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Creative Design Thinking based on Understanding Human Imagination

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Abstract. This study aims to develop a methodology for designing based on human imagination. To propose and investigate the methodology, we carry out an action study for collecting the impressions of the products designed by the authors. We adopt the concept network analysis approach to compare the imagination which is underlying the impressions from three groups of the products: our proposed products, random selection of products, and the existing products. A clear difference was found among the three groups. The results confirm the effectiveness of the proposed methodology in understanding human imagination. We propose an implementation of the findings in the selection of colour for hospital uniform design.

Keywords: formation of imagination, underlying imagination, associative concept, design methodology, action research

1 Background

In order to develop Product-Service System Design (PSSD), user-centred design became the main stream of research on design. The core issue is to gain our understanding the users' mind, especially the human imagination. Understanding the users' mind leads to a sense of the product on the basis of the impressions in the users' imagination, that is, the users' cognitive interpretation of the designed products. (Norman, 2004).

A number of studies focused on this interpretation of the products (Yamamoto et al. 2009, Fasiha et al., 2010). E.g., Fasiha et al. (2010) focused on deep impressions, which were seen as the impressions that are related to the deep feelings towards a product and lie under the explicitly recognised human impression (Figure 1). Their study approached in deeper level of the users' mind in comparison with other product evaluations using the SD method. Aiming at understanding the nature of preference with regard to a product, they developed a method for constructing and analyzing 'virtual impression networks'. They have shown that the smart handling techniques are successful in capturing user's impressions, which are complex and uncertain. The results suggest that the understanding of the deep impressions and underlying imagination may be the clue in understanding human preference. However, their study uses existing products as stimuli, instead of creating new product to evoke the specific impressions of the users (Fasiha et al., 2010). In other words, their stance to the products is almost in the same position with the approach of SD method.

1.1 Methodology

This study focuses on capturing the underlying imagination of users and considers the design of ideal products through providing original products according this imagination.

To do that, the first challenge was an issue of "how to capture users' underlying imagination". To capture this imagination, we applied a methodology to identify the depth impressions, which underlie the surface impressions of design, by using concept network analysis (Zhou et al., 2009). The methodology consists of construction of concept network from users' free descriptions, and extraction of the in-depth underlying imagination from the network. The underlying imagination indicates users' impression towards the product.

The second challenge was to be closer to our stance with the products, which challenge is in the focus of this paper. In other word, we approach yet-designed products and we commit them in the conducted study (namely, "action research").

1.2 Focus

The case of healthcare demands design of products customized to users' imagination. For example, Jun et al. (2010) investigated the roles of different diagram types in various healthcare systems design cases. Their research provides insights into how dynamic are the users' requirements in healthcare. To address this issue, we propose custom products, which dynamically correspond with users' imagination. In our study, such custom products are season colour uniforms for a hospital.

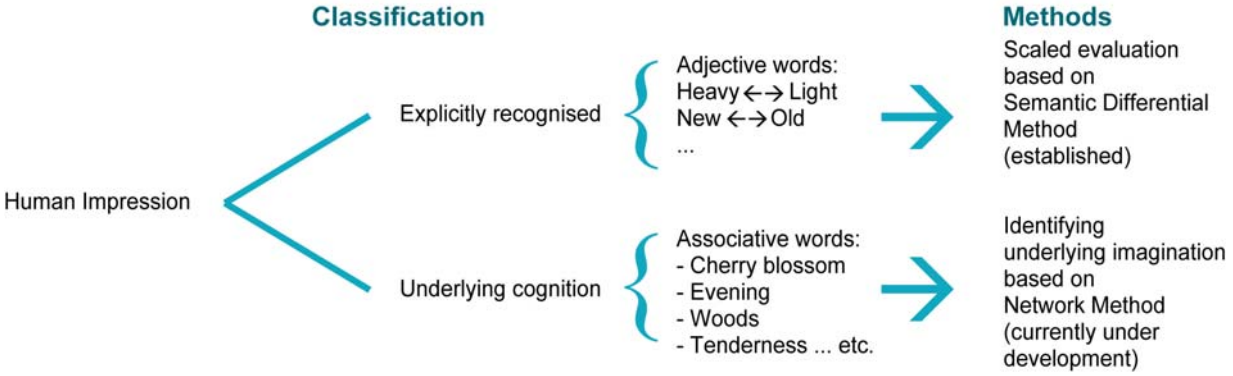

Fig. 1. Classification of human impression from designed artefacts into explicitly recognised (affective) and underling (essential) based on the human imagination

2 Study

We aim at proposal of human imagination-based design through understanding the users' underlying imagination indicating this impression. To address this aim, we carried an action research of the medical colour uniform design in a hospital.

