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DESIGNING BASED ON THE EVOKED METAPHOR - CASE STUDY

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1. Introduction

For many years, the term "Kansei" has been introduced in many international conferences and journals on design as a Japanese concept related to feelings and emotions. However, most of these papers do not define the term properly, because of the actual lack of such definition or description. These definitions are most of the time approximate, focusing on the paper research topic, and usually sufficient for the research's requirement on the description of Kansei. Currently, a research started at the University of Tsukuba is precisely focusing on the description of Kansei, and on the structuring of Kansei studies, the research domain gathering all the fields related to Kansei [Lévy 2007b]. In this research, Kansei has been described based on three components:

- **Kansei process** gathers the functions related to emotions, sensitivity, feelings, experience, intuition, etc., including interactions between them.
- **Kansei means** are all the senses (sight, hearing, taste, smell, touch, balance, recognition...).
- **Kansei result** is the fruit of Kansei process. It appears to be a unified perception providing a qualitative meaning and value of one's direct environment.

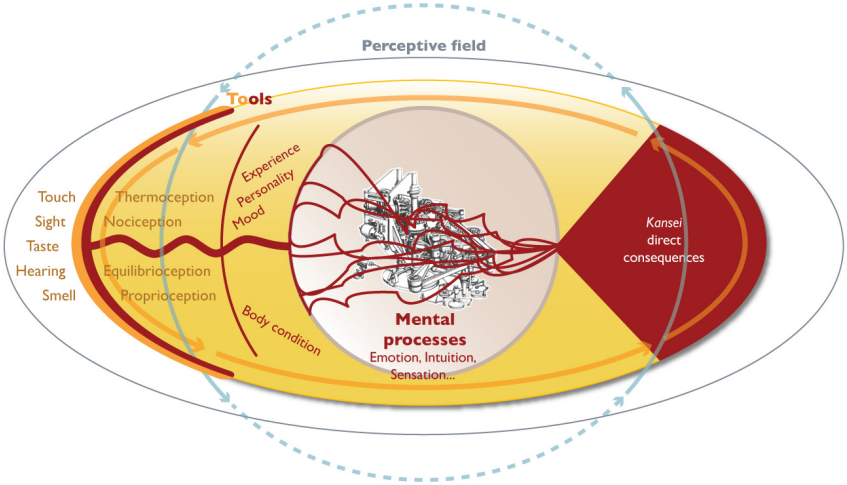

Figure 1. Kansei

Based on information provided by a multi-sensory system, influenced by many aspects (such as personality, mood, or body condition), many mind processes are yet able to conclude with one comprehensive, valuable, and (in most of the cases) no contradictory perception of the environment. Also, in the other way around, this perceived environment is a key aspect influencing one's psycho-physiological behaviour (cf. Fig. 1). This entire cyclic process is viewed and described in Japan as *Kansei*. To simplify, Kansei is the intermediate mind process between the actual environment and the perceived environment.
The possible contribution of Kansei research to design is obvious. However, the targets of Kansei research for design are described as follow [Yamanaka 2007]:

- explaining and evaluating creativity;
- understanding the structure of the mind (of the users or of the designers);
- explaining comprehensive characteristics of the human from physiological and psychological approaches;
- developing new methods for design, involving Kansei considerations.

The research presented in this paper is part of the last target of Kansei research for design. Its aim is to build up a design method for interdisciplinary workgroup context. The bases of this method have been published in the past [Lévy 2006]. In this paper, this method and a more practical way to apply it will be introduced, before presenting a case study output from a course taught from April to November 2007 to Master students.

2. Design method based on the Evoked Metaphor

2.1 Interdisciplinary design and meta-artefact

The study object of interdisciplinary design is the meta-artefact, defined as a *context-amplified artefact*. In other words, the meta-artefact is an artefact which is considered to have as many dimensions as a classic artefact has links with the context (or the environment). These dimensions can be:

- **elementary** (form, function, technology…), i.e. fundamental aspects of the design,
- **complementary** (emotion, ergonomics, security…), i.e. nowadays consciously treated aspects of the design,
- **induced** (culture, history, ethology…), i.e. eventually subconsciously treated as aspects of the design, but that are necessarily present because of the context.

