Multisensory MAYA – A Design Thinking Method to Enhance Predictability of Experience Design

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Abstract. The MAYA ("Most Advanced, Yet Acceptable") is a classic design principle, which aims at balancing the most advanced (novelty) with the yet acceptable (typicality) for enhancing product aesthetics and creating pleasurable experiences. The MAYA principle is established and widely examined, however, it has not been developed into a design thinking method for multisensory experience design purposes. In this paper, we present a multisensory design thinking method for MAYA, that facilitates designers' problem finding and solving during all phases of a design process. The focus is on developing the design thinking method in a manner that incorporates research knowledge on the five basic senses as well as design reasoning and the iterative nature of design thinking to enhance the predictability of multisensory experience design. The initial thought experiment questions and procedure were tested in a workshop with industrial designers. In the discussion, we elaborate on future development requirements, possibilities, and research directions.

Keywords: MAYA principle, Multisensory experience, Design thinking method, Experience design.

1 Introduction

How people experience design artefacts is a complex issue. Especially from the designers' perspective concerning the possibilities of understanding and managing how design intentions transfer to users. Numerous approaches have been introduced and several research results have been presented to enhance the predictability of experience design ranging from low-level visual elements [e.g., 35, 1, 52], and higher-level design principles [20, 6, 26, 62] to, for instance, computational approaches [e.g., 36, 28, 42]. Recently, research on the role of the multiple senses in human experience has expanded. This is a natural progression in experience research focusing on humans interacting with technological artefacts as human experience is always multisensorial. We make sense of and experience artefacts through the senses in a cognitive-affective manner. Numerous studies have concentrated on elaborating the dynamics of different senses and their role in overall experience formation [e.g., 39, 59, 58, 53, 43].

Due to recent advancements, incorporating a multisensory design approach to experience design is considered an efficient strategy for controlling design communication and establishing more predictability when aiming to transfer intended experience

contents from designers to users [e.g., 58, 53, 43]. Many studies report positive effects of cognitive information processing fluency on experience formation [e.g., 41, 63], which means that we tend to prefer objects that are typical, familiar and predictable. However, highly typical objects can also be experienced as uninsightful. Thus, pleasurable experiences need to balance typicality with a perceptual challenge by proving something novel allowing insights and raising interest [38]. For designers to be able to incorporate the sensory design approach in practice, methods and tools are needed to be able to manage the complex totality and underlying dynamics of experience design. Multisensory MAYA as a design thinking method aids in creating suitable outcomes and finding a solution that is in the current context the most optimal. However, creating pleasurable, awakening and intriguing designs requires the designer to sensitise and deeply understand the cognitive-emotional, socio-cultural and material environment of use.

A design thinking method called multisensory MAYA, its theoretical basis, rationale, and the possibility to increase the predictability of experience design are presented. The MAYA ("Most Advanced, Yet Acceptable") design principle indicates that in successful design the balance between novelty and typicality needs to be identified [34, 20]. The balance is context-dependent and originates from human psychological pursuits in avoiding the far ends [4]. Even though the identified balance is context-dependent, the underlying mechanisms of MAYA are more general and can thus be utilised in numerous different design contexts. Here, we focus on discussing the multisensory MAYA method from the design artefact's perspective, but the MAYA principle along with the presented method can be utilised in experience design in broader terms, such as in service design and brand design. Empirical evidence indicates that the MAYA principle operates reliably in several experience and design contexts [e.g., 7, 26, 22]. In addition, MAYA has been examined concerning simultaneous preference tendencies of prototypicality and novelty, complexity, and trendiness [26]. Overall, MAYA is recognized as an established design principle. A validated measurement has been developed (The Aesthetic Pleasure in Design Scale) which includes MAYA as one of the determinants of aesthetic pleasure [8]. However, there is no validated measurement to assess only MAYA, nor are there systematic design thinking methods to incorporate MAYA explicitly into the design processes, nor is there a MAYA-based method that would incorporate the different senses to the principle and the design process. Therefore, this paper focuses on the latter by presenting a design thinking method of multisensory MAYA.

