THE VALUE OF DESIGN RESEARCH

11TH EUROPEAN ACADEMY OF DESIGN CONFERENCE

APRIL 22-24 2015

PARIS DESCARTES UNIVERSITY
INSTITUTE OF PSYCHOLOGY

BOULOGNE BILLANCOURT
FRANCE

CONFERENCE ORGANIZERS:

PARIS DESCARTES UNIVERSITY
PARIS SORBONNE UNIVERSITY
PARIS COLLEGE OF ART
ISTEC PARIS

FOSTERING SUSTAINABLE USER BEHAVIOUR: EXPLORING MEANING AND ITS CREATION IN PRODUCTS AND SERVICES

Gregor Waltersdorfer University of Luxembourg gregor.waltersdorfer@uni.lu

Kilian Gericke University of Luxembourg kilian.gericke@uni.lu

Lucienne Blessing University of Luxembourg lucienne.blessing@uni.lu

ABSTRACT

This paper is integrated in our research project on fostering sustainable user behaviour by designing meaning. It explores different types of meaning in products and services, and their creation. For that, the results of a literature study are integrated into an initial taxonomy of meaning and an initial framework for creating meaning. From the taxonomy we derive four roles that products and services can play in meaning making. Additionally we discuss how five possible interventions in users meaning making for behavioural change can be pursued by design on the basis of the framework. We illustrate the role of designers in creating meaning with examples, touch on its potential for behavioural change of users and outline further research needs.

Keywords: making meaning, creating meaning, taxonomy, framework

1 INTRODUCTION

Products influence human behaviour: their purpose is to realise a specific process that fulfils a particular (set of) need(s). Over the last decennia, the needs of society concerning sustainability have led to products that are environmentally-friendly, and/or aim at environmentally-friendly user behaviour. Unfortunately, despite the best attempts of designers, many products are not used as intended, i.e. do not influence user behaviour as foreseen, and hence, products aimed at sustainability do not contribute as much as they could, if at all.

In her paper "design's role in sustainable consumption" Thorpe (2010) draws on sociology to put forward the idea that, in order to influence the consumption of goods and user behaviour, design can help by creating *meaning* for users. Hassenzahl et al. (2010) also focus on meaning as one of 10 "universal psychological needs" and they emphasise that products that have meaning for the user can lead to positive experiences.

The goal of our research is therefore to support designers exploiting the role of meaning in products and services to foster sustainable consumer and user behaviour. For example, a fuel-efficient hybrid vehicle can be a meaningful purchase, if it fits the user's worldview. By that the user may feel attached to the car and may handle it with extra care. The vehicle can be used for self-expression and by that be meaningful in a further way. This may influence others' behaviour in order to belong to a social group.

As a first step, we developed an initial Meaning-Behaviour Model based on insights from psychology, sociology, and consumer research. Details can be found in Waltersdorfer et al. (2015). The model shows how consumers, as

buyers and users, "make meaning" and how this meaning influences their behaviour. The model was used to derive five possible ways for designers to intervene in this "meaning making" process through a process of "meaning creation". Meaning creation in this context involves the development of products and services in such a way that the intended meaning is correctly understood by the consumer and users and a lasting change of their behaviour is encouraged. The processes of meaning creating and making are based on Kazmierczak's (2003) distinction between intended, constructed, received and reconstructed meanings. When the two processes are aligned, the four meanings should be very similar, if not the same.

In this paper we focus on two underexplored areas: the types of meaning resulting from the user's meaning making process; and the product properties and characteristics that can be used by designers to create meaning. Here, we prefer the term user over consumer to emphasise the interaction between product and user for meaning making.

Based on our current understanding of the meaning making process, we propose an initial taxonomy of meanings in products and services (Section 2). This taxonomy is part of a proposed initial framework for creating meaning that links the five identified design interventions to features of products and services (Section 3). The taxonomy and framework integrate several research areas, including semiotics, design semiotics and product semantics, as well as product and service design. In our view, design semantics and design semiotics provide useful complementary rather than contradictory perspectives, despite the ongoing dispute between scholars of these areas, such as Krippendorff (2006) and Vihma (2007).

Finally, in Section 4 our contribution, the limitations and implications of the taxonomy and framework are discussed.

2 MEANINGS OF PRODUCTS AND SERVICES

Before introducing our taxonomy of meaning, we define key terms in the field of meaning and discuss existing approaches to classify meaning.

