

Towards the maturation of design: From smart to wise products

Abstract

Recent years have shown the introduction of several types of smart products. These products gather data about user behaviour and try to determine an optimal response, in order to make the user's life easier. However, some smart products also lead to user behaviour that is undesirable. Hence, we would like to introduce a new design paradigm aiming for wise products that make the user's life better. These products allow the user to be in control of his own life, they are empathic, and they know multiple ways to evoke desirable behaviour. Besides awareness of the user's current situation, wise products are connected to a knowledge source that helps them decide on the appropriate behaviour, and they possess a repertoire of possible actions that may be customized to momentary demands. The aim is for wise products to contribute to the user's and society's subjective well being. We discuss several examples of how people experience wisdom in products and in the way they interact. In addition, we describe implications for the design process.

Keywords

Wisdom, smartness, design paradigm, well-being, interaction design, product design

1 Introduction

Since computing devices have become smaller in size, computing elements have become part of many

everyday products. Common examples are smartphones and tablet computers, but also dedicated products like smart thermostats, refrigerators, ovens, and medical devices that we carry on our bodies. Environments can become smart, now that GPS and sensory networks can track our whereabouts across locations. In addition, new materials and technologies allow new forms of communication.

Smartness is a common term to state that some sort of intelligence is embedded in interactive products (e.g., phones, refrigerators, health-trackers) in order to make our lives easier. For products to attain this smartness, we may need to provide our system preferences requiring explicit user actions, or the products may just automatically gather data about our preferences and behaviours, without us even being aware of it. We benefit from smart products, because they are autonomous in initiating certain actions and thereby reduce our workload. However, some smart products lead to user behaviour that is undesirable. For instance, the smartphone has provided ubiquitous access to the Internet, which has resulted in people's addiction to Facebook, Instagram, and other social media, while neglecting face-to-face contacts and interfering with work and study demands. Other smart products, such as alarm clocks and thermostats calculate an optimal response based on past behaviour, but do not take into account a person's momentary biological state (e.g., illness or fatigue) and thus seem to take over control

of a person's life. As a result, interactions with smart products can feel intrusive, may demand immediate change in behaviour, radiate authority by outsmarting a person, and exhibit an obvious sense of righteousness. Therefore, we would like to introduce an alternative paradigm for designing a new generation of products that have an empowering, inspiring, encouraging, and soothing role in people's lives: wise products. Our starting point is that while smart products make our lives easier, wise product should make our lives better. In this paper, we set the scene for this new paradigm by presenting the basic constituents of wisdom and how they can translate into product properties. While we acknowledge that wise products are inherently interactive products, our methodology is based on theoretical explorations and on the first impressions of design students into this new topic in the field of product development. Hence, the studies are exploratory in nature and the tools are traditional and familiar to the design context (e.g., mind maps, mood boards, sketching).

Throughout the introduction of this paper, we will contrast wise with smart products. First, we indicate how smartness and wisdom differ in the context of human life. Second, we describe the value of wise and smart products, by explaining how they affect people's lives and in what way they contribute to their well-being. Subsequently, we explain the differences in the underlying properties of smart and wise products, we review consequences in terms of the way people interact with the different types of products, and we indicate how the products are connected in networks and product ecologies. In addition, we provide examples of how people experience wisdom in products, by providing student descriptions of products that can potentially be wise. Finally, we discuss implications for design, by describing several ways in which products can communicate wisdom through their physical properties, interactions and behaviour.

2 The difference between smartness and wisdom in daily life

The Oxford dictionary definition of smart indicates two subconcepts: being *quick* and having *intelligence*. That is, smartness pertains to quick-witted intelligence provided momentarily as a response to an external stimulus. In contrast, wisdom pertains to *experience*,

knowledge, and *good judgment*. Hence, wisdom relies on the interpretation of multiple, repetitive, or longitudinal life experiences.

Wisdom requires the accumulation of knowledge, based on life experiences [e.g., 1]. A person's decisions and behaviour are based on what one knows and how one chooses to act. Hence, whether a decision or action is wise or not, depends on the knowledge and assumptions on which it is based. Wisdom involves changing the balance between acting and reflecting [2]. Knowledge accumulated should not just be derived from textbooks, but from real-life experiences, in particular the ones that are somehow challenging. Knowledge should not be limited to factual knowledge about human nature, lifelong development, interpersonal relationships, social norms, and ways to promote wellbeing of the self and others. It also concerns procedural knowledge about strategies and heuristics for dealing with the meaning and conduct of life, such as heuristics for giving advice, ways to handle life conflicts and life decisions, and knowledge about alternative strategies if things do not work out as expected. As a consequence, the archetypal image for wisdom is an old woman or man, who has accumulated many life experiences [3].