The MAYA principle is enhanced by incorporating the multisensory nature of an experience for increased predictability of experience design and developed into a design thinking method. The method differentiates the basic five Aristotelian senses (sight, hearing, touch, taste, and smell) to be analysed based on the MAYA principle of existing artefacts, or to be utilised in designing novel artefacts. To be able to analyse the overall experience formation with the interaction of the senses, the explications of experience formation and different sensory integration mechanisms are needed. Multisensorial experiences are dynamic, as, for instance, one change in the haptic design of an artefact changes the whole experience concerning representations of the artefact pertaining to the other senses than the sense of touch. How experience occurs, sensations, perceptions, and apperceptions of multisensorial representations of properties in technological artefacts can be explicated with the cognitive-affective process through which

information contents of mental representations are constructed [53, 50, 43]. Sensory properties of technological artefacts are capable of eliciting multisensorial mental contents in mental representations in which experience can be understood as the conscious part of a mental representation [50]. Sensory experiences are qualitatively attributed via apperception to non-perceptual contents, such as timelessness, uniqueness, and imaginativeness [50]. One of the main aspects of design for multiple senses is to achieve congruency and aim at avoiding incongruency (if it's not intentional) [57]. Metaphorically speaking, the whole experience should be orchestrated into a beautiful symphony. How can this be achieved as part of the design thinking process? How can we awaken designers to sensitise multisensory aspects of different designs in a new way? How can we assist the emergence of new perceptions and/or apperceptions in the designers thinking when designing for multisensory experiences? How can the design for multiple senses be integrated into the design thinking process to achieve the desired outcome? These are the questions we are aiming to answer in this article.

The paper is structured as follows. Firstly, design thinking and design thinking processes are described, including an explication of multisensory MAYA as a design thinking method within design thinking processes. Secondly, the problematisation of the predictability of experience design and how the multisensory MAYA method can be utilised in this endeavour to enhance the predictability of the desired experience outcomes is presented. Thirdly, the MAYA principle is described following with a presentation and description of the multisensory MAYA method. Lastly, discussion and conclusion are presented with future research topics.

2 Design Thinking and Design Processes

Many of the prevailing design approaches aim at understanding and emphasising human perspective in technology interaction [45]. This requires designers to profoundly understand how the human mind and the senses work, to be able to design meaningful experiences. The MAYA design principle encompasses a great and inherently human paradox, which is highly challenging to design for. Novelty and creativity are often desired attributes and are called for by designers thinking [18], however, at the same time human beings have difficulties in accepting and adapting to change, which novelty always contains. Therefore, as human beings we are living in constant conflict; on the one hand new, mysterious unknown and surprises are something we grave for, but at the same time we are comfortable in the familiar, routine and ordinary. Too much of the same bore us, but too much uncertainty scares us. Designers' understanding of these kinds of contradictions and human cognitive-emotional and sensory processing qualities are essential in creating experiences that are well received. This paper suggests that the management of complexity can be facilitated with research-based design methods based on mind sciences, such as the multisensory MAYA.

Designers' thinking is a multidimensional and complex reasoning process, especially when it aims at combining scientific knowledge with practical complex problem solving. It requires several design decisions and choices, which are both conscious and subconscious. Design methodologies have been described as falling into a line between two approaches; a) the reflective practitioner [49] which is described as an

improvisational way of reasoning and reflective conversation of experts with the design situation, and b) the rational problem solver [54]. These two schools of thought have been seen in opposition to each other. However, recently Schaathun [46] has suggested that they are not necessarily exclusive, instead, similarities have been found, such as the iterativeness of the process and rationality. The design process aims to produce something (an artefact, service, experience etc.) to a particular situation, that is new and useful - in other words, a creative outcome. The nature of the process is suggested to be co-evolutive, meaning that the problem and the solution are being reformulated continuously [46, 18]. In the context of multisensory design thinking focusing on the MAYA principle, the aim is to find a balance between novelty and typicality in creating sensorial experiences conveyed with the design context at hand.