To cope with all these dimensions, a great variety of knowledge domains has to be involved. Therefore, the design workgroup has to be of an interdisciplinary nature. In such interdisciplinary workgroup, the knowledge sharing becomes a strategic and crucial aspect of the activity. However, because of its interdisciplinary nature, the workgroup is affected by two types of knowledge sharing distortions:

- **tacit knowledge sharing distortions**, since each discipliner's experience is partly coming from the activity in the discipline. As ontology also gathers links between artefacts, and rules and actions being performed in the activity, it influences the way the activity is performed and tacitly understood.
- **explicit knowledge sharing distortions**, since it involves concepts or methods that may be defined differently for each ontology (i.e. the same word may mean different things in different disciplines). Communication on concepts or methods defined specifically to each discipline is a challenging barrier for the interdisciplinary group communication process [Bruce 2004].

Previous research pointed out that the use of a metaphor can satisfactorily minimize the level of these distortions. Instead of dealing directly with these distortions at a disciplinary level (involving disciplinary paradigms), knowledge sharing is brought at a metaphorical level. At this level, disciplinary ontologies disappear to a great extent, and knowledge sharing is based on workgroup member's experiential and intuitional understanding. Therefore, to build the interdisciplinary design

method, a tool had to be created to bring the knowledge sharing process at a metaphorical level: the Evoked Metaphor [Lévy 2006].

2.2 The Evoked Metaphor

The EM is a metaphor related to the project on which interdisciplinary design group is working on. It is defined as a set of intuitively transferable successful information and operating laws (cf. Fig. 2):

- **Intuitively transferable information and operating laws** — The EM is based on intuition and its process, which are supporting knowledge sharing in the interdisciplinary group. The main requirement for this metaphor is that members can understand it and interact with it intuitively. In other words, this EM would be an image analogue to the current problem, which each member would be able to understand not due to their disciplinary skills, but thanks to intuition. This description induces attributes and constraints that have to be developed here illustrating the following explanation.
- **Successful information and operating laws** — One of the most important aspects to be considered while designing the EM is its analogy between the EM and each of the disciplines' points of view involved in the design group. This analogy means that the discipline has to be able to validate the structure of the EM and its processes in full. Each evolution in the description of the EM should be in accordance with each discipline's paradigm. Any contradiction should be corrected in the EM in order for it to be validated it completely by each discipline.

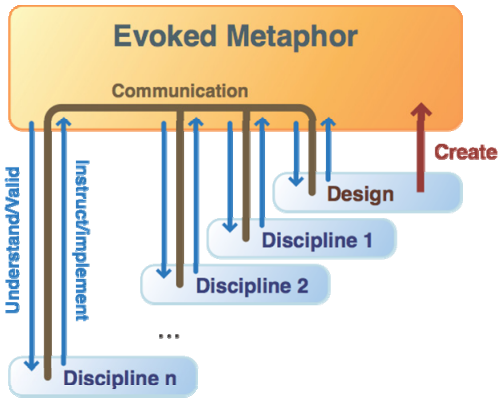

Figure 2. Evoked Metaphor principle

If the relation between the analogy and the EM respects the constraints listed in these two ways, then the EM is said to be successful.

As it is based on intuition, the understanding of the EM should not require any specific disciplinary knowledge. The EM has to refer to concepts understandable by anybody (even people outside of the interdisciplinary design group), thanks to their own intuition and/or their own experience. The EM has to be a meeting point between disciplines in their quest of sharing knowledge. Following this process, during the entire process, the EM would help each discipline to participate, or at least to follow and comment each step of the project, finally making the latter a fully interdisciplinary project.