Wise people know how to communicate their opinion. A wise person can cope with positive and negative emotions, including uncertainty. They understand their emotions, and do not allow themselves to sabotage their good judgement. By experiencing events in real-life, a person obtains awareness about the context in which an event happens (social, economic, cultural), and develops a feeling for nuance. A person gets a feeling for the complexity of issues, develops moral sensibility and is able to predict the consequences of solutions. Wise people may support multiple perspectives, allow for compromise, and recognize the limits of their knowledge.

Baltes and Staudinger [4] define wisdom as "an expert knowledge system concerning the fundamental pragmatics of life. These include knowledge and judgment about the meaning and conduct of life and the orchestration of human development toward excellence while attending conjointly to personal and collective well-being." These authors use five criteria to evaluate

the wisdom in people's responses: (1) rich factual knowledge, (2) rich procedural knowledge, (3) lifespan contextualism, (4) relativism of values and life priorities, and (5) recognition and management of uncertainty. According to Baltes and Staudinger [1] smartness only implies the first of these criteria: Rich factual knowledge. Hence, wise products are likely to show a different behaviour than smart products.

Ardelt [5] makes a comparison between intellectual knowledge and wisdom-related knowledge based on how the knowledge is obtained, what it is used for, and what its effects are on the person. Intellectual knowledge derives from scientific and theoretical approaches that try to quantify facts and describe them. The main aim is to strive for certainty, regularity, and predictability in order to estimate and plan future events. Intellectual knowledge is often detached from personal involvement, because daily events need to be abstracted in order to discover a specific phenomenon behind them. Such knowledge can be acquired through books or listening to lectures. In contrast, gathering wisdom-related knowledge requires personal involvement. The aim is to obtain a deeper understanding of phenomena and to discover the significance of events. This type of knowledge is broad and integrated. It requires an openness to all types of experiences, including negative ones. Wisdom-related knowledge helps one to deal with the unexpected and the unknown. Instead of wondering *how to do* things, wisdom-related knowledge helps one to decide *whether you should do* things.

3 The difference between wise and smart products: product properties, interactions, user impact, and connectedness

Early definitions of smart products included descriptors as *electronic, high-tech, or intelligent* [6, 7]. Rijdsdijk and Hultink [8] defined smart/intelligent products as products containing information technology in the form of micro-chips, software and sensors that are able to collect, process, and produce information. The smartness of the early smart products served mainly a utilitarian function: through user input or data collection and with limited capacity of data interpretation, smart products served a specific need, which was to complement human mental and physical faculties in order to make humans smart and efficient

[9]. Smartness was initially considered as an added attribute to the existing product categories. For example, an autonomous lawnmower differed from a regular lawnmower, because it had the ability to function independently of the user. However, with the advancement of technology, smart products became a separate product category with complex IT systems and embedded multifunctionality, in order to support users with complex mental tasks (e.g., smartphones, navigation devices, PDAs).

In the current decade with high connectivity (Wi-Fi, Bluetooth, GPS, Internet of Things) and easy data collection through mobile devices and wearable technology, products may acquire additional roles, for instance to monitor and provide feedback on people's physical, mental, and social health (e.g., Nike+, Fitbit, AIRO). If this development continues, products may start to take over the role of fitness coaches and mental coaches, having a direct impact on the user's subjective well-being. Because people have become accustomed to sharing parts of their lives through social media and more wearable technologies become available, more data on everyday life patterns become available and can be used to understand and support people at society, group, or individual level.

So, at what point does a smart system become wise? Wisdom and smartness both operate on the basis of knowledge systems. According to Baltes and Staudinger [4], smartness and wisdom both rely on rich factual knowledge. But in addition to that, wisdom makes use of rich knowledge of procedures and regulations, it evaluates situations in the context of everyday life experiences in the past and the present, and it can predict consequences for the future. Furthermore, wisdom takes into account the relativity of values and life priorities, and it recognizes and is able to handle uncertainty. So, whereas smartness relies heavily on intellectual knowledge, wisdom relies on the accumulation of many everyday life experiences and includes personal reflection on emotional events [1, 5]. So, if we look again at the six dimensions that Rijdsdijk et al. [10] identified for smart products, it seems that some of these dimensions might already suggest a wise product, depending on how exactly the product operates. The dimensions of autonomy and the ability to learn both apply to smart and wise products. If the