The design thinking process includes abstraction and practical rationality processes, in which reasoning takes place in problem formulation and solving evolutionarily throughout the whole design process [55, 49]. At its core are generative and evaluative phases, which are iteratively followed until a satisfactory outcome. These aspects are the foundations in several design process formulations, such as the double diamond model of design [3, 17]. These divergent and convergent phases as cognitive processes are highly studied in the research literature on creativity and underlie several process models of thinking that aims at renewal in many fields examining creativity.

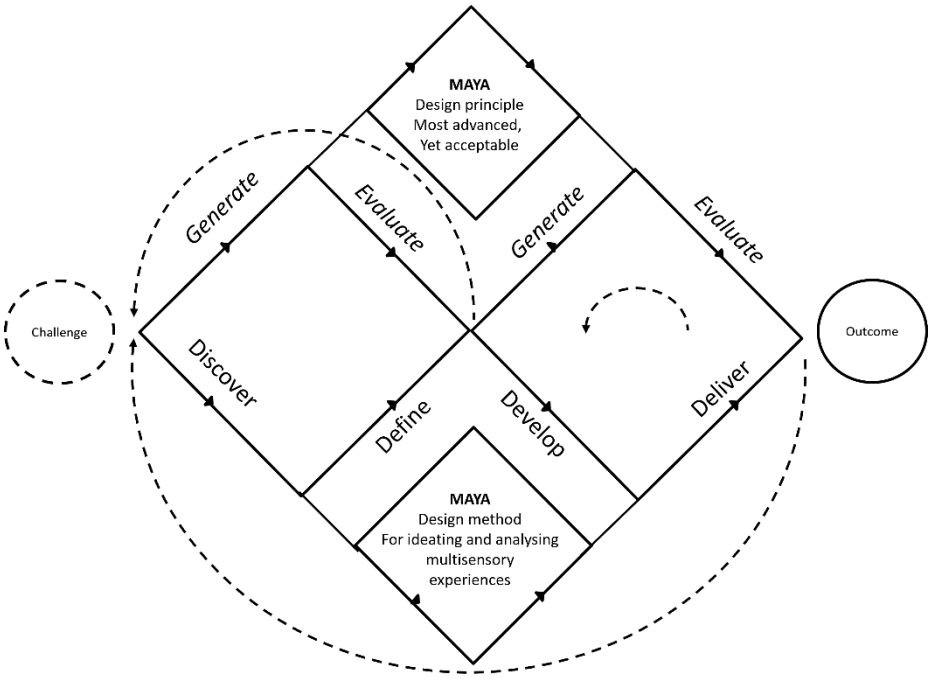

Fig. 1. Multisensory MAYA method as a part of the design thinking process.

In the design process, generative phases (i.e., moves) of discover and develop focus on producing more information (understanding, ideas, concepts, prototypes). Evaluative phases of define and deliver aim at analysing and finding the relevant knowledge for the situation at hand. Generative and evaluative phases alternate within the design process. The Multisensory MAYA method supports all phases of the design process. In figure 1, different phases, principles and methods of the design process are modified for the purposes of this paper and presented as part of the Design Council's framework for innovation [17] (evolved double diamond).

Here, design is seen holistically as an activity that is conducted when aiming to change the current state of affairs into something preferable [55], and design as a discipline revolves around "the conception and planning of the artificial" [9]. Within the current research goals of human-computer interaction (HCI), the aim is to integrate scientific knowledge and understanding into the design for increasing the predictability of the intended experience outcomes [e.g., 29]. Designing for targeted experiences is an interdisciplinary endeavour since it requires synthesising knowledge and balancing perspectives of different disciplines to translate obtained knowledge from abstract ideas and concepts into more concrete practical design properties. This requires an understanding of the foundational difference between the fields; sciences which are investigating the world *as it is*, and design which aims at transforming the world as *it ought to be* [13, 37]. Moreover, design is interested in artificial things, which are related to human actions, values, interests, goals, and purposes [46, 45]. Therefore, design reasoning and decision making, even when using scientific knowledge and understanding as its basis, are always propositional in the sense that they cannot be completely based on existing established laws or scientifically produced knowledge. Effective, pleasurable and ethical design requires careful argumentation and rationality, which benefits from explicating the design decisions and being based on a scientifically proven understanding of the human mind and life [45]. Facilitating this interplay of the fields is the overall goal of the multisensory MAYA method.

