Investigating the Role of Kansei Engineering for Affective Aspects of Empathic Design, a Report of a Case Study

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Abstract: This paper tries to seek possibilities and challenges of applying Kansei Engineering method as a tool to investigate affective aspects of Empathic Design. This trend has been introduced strongly as a holistic approach in Design Studies and there were some proposals for Functional Aspects of This trend, such as activity theory. However design researchers claim that affective aspects are not well considered in this new approach and tools and techniques are needed. In this paper the case study was chosen from children for blood sampling test procedure in the medical centers. The emotional aspect was assessed through Kansei Engineering. Four series of questionnaires were distributed toward them. Their choice and their emotional reactions were gathered and recorded. In one of them, Likert rating was also used for assessing the role. Based on such data gathering procedure, some precious verbal protocols could be generated from users .Also some cartoon characters were more inspiring for children. The results were applied in designing a new service experience for blood sampling procedure for children, and some preliminary responses are included for further investigation. The value of this paper would be helpful for researchers in Empathic design approach, for emotional aspects of such a trend.

Keywords: Kansei Engineering, Activity Theory, Empathic Design, Affective Aspects.

1. INTRODUCTION

Recently Empathic design is known as a holistic approach in design studies and some new proposals have tried to offer best thinking tool to cover both Functional and Affective Aspects of user experiences for empathic design approach. Postma et. al., have examined a variety of

frameworks to select the best one for analyzing user experience. They found activity theory as a scaffold of context that can make best proportion between designer's need and framework's output. As finding of this research, "activity theory addresses emotions merely implicitly, whereas emotions are at the forefront of empathic design." (Postma et al: 2012). They mentioned that "the role of emotions in activity theory needs to be further explicated when using activity theory as a thinking tool in future empathic design projects." According to this finding we hypothesized while in the design process the functional part was supported through activity theory, the emotional aspect could be assessed through Kansei engineering. Can we apply Kansei engineering method as a tool to investigate affective aspects of Empathic Design? To answer this research question, this paper has been structured as follows. We begin by presenting relevant literature, after which we address our research methodology and discuss the results.

2. LITERATURE REVIEW

2.1. Empathic design

"Empathy" is an imaginative projection into another person's situation. (Koskinen, et. al., 2003). It tries to take its emotional and motivational qualities into account. In the traditional design processes, design methods depended on the designer's personal experience whereas empathic design is to understand how the user sees, experiences and feels some object, environment or service in the situation in which he or she uses the object (Koskinen, et.al, 2003, Chen, 2012). Empathic design was first stated by Leonard and Rayport in 1997, they noted how designers could know the potential needs of customers as a process of a design method (Shu-huei and Shyh-huei, 2010)." Empathic design was presented as a process that involved observation, data collection and analysis, and iterative prototyping. Most significantly, the discipline was identified as a way to uncover people's unspoken latent needs and then address them through design (Battarbee et al, 2014)

The goal of empathic design is to capture users' needs and desires, particularly those needs which users, themselves, are not aware of. Even though the product problems can be discovered by the users, they will not have design knowledge to resolve them. (Chen, 2012) The problem of understanding the user and his or her experience has an important role in human-centered design and several tools and methods have been offered to support designers to be in user's shoes in order to design products that fit the user experiences (Kouprie and Visser, 2009).

3. METHODOLOGICAL PROCEDURE

3.1. Choosing the case study

One of the most unpleasant procedures for the recovery and treatment of children, are needle-related procedures in medical centers. Fear and stress of them arise when the sharp needle is supposed to insert into their skin. More than 80 percent of children under age 7 and more than 50 percent of school-aged children scare of needle (Humphrey, et. al., 1992). According to Sarah Gaskell, et al. research result, in 2005, number of children who referred to hospital with fear of needles, in the surgery/hospital treatment and blood testing was more than the other referrals. Therefore, the results of related previous researches emphasize on more attention to needle-related procedures such as blood sampling. Thus we chose blood sampling test procedure as case study.