Also, the EM should have a bilateral relation with each member. First, the EM should be understood intuitively, and its elements should be validated according to the discipline paradigm of each member. That is all the more important for the relevancy and the use of it. Second, each member has to be able to instruct or implement the EM with new elements or ideas to make it progress. Thanks to this bilateral relation between the EM and each member, the former should be used as communication intermediate between members. Previously, it was shown that there were issues in the direct communication of tacit and explicit knowledge between people with different disciplinary backgrounds. The EM, involving the intuition abilities of each person, is a communication support to

prevent, or at least to reduce these issues. That is one of its very interesting and great functions: Thanks to it, people can converse about the project and understand others' points of view intuitively.

2.3 The design method

The design process model in which the Evoked Metaphor is being included is (introduced by C. Owen [Owen 1993] is divided into two main steps aiming at transforming ideas (most of the times related to "user's needs") into artefacts for the real world (Classic Design Process in the Figure 3):

- **The design analysis process** — This step aims at defining, characterizing and analyzing the issues the design has to face. The problem statement establishes the context of the design project and optimizes project goals (problem definition) [Owen 1998]. This definition is essential since it finds the bases of the design project, and characterizes it. Then, these characteristics are analyzed (following various analysis methods) in order to output different solution elements. This step is qualified as 'top-down' since it starts from a global aspect of the project (or system), and aims at detailing it by a segmentation process.
- **The design synthesis process** — Once the functions are known and detailed, the designer uses this knowledge to conceptualize the design. Starting from the functions listed by the previous step, the designer clusters them to define a global information structure. During this information structuring, ideas are generated and output, for a better anticipation of the conceptualisation step.

The inclusion of the Evoked metaphor modifies the design process. The first part of the process (design analysis) does not change, but its output is used differently. Instead of passing directly from the design analysis to the design synthesis, a shift to a metaphorical level is required to build the EM (as it will be described in the section 2.4). Then, after the EM is built, continuous comings and goings between the design and the metaphorical levels are operated for the EM to support the knowledge sharing process in the workgroup.

This design process, including the EM, is a Kansei design process. In the Kansei design process, the role of the EM is actually to be a medium for the knowledge flow in the group. Thus, the Kansei design method appears to be an adapted and efficient tool for better knowledge sharing abilities of the interdisciplinary design group.

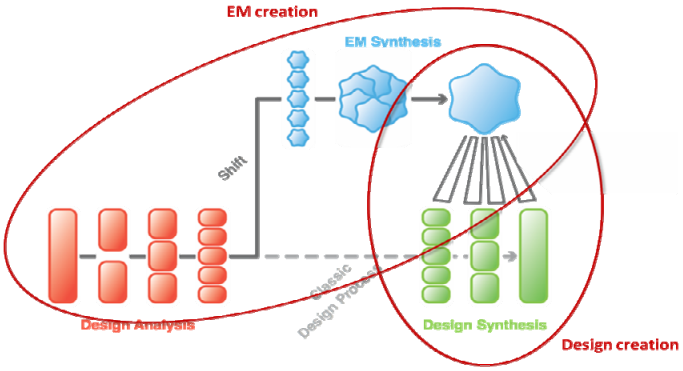

Figure 3. Two design processes: the classic one and the EM one

2.4 Constructing the Evoked Metaphor

The final stage of the method development presented in this paper intends to introduce the way the Evoked Metaphor is created (for more details, cf. [Lévy 2007a]). The creation of the Evoked Metaphor is a crucial step of this design process. As knowledge spaces such as the EM are included in design skills, the field of design can be in charge of elaborating it before its validation by other disciplines [Tacla 2003]. If no designer is involved in the project, then the project coordinator should be in charge of the EM construction and 'maintenance'.