Despite the commonalities of the methods of Simon and Schön mentioned above, Schaathun [46] proposes that the major issue where the two paradigms of thought diverge is the way new insights are formed during the process. This is highlighted especially in wicked problems [9, 11] like multisensory design, where there are no one right formulation or solution and many interdependent factors are intermingling. In Simon's general problem solver, in the context of ill-defined problems, all the relevant information is already known, and the challenge of problem formulation is seen as the lack of computational power [54]. Instead, for Schön [49] design is essentially explorative and insights - which present themselves and are experienced as a surprise in designers' thinking - are born from the encounter with the yet unknown and unprecedented. New human behaviour, goals, and values are consciously and actively searched during the process. This way of approaching the nature of designers' thinking qualifies it as inherently creative, and the process as meaning creation. As Dorst and Cross [18] also suggest, this way of being directed towards and actively searching for surprises and insights is what assists designers to keep their thinking fresh and innovative and drives the creativity of their projects. Insight assists in thinking that transcend the existing frames of the mind. Balance their thinking between the routine way of thinking and its

disruption act as the 'creative 'engine' of designers thinking. The Multisensory MAYA design thinking method is aiming to assist designers to gain insights into wicked problem solving situations by directing the focus on different aspects of the principle at a time.

Schaathun [46] proposes that Schön [49] sees expert thinkers as doing *thought experiments* when working with the design moves they have made. This is what he means by saying that design is a dialogue between the designer and the design and where the situation 'talks back' to the designer. In the multisensory MAYA method, the thought experiments can take two forms 1) generating a new, or 2) evaluating an existing artefact or experience. When creating a new concept, the designer may empathise and explore the situation as they imagine the user would, or act as the user in the situation (e.g., architect going into the building, user experience designer using the device; fashion designer using the clothes in the usage context and culture). By 'seeing' and/or 'being' with the design as the user, the designer can reframe and reinterpret problems, design properties and whole designs as well as empathise with relevant human values and goals. In the generative phase new insights and ideas are formed by experiencing and picturing the world imagined. In the evaluative phase, insights come from understanding what is relevant comes from evaluating the existing moves or parts of design and their interaction within the environment. This assists the designer in finding what is relevant to the situation at hand because there are several design decisions made in an 'ad hoc' manner and all the design decisions are not done consciously. This interplay of different cognitive processes in designers' thinking is essential for reaching rationality in design decision making because information processed with intuition and rationality are balancing and 'taming' each other [46, 49, 30]. Checking for biases in decision making and making the intuitive aspects of thinking more explicit are both supported in the multisensory MAYA method by phasing the process into focused reasoning, which concentrates on different aspects of the multisensory experience creation (experience, properties, the whole design, in Fig. 2).

According to this view, designers' reasoning progresses in an evolutive and iterative fashion: from disorder (focusing on insight) to order (focusing on relevance) and back again. The designer's own experiences assist in multisensory design experience creation by helping to generate, evaluate and integrate design moves. This suggests that designers' thinking and personal sensorial experiences as well as the outcome of the creative process and resulting user experiences are closely intermingling in designing for multisensory experiences. This interaction is supported by the multisensory MAYA design thinking method by providing research-based procedures and thought experience questions, that give boundaries and direction for the designers reasoning to evolve organically towards a desired outcome in the design situation with more predictability. In other words, it is guiding the designer towards 'where to look', but not telling 'what to see'.