3.2. Research process

As mentioned, blood sampling procedure was selected as case study and survey research performed for children hospitalized in Children Medical Center of Tehran and students of a painting class in Tehran. Therefore, during repeated visits to the laboratory and surgery department of the hospital and painting class, required data were collected in two separate phases. In the first phase, research based on activity theory, laboratory of the medical center has been chosen as a similar environment for the initial evaluation of blood sampling activity. The procedure of blood sampling for children aged 7-12 was observed and recorded for several cases. In the second phase (Kansei engineering), the sample was chosen from 17 subjects who were children between 7 to 12 years old, 10 subjects were hospitalized in Surgery Department of Children Medical Center of Tehran. Four series of questionnaires were distributed toward them. Their choice and their emotional reactions were gathered and recorded.

3.3. Kansei Engineering as an Affective Tool

3.3.1. Choice of domain

In order to applying Kansei engineering as an affective method, we had to achieve emotional data from focus group (children aged 7-12). Thus some researches have been studied related to service experience design and design for children. One of our limitations was that children cannot understand the meaning of the words exactly. Therefore only one experience factor (physical) was considered as service components to measure through Kansei engineering. One of the available sources related to different aspects of service experience is John et al. research in 2009. Based on their classification, service for user experience is composed of parameters including: Service benefits, People, Physical, Process, Perception, Emotional theme & Participation Activities. Finally, according to the available limitations associated with focus group, two parameters of color and theme/character as physical factor associated with sight sensory were considered.

Table 1: Experience factor (physical) and services component

Experience Factor	Services component
Physical	Sensory Design Sight, Sound, Touch Smell, Taste Physical clues Signs, Symbols, Artifacts

3.3.2. Spanning the semantic space

Collection of Kansei words (emotional adjectives) were selected through previous Kansei studies for children (Tharangie et. al., 2008, 2009) and from interviewing children related to their favorite things.

3.3.3. Spanning the space of properties (colors and theme)

Spanning the space of properties was based on, field research, previous Kansei studies for children and the results of previous research with similar object (Coad, 2008). The field research was conducted through interviewing vendors of games and animated series for children as well as teachers of children. The result was a list of 12 most favorite themes of children.

3.3.4. Questionnaire

Planning the questionnaires was based on the space of semantic and properties (color and themes). Five series of questionnaires were prepared. Elements were consisted of Color, Cartoon Characters and a sample of natural elements such as visions of see or mountains. One of them was composed of children favorite themes in A3 size, and the others were included the colors in A4 size. In one of them, Likert rating was used for assessing the role. The sample was chosen from 17 subjects who were children between 7 to 12 years old, 10 subjects were hospitalized in Surgery Department of Children Medical Center of Tehran and the other were students of a painting class in Tehran. The questionnaires were distributed toward them and their choice and their emotional reactions were gathered and recorded. One sample of questionnaires is here:

Figure 1: Questionnaire of themes/characters

4. RESULTS AND DISCUSSION

Inferential analysis was done by SPSS software using binomial test, Pearson chi-square test and Spearman's rho on the data. The results are explained in following. In order to rate happiness of 8 different colors (Violet, yellow, green, sky, blue, red, blue, orange and pink) using Likert scale, we examined the feeling of being happy using binomial test because the data were qualitative and our aim was to test a single sample. According to the results of table 2, the degree of happiness test, for blue, yellow, sky blue colors is significant.

Table 2: Binomial test results for happiness degree of colors

Parameters	mean	Std deviation	Observed prop	Test prop	Exact sig (2-tailed)
Violet happiness degree	3.29	1.10	Group1 0.53 Group 2 0.47	0.5	1.00
Yellow happiness degree	3.94	1.08	Group1 0.18 Group 2 0.82	0.5	0.013
Green happiness degree	3.12	1.49	Group1 0.47 Group 2 0.53	0.5	1.00
Sky blue happiness degree	4.12	0.928	Group1 0.24 Group 2 0.76	0.5	0.049
Red happiness degree	3.65	1.22	Group1 0.29 Group 2 0.71	0.5	0.143

Blue happiness degree	2.65	0.931	Group1 0.82 Group 2 0.18	0.5	0.013
Orange happiness degree	3.53	1.12	Group1 0.53 Group 2 0.47	0.5	1.00
Pink happiness degree	4.06	1.08	Group1 0.41 Group 2 0.59	0.5	0.629

Table 3: Happiness degree of colors (considering P-Value)

Violet happiness degree	
Yellow happiness degree	
Green happiness degree	
Sky blue happiness degree	
Red happiness degree	
Blue happiness degree	
Orange happiness degree	
Pink happiness degree	

Yellow and sky blue are happy, violet, green, red, orange and pink are not happy not sad and blue is sad. The next tests was done on the colors of happiness, sadness and anger (chosen by children) in terms of physical conditions (healthy and the sick) that was evaluated Spearman correlation test. The table of Spearman correlation coefficient among happiness, sadness and anger and 8 colors has shown in following.