2.1 DEFINITIONS

Meaning can be defined as "a mental representation of possible relationships among things […]" (Park 2010 referring to Baumeister 1991). These relationships can be found in other notions of meaning, such as: implications, relating something to objective facts (Anderson 1933); symbolic association (Crilly et al. 2004), connecting things mentally; significance, relating to the worth of an event for one's life; and comprehensibility, relating to one's view of the world (Davis et al. 1998). Meaning is "often multidimensional, subtle, concealed, multisensory, dynamic, and contingent on sociocultural and personal contexts" (Mick et al. 2004).

According to Anderson (1933), an "**inequality of interest**" exists between two entities that are related through meaning. The less interesting entity is the symbol; the more interesting entity being symbolised. For example a ring on a person's left hand is a symbol for being married: the marriage is more important than the ring and the hand. This "inequality of interest" creates a tension, which differentiates meaning from context (Anderson 1933).

"**Context** is the frame of mind invoked to characterise an entity" (Shahare & Gurumoorthy 2007). In some simple models of communication, context is only used to explain misunderstanding or ambiguity (Doyle 2007). But, as Doyle further argues, there are no context-free meanings, because of "human presence as an integral part of the context".

Signs can contribute to investigating meanings. A sign is "something which stands to somebody for something in some respect or capacity" (Sowa 2000 citing Peirce). Semiotics, the study of signs, can be divided into: "syntax", the study of relations between signs; "semantics", the study of the relations between signs and objects; and "pragmatics", the study of relations between signs and sign-using agents (Sowa 2000).

Meaning making can be understood as decoding signs and described as a two-step process: denotation (determining the definitional meaning) and connotation (determining the "cultural, ideological, and personal implications") or identification and interpretation (Puntoni et al. 2010). This process uses schemata, i.e. "relationships between implicit and explicit propositions that are abstracted from our experiences" (Proulx & Inzlicht 2012), and can require both cognitive and emotional processing of information (Park 2010). According to Proulx & Inzlicht (2012) meaning answers "what is going on" and "why it should be so", and can therefore provide understanding and purpose of an experience.

In summary, meaning involves relationships between things, is context-dependent, and can be investigated through studying signs, which also helps to explain meaning making. In the following section, we discuss how different meanings in products and services can be classified.

2.2 EXISTING CLASSIFICATIONS OF MEANINGS IN PRODUCTS AND SERVICES

Consumer research has a long tradition of investigating product meaning. Allen & Ng (1999) distinguish between utilitarian, or functional (Ligas 2000), and symbolic meanings. **Utilitarian meanings** "are those aspects of the product that allow users to control their environment and focus on the product in-use". In contrast, **symbolic meaning** "is a potent vehicle for self-expression", as it "refers to the personal and social characteristics of the product user".

Fournier (1991) proposes a "meaning-based framework of consumer-object relations" in which she uses a similar distinction as Allen & Ng when describing the basis of meaning as either objective, tangible, and verifiable through senses, or subjective, dependent on associations and interpreted through experiences. She complements this distinction of tangibility by the dimensions of "commonality" (shared or individualised character of meaning), and "emotionality" (the intensity of emotional response). Friedmann & Lessig (1986) add the dimensions "salience" and "context". "Salience is a measure of the relative importance of components". As one of few, the authors acknowledge the role of context in meaning making, and distinguish between three context variables: individual, social and situational.

Design literature also shows a diversity of product meaning classifications. Battarbee & Mattelmäki (2002) propose three categories of meaningful products: "meaningful tool" as a facilitator to satisfy needs but also to express oneself; "meaningful association" referring to something outside the product, such as identity, style, taste, kink to memory, emotion, story; and "living object", specified by an emotional bond, which makes the product a companion with personality, soul and character.

Krippendorff's (1989; 2006) four "theories of meaning" describe product meaning in different contexts: in operation (during use), in language (becoming part of communication), in the life cycle of things (moving from one phase of the life cycle to another), and in the ecology of things (interacting and forming species of things).

Mick et al. (2004) reviewed literature on semiotics in consumer research and product design. They conclude that current design research occasionally remains in "cryptic descriptions and applications of new conceptual terms for describing the nature of signs" as well as in the development of lexicographic and taxonomic knowledge, and that knowledge about "product design beyond functionality, including meaning and its consumer implications" is lacking.

Overall, many classifications of product meanings exist. Some only distinguish few types of meaning, but provide details of their characteristics; others take a broader view, but remain abstract. Interestingly, only few include the meaning of services. Our aim is to develop a new taxonomy of meaning, covering products and services, by integrating several scholars.

2.3 TAXONOMY OF MEANINGS

For developing the taxonomy, we start from a general model, which links several key terms. We call the model "**meaning space**" (see Figure 1). This space is explored to build our taxonomy of meaning, using semiotics as a theoretical basis.