3 Multisensory Design and Predictability of Experience Design

Experience research and design in different disciplines have traditionally concentrated on the sense of sight [12] as the most dominant sense in experience formation. More recently emphasis has been placed on examining the role of the other senses in how experiences occur. The multisensory design approach focuses on each sensory modality within a design process contributing to the overall experience formation in a way that the design properties convey certain experience contents [24]. At the core of understanding, experience formation is human cognitive and affective processes, especially in the context of designed artefacts to understand how experience contents are conveyed. This can be explained by the concept of apperception, i.e., 'seeing something as something' [27, 31, 44]. Apperception integrates already existing information and new information into a meaningful mental representation. Thus, apperception is different from perception as it integrates and operates as a unifying process in experience formation by incorporating existing and novel information of different sensory modalities. Understanding the contents of meaningful mental representations includes experiences conveyed via tangible design properties, but also non-perceivable contents, such as timelessness and uniqueness which are of the essence of meaning making [50]. Apperception thus can be used in shedding light on the non-perceivable experience contents and their importance. The multisensory MAYA method acknowledges in analysis and ideation phases the tangible design properties level and the semantic meaning making level by first focusing on what kind of experience contents would be targeted and then, via what kind of sensory design properties these could be conveyed.

The multisensory design approach has also been applied by some companies in developing successful multisensory design strategies [24]. However, multisensory marketing and/or design strategies are rarely created with scientific rigour, and thus, not utilising their possible full potential [25]. Multisensory design is one effective approach to enhancing the predictability of experience design. By focusing on one sense at a time and carefully analysing and designing certain experience contents via specific sensory design properties, more predictability to the overall experience formation can be obtained. As we humans are inherently multisensorial beings, all the senses play a role in the overall experience formation. If some sensory design properties are not explicated but still convey meanings to individuals, it affects the overall experience unpredictably and uncontrollably. For instance, many technological artefacts (e.g., car doors) incorporate sounds and if not deliberately designed to elicit certain experience contents, the sounds still affect the experience.

It is not simple to design specifically targeted experience contents. Understanding how human experience constructs, its underlying cognitive and affective processes, operations of the sense and their interactions, and the relationship between design properties and the elicited experience contents are in a central role. Through careful examinations of the above-mentioned central factors incorporated in design thinking and design processes, more predictability can be obtained. For example, there is more predictability of designing for cognatisation (e.g., in visual design the sense-making aspect based on the information processing fluency paradigm; an example of this in icon design, see [51]), and for touch compared to sight [53]. Stimuli evaluations focusing on sensemaking are conducted more unanimously between individuals than affective appraisals. As the ease of information processing fluency enhances the likelihood of

positive affective appraisals to occur (e.g., aesthetic appeal), by focusing on the design of the sensemaking dimension more predictability can be achieved for the more unpredictable and unanimous affective dimension [51].

Key concepts in multisensory experience and design focus on sensory integration and one opposite concept with a focus on sensory incongruity. Multisensory integration combines information obtained from the different sensory modalities by harmonising sensory stimuli into one coherent experience [60]. Multisensory semantic congruency aims at designing to convey the same experience contents for the unexplicated senses based on the existing sensorial experience contents [58, 32]. Multisensory semantic congruity has been specially developed and examined in the fields of multisensory marketing and sensory branding [58, 32]. However, multisensory integration and multisensory semantic congruency do not incorporate the MAYA principle. Crossmodal correspondence focuses on spatial and temporal factors affecting sensory integration [56, 16]. Thus, crossmodal correspondencies can operate within multisensory integration to examine and explicate how integration occurs. The majority of multisensory design pursues the integration of sensory information. A contrary approach to multisensory design focuses on sensory incongruities by clashing sensory information obtained via one sensory modality to another sensory modality within a design context (Ludden et al). This leads to incongruity in the obtained sensory information as the expectations constructed via one sensory modality are not supported by information obtained via another sense. This concept has been utilised as a design strategy for eliciting surprise via sensory incongruity and found to increase liking and elevate word of mouth [33]. However, design context plays a significant role in whether this strategy is successful or not [e.g., 19].