Table 4: Spearman correlation value among happiness, sadness, anger and the colors. (The numbers in the parantesis are P-Value.)

Color	**Correlation value**		
	Anger	**Sadness**	**Happiness**
Violet	-0.06 (0.82)	0.54 (0.02)	0.06 (0.82)
Yellow	-0.22 (0.23)	-0.27 (0.29)	-0.15 (0.56)
Green	0.03 (0.90)	0.12 (0.66)	0.37 (0.14)
Sky blue	0.18 (0.49)	-0.18 (0.50)	0.18 (0.49)
Red	0.22 (0.40)	0.07 (0.78)	0.41 (0.10)
Blue	-0.25 (0.34)	-0.09 (0.73)	-0.51 (0.03)
Orange	-0.49 (0.04)	-0.20 (0.44)	0.11 (0.67)
Pink	-0.08 (0.75)	-0.32 (0.21)	0.43 (0.08)

According to the above table, there is an inverse relationship between blue and happiness(correlation=-0.51, sig=0.03) that is not significant. orange and Anger(correlation=-0.49, sig=0.04) and also a significant relationship between violet and sadness (correlation=0.54, sig=0.02), happiness and pink (correlation=0.43, sig=0.08). The following is cross-tabulations test to examine the relationship between the child's first favorite color and her/his feelings toward it. Firstly, we examined that the relationship was significant, or not.

Table 5: Results of Pearson chi-square tests of the favorite color of children and their feeling

	Value	Degree of freedom	significance level
Pearson chi-square	32.371	25	0.148
Likelihood ratio	26.004	25	0.407
Number of valid samples	17		

According to the table of Pearson chi-square test, significance level of chi-square test is 0.148 thus the null hypothesis that is “There is no relationship between first favorite color and feelings” is not rejected. Therefore, the test is not significant, and there is no correlation between the feelings and first favorite color. All samples had a different feeling toward their favorite colors. Consider the following diagram:

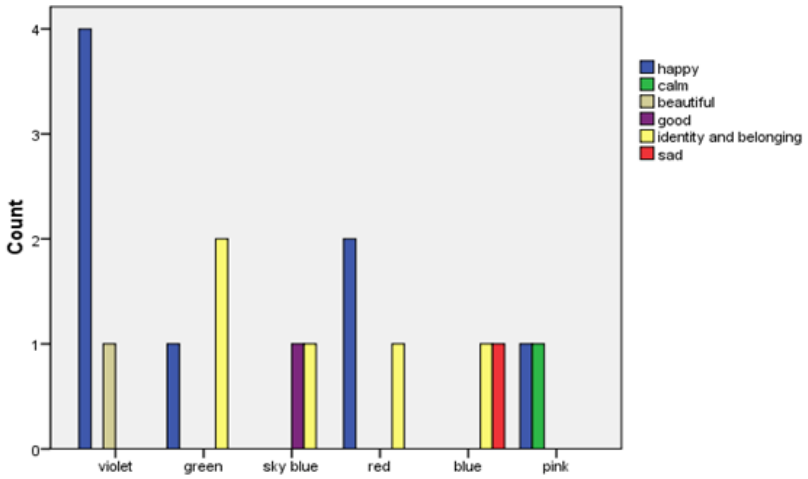


Figure 2: Children’s feelings toward the favorite colors

The following is cross-tabulations test to examine the relationship between the child’s first favorite theme/character and her/his feelings toward it. Firstly, we examined that the relationship is significant, or not? Consider the table of Pearson chi-square tests. According to Chi-square table, significance level equal to 0.272 and the null hypothesis will be rejected. Therefore, the test is not significant, and there is no correlation between children’s favorite theme/character and their feelings. All samples had a different feeling toward their favorite theme/character. Consider the following diagram: Based on such statistical analysis, this precious result generated; Sky Blue color was assessed by children as quite happy. Also Yellow, Red and Pink could be categorized in the happy range for children. Also some cartoon characters were more inspiring for children, such as Sponge Bob.