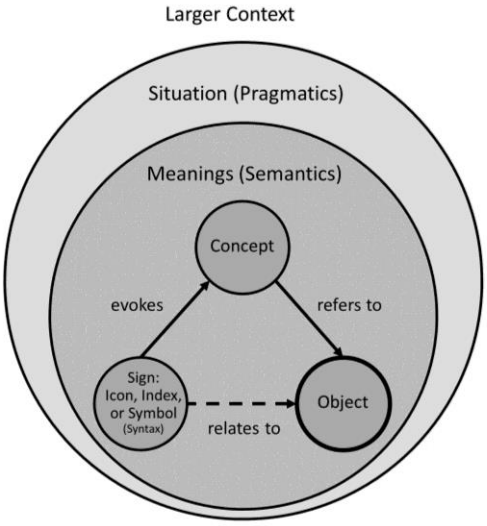

Figure 1: Meaning space

The core of this meaning space is Sowa's (2000) "**meaning triangle**", which originated from Peirce, relating the entities signs and objects through concepts.

Following Peirce, Sowa distinguishes **three types of signs** – icons, indices, and symbols – which differ in their relation to the object. Icons have "some structural similarity" to the objects they stand for, indices are causally related to their objects, and symbols are related to objects through conventions, i.e. this relation has to be learnt.

Although related, Sowa (2000) emphasises that signs and objects cannot be linked directly. Instead, signs evoke concepts in the mind of the agent, which in turn refer to objects. **Concepts** can be defined as tools for persons "to categorize and draw inferences about objects in the world" (Weiskopf 2008). They contribute to meaning by allowing inferences on possible relationships, and can therefore be considered as mediators between signs and objects (Sowa 2000). The concept considers some respects of the sign and of the object and the relevant schemata of the agent for meaning making in a given situation (Section 2.1). Other than the first step of meaning making (denotation), the second step, connotation, depends on the particular situation. The situation is the relevant part of a larger context and includes the "immediate circumstances" of meaning making. This specification of context follows the distinction of "proximal" and "distal context" by Puntoni et al. (2010).

Considering the whole meaning space, products can play **four different roles** in meaning making: as object, sign, part of a concept, or part of a situation. For example, a car (sign) may evoke symbolic meaning through the concept of ownership, which refers to the user (object). Achieving a user's goal of mounting (sign) a hook on a wall with a screw (situation) may evoke the concept of function, which refers to the product screw driver (object). Through the concept the object implies being useful. Following Anderson (1933), in the first example the user (the symbolised) is more interesting than the product (the sign). In the second example it is the opposite: the product is of more interest than the user. The product can also be part of the concept as mediator. For instance, the "Arc de Triomphe de l'Étoile" in Paris implies the honours (meaning) of fallen soldiers (object) in the Revolutionary and Napoleonic wars (sign), by representing a concept, which in turn can be described as a meaning triangle: in the Roman Empire, arches (sign) symbolised triumph (object), through proving construction skills (concept). In its fourth role, products are part of a situation and facilitate meaning making. For example, the event of watching (indexed sign) a movie (object) with a projector instead on a screen (situation) may evoke increased sensation (concept) and therefore the event may be significant.

We assume that services can play the same four roles in meaning making as products. For example, the service car sharing (sign) may evoke the concept of permanent available mobility to its user (object), who therefore infers being empowered by that service. Similar to products, the function (concept) of a service (object) can be evoked by the service's ability to fulfil a specific task (sign) and therefore the function may imply usefulness.

Our recent literature review (Waltersdorfer et al. 2015) showed that meaning can be the relationship among a variety of entities. Based on the meaning triangle, those entities can be either signs or objects. We group these entities into four categories: "**what**" (the product or service, or a part or quality of them, other things such as ideas, events, or experiences, and anything beyond those); "**who**" (the user and his/her selves, other people such as stakeholders, and anything beyond); "**when**" (the past, present, future); and "**where**" (spaces, places).

These relationships among categories result in the **taxonomy of meaning** as shown in Table 1. Each cell of the table indicates the possible meaning(s) as relation(s) of a sign (row) to an object (column), mediated through concept(s). We exemplarily filled some cells with the examples from above and additional ones.