4 The MAYA Principle

The MAYA principle (*"Most Advanced, Yet Acceptable"*) stresses the importance of balancing the typical and the unknown or fluently cognized entities with elements disrupting the unity in designing the most pleasurable artefacts [22, 20]. The principle originates from Raymond Loewy [34]. He highlighted individual consumer thresholds for novelty. Every consumer has a certain level that novelty is wished for and if going over the threshold the novelty value transforms into a shock level. An artefact that balances the levels of typicality and novelty in the best way (highly context-dependent) reaches the MAYA level and thus, is the most successful one. The MAYA principle operates successfully based on the human tendency to avoid far ends, and therefore, the principle can be applied in a variety of domains [4].

The *"Most advanced"* part of the principle refers to novelty. Novelty is often considered in relation to typicality and stands as its counterpart [22]. Research on the effects of novelty reports positive outcomes, for example, that people prefer things that they experience as novel [6]. Artefacts appraised as novel can increase demand, accelerate the adaptation phase and redefine important aspects of personal consumption preferences [10]. In addition, novel, or atypical product designs, are also considered intriguing and are actively sought [23]. Designs appraised as novel are also apperceived as more attractive compared to highly typical designs [47].

However, in the overall experience formation influencing behaviour and interaction with artefacts, the *"Yet Acceptable"* also plays a significant role. The Yet Acceptable part of the principle refers to typicality and prototypicality. Typicality and prototypicality refer to what extent the object is a representational example of some category [22, 6, 62]. Research also reports positive effects of typicality on artefact preferences [21]. Perceiving something as typical is a cognitive process [62]. Typical or prototypical stimulus is cognised fluently and categorised based on previous existing knowledge of an object pertaining to some category. Overall, preferences of typicality originate from human tendencies to avoid harm and danger and conduct safe choices [21]. Typical and prototypical stimulus is processed more fluently than novel stimulus [63] and the information processing fluency increases positive appraisals [40]. The fluency of the processing experience in itself has been indicated to increase aesthetic appeal [41]. Cognitive information processing fluency based on typicality or prototypicality perceptions increases the possibility of positive aesthetic appeal but involves other factors also. For instance, the design styles of different design eras question this relation, typical stimuli can be fluently processed but at the same time appraised as unappealing and old-fashioned [51]. Incorporating the MAYA principle in design practices benefits of acknowledging the effect of time and design eras on artefact evaluations.

Typicality and novelty are related in that people prefer moderated amount of typicality contrary to a high amount of typicality or novelty [5, 62]. Thus, finding the optimal balance between typicality and novelty increases preferences and aesthetic interest. The ideal balance of typicality and novelty (i.e., The MAYA level) is highly context-dependent as people assess and experience artefacts with different goals in their minds which highly influences how to design properties are aesthetically appraised [2]. Overall, novelty and typicality appraisals are separate but highly influential contextual factors, both contributing to aesthetic appeal appraisals of artefacts [7].

5 Multisensory MAYA – The Design Thinking Method

The overall rationale of the MAYA method (Fig. 2) is to analyse an existing artefact (including prototypes etc.) or ideate (design brief or challenge) separately for each sensory modality (here, the five Aristotelian senses) to find a meaningful balance within the MAYA principle for each sense. The design process is supported by the method's thought experiment questions awakening the designer(s) to investigate and ideate experience contents, design properties, and the overall experience design. The sensory design suggestions in conveying certain experience contents are ideated in terms of sensory design properties through which the experience contents could be communicated for each sense at a time focusing on a pleasurable context-dependent MAYA level. Lastly, the sensory design suggestions are analysed and further elaborated from the perspective of how the sensory design solutions interact with each other in the overall experience formation process. This phase refers to the design principle of the optimal match [20]. The principle of optimal match stresses that the information obtained via different sensory modalities is required to be internally consistent throughout the artefact to elicit meaningful experiences. Thus, optimal match functions through

multisensory integration in which cross-modal correspondences operate. In addition to sensory integration, a contrary design approach can be utilised. This refers to the design strategy of deliberate sensory incongruities. In addition, experience design can take different stances concerning the intensity of the experiential goals which are incorporated in the design thinking method of multisensory MAYA.