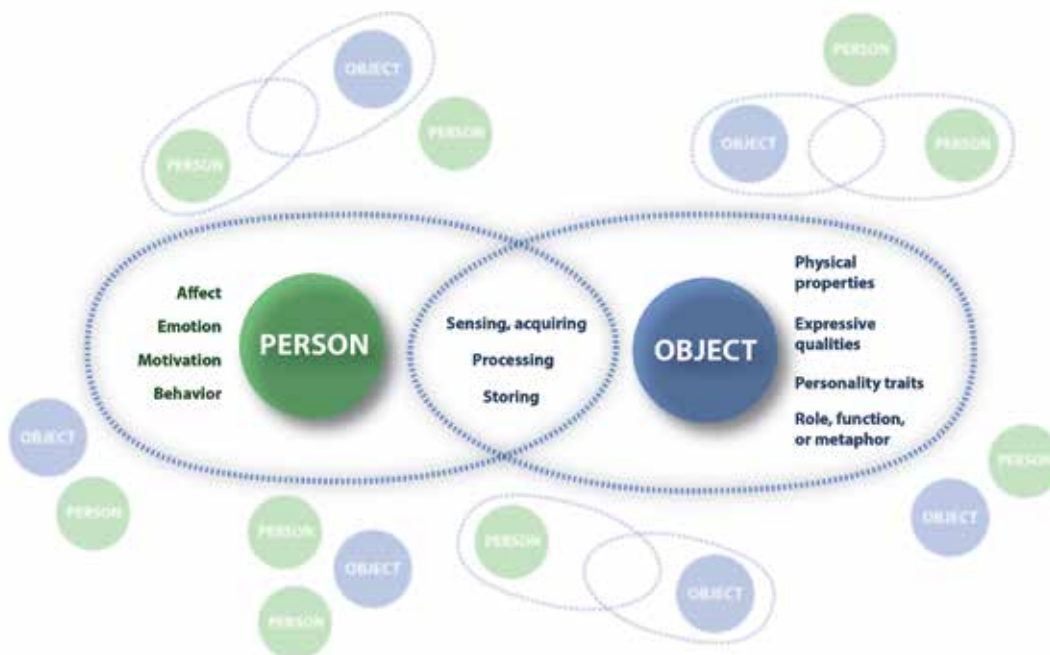
ability to cooperate with other products is used to gather basic behavioural data, the product is smart, but if the data come from multiple sources and give in-depth insight in a person's life, then the product may act wisely. Similarly, the dimensions of reactivity probably refers to basic stimulus-response patterns that applies to smart products, but if the interaction becomes more human-like and the product exhibits a specific personality, this opens up possibilities for more complex and sophisticated types of product behaviour. Wisdom has a large impact on the style of interacting with the product. Wise products foster more subtle, intimate and empathic connections with the technologies surrounding us. Technically, interactive screens could be replaced by smart materials with which users can interact in a multisensory way, in order to enhance the intuitiveness of interactions. As wisdom enables a natural integration of technology in people's lives, it also promotes more meaningful interactions with products. Instead of taking over control or producing an increasing number of notifications and alerts, a wise product should really connect to its user, hence fostering a feeling of well-being. Possibly, a wise system can grow with a person, so that after some time it knows best what is good for them. Instead of having a fixed expert system, the product could make use of

new developments in machine learning that facilitate long-term learning.

Also, wise objects are perceived as empathic, they know what questions to ask and they have the technology to get the information they need. In addition, they should know how to communicate a certain message. They are aware of the situational context in which they operate: The physical environment, but also a person's emotional and mental state and history, his routine daily practices, any sudden events that may have occurred and the feelings that may have caused. Wise objects can foresee the consequences of their actions, they know when (not) to say things, and they know what is the best way to deliver a message. Based on the situational data, a user may be assigned to a certain profile, which activates a specific interaction pattern according to which the product can respond. The interaction patterns may involve various expressions of personalities: Sometimes the product may act annoying, sometimes it can be very loving and caring, if that is necessary.