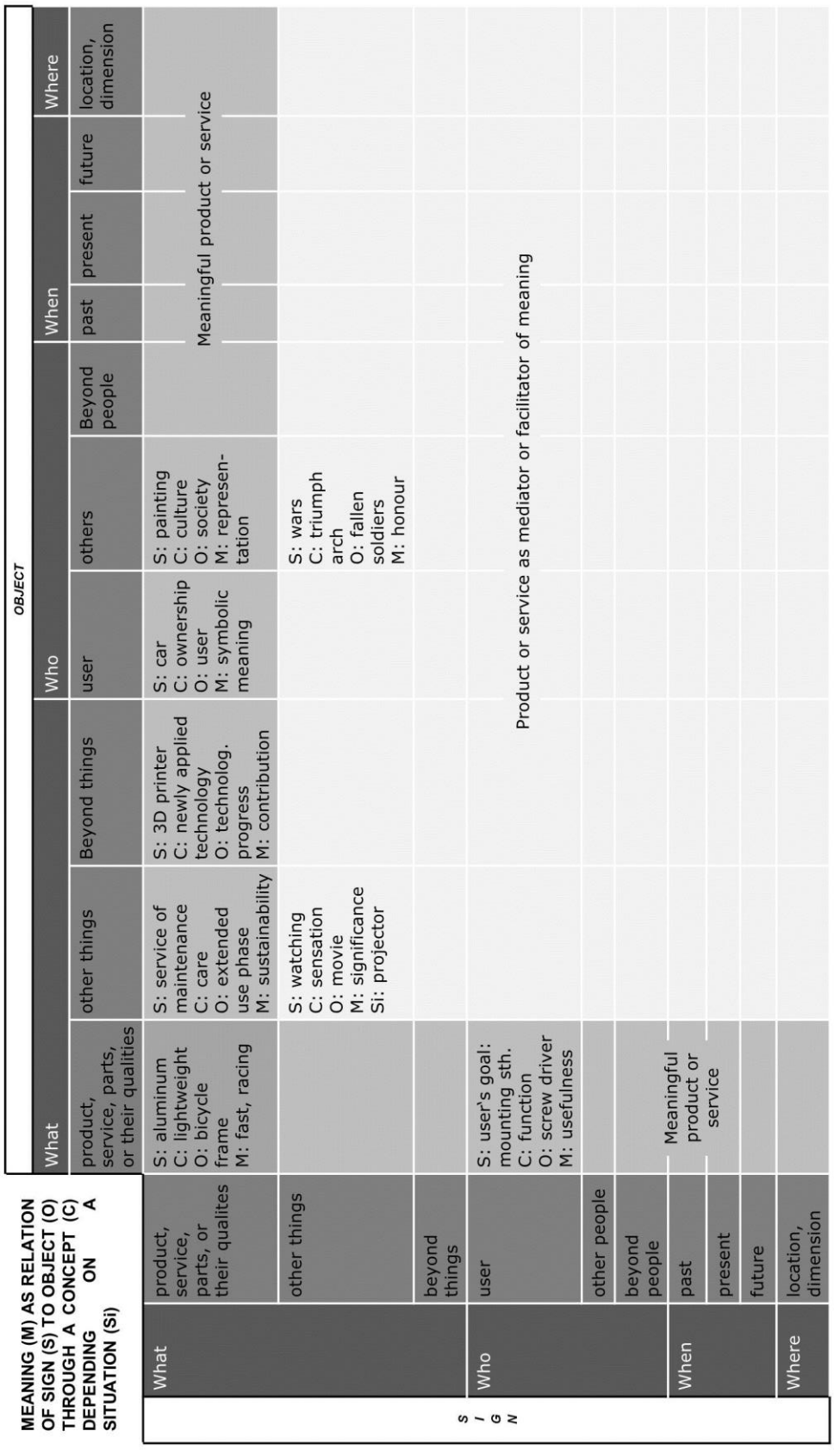

Table 1: Taxonomy of meaning

People may reconstruct several meanings of a product or service, based on different situations, but may find one meaning more significant than other meanings.

In the taxonomy of meaning, the four roles of products and services can be identified: as sign or object, resulting in meaningful products or services (first row and column in Table 1), and as part of a concept or situation, acting as a mediator or facilitator of meaning (light area). Products and services can also relate to (parts of) themselves (dark cell in Table 1). The roles of products and services and the categories ("what", "who", "when", and "where") should help the designers in understanding which relations users can build during meaning making. Through the taxonomy we can distinguish two types of symbolic meanings: in its narrow sense products and services with symbolic meaning only act as representation to other people (see Section 2.2); in the broad sense, symbolic meaning encompasses all meanings that involve symbols as one of three types of sign.