Table 6: Pearson chi-square tests of the most favorite theme/character of children and their feeling

	Value	Angel of freedom	significance level
Chi-square Pearson	28.817	25	0.272
Likelihood ratio	21.389	25	0.671
Linear-linear relationship	0.424	1	0.515
Number of valid sample	14		

Table 7: Symmetry measurements

	value	Approx. on of sign. level (3)	2T approximation	Asymptotic standard error(1)
Pearson'R distance-distance	-0.181	0.537	-0.636	0.198
Spearman's rank-rank correlation	-0.042	0.887	-0.145	0.286
Number of valid sample	14			

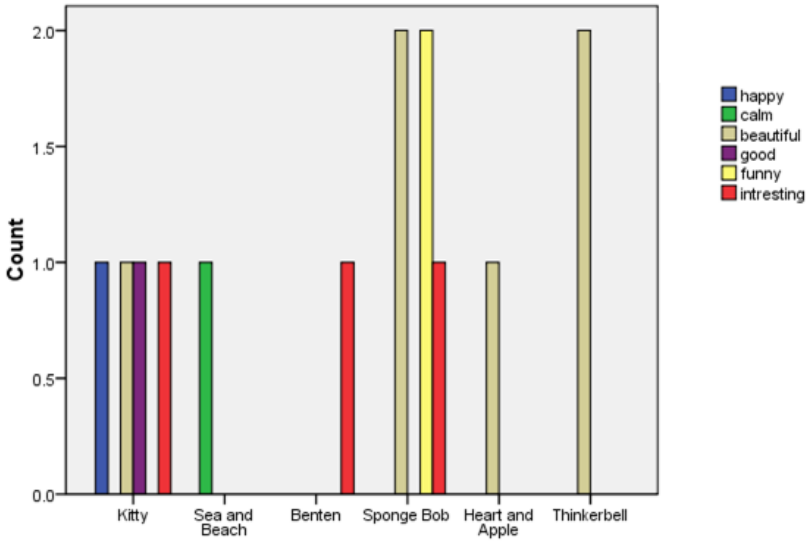
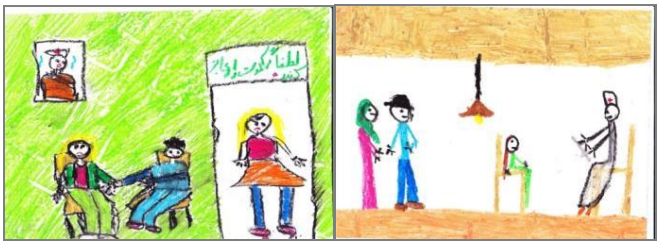


Figure 3: Children's feelings toward the favorite theme/characters

5. CONCLUSION

As this study was service-based research, in order to understand the user and create the ideal experience through Empathic approach, Scenario as a tool was used in design phase. As we know, personal experience is an important element in Empathic design especially related to services. Theatre play design could apply to service situations than originally thought (Stuart and Tax, 2004). Children's creative theater and paintings was considered as a basis source for inspiration in the design phase to better understand how children feel and behave in that situation. Some of children's paintings are in following: Four Scenarios was created through inspiration of close observation of the blood sampling process, watching children favorite animations and cartoons, creative theatres and paintings. The results of using activity theory in this study was also considered, models such as Engstroem Triangle Model were mixed with Semiotic Analysis, meaning Paradigmatic and Syntagmatic layers of an Activity.