In order to describe the characteristics and effects of smart and wise products, we use the general framework in Figure 1 that distinguishes between different types of aspects in the person-object interaction. First of

Fig. 1. Conceptual framework of user-product interactions for smart and wise products.



all, if we look at the properties of objects, we can describe physical properties (e.g., material, instrumental properties), expressive qualities (e.g., looking sincere or moving calmly), the personality traits conveyed by the product (e.g., confidence, patience or maturity), and the roles it gets in people's lives (e.g., taking care) with the corresponding metaphors (e.g., it acts like a father). The properties we distinguish for the object may either be due to the characteristics of the static object or they may be perceived during dynamic interactions with the object. Therefore, we see them here as resulting from either the object itself or the object's behaviour during manipulation.

Second, smart and wise products need to gather information. Therefore, they need to sense their environment and acquire data, they need to process this information, and store the information for future use, just like users do. Third, the product has a certain effect on the person who interacts with it. After sensing and processing the product's behaviour during the interaction, the person may experience some affect (i.e., feel good or bad), may experience emotions (e.g., feel happy, surprised, relaxed), may become motivated to act, and may engage in specific actions.

4 The characteristics of wise products according to design students

To explore the new concept of wise products and to obtain a better understanding of people's preliminary conceptions of what wise product could be like, we conducted two studies with industrial design students at master level at Delft University of Technology. The first study investigated possible conceptual frameworks for wise products in order to determine such products' roles and functions in users' daily lives. The second study explored the physical and, to a certain extent, interactive properties of wise products. Both studies were exploratory in nature and their results were merely inspirational for the conceptualization of wise products.

In the *first study*, 15 industrial design students were asked to write an essay on how they envisioned the concept of wise products as opposed to smart products. Students first explored the definition of wisdom and then reflected on the discovered properties of wisdom-related knowledge and experiences and their fit to future product concepts.

In the *second study*, 61 industrial design students were asked to analyse the personality of a daily product of their own choice (e.g., sportive watches, professional bikes) and the physical and interactive properties that facilitated meaning attribution to this trait. In addition, students redesigned their selected product so that its physical properties and personality traits represented wisdom (e.g., wise watch, wise bike). By transforming the existing personality traits and product properties into 'wise products', students were able to reflect on the essential features of wisdom. Students were free in expressing their ideas in any form they preferred (e.g., mindmaps, moodboards, sketches). The aim was to see the immediate response of designers to the conceptual development of wise products. Results of these studies are presented in the following paragraphs.

Study 1 – Conceptualization of wise products

The defined object properties in Figure 1 will be used to summarize students' conceptualizations of wise products. First of all, students described the wise products' *technical qualities* as containing big data sets of information about users (their habits, emotional tendencies, daily practices). Data collection occurs through monitoring user experiences of daily events (e.g., driving, running, making coffee) through sensing and IT technologies (e.g., activity sensors, accelerometers, voice activators). This data collection is needed for the wise product to understand the working principles of the user's daily life. The product becomes knowledgeable of the user's life in an idiosyncratic way. Such knowledge also allows the product to predict the user's next step and perhaps adjust or develop strategies to support them better. Furthermore, data collection through observation not only uncovers daily practices but also emotional experiences or expressions. Hence, the wise products' user awareness will be their distinguishable technological asset, even though the technological constructions of wise products are essentially based on smart products.

The *expressive qualities* of wise products mostly involve empathy, humility, and sometimes sympathy. All these qualities imply a strong emotional content, especially in comparison to smart product qualities. Students indicate that it is essential for wise products to understand and predict user emotions, and to help users cope with them. This enables users to take

important decisions without being adversely affected by their momentary emotions. Thus, assisting emotion regulation comes across as one of the fundamental functionalities of wise products. Furthermore, humility was said to encourage a dialogue between the wise product and the user. Because humans are social creatures who tend to deal with daily struggles by sharing them and by reflecting on them, a humble and empathic product supports such a dialogue and encourages users to build a relationship with it.

Consequently, the *personality traits* of wise products were suggested as being fatherly, caring, kind, concerned, communicative, humble, moral, comforting, assuring, and altruistic. These personality traits also facilitate the *function and role* of wise products as supporting users in their lives in order to incentivize a better quality of life. Other supportive roles were described as encouraging, motivating, and empowering. Wise products were suggested to be present and active in users' lives when experiencing difficulties. Such difficulties could range from maintaining a physically active life style (e.g., finding motivation to exercise, keeping a balanced diet, being able to wake up early) to dealing with mental problems (e.g., miscommunication among partners, being stressed out) and even with life changing events (e.g., recovering from cancer). These important life events can often be characterized by the elicitation of intense emotional reactions (e.g., feeling overexcited or sad) or of mixed emotions (e.g., feeling happy and guilty simultaneously due to conflicts encountered). In such situations, people need to find a good balance between rationality and emotionality. The *functions* of wise products are defined based on two behavioural tendencies in difficult situations. First, people find it hard to recognize their bodily feelings and sensations, and lose contact with their intuition. Second, people find it difficult to foresee the consequences of their actions. Initial ideas for wise product functionality include evoking self-awareness on mental, physical, and emotional levels and facilitating reflective processes in order to reappraise an emotionally charged situation.