In order to investigate the creation of meaning, a closer look on the meaning space is needed. We know from the definition of signs that they stand for something in some respect (Section 2.1). This "respect" is elaborated to highlight the link between sign and concept, which allows inferences about the object. Thus, this quest for "respect" leads to the syntax of signs, also known in semiotics as their qualities (Vihma 2009). In engineering, these qualities are called properties and characteristics. **Characteristics** are product or service attributes designers can directly determine, e.g. material and dimensions. **Properties** are attributes that follow from the characteristics, given a particular context. Examples are weight, and performance (Andreasen 1994). These qualities help us in describing the link between signs and concepts. Moreover these qualities should help in specifying the five interventions for fostering behavioural change through meaning as derived from our initial Meaning-Behaviour Model (Waltersdorfer et al. 2015). The elaboration of these qualities will be addressed in the next section.

3 **CREATING MEANING BY DESIGN**

It is in the power of the user to reconstruct the intended meaning of the designed system (Vyas & van der Veer 2006). Therefore it is key to anticipate the reconstructed meaning when creating meaning by design, taking into accounts the contexts and the users.

In this section we discuss existing approaches to designing meaning. They do not necessarily describe a design process, but focus on what needs to be addressed by designers and what they can influence.

Marketing and branding also play an important role in creating meaning (Mick et al. 2004). These areas fall outside the scope of this research paper, since we explore the levers of designers for creating meaning.

3.1 EXISTING APPROACHES FOR CREATING MEANING BY DESIGN

In the field of product semantics, Krippendorff & Butter (2007) reject ontologies for the conceptualisation of meaning by design. They stay on a general level when they develop support (e.g. proposing the use of metaphors, or reframing) for practitioners. This limits the practical contribution of their research. Even though Krippendorff (2006) highlights the link between meaning and action

several times, it remains unclear how meaning can influence behaviour and where designers should start.

Helfenstein (2012) describes variables influencing product meaning: qualities of products and services, such as features and utility, image, look, scarcity; the context and purpose of use (for example, task setting and degrees of freedom); and the characteristics of individuals involved, which subsume gender, age, personality, self-concept, needs, beliefs, values, and memories. Helfenstein's specification of product meaning is close to our meaning space, but is used for investigating consumer choices, rather than the creation of product meaning by design.

Applying semiotics to design, major contributions come from Vihma (1995), cited by Mick et al. (2004). She explores the qualities (properties and characteristics) of the three different types of signs (icon, index, and symbol) and relates them to potential meanings. For instance, iconic qualities can encompass colour, materials and analogy and may for example be used to evoke a mental representation of white for clean products, or glassy look for fragility. Indexical qualities can include sounds and lights signals, which can for example indicate the status of a product. Examples for symbolic qualities are logos and other graphics. Vihma further argues that product designs are a combination of signs of different types, which may evoke several meanings. Vihma's research highlights that product qualities may serve as an entity for creating meaning and that the different types of signs help to structure them.

Schifferstein & Zwartkruis-Pelgrim (2008) propose four categories of possible determinants of product attachment / product meaning: "enjoyment, individual autonomy, group affiliation, life version". Desmet & Hekkert (2007) discuss meaning as one part of product experience. Referring to Savas (2003), they specify that profound meaning can be achieved by evoking feelings, such as for confidence, independence, relaxation, achievement, security, friendship, and control. Both references provide suggestions for designers on how they can achieve product attachment.

According to Mick et al. (2004), there is only little knowledge on the effects of design choices on users' meanings, such as status, ecology (e.g. morals, fears), and memory. They add that further semiotic research is required to address the growing designers' responsibilities of "reconstituting sign-concept relations and consumer's identities".

In summary, abstract suggestions for creating meaning in products and services exist. Meanings are rarely boiled down to product attributes, not to mention services.

3.2 A FRAMEWORK FOR CREATING MEANING BY DESIGN

In the following we discuss an initial **framework for creating meaning** (Table 2). This framework only focuses on the role of products and services as signs (see Table 1), since signs have a high influence on meaning through their qualities. Similar frameworks need to be developed for exploring the creation of meaning through products and services as objects or as part of concepts and situations.

