HexDeck: Gamification of Tangibles for Brainstoming

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Abstract: So far, brainstorming has been widely used for creating new products. By providing various kinds of novel or unusual thoughts to think outside the box, brainstorming has developed some auxiliary methods and tools to stimulate creativity. As a tool for stimulative thinking, cards are said to have numerous advantages. In recent years, the appearance of gamification, which connects the concepts of HCI and games, has caused a sensation to the game world. Gamification is to employ game-designing elements in nongame contexts and the concept gives us another idea in brainstorming. This essay aims at how to combine gamification with creative cards in brainstormting. We digitalize the physical cards to display its information, improve cards through game-designing elements and interact with game-like methods. With game elements, we can change people's behavior, help users enjoy the meeting and further stimulate deliberations.

Key words: Gamification, Card, brainstorm

1. Introduction

In terms of novel ideation meeting, the scholars have already brought up documents that cards can help deliberation. Hornecker (2010) takes questioning cards as material for interaction design. According to the document's conclusion to the property of card, we can see the assistance of card shouldn't be underestimated through its arrangement and abstract questioning to make participants conduct deeper deliberation and send out ideas. Furthermore, plenty of designers put cards into games, hoping the atmosphere helps team reflection, more pleasure interaction and originality [4]. Ioana Ocnarescu et.al (2011) took the advantage of communication during meeting through intermediate objects as threshold and made TechCards. Using TechCards helps designers, technicians and human resource professionals in the meeting and shares a collective technical knowledge. The content and design make it easy to understand how and where to use certain technical information [8]. As far as gamification is concerned, due to the success of regional recording service provided by Foursquare, Deterding(2011) indicated that it is the game element applied to nongame contexts that encourage users to be more dynamic and manage data to interchange and interact with friends. The appearance of the term, gamification, has gradually come into notice and begun to broaden some related application like production, finance, education, news, press media and so forth. We notice that companies will provide rewards on software like bonus points, badge, ranking system and billboard. The game elements applied to nongame contexts are regarded as the most important reason users use software vigorously [1]. Brainstorming is an indispensable activity in innovative

process. As the unceasingly progress of meeting, building blocks, prototype-making tools and cards are appearing to assist the process of brainstorming. The reason of adopting cards in brainstorming is to remove blockages in discussion. Taking cards as examples, with the stimulation of property, pattern and characters, many experiments confirmed that they validly decrease deadlocks and produce a large number of concepts so that the meeting can go on smoothly. However, deadlocks might still occur when employing cards. This research hopes that meeting applied with gamification would make designers participate in the meeting more vigorous through the subconsciousness of attaining rewards.

The goal of this research is to unveil the reason why brainstorming still reaches an impasse with cards and how users feel when using cards as stimuli. Through the result we observed, gamification has the specialty to raise users' ambition, adding gaming elements into card playing in brainstoming and probe into future possibility.

2. BACKGROUND

2.1 Gamification

Gamification is a phenomenon that is defined as using game elements in nongame context. Due to the influences that serious games brought at the beginning of the twenty-first century, games are regarded as a means of training and education. Furthermore, HCI also probes into every aspect of user experiences, like design for pleasure, design for fun and motivations, which have become popular issues. The present Internet industry applies these results to their services; therefore, new popular word, gamification, comes into being. The main ideas of gamification is not to establish a complete game, but to use game elements in nongame contexts of designs, products, serving to stimulate expected behaviors.

Deterding (2011) used more concrete concepts to expound gamification. The main design purpose of TV games and PC games is to entertain and to intensively engage users incomparable length of time. Therefore, game elements may be used to make nongame products and to provide more pleasure.

Gamification should be seen as a management system and mingled with real life, just like the feeling of playing a game in daily life. This method has caught attention in recent years; for example, Foursquare and Nike plus lifted their user experiences by adding game elements to their services to make customers get more motivations to use their software [1].

2.2 Card

Cards, used as brainstorming tools, can be divided into two categories: inspiration hints and card games. The type of inspiration hints puts emphasis on cuing cards and pictures without regulating users how to use the set of cards. Picking up one randomly and deliberating with many cards are both fine; every card can be used independently.

According to the research of Hornecker (2010), using cards as design tools can open a discussion topic smoothly. Cards can be directional materials. They can not only help discussion deliberating in light of hints on them but also give a focus when the train of thought gets stuck in a hopeless tangle [4]. This interaction card aims at stimulating users to associate with topics that their design probes into. Every card has different questions. We can facilitate communication with cooperative ways and the specialties of physical cards make more interactive mode between participants. Cards can make the discussion within groups transfer focus and provide new thoughts and ideas when hindered. The hints on cards adopt question mode instead of guideline to avoid groups from being

caught in the bypath of directions. This card is divided into four groups: tangible manipulation, spatial interaction, embodied facilitation and expressive representation [4].