The effect of wise products on the user is proposed to be mainly for the long-term. It involves training users and making them gain new and healthy habits that support subjective well-being. Consequently, users are motivated to satisfy their intrinsic needs and

reach intrinsic goals (e.g., valuing friendship, gaining self-confidence) rather than extrinsic ones (e.g., earning more money, winning a prize). As a result of their interactions and experiences with wise products, people can have an increased feeling of self-awareness, a broader perspective on the events surrounding them, become more sensitive to their and others' feelings and emotions, and attribute new meanings to daily events. Nonetheless, when wise products are still learning about the user, also some short-term reactions may be expected. After all, wise products are described as products that aim to interact with the user. During their interaction with the user, wise products will need to draw the user's attention to a message they want to deliver or ask for reactions in return by creating short-term effects.

Students also explored product ideas while investigating the concept of wise products. One of these ideas tackled the experience of being stressed while driving. In this idea, the car's steering wheel is embedded with sensors to measure the driver's stress level, it is connected to his agenda and other communication applications, and the car knows his daily driving routine. If the driver is too stressed, the car blocks all notifications and incoming calls, allowing a more relaxed driving experience by prioritizing safety. Another idea tackled obesity. This student designed plates that change colour according to the caloric content of the food on it. The aim is to trigger the user to reflect on healthy eating habits. Another student designed an app for cancer patients to manage their lives mindfully during recovery. Apparently, cancer patients feel vulnerable after leaving hospital, because they no longer have daily access to medical and expert support. This app provides tips to feel confident about their recovery, embedded in an interface that supports realism, compassion, and altruism. All these design ideas tackle a critical situation where a little wisdom is welcome.

Study 2 – Physical properties and personality traits of wise products

But how will people perceive that an object is wise and that they can trust that it has the best intentions? Students' strategies for embodying ideas for wise products often involved a metaphor and mapping the properties of the metaphor onto the product. The *metaphors* found apt for wisdom included 'mother, father, grandmother, coach, Yoda (from Star Wars),

Einstein, Buddha, God, and the universe'. The majority of these metaphors involve human characters that serve as role models or that have a positive influence on one's life. In relation to the metaphors, students described the personality traits for wise products as 'patient, dedicated, understanding, serene, divine, elegant, subtle, cautious, caring, altruistic, appropriate, having manners, accurate, sensible, clever, sharp-sighted, trustworthy, feminine, well-informed, knowledgeable, sophisticated, able to foresee things, and reflective'. The *expressive qualities* of wise products included 'calm, quiet, subtle, mature, detached, serious, balanced, and regular'. As expected, these personality traits and expressive qualities imply a virtuous person who values the future consequences of their actions as well as an intelligent person who is aware of his/her past and current surroundings. In addition, many of the metaphors and one of the personality traits indicate a feminine characteristic for wise products.

Furthermore, students described the *physical properties* of wise products in detail. The *form* of wise products are 'well-balanced, stable, heavy at the bottom, present, upward, round, non-geometrical (as in organic), and centred'. The *material composition* of wise products refers mostly to natural materials that can age over time or show the effects of aging such as 'wood with wrinkles, dark wood with nerves, metal, leather, and marble'. The *texture* could be 'worn, seasoned, and not smooth'. *Colour* combinations include darker shades of warm and natural colours 'brown, red, pink, violet, beige', and also pure and full colours such as 'black and white'. Students also mentioned the altered *functionality* when they redesigned their existing products to have a wise character. The new functionalities included 'analysing user behaviour', 'observing mood', 'suggesting / offering advice', 'watching out for danger', 'reflective', and 'enabling discoveries'. On an *operational level*, the wise product should be 'quiet, efficient, focused, direct, easy, moving by itself, multi-layered, changing over time, growing up, and logical'.

Table 1. Basic differences between smart and wise products.

