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Designing Positive User Experiences to Encourage Older Adults' Self-care

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ABSTRACT

User's capabilities can be divided into four components: sensory perception is related to the inputs from the environment, whilst cognitive processing and affective mediation judge and decide what the most appropriate physical output for an interaction should be, according to the context in which the overall user experience takes place. With ageing, there is a natural decay of the sensory, cognitive and physical levels. The affective level, in contrast, becomes a stronger component of users' capabilities, compared to the other three levels. However, unless a vigilant design process that addresses older adults' requirements is in place, the consequences of sensory, cognitive and physical ageing result in a slow-paced, hesitant interaction and an unsatisfying user experience. This work focuses on better understanding older adults' needs, capabilities and attitudes, and emphasizes the necessity to design for their inclusion by involving this user group in human factors activities throughout the medical device development process.

Keywords: User experience, Human factors, Medical devices, Older adults, Self-care

A SIMPLE FRAMEWORK FOR POSITIVE USER EXPERIENCES

User experience can be defined as the sum of responses elicited from the user by a succession of events that take place during the interaction with a product, where not only the users' capabilities are considered, but also their needs and attitudes. In this work:

- Needs refer to the users' set of personal requirements in relation to the utility of a product or family of products. It is about what for users use a product, i.e., the goals users want to achieve by using the product.
- Capabilities refer to the users' set of functional abilities with which they interact with a product. It is about how users use a product, i.e., the means users possess to interact with the product.
- Attitudes refer to the users' set of sociocultural aspects in relation to the product. It is about, if given the possibility to choose, why users use a specific product within a range of similar options, i.e., what leads users to behave in a favorable or unfavorable fashion towards a certain product.

The perceived attributes of a product can be summarized as its utility, usability and desirability, where:

- Utility refers to the functionality of a product or system that is deemed useful to the user.
- Usability refers to the potential for the user to benefit from a product or system's utility through successful interaction.
- Desirability refers to a product or system's potential to motivate a user to approach and interact with it.

Research suggests that usability is a component of a pleasurable experience, but not the only one. In order to achieve a positive user experience, it is important to find the balance between the attributes of the user and the perceived attributes of the product – utility should fulfil needs, usability should address capabilities and desirability should correspond with attitudes. In other words, if a product is useful, usable and desirable, it is likely that the resulting experience will be perceived as pleasurable, if the context of use is favorable too (Medeiros et al., 2012).

In practice, however, during the medical device development process, the main reason for applying human factors is to ensure the device's safety and efficacy in the hands of the user. Often, the holistic approach to include the other attributes of the user and of the product – necessary to achieve a balanced user experience – is relegated to a lower priority, if at all taken into account. For instance, once user's frustration kicks in, it can lead to use errors and a negative behavior towards the medical device, both of which can result in compromised self-care, especially in the non-clinical environment. Additionally, it translates into formal complaints and impacts negatively on medical device businesses.

This work focuses on better understanding older adults' needs, capabilities and attitudes, and emphasizes the necessity to design for their inclusion by involving this user group in human factors activities throughout the medical device development process, asking them the right questions and paying attention to what they have to say.

THE OBJECTIVENESS OF THE SUBJECTIVE

In a simplistic view, user's capabilities can be divided into four components: sensory perception is related to the inputs from the environment, whilst cognitive processing and affective mediation judge and decide what the most appropriate physical output for an interaction should be, according to the context in which the overall user experience takes place. In young adults, these responses tend to happen almost simultaneously.

With ageing, there is a natural decay of the sensory, cognitive and physical levels. The slow-down of sensory conduction speed and a decrease in the intensity of sensation translate into a partial awareness of the world around us. Cognitive decline impacts negatively on information processing which progressively takes longer. On top of that, motor abilities are compromised, and physical responses are delayed. Unless a vigilant design process that addresses older adults' capabilities is in place, the consequences of sensory, cognitive and physical ageing result in a slow-paced, hesitant interaction and an unsatisfying user experience.