	SPECIFICATON	Aluminum (supplier)	Service of maintenance	3D printer	Car	Painting	Religious symbol	Antique	Any service	Investment service	Any product, service
SIGN	Example of Product, Service				WHO			WHEN			WHERE
OBJECT	Object's categories	WHAT									
		Product, service, part	Other things	Beyond things	User	Others	Beyond people	Past	Present	Future	Location, dimension
	Signs relate to objects:	Bicycle frame	Extended use phase	Technolog. progress	User	Society	Religion	Antique epoch	Its delivery	Increased value	Country of production
MEANING	Possible relationship	Fast, racing	sustainability	Contribution	Symbolic meaning	Representation	Representation	Represen-tation	Proof of Existence	Expectation	Reference
CONCEPT	Sign evokes concept as mediator	Light-weight	Care	New applied technology	Expressing the self through ownership	Culture	Worshipping, greater Power	Artistic style	Perishability of service	Return on investment	Origin, Uniqueness
PROPERTIES	Tangible		Operational properties, such as safety	Technological properties		Artistic cultural properties				Life cycle costs	
	Intangible							Time-dependent Aesthetic properties	Availability and reliability of service	Expected efficiency of operations	
CHARACTER-ISTICS	Product life phase system	Material, stiffness					Specific composition of religious symbols				
	Activity system		Repetition frequency			Cultural habits and activities	Directives how to handle the symbols				Distances to cover, location of delivery
	Actor network			Technical know-how	User's self: background, experience	Cultural background, knowledge					
INTER-VENTIONS			I, V	I, II	III, IV	IV	III	V	II	II	I, II

Table 2: Exemplary Framework for creating meaning by designing products and services as signs (Legend: I: New experience, II: appraised meaning, III: global meaning, IV: discrepancy, V: reviewing)

For developing the initial framework, we start from the taxonomy of meaning. Since we focus on products and services as signs, only the first row (called "meaningful product or service") of our taxonomy (Table 1) applies. We leave out the situations, as the part of context for meaning making, since we aim at outlining the basic structure instead of a complete framework. Further, we only fill the framework exemplarily. For better readability we change the order of concept, object and meaning, since concepts are central for our framework. The concepts link the results of meaning making (described in the taxonomy) with meaning creation, since concepts draw upon properties and characteristics (qualities) of signs, which the designers can influence. Therefore designers can only aim at a concept through these qualities of signs. It depends on the user, if the sign evokes the same concept in his/her mind.

The framework starts with examples of products and services that act as signs in the meaning space. They are followed by objects, to which they relate. Those objects are categorised by "what", "who", "when", and "where" as discussed in Section 2.3. Further the concepts determine the relation between signs and objects, by drawing upon properties and characteristics of signs, and implying meanings that relate to objects.

Following Allen et al. (2002), we divide properties into tangible and intangible properties. For characteristics we merge Tan's (2010) and Matzen's (2009) perspectives on product-service systems (PSS), since their conceptualisations of these systems can also describe pure products and services. Their perspectives on product-service systems include three domains: "product life phase system" are "all the technical systems surrounding the product and actor that enable the activity to happen" (Tan 2010); "activity system" includes both user and company activities; and "actor network" as humans "actively engaged in the business between a company and a customer" (Tan 2010).

For example, designers intend to evoke the concept of care by creating a service of maintenance (sign). The service should extend the use phase of the maintained product and imply sustainability. Therefore the designers can characterise the "activity system" of a service, such as defining processes and the frequency of service delivery. The user may identify the service as a sign for extending the use phase of the maintained product through forming the concept of care in his/her mind, e.g. instead of perceiving it as an extra burden, based on the characteristics and derived properties of the service.

In summary, within the framework of products and services as signs, the reconstruction of the designers' intended meaning by the users depends on several things: the abilities of the designers to anticipate and address those qualities of signs that evoke the "right" concept, which refers to the object and the intended relationship. The "right" concept is the one from which users can infer the intended meaning easiest with regard to their predispositions and a given situation. Therefore, designers additionally need to take the users predispositions into account and also consider the situation.

Finally, the **five interventions** for behavioural change through meaning, as developed in Waltersdorfer et al. (2015) can be discussed through the framework. The interventions include: I: creating a new experience; II:

targeting new appraised meaning; III: addressing global meaning[1]; IV: intentionally causing a discrepancy between appraised and global meaning; and V: reviewing past experiences. All interventions address meaning making in some way, which in turn influences behaviour through intrinsic motivation or forming an adaptive attitude.

With regard to the framework of products and services as signs, new experiences (I) may be the concepts that refer to novelties such as technological progress (object). Appraised meaning (II) may be addressed, when sign and object are related through factual concepts, such as return on investment. The intervention on the level of global meaning (III) may address the self-concept of the user or schemata that are strongly tied to a person's belief system, such as religious symbols. Provoking discrepancies (IV) in meaning making may deliberately question any kind of conventions, which determine socially shared symbols, such as culture or means of self-expression. The intervention of reviewing (V) emphasises the time dimension of experiences and therefore can address meanings that provide mental relationships to the past.