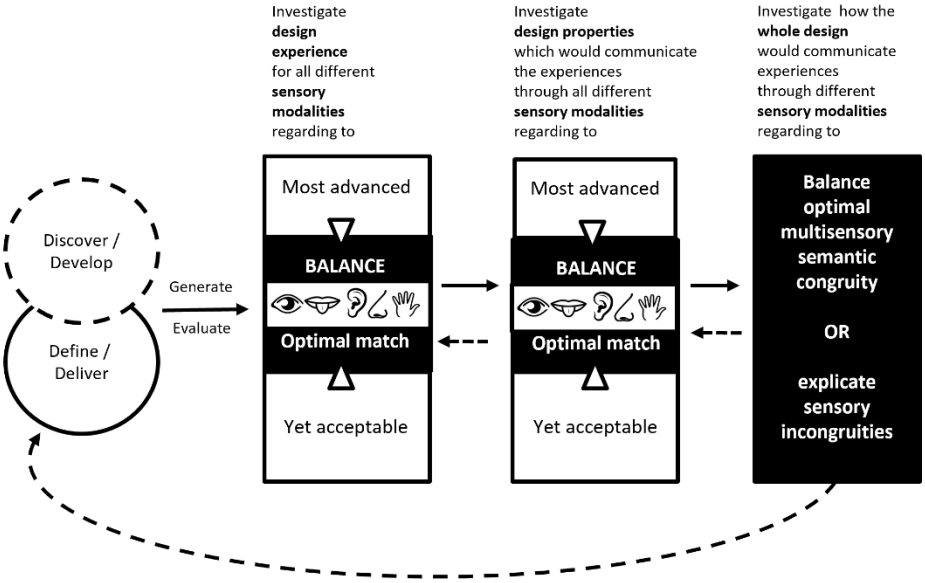

Fig. 2. Procedure for Multisensory MAYA Method.

The multisensory MAYA method was tested and utilised in a workshop involving designers of a large industrial design company and gained positive feedback on its ability to enhance design thinking for creativity and ideation providing a change in perspective. The method was also appreciated for enabling a detailed analysis of an existing artefact via different sensory design dimensions and being able to ideate novel sensory design possibilities for the different senses contributing to the overall experience formation. The results of the workshop are kept private due to the company's privacy policy and non-disclosure agreement and, thus, cannot be further reported here.

In our future research, we focus on more empirical examination of the method and development. In figure 3 the utilised multisensory MAYA template is presented. Firstly, (1) workshop participants were briefly introduced to the topic with an introductory lecture on the multisensory design approach, its benefits, description of the MAYA principle and its underlying dynamics in human experience, key concepts of multisensory integration and sensory incongruity and instructions on how to use the template. The next step (2) was to analyse an existing artefact to ideate ideal MAYA levels for one sense at a time regarding what kind of experience contents would be targeted. The MAYA method was conducted in pairs with printed templates in A3 size (29,7cm×42,0cm). Participants carefully went through the context-dependent balancing

process for each sense separately and examined carefully the balance sections of the template. The next step (3) was to ideate how MAYA balanced sensory design ideas could be conveyed to users via design properties including the context-dependent balance within the MAYA. Lastly, (4) participants wrote and drafted their novel design ideas as an entity.

Fig. 3. An example template of a multisensory MAYA design thinking tool.

The method can be used by individual designers, or it can be used by design teams. It provides a communication platform between designers in the design team, which assist in verbalising and communicating ideas. Often the language regarding sensory experiences is metaphorical and abstract. Therefore, multisensory MAYA is efficient when used as a collaborative design method to achieve a common understanding and shared language of design decisions related to sensory experiences.