We investigated a case of colour hospital uniforms in three groups – conventional (white (CU4)), random selection of strong (red (CU5), ultramarine (CU1)) and proposed products – uniforms with 6 seasonal colours (cherry pink (CU6), young green (CU7), light blue (CU9), apricot yellow (CU8), grass green (CU3), and pale pink (CU2)) (Zhou et al., 2009). The impressions expressed by 13 subjects (visitors of the hospital) in the free style written descriptions were collected for each stimulus (uniform). We applied a methodology to identify the depth underlying imagination, which underlie the superficial impressions of design, using concept network analysis (For details of the methodology see Zhou et al., 2009). We have explored the underlying imagination based on the associations behind each of the impressions as evoked by the person that was interacting with the designed artefact. These associations are the stimulus words used to evoke the explicit impressions. In practical terms, the underlying imagination can be considered as associations initiating a higher number of connections. The number of connections might be assigned as weights for associations. Thus, highly weighted associations are underlying imagination cores.

To investigate the structure of the underlying imagination elicited by the nine coloured uniforms, we adopted a Centring Resonance Analysis method (CRA, Corman, 2002) on the association network in order to capture the underlying imagination of the participants' impressions. On the basis of the significant underlying imagination words, and CRA we constructed a semantic meanings map of the hospital uniforms (Figure 2).

The CRA is a new text analysis method that has a broad scope and can be applied to large quantities of written text and transcribed conversations (Corman et al. 2002). It differs from the traditional word frequency-based approach to modelling text. The CRA is based on the linguistic theory that deals with how people create coherence in their communication. Thus, the CRA employs natural language processing to create a network model of text. Networks via the CRA accurately represent the concept map that emerges when a person reads the text. Word influence values are calculated on the basis of the structural position of each word within the CRA network.

This map indicates the relative placement of the uniforms (CU1 to CU9) on the scales 'relaxed-exited' and 'warm-cool'. The underlying imagination words indicating users' impressions are placed on the same semantic map. Additionally, we categorized the depth impressions into seven categories (Figure 2).

In order to investigate the relationship between the 9 uniforms and underlying imagination words, we categorized the extracted words. The categorization is based on the obtained underlying imagination words belonging to a higher abstract conceptual category. The concept hierarchy of the WordNet 2.1 database has been employed for this purpose (WordNet, 2009). For example, the in-depth impressions such as 'leaf', 'bud', and 'peach' belong to the higher abstract category of 'natural object'. In our case, 7 major categories of the obtained in-depth impressions were identified: Natural object/Plant, Colour, Person, Artefact (connected with living space), Phenomenon, Abstraction, and Other (general category). This categorization is relevant to the discussed case only. These categories are shown on the map of the CRA results (Figure 2).