		Smart	Wise	Wise interaction characteristics
Why	Design intention	Striving for a predefined optimum	Setting the stage for reflection and action	Feels open, curious, and supportive
Who	Personality characteristics	Monitoring, controlling, judging	Authentic and supporting	Feels trustworthy since awareness is shared and negotiated. Product is perceived as making suggestions rather than demanding.
How	Interaction	Rigid / digital	Fluid / flexible, subtle	Feels like the product embodiment and materiality is authentically connected to its behaviour
	Role	Assistant	Coach	Has an adaptive attitude in order to induce awareness and reflective user behaviour
What	Presence	Ubiquitous / obtrusive	Occasional and timely	Tactfully tackles sensitive and critical situations
When and where	Connectedness	Predefined individual knowledge	Wisdom of the crowd	Perceived as knowing more general knowledge
	Development	Fixed knowledge base	Evolving system architecture	Perceived as naturally developing connection

5 Implications for design

Now let us see how the distinction between smart and wise products affects the design process and the way in which people will interact with the products. In Table 1 we make a distinction between different aspects of the product design, according to the six basic questions why, who, how, what, when, and where?

The *why* defines the reasons for existence of the product design. Typically, smart products strive to achieve some predefined optimum state, from which designers can deduce settings for preferences or behavioural markers. In contrast, wise designs will set a stage for reflection and action, in order to strive for the user's long-term well-being. They are designed with open-endedness in mind.

The *who* in this case refers to the characteristics of the product personality. Wise products do not just monitor us (Big Brother), but acknowledge our presence and allow us to disclose ourselves through negotiation (as in two-way communication). Although wise products assess our behaviour, they do not judge or condemn us. Instead, a constructive dialogue between the user and the wise product evokes a more trustworthy and sincere interaction. Within such a dialogue the wise product takes on a suggestive role rather than a demanding one as in smart products.

The *how* refers to the way in which the product interacts with the user. In smart products, communication may rely on an algorithm with a rigid digital format with specified material interactions. Wise products, however, use more subtle ways of communicating. They evaluate the circumstances first and reflect on the actions that need to be taken. The outcome of this decision process may give rise to varying expressions and behaviours: they can tease us, ignore us or confront us. The wise product selects the type of behaviour that is most likely to promote desirable changes in user behaviour. These behaviour changes include evoking awareness of oneself or inducing a reflective process.

The *what* refers to the physical properties of the objects. Although the physical properties may not differ that much between smart and wise products, we may experience a difference in perceived presence:

smart products have a ubiquitous presence in our lives and present themselves rather obtrusively in daily situations. The presence of wise products, however, is only noticeable when the situation is critical and asks for sensitivity, for example, when people undergo difficulties or cannot cope with emotional stress.

The *when and where* refer to the context in which the product and its user operate, and the way in which they are connected to other objects and people. Smart products know more than us, because they have more sensors and data, and they try to optimize their behaviour pattern over time. However, wise products go a step further: Wise products have awareness of the context in which they operate: they know the history, they know the trends, but they are also aware of momentarily relevant events, so that they can respond to how a user is likely to feel at that moment. Because a wise system accumulates knowledge over time, the products evolve and grow with users.

6 Conclusions and future directions

Although smart and wise products have much in common in terms of constructive elements, they differ in the way they interact with users and the resulting effect on behaviour change. Wise products are particularly suitable in situations where users' well-being is at stake, which requires changes in behaviours and attitudes. Designing wise products requires an understanding of complex situated experiences and rituals, and their embedding in social practises [11, 12]. In addition, it requires knowledge on how design features connect to character and personality [13] and how subtlety in interaction can enrich the action repertoire by its sound, materiality and product behaviour [14]. We expect that insights obtained in the field of persuasive technology will be extremely useful in this respect [15].

Currently, we investigate this new design paradigm by reflecting on the design process, design outcomes and design skills. For wise products to become a viable future option, there is much to be learned from psychology, sociology, ICT, and interaction design. Furthermore, there are many critical issues to be tackled regarding privacy and ethics, because of the way in which wisdom is created through connected objects that observe human practices and seek for behavioural patterns [16].

As a next step, we will conduct embodied explorations to define the behavioural, expressive and interactive qualities of wise products and look for action-reaction coupling, context dependency and complex system behaviour. We will also study benefits of wisdom in daily circumstances by observing behaviour change in users with prototypes specially built to act wise. These studies will utilize and assess the knowledge in Table 1. To conclude, we are positive about the potential effects that wise products can have on user's well-being and their role in society. Interacting with wise people generally induces wisdom for a person. Hence, we think that interacting with wise products will also be beneficial, because it makes people wiser. And if people will act wiser, society is likely to benefit, which makes the world a bit more beautiful.

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