IDEO(2003) launched their own designing card deck, with 51 cards in a set. On the back of them, 51 different observing research methods are proposed and the other side shows the images of the research method. Based on the descriptions of IDEO, every card is a skill or method in house. The *observe* side is exquisitely printed pictures; the reverse side illustrates contents. Most of these ways are applied in projects; for instance, the common ways in Psychology and Anthropology. This set is classified into four categories: learn, look, ask and try [5]. There are no rules of using cards. When encountering bottleneck, a designer picks up a card and uses the method, just like placing oneself in IDEO, dealing with projects and feeling helpful for product design. These cards make users a core and direct designers to design products that reach customers' expectations from their points of view.

Lockton's Design with Intent(DwI) cards probe into eight different aspects of how to make use of design to influence the behaviors of users. The eight aspects are architectural, error proofing, interaction, ludic, perceptual, cognitive, machiavellian and security [7]. Lockton believed that design can change users' behaviors to deal with the problems we encountered in social contact conditions. Every card has a question collocated with a picture and example focusing on a certain point to make users deliberate. This card deck mainly helps designers, customers and potential users that have different thinking ways in daily life. For example, architects can refer to cards of architectural category and think how to affect users' behaviors; human factor engineer can refer to error proofing category to design products that are easy to use. The author points out that these cards can be used in brainstorming, designing methods and analyzing present systems or references. The classification of cards is loose without specific rules and can be used randomly.

The biggest advantages of cards are easy to sort and arrange. Donna Spencer introduced how to use cards for information architect named Card Sorting [10]. Card ordering is a common way in information architects since a website designer needs to understand users' presumption towards various functions and categories and card sorting is the easiest way no matter in classifying or ordering. Spencer also mentioned that we can use card ordering under three conditions: designing a new website, designing a new zone in website and redesigning a website. However, she clarified that card ordering is not a website evaluating skill, nor can it tell us what's wrong with the website. Card ordering is something more than this. All designs that need classification can use this method. When conducting a test within a group, five people will produce five distinct classification ways. If carrying out smoothly, it can help us grasp some useful information and further facilitate the process of product design.

In short game itself has rules and brings positive effects for brainstorming. Rules take effects in procedures and have directions for clear goals, making players know how to receive highest benefit. Success itself also brings a power of inspiration. Traditional brainstorming needs an experienced leader to guide other participants to keep focusing while conceptual deliberation games possess the characteristics of providing discussion atmosphere.

3. Problem Observation

3.1 User observation

We observed the phenomena of creative deliberation by practically conducting brainstorming session with stimuli, IoT cards and the topic of Internet of things. There were four groups in the first stage and each group included four participants. The hosts of every session were the researchers. During the session there was no rule when using cards. Other materials included post-it notes, A3 papers, markers and snacks that supply physical strength during deliberation.

The meeting space was decorated mainly by the means that everyone surrounds the table and discusses. On the table, A3 papers, post-it note, markers and snacks were provides. Four participants could use notes and markers randomly (Figure. 1). Each session introduced the concepts of IOT; therefore, the definition and examples would be illustrated for about fifteen minutes before addressing the topic; cards were evenly distributed to everyone. After the meeting began, the researcher hosted and observed. The session lasted for about an hour.

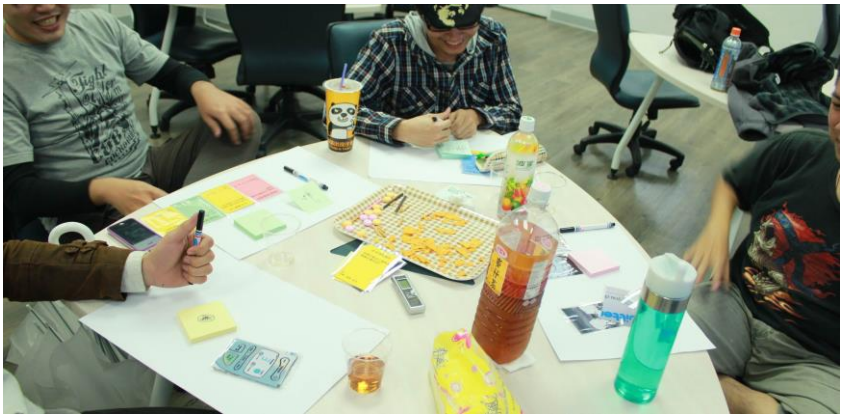

Figure.1 Brainstorming session

3.2 Results

After each session, we interviewed every participant focusing on the feeling of using cards, the reason why the deliberation is difficult, and the suggestions on cards. The results are as follows.

- In the beginning, people using cards for the first time would usually feel lost. For instance, at the first round of the first session, the participant 4 showed this condition that guidance is needed to stimulate thinking.
- In the middle, some impressive thoughts appeared, yet in the last, ideas became less.
- Some pictures on cards were hard to deliberate, while some cards were hard to deliberate no matter what contexts and pictures.
- If the information on cards is unclear and vague, the process of deliberation was affected.
- Similar thought appeared repeatedly because of the repetition of cards.
- The textual messages are too many so that they make participants uncomfortable.
- Pictures have certain help towards deliberating.
- The biggest benefits of pictures are making participants memorize more easily.

- Pictures on cards are easier to use when their sizes are appropriate.
- Abstract questions could inspire more thoughts and deliberations, yet the participant 2 thought that the shortage of context will affect his thinking output.