The creation of the EM requires four steps (detailed examples are provided in the Chapter 4):

- The very beginning of the project is similar to all design projects. The design group is formed, and the design problem and goal are stated. The socialisation aspect of this step enables the emergence of these statements and of the context in which the EM can be created. Once the design problem is stated, it can be split into elements, which may be thereafter recursively split again until obtaining a list of undividable basic elements. This composes the output of the first step.
- The next step corresponds to the shift of the basic elements at the metaphorical level. In a practical way, the designer is asked to describe each of the basic elements in an abstractive and simple way, without using any disciplinary word. A few trials may be required in order to obtain a satisfactory result. This may be a long step, and may be one of the hardest steps for the designer, especially concerning the shift. However, this step is a determining factor for the nature and the relevancy of the EM. The output of this step is metaphorical basic elements.
- Once the metaphorical basic elements are established, the following step structures the metaphorical components. These components are objects and articulations between objects. The process used in this step consists in a synthesis at the metaphorical level. In a practical way, the task is to rephrase the design problem (stated in the first step) using the metaphorical basic elements. Thereafter, the designer has to check that the new metaphorical problem statement makes sense and still relates to the design problem.
- Finally, this metaphorical statement is used by the designer to create the EM. This task is highly based on her/his intuition and on her/his ability to use both experience and imagination to refer to situation in which the metaphorical statement is applicable. However, these are recognized as designer's skills [Tacla 2003]. Once an EM is crated, the designer introduces it to the other members of the group, who have to validate the EM and all its components. This validation endorses that the EM is compatible with each discipline's paradigm involved in the project.

Figure 4. Evoked Metaphor creation process

The description of these four steps shows that the construction of the EM is an analysis/synthesis process, starting from the design problem and ending at the EM statement. Therefore, the construction of the EM has to be considered itself as a design sub-process, part of the 'global' interdisciplinary design process.

It had been shown here that the creation of the EM is following the first spiral of the SECI Model, and was structured as a design process (analysis/synthesis process). These are the two main points of the theoretical approach to describe the construction of the EM. However, the aim of the authors is to provide a more practical way to build an EM, in the respect of the theoretical aspect of the EM design, of the SECI model, and of the design process model. This practical approach had been set up by practice: ten students of the Art and Design Institute of the University of Tsukuba have been learning and using the EM design method for product design. The questions and the weekly reports submitted by each student were used to improve and validate this practical EM design method and the design method using the EM. The approach presented in the two following sections has been successful for all the students.

3. Teaching

The method has been taught to a group of ten Master students (seven first-year and three second-year students) during two semesters between April to November 2007. The class and the student presentations were done in Japanese. In the Chapter 4, all the translated work is provided by the authors. The course content focused on an introduction to interdisciplinary design, on principles of the

EM-based design method, on the EM construction process, and on design management, on knowledge sharing, and design planning when the EM is involved.

3.1 First semester

During the first semester, each of the first year Master students worked individually on a design project. They chose a design topic (car navigation system, automotive design, portable game station) on their own, and applied a quantitative analysis (Type III) in order to propose a design problem. Based on the design problem that stated (first step), they followed the EM creation process. The second year students were "supervisors" for a few first year students. Their role was (at different points of the semester) to help, to assist, and to constructively comment the work made by the first year students. For the final presentation, the creation of the EM had to be explained. Also, the EM had to be presented and to be justified.

The method was globally well accepted by the students, even though they never heard about such method before the class. All the students went through the three first steps without any notable issue. Concerning the EM creation:

- Three students could present a successful EM from the first time.
- Two students needed to fix some issues due to the lack of analogy between the EM and the design problem. For both of them, the problem was related to the links between the various components of the EM (not reflecting the component links in the design problem).
- The two last students had to review entirely their first EM, as they couldn't clearly express the analogy between the EM and the design project. One needed just another trial. The second one required two more trials.

Finally, the seven projects were successful concerning the creation of an EM. However, one of the students misunderstood the use of the EM for the design project. At the end of the semester, the students were asked to propose a quick idea of possible design using the EM. For this proposal, no real justification was required. It was a free expression of creativity to make sure that the students did understand the relationship between the EM and the design process. It occurred that six of the seven first year students made a correct proposal, but one did not. The second year in charge was able to notice the mistake, but had a hard time to explain the first year student how to correct. Actually, the student was confused between the EM and a design reference: he proposed a design that "looks like" the EM.