For example, in order to improve the waste management in institutions in terms of sustainability, designers may: change the locations of the waste baskets to provide a new experience (I); introduce compostable materials (signs) that refer to technical progress (object) (II); target the users' global meanings so that users consider themselves as environmental conscious persons (III); provoke by disturbing conventions, such as colour codes, for separating waste streams (IV); or engage the cleaning staff in reflecting with others on waste management processes (V).

4 DISCUSSION AND CONCLUSION

In this paper we developed an initial taxonomy of meanings, which is integrated into an initial framework for creating meaning by designers by combining literature from different areas. In order to create meaning, designers may start from anticipating the reconstruction of meaning by users. Therefore the framework may be used to explain both processes: meaning creating and making.

Through the taxonomy we discussed four different roles for products and services in meaning making (as sign, as object, or part of concept or situation). By that we expand the widely used notions of utilitarian and symbolic meaning of products and services (if they are signs or objects), since they can also act as mediators and facilitators in meaning making (as part of the concept or situation). For designers the taxonomy can also be a tool for analysing competitors.

The meaning creation framework highlights the importance of concepts that are shared by users and designers. The framework may look differently from designer to designer, but nevertheless can help to structure meaning and provide a basis for discussion when creating meaning. By elaborating the other frameworks of products and services as objects, and part of concepts and situations (only the framework of product as a sign is discussed), we envision

[1] Appraised meaning is the result of denotation (1st step of meaning making, see Section 2.1). Global meaning refers to the belief system, values and goals of the meaning making agent.

providing designers more guidance in creating meaning. This in turn, will probably allow designers to target and evoke the intended meaning effectively and intervene in the user's meaning making to foster behavioural change. Additionally we picture that the taxonomy and framework can help designers in aiming for a positive connotation of sustainability of their products and services, maximising the acceptance of required behavioural change, and making the sustainable behaviour stick through building close relations to the user's self or to social groups.

The taxonomy and framework can be considered when conducting studies on meaningfulness of products and services. We also assume that by exploring the meanings of services in research, we can provide designers an additional lever in fostering behavioural change. Both results can help in describing the cultural transition of products and services, how their roles change and even may predict their future roles.

Further research is needed to validate the initial meaning behaviour model, the taxonomy and the framework through empirical studies. Once validated, the taxonomy and the framework may help in focussing on a particular meaning, intervention and situation for meaning making, in order to develop tailored support for designers to create meaning, which is reconstructed accordingly.

Moreover, further research is needed on the interaction between people, such as customers and users, users and third persons or designers and marketers. This can give rise to the detection of shared symbols and concepts for creating and making meaning.

ACKNOWLEDGEMENT

The present project is supported by the National Research Fund, Luxembourg.

REFERENCES

Allen, M.W. & Ng, S.H., 1999. The direct and indirect in infuences of human values on product ownership. *Journal of Economic Psychology*, 20(1), pp.5–39.

Allen, M.W., Ng, S.H. & Wilson, M., 2002. A functional approach to instrumental and terminal values and the value-attitude-behaviour system of consumer choice. *European Journal of Marketing*, 36(1/2), pp.111–135.

Anderson, F., 1933. On the Nature of Meaning. *Journal of Philosophy*, 30(8), pp.212–218.

Andreasen, M.M., 1994. Modelling - the language of the designer. *Journal of Engineering Design*, 5(2).

Battarbee, K. & Mattelmäki, T., 2002. Meaningful Product Relationships. In *Proceedings of Design and Emotion Conference*. Loughborough.

Baumeister, R.F., 1991. *Meanings of Life*, New York: Guilford Press.

Crilly, N., Moultrie, J. & Clarkson, P.J., 2004. Seeing things: consumer response to the visual domain in product design. *Design Studies*, 25(6), pp.547–577.

Davis, C.G., Nolen-Hoeksema, S. & Larson, J., 1998. Making sense of loss and benefiting from the experience: two construals of meaning. *Journal of personality and social psychology*, 75(2), pp.561–74.

Desmet, P.M.A. & Hekkert, P., 2007. Framework of Product Experience. *International Journal of Design*, 1(1), pp.1–20.

Doyle, T.F., 2007. *The Role of Context in Meaning and Understanding*. Universitaet Potsdam.

Fournier, S., 1991. Meaning-Based Framework For the Study of Consumer-Object Relations. In R. H. Holman & M. R. Solomon, eds. *Advances in Consumer Research Volume 18*. Association for Consumer Research, pp. 736–742.