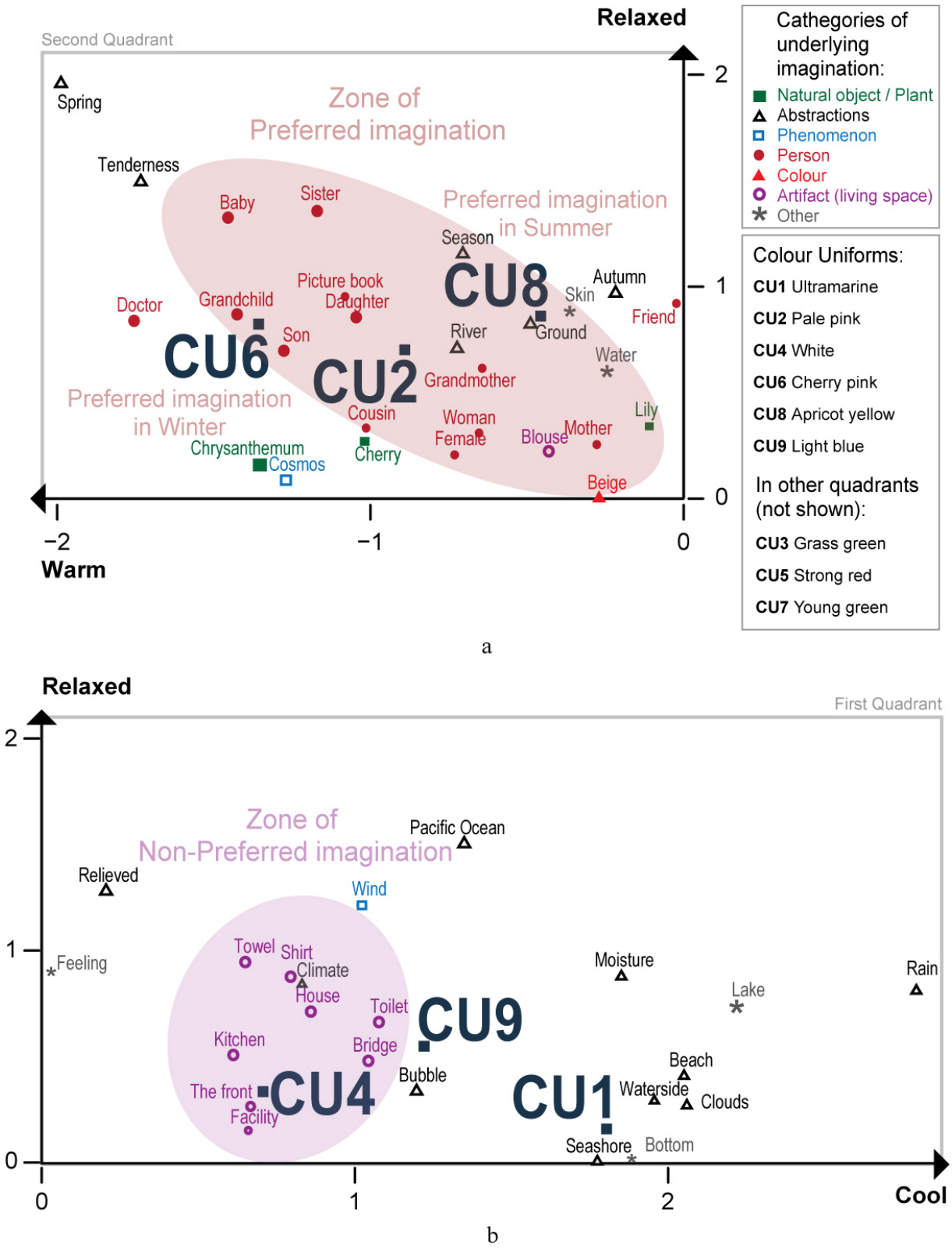

Fig. 2. Details of the map of colour uniforms and underlying imagination words based on Centring Resonance Analysis (CRA): (a) zone of referred imagination in second quadrant and (b) zone of non-preferred imagination in first quadrant

The extracted underlying imagination words represent the combined users' impressions in terms of seasons, colours, and uniforms. This step integrates the results from separate designed artefacts (colour uniforms) in this semantic map to investigate the relationships within the total impression space. This semantic map serves as qualitative visualization for the season-coloured uniforms. Horizontal represents temperature (warm/cool) and vertical axis represents stability (excited/relaxed). The preferred impressions correspond with warm and relaxed directions in conjunction with underlying imagination connected with of family (words like 'baby' or 'grandmother' in zone of preferred imagination in Fig. 2 (a)). The non-preferred imagination is connected with dimension of cool and underlying imagination words connected with hospital (e.g. 'towel' or 'toilet' in Fig. 2 (b)).

We can choose and coordinate the colours of the uniforms to evoke intended imagination in users on the basis of the semantic map of the CRA results and the classification of the underlying imagination words. In this study, we propose an implementation of the map in the selection of colour for hospital uniforms.

3 Results and Discussion

We tested the proposed colours based on a network analysis. We confirmed the high central concepts based on CRA map, which reveals not only the correlation between selected colours and imagination of the users, but also the differences with regards to the seasons (Figure 2).

In this study, we propose a colour coordination system on the basis of the findings (Table 1). The plan depends on the season and shows dynamic and multilayered system of colours to respond on users' imagination needs.

On the basis of understanding of users' imagination, we propose sets of coloured uniform, which focus on seasonal impressions. This coloured coordination is based on the identified key concepts from the constructed semantic meaning map in our study of hospital uniforms. The diversity of the proposed coordination of coloured uniforms varies depending on the season.

In this proposal, we chose and coordinated the colours of the uniforms to evoke intended images in users—'family' and 'gentle dynamics of nature', avoiding the 'hospital' and 'forces of nature'—on the basis of the CRA results and the classification of the underlying imagination words.

Our scheme for the new uniform coordination consists of the following characteristics, which evoke feelings of the 'family' and 'gentle dynamics of nature':

- Sequential plan of changes in the coloured uniforms according to the season; and
- Synchronicity of the colours at every stage (Table 1). These characteristics create a meta-level dynamics of the human impression from the uniforms, thus adapting the product to specific impressions of the users.

In the proposal in Table 1, the colours of uniforms are synchronized based on users' underlying imagination and season-based user requirements.

Our research shows the future view of the interactions between designers and users, which would be dynamically structured. The understanding of users' impression and underlying imagination will guide design thinking towards a meta-level structured response on the dynamics of users' requirements.

Table 1. Colour coordination for sets of colour uniforms on the basis of the impression of seasons

Season	**Colour Diversity**							
	Exsisting colours						**Tentative colours**	
	CU2 **Pale pink**	**CU3** **Grass Green**	**CU6** **Cherry pink**	**CU7** **Young Green**	**CU8** **Apricot yellow**	**CU9** **Light blue**	**T1** ***(colour with high scores on relaxed and warm)***	**T2** ***(colour with high score on relaxed and low score on warm)***
Spring	-	-	X	X	X	-	X	-
Summer	X	X	X	-	X	X	X	-
Autumn	-	X	-	-	-	X	-	X
Winter	X	-	-	X	X	-	-	X

4 Conclusions

This study introduced the new methodology for designing based on human impression and underlying imagination, which would develop creative imagination-based products. We carried out an action study at a hospital to investigate and propose the colours of hospital uniforms which represent seasonal colour impressions. The result of the action study suggests a plan of the medical uniforms, paying attention to underlying imagination of the dynamics of the nature and family, in particular with a pattern of gentle moves that will be in resonance with the human imagination integrated with “nature” and “healing”.

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