3.2 Second semester

During the second semester, three design projects were selected among the seven ones output during the first semester. The second year students were in charge of a group to work on the design project and to output design proposals. Each of the groups met a design department of a company (designers from Subaru, Panasonic, and Sony gratefully accepted to participate). These companies generously accepted to comment the student projects, both on the EM use and on the design project. These comments and their consideration in the design output (final presentation) by the students were a requirement for the credit.

One of the three projects will be introduced here as case study.

4. Case study: Hunting CarNavi

4.1 Design Problem

The first project introduced in this paper concerns car navigation system (CarNavi). During the first semester, this project was introduced by Wang LIU. During the second semester, this project was executed by Yumiko SAIJO, Wang LIU, and Mahshid BANIANI. The company Panasonic was kind to help the students by commenting on their work. This system allows a car driver to position the car dynamically on a digital map. Using this functionality as a core function of the system, many services can be proposed to the driver, such as co-piloting based on configured itinerary, or indicating the closest gas station or the closest restaurant, etc… However, many issues related to usability and

security remain, as the complete system is supposed to be an added display in an automotive, and has not really been integrated to the environment. These issues are in disfavour of not only usability of the system, but also of the consistent toward driver's sensory abilities. Therefore, the design problem was enunciated as follow (step 1):

Designing a CarNavi which improves functionality thanks to an effort on usability, and which would be consistent with the driver's sensory abilities.

4.2 Shift

Based on this design problem statement, the keywords were extracted and were shifted to a metaphorical level (step 2 – cf. Figure 5):

- The "CarNavi" is actually the object to design. Therefore, it is translated (or "shifted") to the term "something". That is similar for all EM creation process.
- The terms "functionality" and "usability" are gathered and shifted to the notion of "easy to use".
- The "driver" is shifted and becomes a "person moving around". This shift is a good example to show that only necessary information is considered for the shift, and that the shift's result should be as open as possible. Indeed, the concept of car is not required in this shift. Only the fact the person is moving around is important. This activity may require a locomotion tool, but not necessary a car.
- The "sensory abilities" were shifted as "satisfying the sensations and the mind" [of the driver]. It is to be noted here, that these translation seems to be greatly influenced by Kansei study considerations. However, as the result is greatly understandable, and does not rely on any specific disciplinary terms, it can be accepted as is.

4.3 EM analysis

Once the terms are shifted, the EM analysis is quite fast and easy. It consists simply in gathering the terms, following the original design problem statement (step 3):

Something easy to use and satisfying the sensations and the mind of a person moving around.

The figure 5 shows the three first steps presented previously:

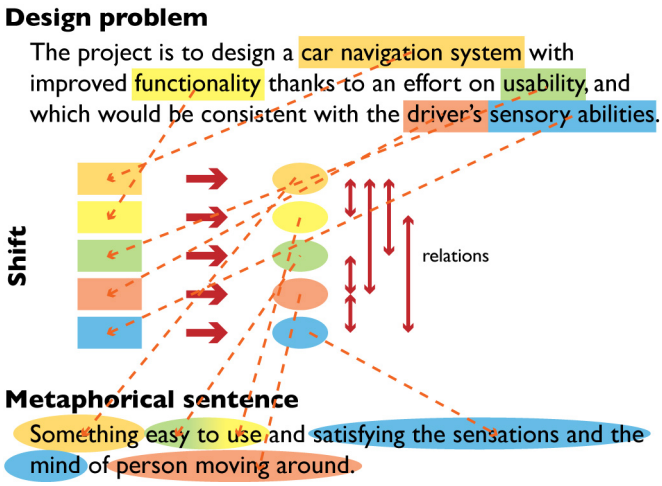

Figure 5. The three first steps applied to CarNavi

4.4 EM Creation

The last required step is the actual EM creation. Based on the intuitive sentence proposed by the third step, the EM can be created. This step cannot be described in a systematical way since it requires the designer's skill to use both experience and imagination to refer to situation in which the metaphorical statement is applicable and the analogy with the design problem is possible. The EM resulting from the fourth step was:

The beagles used during hunting help the hunter to navigate and find the quarry.