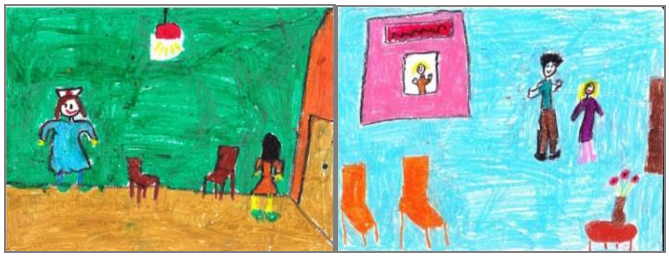


Figure 4: Children's paintings

Regarding Bruno Latour terminology the role of children in this procedure was changed from an actant to actor, meaning that they became able to affect the medical procedure. Also the protocols resulted from Kansei engineering was applied in these scenarios. In order to developing the scenarios consultation with industrial designers was done. Finally, one scenario was selected and transformed in to a new service experience for blood sampling procedure for children, and some preliminary responses are included for further investigation. The result will generate some positive results, such as decreasing the level of reaction toward pain; also the level of fear and stress in medical procedure will be decreased as well.

REFERENCES

Engeström, Y. (1987). Learning by expanding. An activity-theoretical approach to developmental research, Helsinki,Orienta-Konsultit.

Chen, C. B. (2012). An Approach to Empathic Design for Assistive Technology.

Coad, J., & Coad, N. (2008). Children and young people's preference of thematic design and color for their hospital environment. Journal of Child Health Care, 12(1), 33-48.

Gaskell, S., Binns, F., Heyhoe, M., & Jackson, B. (2005). Taking the sting out of needles: education for staff in primary care. Paediatric nursing, 17(4), 24.

Hartono, m., Chuan, T. K., Peacock, J. B. (2012). Cultural Differences in Applying Kansei Engineering to Services, Southeast Asian Network of Ergonomics Societies Conference (SEANES)

Humphrey, G. B., Boon, C. M., & van de Wiel, H. B. (1992). The occurrence of high levels of acute behavioral distress in children and adolescents undergoing routine venipunctures. Pediatrics, 90(1), 87-91.

John, R. A., Simons, L. P., & Bouwman, W. A. G. A. (2009). Designing and Testing Service Experiences (Mobile, Web, Public Displays) for Airport Transit. Proceeding of the 22nd Bled eConference eEnablement.

Katja Battarbee, Jane Fulton Suri, and Suzanne Gibbs Howard, IDEO, January 9, 2014

Koskinen, I., Battarbee, K., & Mattelmäki, T. (2003). Empathic design: User experience in product design. Helsinki: IT Press.

Kouprie, M., & Visser, F. S. (2009). A framework for empathy in design: stepping into and out of the user's life. Journal of Engineering Design, 20(5), 437-448.

Nardi, B., (1992). Context and Consciousness: Activity Theory and Human-Computer Interaction, MIT Press, Cambridge

Postma, C., Lauche, K., & Stappers, P. J. (2012). Social Theory as a Thinking Tool for Empathic Design. Design Issues, 28(1), 30-49.

Schütte, S. (2005). Engineering emotional values in product design: kansei engineering in development (Doctoral dissertation, Linköping).

Stuart, F. I., & Tax, S. (2004). Toward an integrative approach to designing service experiences: lessons learned from the theatre. Journal of Operations Management, 22(6), 609-627.

Tharangie, K. G. D., Kumara KG K, Jayasinghe I, Marasinghe C A, & Yamada, K. (2008), Kansei Color Associations for an Interactive Learning Environment for Children, SCIS & ISIS, TH-B2-4.

Tharangie, K. G. D., Marasinghe, A., & Yamada, K. (2009). When Children Sense in Colors: Determinants of Color-Emotion Associations. In Biometrics and Kansei Engineering. ICBAKE 2009.

Wang, S. H., & Hwang, S. H. (2012). A Case Study of Empathic Design, 17th International Conference on Learning / Creative and Imaginative Futures for Schooling, Hong Kong.

Wiberg, M., & Olsson, C. (1999). Designing artifacts for context awareness. In Proceedings of IRIS (Vol. 22, pp. 49-58).

BIOGRAPHY

Alireza Ajdari, PhD received his bachelor and master in Industrial Design from University of Tehran, Iran in 2001. Afterwards he worked as a PhD researcher and received his Doctorate in Industrial Design and Multimedia Communication from Politecnico di Milano, Italy in 2008.The title of his thesis was an experimental study on cultural affordances. Since then he has worked as an Assistant Professor in School of Industrial Design, University of Tehran. His research interests are interaction between semiotics theory and Affordance based design, Futurology in Design, Design management topics and Design Criticism.

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