Aspects of the affective level, on the other hand, are likely to stabilize and even improve as people mature, for example emotional regulation and selectivity. It is known that as people approach the end of life, they become more emotionally selective: goals associated with immediate emotional well-being become more urgent because of the perception that "time is running out" (Mather and Carstensen, 2005). Selecting one's experiences operates as a mechanism for affect regulation and allows people to conserve physical energy, a task that becomes more important with age (Fredrikson and Carstensen, 1990). In order to avoid disappointment, people tend to choose tasks they believe they are capable of accomplishing, depending on their motivational and cognitive resources (Staundiger, et al., 1989).

In other words, with advanced age, the affective level develops into a stronger component of users' capabilities, compared to the other three levels – sensory, cognitive, and physical. Gradually, it serves more and more as an aiding tool for decision making, prior to, and during user experience. *Its subjectiveness becomes somewhat objective.* Consequently, cognitive performance on emotionally charged tasks shows greater improvement in older adulthood than performance on non-emotionally charged tasks (Carstensen et al., 2006). Besides, greater focus on emotional satisfaction among older adults leads them to favor positive and avoid negative information in their attention and memory. For instance, if reading through instructions for use (IFU) has caused frustration in the past, it is very likely that older adults will not spontaneously want to read any new IFUs, no matter how well and carefully designed these may appear to be. Therefore, to get the design of a new IFU right, the primordial question here is not simply whether or not older users can follow it. Instead, we should aim at understanding, in the first phases of the medical device development, what would make this user group refer to the instructions, how the navigation could ensure they find what they might look for, as well as what level of information would they expect to find and understand, to then design the IFU more inclusively.

THE FAMILIARITY OF THE UNFAMILIAR

All human activity is subject to habitualisation – any action that is repeated frequently becomes cast into a pattern, which can then be reproduced with economy of effort (Berger and Luckman, 1966). In the context of device use, repetitive use leads to ingrained mental models and the corresponding automated responses, which are unconsciously replicated. Following a routine is energy saving, which is particularly relevant in later life. Moreover, the accumulation of previous experiences creates a library of general and specific knowledge against which older adults consciously or subconsciously compare new experiences. Most likely, when dealing with an unknown task, older adults will rely on the closest possible existing way of carrying out that task to achieve a result similar to what they expect. Couple that with cognitive decline and you have older adults who are: less likely to learn how to use a new medical device without a considerable degree of reluctance and frustration; and more likely to end up using an old mental model when interacting

with a new product. Depending on the product, the latter can result in a number of risks in a range of severities.

On the bright side, it is possible to take advantage of prior general knowledge to inspire design. An example is the use of knowledge derived from basic sensorimotor experiences, also called image schemas (Hurtienne et al., 2009). For instance, the observation that the higher the level of liquid in a cup, the more volume you get, leads to the associations that "up is more" and "down is less". Applying this example to product interface, by pushing a sliding button upwards on a physical device or digital user interface, the user instinctively expects it will increase the level of a feature, e.g., sound volume, weight, or dosage of a medication, whereas sliding the button downwards is expected to decrease the level of the same feature. Evidence suggests that by using image schemas, designers have been able to provide products with an intuitive, easy-to-use interface. This is advantageous when designing for older users because it has the intrinsic ability to trigger responses based on their general knowledge and compensate for cognitive losses.

Familiarity with products, on the other hand, is an example of accumulated specific knowledge. Designs that explore users' experiences with previous generations of products, by referring to past features, are more likely to be perceived as easy to use (Lewis et al., 2006). Although there has been the debate whether image schemas can surpass familiarity, in the author's understanding they make use of different resources (general and specific knowledge) to propose design solutions. Therefore, in this sense, they can be considered mostly complementary design approaches.