Therefore, the person moving around is the hunter (on the horse); the something is the beagle; the easy to use is rendered by the breeding of the beagle for the activity of hunting; and the satisfying the sensations and the mind of the hunter is providing by the integration of the hunting activity in the environment and by the permanent and organized help of the beagle. The analogy was defended by the student, and accepted by the entire class. It did actually made sense immediately, from the enunciation of it.

4.5 Design proposition

During the design process using the EM, the group proposed many ideas. More than the hunting situation itself, the different activities of the beagle were a source of inspiration. During the hunting, beagles have many tasks to do as an organized group. For example, they are guides for the hunters, trackers for the quarry, and carriers to bring the newly shot quarry. Therefore, using the scenario of the hunt to imagine new functionalities for the CarNavi, the group of students came with four different ideas, among which the information gathering interactive function, introduced here.

When the hunters seek the quarry, the beagles move around and help the hunt. In order to be efficient in this task, beagles are "communicating" with each other by intense and loud barking. That means that the efficiency of their task comes, at least partially, from the fact that they are cooperating and not trying to figure what to do on their own. The information provided by the entire group does help each of them to behave with more relevancy and efficiency. That is especially true when one of the beagle does find a quarry.

Using this observation, and deepening the understanding on the way the beagles do interact, the design group came with a few ideas, among which the main one was about interactive system to transport information in the traffic.

If a car gets in a traffic jam, or any unusual situation, the CarNavi would try to get information concerning the reason of such a situation. That is to inform the driver about the situation. To do so, the CarNavi can contact other similar CarNavi around and can create a communication network, until one of the CarNavi faces the possible reasons of the traffic. Then, the information (picture) is spread in the entire net, and the driver receives the information on the windscreen. This information provided to the driver intends to satisfy her/his sensations (by perceiving what is going on in the surrounding environment) and her/his mind (by knowing what is going on).

4.6 Discussion on the project

This project shows a good progression in the application of the method. Each of the steps had been well stated, and was consistent with previous steps. Moreover, the EM does make sense from the start of the design project and the way it had been used is simple and meaningful.

In this project, the students have been pointed out the lack of interaction between the CarNavi and the direct environment, even though it is one the main concern of the driver. CarNavi technology have been developed extensively using global communication technologies (GPS and the Internet), but not local communication network. That goes in contradiction with the concern of the driver for who the direct environment is of a great concern.

The EM, and its beagles, were a great source of inspiration to design a new solution for CarNavi. These innovations may not only propose new ideas of functions, but also improve the existing

functions and the usability of the CarNavi by considering more on the human intuition of perceiving the environment and of using products.

