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EXPERT DESIGNERS' PERCEPTIONS ABOUT DESIGNING USING KANSEI ENGINEERING RESULTS

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ABSTRACT

In a KE study to determine the emotional design features of a traditional product from Turkey, expert designers' opinions were collected for the *span the semantic space* and *span the space of properties* steps of the KE methodology and an additional discussion came up. It was noted that the expert designers raised several questions about KE. They seemed to approach the potential KE results with caution because it was perceived as an intervention to their creative processes.

During the interviews the following arguments came out: Design problems are irrational and wicked and do not have only one solution. What KE offers is scientific, but it may interfere with the creative process needed for designing. It can be useful for novice designers, but some experts think that they already have the intuitive knowledge of Kansei.

After discussing with other KE researchers, about the similar experiences working with expert designers, there was the need to explore the issue in more detail.

First, interviews were conducted with 4 expert designers. A scale was developed to assess their attitudes towards using KE results in design problems. Data was collected with an online questionnaire from 59 experts on the scale. The findings can be used in creating new strategies to introduce KE to design experts in a way that they can be convinced to use KE in their further design processes.

Keywords: *Expert Designer, Kansei Engineering, Design Process, Design Creativity*

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1 INTRODUCTION

Designing is a high level cognitive ability which is mostly defined as creative problem solving (e.g. Akın, 1986; Cross, 2006; Dorst & Dijkhuis, 1995; Dorst & Cross, 2001) involving many cognitive processes as divergent, convergent and reflective thinking, cognitive flexibility, associative processing, analogy making, decision making as well as intuitive and emotional processes (Simon, 1969; Dorst & Cross, 2001; Lawson, 2005; Cross, 2006; Hasirci & Demirkan, 2007; Lawson & Dorst, 2009). Design problems are irrational in nature (Reitman, 1965; Rittel & Webber, 1973; Newell, 1969; Simon, 1969, 1973). They are not problems for which all necessary information is available to the problem solver. Both the definition of the problem and solution spaces depend on the knowledge, cognitive abilities, insight and experience of the designer. Design process starts with defining the problem, setting the frame followed by generating possible creative solutions. It is an iterative process which may require the reformulation of the problem. As British Design Council's "Double Diamond Design Process" model (2005) clearly depicts both design problem formulation phase and solution generating phase progresses together, uses divergent thinking that is seen as the core ability of creative thinking. Defining the problem space is seen as the most important phase of creative cognition (Russ, 2014).

Kansei Engineering providing data about the emotional connections between the design features and user perceptions, clearly defines the problem space by starting with the *span the semantic space* and *span the space of properties* steps where the possible/potential design features are selected to be tested (Schütte et al. 2004). Even only this part could be seen as the initial attempt for 'defining the problem' phase of the design process. After the KE study is completed, the results give a clear picture of how the design features could lead to different emotions of users. However, many experts were observed to be reluctant to use Kansei Engineering claiming to find it to be something which limits their divergent thinking. This could be the reason why this methodology has not been widely incorporated with design practice, design related professions and design education.

This study has been conducted to investigate expert designers' perceptions of the KE methodology and their attitudes towards using the results of KE in designing. As the preconceptions about KE are clarified and opinions are determined, tools may be designed to introduce use of KE to expert designers so that they will be willing to try KE in their future design processes.

2 METHOD

In this study, for the purpose of determining perceptions and attitudes of expert designers towards using KE results in their designs, data were collected through interviews and a questionnaire.

2.1 Interviews

Semi-structured interviews were conducted with 4 expert designers. Three of them were familiar with the concept of KE but one has never heard of KE before. First the expert designers were presented with an introduction to the KE methodology and sample KE results from the study

of Erol & Leblebici Basar (2021). Then they were asked about the potential advantages and disadvantages of using the KE results in designing. They were also asked if they would consider using KE results in their own design processes and the reasons were discussed. Finally, they were asked if KE would help novice designers during design education.

2.2 Questionnaire

A questionnaire was developed taking the comments of the expert designers from the interviews into consideration. After each interview was transcribed, the main issues were coded and categorized. In preparing the questionnaire several items were developed for each category indicating a relevant issue regarding using KE results in design. The items corresponded to both positive and negative attitudes. The most suitable 20 items were selected to form the scale.

The questionnaire was administered to a total of 59 participants online. The participants were experts from the fields of design such as industrial design, architecture, interior design, landscape design, UX design, and engineering design. They had at least 5 years of experience. They were residents of the countries Austria, Finland, Germany, Italy, Netherlands, Sweden, Turkey, United Kingdom and United States. 54% of the participants were female and 46% were male.

3 RESULTS

According to the results of the semi-structured interviews, expert designers expressed both interest and some concerns regarding the idea of using KE results in their design processes. The issues which came up could be discussed under several categories such as: data-based design opportunity, guidance for designers like technical specifications, impact on creativity and authenticity, interference to expertise.

The data that were collected with an online questionnaire from 59 experts on the scale were first investigated to assess the quality of the scale. Negative items were recoded so that on the scale the scores of 5 always means positive and 1 means negative. The reliability analysis showed that the internal consistency of the 20-item scale was satisfactory where the Cronbach Alpha coefficient was found to be 0.82. The item total correlation coefficients for 18 items exceeded the desired value of 0.15. Two items were deleted from the scale. The Cronbach Alpha coefficient for the 18-item scale was found to be 0.85.