Friedmann, R. & Lessig, V.P., 1986. A Framework of Psychological Meaning of Products. In R. J. Lutz, ed. *Advances in Consumer Research Volume 13*. Association for Consumer Research, pp. 338–342.

Hassenzahl, M., Diefenbach, S. & Göritz, A., 2010. Needs, affect, and interactive products – Facets of user experience. *Interacting with Computers*, 22(5), pp.353–362.

Helfenstein, S., 2012. Increasingly emotional design for growingly pragmatic users? A report from Finland. *Behaviour & Information Technology*, 31(2), pp.185–204.

Kazmierczak, E.T., 2003. Design as Meaning Making: From Making Things to the Design of Thinking. *Design Issues*, 19(2), pp.45–59.

Krippendorff, K., 1989. On the essential contexts of artifacts or on the proposition that" design is making sense (of things)." *Design Issues*, 5(2).

Krippendorff, K., 2006. *The semantic turn: A new foundation for design*, Boca Raton, FL: CRC Press, Taylor & Francis Group.

Krippendorff, K. & Butter, R., 2007. Semantics: Meanings and Contexts of Artifacts. In H. N. J. Schifferstein & P. Hekkert, eds. *Product Experience*.

Ligas, M., 2000. People, Products, Pursuits: Exploring the Relationship between Consumer Goals and Product Meanings. *Psychology & Marketing*, 17(11), pp.983–1003.

Matzen, D., 2009. *A systematic approach to service oriented product development*. Technical University of Denmark.

Mick, D.G. et al., 2004. Pursuing the meaning of meaning in the commercial world: An international review of marketing and consumer research founded on semiotics. *Semiotica*, 152(4), pp.1–74.

Park, C.L., 2010. Making sense of the meaning literature: an integrative review of meaning making and its effects on adjustment to stressful life events. *Psychological bulletin*, 136(2), pp.257–301.

Proulx, T. & Inzlicht, M., 2012. The Five "A"s of Meaning Maintenance: Finding Meaning in the Theories of Sense-Making. *Psychological Inquiry*, 23(4), pp.317–335.

Puntoni, S., Schroeder, J.E. & Ritson, M., 2010. Meaning Matters. *Journal of Advertising*, 39(2), pp.51–64.

Savas, O., 2003. A perspective on the person-product relationship: attachment and detachment. In D. McDonagh et al., eds. *Design and Emotion*. CRC Press, Taylor & Francis Group.

Schifferstein, H.N.J. & Zwartkruis-Pelgrim, E.P.H., 2008. Consumer-Product Attachment : Measurement and Design Implications. *International Journal of Design*, 2(3), pp.1–13.

Shahare, M. & Gurumoorthy, B., 2007. TOWARDS DEFINING CONTEXT. In *Proceedings of the International Conference on Engineering Design, ICED*. Paris, pp. 1–12.

Sowa, J.F., 2000. Ontology, Metadata, and Semiotics. In B. Ganter & G. W. Mineau, eds. *Conceptual Structures: Logical, Linguistic, and Computational Issues*. Lecture Notes in Computer Science. Berlin, Heidelberg: Springer Berlin Heidelberg.

Tan, A.R., 2010. *Service-oriented product development strategies*. Technical University of Denmark.

Thorpe, A., 2010. Design's Role in Sustainable Consumption. *Design Issues*, 26(2), pp.3–16.

Vihma, S., 2007. Design Semiotics - Institutional Experiences and an Initiative for a Semiotic Theory of Form. In R. Michel, ed. *Design Research Now: Essays and Selected Projects*. Basel, Boston, Berlin: Birkhäuser Verlag AG, pp. 219–232.

Vihma, S., 2009. On design semiotics. In B. Darras & S. Belkhamsa, eds. *MEI (Médiation et Information) n°30-31: Objects & Communication*. L'Harmattan, pp. 197–208.

Vihma, S., 1995. *Products as Representations: A Semiotic and Aesthetic Study of Design Products*. University of Michigan.

Vyas, D. & van der Veer, G.C., 2006. Experience as Meaning : Some Underlying Concepts and Implications for Design. In *Proceedings of the 13th Eurpoean conference on Cognitive ergonomics: trust and control in complex socio-technical systems. ACM*.

Waltersdorfer, G., Gericke, K. & Blessing, L.T.M., 2015. Designing meaning to change consumer behaviour: an exploration. In *5th International Conference on Research into Design*. Bangalore: Inidan Institue of Science.

Weiskopf, D.A., 2008. The plurality of concepts. *Synthese*, 169(1), pp.145–173.