needs that will help deliver a better experience for AT users and eventually increase well-being [6].

Based on much of the literature reviewed to date, the focus has been on the qualitative literature only, of the current approaches and frameworks about the design of emotionally engaging products. Yet, this research focuses on both quantitative and qualitative data to investigate the employment of emotions to overcome ageing difficulties in the user experience with their assistive devices by encouraging attachment. This study does not seek to develop a particular product but to develop a conceptual framework to guide the new design direction and develop a simple solution to add value to the future/existing market. This doctoral research will follow the methodologies and measures used by post studies, with alterations to fit the purpose of this research. This study aims to explore the subjective feelings towards AT among seniors. It begins by reviewing the literature concerning assistive devices and older adults' attachment to AT, introducing the most relevant theories on UX and concepts from anthropology, psychology, and neuroscience to be combined as research tools. This tool was designed carefully to suit the sample group. As people cannot express how exactly they feel, they can show it in the shape of evocative tasks, which follows the user-centric design approach (UCD), also known as 'Empathic design ", and can be flexibly constructed. Then, pursue investigating seniors' difficulties, interactions, and behaviours while using AT. That will be performed through three sequential stages of three size sample groups. The data should help define the scope of this research and construct a clear work-frame to influence the next stage of the primary research process. Due to the size of the sample group, the research tool will evolve to shape a set of evocative tasks using a web-based template to obtain inspirational responses from people and get an asymptotic clue about their thoughts and emotions. The results should address all the influencing aspects, which will be analysed to define the significant key issues that impact the attachment.

This research will focus on the assistive technology market and, specifically, the Aid-For-Daily-Living market for situational impairments (ageing and life situation impairments). This is because the nature of the relationship between the user and the assistive device demands a high degree of emotional bonding. Based on the researchers' experience, literature, and initial observation of the problem, this research argues that, if this attachment occurs successfully, it will help serve several other aspects of the main goal that operating the assistive-device function; It motivates regular use, increases independence, and improves psychological and physical functionality, it also leads to a long-term product relationship and ultimately increases the quality of life. As an outcome of this research, the suggested evaluation tool seeks to identify previously unexplored areas in the future design of the AT market. It will provide product designers, design academics, and professionals with a new method of developing an effective product, along with opening up opportunities for market and business owners to expand their business, thus meeting a previously unmet demand. This may lead the design decision toward an emotional experience, resulting in a long-term relationship with the user and eventually maintaining users' well-being, pleasure, and satisfaction.

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