Although the sample size was small, the results of a factor analysis provided a four-factor model which explained around 58 % of the variance. The consistency of the factors with the conceptual categories for which the items were generated indicated the construct validity of the scale. The categories referred to usefulness, relevance for problem solving, individual & collaborative learning and creativity. Sample items for each category and corresponding factor loadings are presented in Table 1. The negative items which were recoded for calculations are shown in red.

For each participant a total score indicating how positive their perceptions were towards using KE result in their designs was calculated. The mean total score was 67.64 with a standard deviation of 6.9 where the minimum possible score was 18 and the maximum possible score was 90. Figure 1 shows the distribution.

Table 1. Sample Items, Categories and Factors

Categories	Sample Items	Factors			
		1	2	3	4
Usefulness	Evidence from KE results can help me create alternative designs.	0.811			
	KE results would help a designer for data-based decision-making.	0.751			
	KE results may be useful for preparing to design a new product that the designer has never encountered before.	0.434			
Relevance	KE results would provide solutions to sociological and cultural characteristics in design problems.		0.814		
	KE results may provide valuable information from scientific evidence for designers.		0.778		
Individual and Collaborative Learning	KE methodology could be taught to design students as a technical skill.			0.757	
	Interpreting KE results could be a part of design education.			0.622	
	Using KE results can be a similar practice like considering technical specifications for certain products such as medical tools or educational materials for children.			0.608	
Creativity	Exposure to KE results might cause an unnecessary mental barrier in the design process.				0.758
	Seeing the KE results would limit my ability to design creatively.				0.727
	Authenticity in the design process is not something that can be enhanced by scientific evidence from data.				0.643

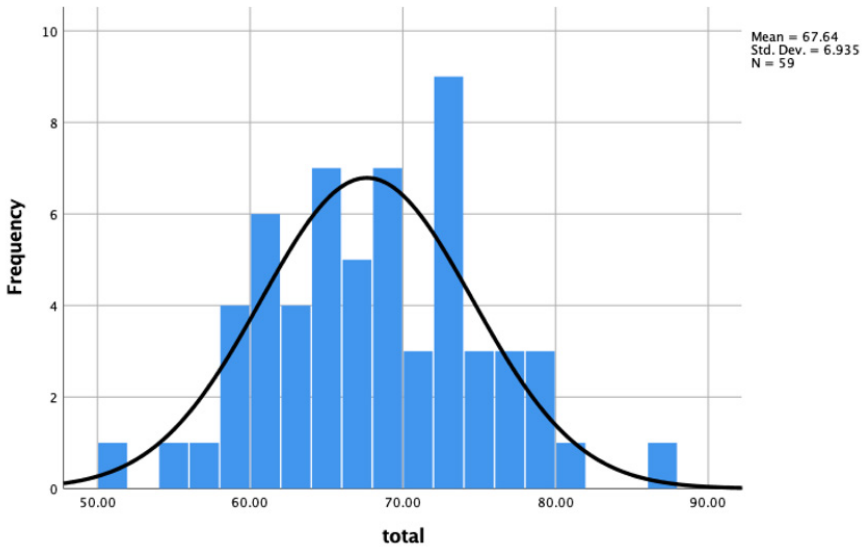

Figure 1. Histogram

The mean scores for each item were calculated. The mean of the item means was 3.8 and the standard deviation of the item means was 0.27, which showed that the attitudes of the expert designers was not found to be as negative as hypothesized to be in the beginning. The three items

with the highest means (>3.98/5.00) were "KE results would help a designer for data-based decision-making.", "If KE results for a product are provided, I could think of using them for designing." and "Design teams can benefit from KE results for resolving conflicting ideas". The three items with the lowest means (<2.44/5.00) were "Authenticity in the design process is not something that can be enhanced by scientific evidence from data.", "Expert designers will not find KE results essential for their designs." and "Only novice designers may benefit from KE results, not experts".

The means of the total scores and mean of each item from the questionnaire which were investigated, indicated that the overall attitudes of experts towards using KE in their designs was found to be more positive than anticipated. Especially the means of the items regarding preconceptions for KE results limiting creativity of designers got lower scores indicating lack of evidence for these concerns.

4 CONCLUSION

A scale that can be used to assess the attitudes of designers towards using KE has been developed. [2] The designed questionnaire may be a tool to determine the willingness of individual designers in a team for using KE before starting with a design project. It can also be used for research purposes to identify the relationship between expert designers' attitudes and related characteristics such as creativity or design skills.

The results regarding the attitudes of the experts not being as negative as it was anticipated provided sufficient evidence to be optimistic for more expert designers to use KE in their design processes. On the other hand, there is still a concern for using KE results regarding the issue of 'design fixedness', a cognitive bias which prevents designers from interpreting objects in new ways rather than their prescribed versions (Duncker, 1945) which leads to the limitation of their creativity (Olteteanu ve Shu, 2017). Although this issue requires further research, as far as the opinions of expert designers are concerned, they seem to be willing to try using KE results for solving design problems at some point.

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