The multisensory MAYA templates can be filled with text and/or drawings. Sketches are important design thinking tools [13, 61]. In order to accurately reason, evaluate and

communicate ideas, designers need *stable forms* [46], this assists in the thought experiment to 'talk back' in Schön's terms. The sketch gives feedback to the designer on the ways the experience design is developing and advises ways to improve the design at hand. This iterative process can bring hidden and tacit expertise and knowledge about sensory experiences to light and advance design reasoning. The design process is an evolutionary system which evolves through a series of phases (moves), each phase is born from the current frame and then continues to create the next new frame [46]. By sketching the design concept is being con-figurated and re-figurated [46]. Sketches assist in the dialogue between designers' intuition and scientific information in the multisensory design, they help with design reasoning by assisting in dealing with the experiential contingencies and sensorial uniqueness of the real-world design stance.

6 Discussion and Conclusions

Designing for multisensory experiences is a complex and multifaceted process, which calls for the awakening of the designers' senses, as well as a deep understanding of human cognitive and affective processes when interacting with design artefacts. At the core of design practice is the question: How do designers' intentions transfer to users and how to manage this? And how to incorporate more predictability in designing for targeted experiences? An efficient way to approach this dilemma is to incorporate the multisensory design approach [25]. By designing for one sense at a time and analysing each sensory design solution contributing to the overall experience formation, more predictability of the experience outcomes can be obtained. The MAYA principle [34, 22] is efficient in combining human tendencies to avoid far ends [4] with the quest to find something novel and delightful. A desirable MAYA level is obtained when a balance in the design decisions is reached that balances typicality and novelty in a context-dependent manner [34, 22]. To aid in the design process incorporating the MAYA principle we developed and presented a design thinking method: The multisensory MAYA. The method development operationalises the MAYA principle into a design thinking method enhanced with the multisensory design approach to further increase the predictability of experience design.

The multisensory MAYA can be utilised in a variety of design contexts and was tested with industrial designers. Even though, the method is ready to be utilised as presented in this paper, for instance with the example template, requirements for further developments have been identified to make the multisensory MAYA method more explicit, detailed and extended with existing research on design principles. In our future research, we focus on empirical examinations of the method to get more insights into the development work and to test the method in different design phases, since in the workshop the method was only tested in an evaluative manner. It would be also interesting to examine whether the method could be digitalised enabling remote group work, co-ideation, and co-creation. The thought experiment questions are to be further elaborated to aid in the process in more detail. Also, a more structured manner to map the experience contents to be conveyed via each sensory modality with the sensory design properties would aid the design thinking process. Moreover, the multisensory MAYA

method could be extended to include also other senses in addition to the five Aristotelian senses.

A continuous balancing act is required for communicating effectively to the users and customers, for example, newness can be inserted into the designs gradually like Apple does when it modifies products bit by bit [15]. On the other hand, typicality can be balanced by the conscious use of existing design conventions and common design principles, which are already familiar to users. In turn, sometimes it might be important to make a more radical sensory design to get attention or separate the design from the competition or to gain the attention of special user groups such as the young generations. This is a more risky approach since it takes time for users to accept the bigger changes made to the design. Big companies have less risk in applying newness, but for smaller companies, it might be riskier. However, they often have to find ways to bring forth originality that is lacking from the larger competitors.

Future research and MAYA method development will focus on examining and explicating which existing laws, principles, heuristics, psychological effects and design guidelines can be used in designing for typicality (e.g., conventions and standards) and what design thinking methods or ideation tools can be used for ideation for the most advanced. Future development would also include further formulation of essential thought experiment questions to guide the design thinking process. In addition, as cognitive scientific understanding of human-technology interaction can assist designers by giving vocabulary and conceptualising otherwise often implicit and intuitive aspects of interaction, such as multisensory experiences, future research focuses also to include examining the ways in which research could assist especially in the integration phase of the MAYA design process. since the integration phase is the most challenging part of the multisensory experience design.

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