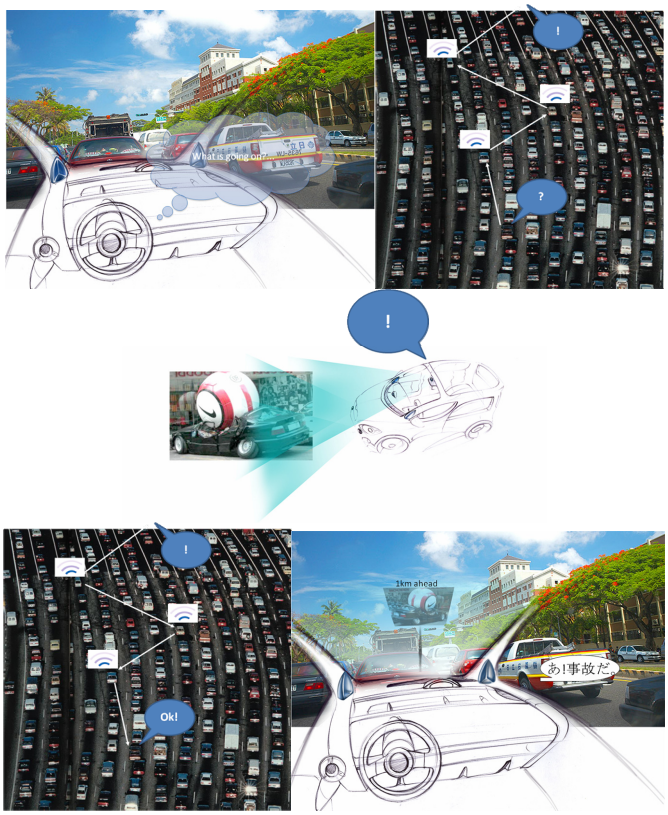

Figure 6. Scenario for the interactive system for information transportation

5. Conclusion

This method, created to minimize knowledge-sharing distortion in interdisciplinary design context, is actually based on the structuring of a communication tool for the design group. This tool, the evoked metaphor, intends to raise the communication skills of each member for a better understanding and sharing ideas with all members. Shifting from "disciplinary" skills, which are peculiar to each, to "human" skills (such as intuition and use of experience…), which are common to all, this method proposes to explore a new way to communicate in design, and to create a new level for both communication and inspiration.

Students' comments on the method revealed that although it requires some time and energy before being able to start the actual design project, the EM was an enjoyable tool to play around with the design issue, and to find motivation in exploring original solutions.

However, many trials are still required to improve the practice of this Kansei Design method. This session was a first session that showed that this method is understandable, teachable, and usable by student-designers. To go further and to develop this method forward, two developments are necessary:

- Improving the validation process at each step of the method – Indeed, validations were mainly done by discussion and agreement. There are rules to validate the progression of the EM

creation (e.g. checking permanently the analogy with the actual design problem), but yet there are tools or tasks which would clarify how to apply these rules. These need to be created.

- Promoting the method at an industrial level, and targeting designs for the real market.

These two objectives will be addressed by the authors.

Acknowledgment

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References

Bruce, A., Lyall, C., Tait, J., Williams, R, "Interdisciplinary integration in Europe: the case of the fifth framework programme", Futures, Vol. 36, 2004, pp 457–470.

Lévy, P., Yamanaka, T., "Interdisciplinary workgroup methodology based on Intuition - Application to a communication tool design based on Kansei information approach", Kansei Engineering International Journal, Vol. 5, No. 4, 2006, pp 31-40.

Lévy, P., Yamanaka, T., Liu, W., Igarashi, H., "Creating an Evoked Metaphor for Kansei Design", in proceeding of the International Conference on Kansei Engineering and Emotion Research, KEER07, Sapporo, 2007(a), on CD.

Lévy, P., Yamanaka. T., "On Kansei and Kansei Design - A description of Japanese design approach", Proceedings of the 2nd Congress of the International Association of Societies of Design Research (IASDR07), The Hong-Kong Polytechnic University – School of Design, Hong-Kong, 2007(b), on CD.

Owen, C. L., "Design for integrity", Institute of Design Communications Center, Illinois Institute of Technology, Chicago, 1993.

Owen, C. L., "Design, advanced planning and product development", Proceedings of the 3e Congresso Brasileiro de Pesquisa e Desenvolvimento em Design, Rio de Janeiro, Brazil, 1998.

Tacla, I., Divry, C., "The contribution of industrial design to knowledge creation: A case study of an sme's innovation", Proceeding of The 12th International Conference on Management of Technology IAMOT 2003, Nancy, 2003.

Yamanaka T., "Kansei Science for the Design Process", Presentation at the symposium on 'The Aesthetic of the Impossible' (Oct. 26, 2007), Auditorium of Eindhoven University of Technology, 2007.

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