Again, the question is not simply whether or not older adults can use a new product after it has been already designed. We should aim at understanding, in the early stages of medical device development, how much these users could deviate from their established ways of doing things, and still achieve a successful interaction with the new product. By doing so, it may be possible to cleverly design a breakthrough innovation whose use process, and the corresponding mental model, still resembles something the user has experienced in the past and feels comfortable with. *Its unfamiliarity is somehow familiar.* As a consequence, in theory, it might as well be possible to design a less frustrating, more pleasurable overall user experience, which can contribute to compliant use of medical devices for self-care in the non-clinical environment.

THE DISRUPTIVENESS OF INCREMENTS

Designing for self-care and connectedness, especially for older adults, represents a market opportunity due to the rising pressure on healthcare systems, as well as the steadily growing ageing population. For instance, the increase in older adults' use of IT products for communication over the years has impacted positively in general well-being by keeping these users in touch with their loved ones – a basic human need. Additionally, it has the not-yet-fully explored potential to assist in remote health monitoring, as well as improve adherence to health treatments and management of health conditions. That is, provided the device is intuitive to use and patients feel like

they can communicate with someone who can assist them before hesitation becomes frustration and undermines the user experience. Whilst it is true that some older adults struggle to use connected devices and mobile phones, others succeed despite sensory, cognitive or physical issues. Understanding older users' attitudes and what leads them to behave in a favorable or unfavorable manner towards a certain product is, therefore, of great importance.

In general, users' attitudes precede behavioral intention, which in turn precedes actual behavior in situations where the user is in control (Melone, 1990). Social impositions older users are under may lead to involuntary behavior – for instance, when older adults are encouraged to use a mobile phone given by their children. Although involuntary behavior may lead to eventual adoption of technology in gross numbers, it cannot ensure actual usage of the technology because older users' attitudes have been taken for granted. Motivated adoption, in contrast, is more likely to result in actual usage.

To illustrate the above, consider all the older adults you know that willingly use social media to keep in touch with family and friends. They are motivated to do so because: 1) the expectation is that the psychological reward is not only immediate, but also greater than any annoyances associated with the use process, especially when compared to using the sound-only landline or traditional mail; and 2) the social networks are based, to a certain extent, on features of pre-existing mental models of, for example, the photo album, diary, scrapbook and letter writing, combined (or not) in online platforms which are continuously updated by mostly incremental changes. Gradually, the initial motivation to act is replaced by the positive attitude to adapt to such changes so that usage is sustained and the need for social contact is fulfilled. *The increments become disruptive.* In that sense, user experiences that are perceived as beneficial have the potential to promote motivated adoption and contribute towards older users' inclination to adapt despite their resistance to changes. Altogether, this can lead to a positive shift in technology usage in old age, which could include the use of connected medical devices and mobile applications for disease management, for example.

It is important to notice that the clash of human ageing with novel technology is not merely a transitional issue between generations. Instead, it is a recurrent ageing-related matter that is prone to come up at some point in future generations, if products and experiences are not designed with older users in mind.

ALTOGETHER

Considering all that has been said, questions spring to one's mind – are we including user research, and running usability studies involving older adults, early enough in the development process? Are we asking them the right questions? Should we be investing more effort trying to gauge their previous experiences and mental models, and less time asking questions they do not understand or relate to? And above all, are we innovating in their direction, or are we asking them to resort to abilities they can no longer use with

confidence to try and adapt to systems that introduce more problems than solutions into their lives?

Human-centered design in healthcare should aim at realizing the optimal embodiment of user/patient requirements to deliver the best possible experience and encourage compliance. The product has not only to be useful and usable; it also needs to be desirable in ways that transcend aesthetics. Its design must communicate to users that the product matches their capabilities, meets their expectations, and provides obvious information about its utility. The ultimate goal is to help improve the physical and emotional aspects of older patients' well-being by removing, as much as possible, any negative elements from the use process to facilitate an inviting, engaging and – why not – fulfilling experience.

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