4. Card Design

4.1 Present problem

Since the appearing of brainstorming session, there have been many improvements and additional processes according to different demands or circumstances. For example, plenty of researches agreed that adding cards into meeting helps stimulate deliberation and makes meeting continue smoothly. Furthermore, in the cross-disciplinary meeting, adding cards can let participants from different areas bridge gaps between them and conduct communication and discussion more successfully. The sorting of physical cards can also organize the concepts of the meeting.

These improvements aim to increase visual and tactual stimuli to lower communication barriers and produce numerous creative thoughts. However, if participants felt bored with the topic or the motivation of attending was weak, the outcome of meeting will be affected.

Secondly, using cards as intermediate objects in the meeting is discovered that the information for deliberating is limited; therefore, the way of using cards should be improved. Whether there are methods to provide participants with more information is also the problem that should be considered.

4.2 Design goal

Most of the interviewing results from participants were suggestions regarding pictures and contents of cards; nevertheless, we found more problems during observation. Most brainstorming session needs a host to lead participants to speak. Passionate and positive participants are rare, and most of time, people just stay inactive and wait for others' ideas because they had no motivation of producing a good design here. Perhaps no intention might be the most common problem in a brainstorming session. (The thing we discussed is something that participants feel uninterested, yet they have to do.)

Therefore, according to the suggestions on cards from participants, the mode of cards should be improved by providing more various messages. After this, we hope to provide more motives to make them take part in the discussion with more positive attitude and have new experiences under new frames. These will be our designing priority.

4.3 Design process

Some research has already pointed out that digitalizing the cards can make single-topic cards provide more inspirations, such as showing more pictures and related contents. Therefore, the initial improvement is developed from the concepts of digital cards (Figure. 2). Of notice is that digital cards remain some merits that physical cards have, like ordering, dragging, and rotating, and we will continue this spirit and keep designing.

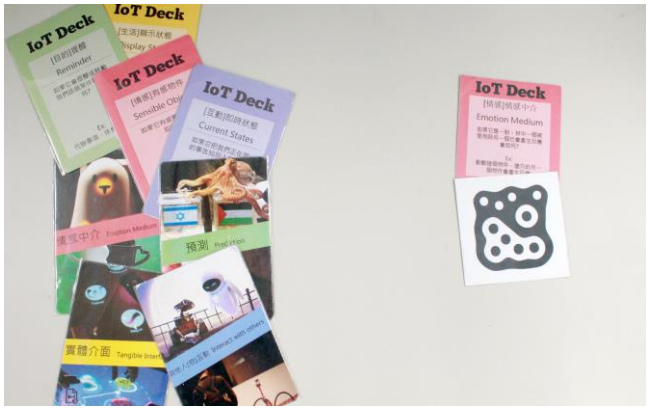

Figure.2 IOT digital cards(right) and physical cards(left)

While deciding to continue the development of digital cards, how to raise the motives forced us to be stagnant for a while. We turned to probing into serious games and during the time, we accidently discovered the issue of gamification. According to the description of Deterding (2011), the biggest differences between gamification and serious games are that serious games are designing games at the very beginning and the games will have the functions of education and simulation [1]. Gamification extremely emphasizes that putting game-designing elements in nongame contexts. It regards intention of creation as a goal and borrows few elements from games. The example of Foursquare makes us believe that adding game elements into brainstorming is possible to increase the output.

Game elements include points, badges, achievement, levels and so forth and gamification utilizes these simple numeral units to design intentions to make users use the applications more actively. Since the nongame applications have already had many successful examples, we might start thinking how to utilize these elements in brainstorming session.

4.4 Final Design

The platform we built is a multi-touch table to display cards' information. The multi-touch table is made of wood, 100 centimeters in length, 120 centimeters in width, and 100 centimeters in height. We put some essential equipment, including computers, IR LEDs, projectors and IR cameras under the wooden table (Figure. 3). The acrylic on the table for projection has been specially buffed so that it detects tags more accurate and easier to read fingers' information.

Figure.3 Multi-touch table and other divices

As to the card design, we chose badges, achievements and levels from game elements and combined them with cards. Our prototype produced a hexangular polyhedron which looks like token with the metaphor that can be collected like points. Furthermore, it reserves the merits that digital and physical cards have.

During the process of card development, considering the concepts of aesthetics and connection, we chose regular hexagon block as card form. For size concern, we chose what can be shown on the screen with appropriate size and easily held in hands. After we practically made several prototypes and referred to some people's opinions, the block cards were eventually set as hexagon block with the diameter of ten centimeters and point five centimeters in height (Figure. 4). The following design classified the cards into four colors and applied to level, a concept of game elements, which classifies cards by colors.

Figure.4 Prototypes of block cards and digital tags

As to level, we currently classified cards into four levels with different deliberation background respectively. Red means users' feelings, such as emotion, aesthetics, abstract and fun. Blue represents cards that are helpful for functions and modeling of products, like methods, forms, functions and materials. Green is the value-added cards more than function and ease of use; for example, value, motivation, goal and achievement. Yellow cards are used when doing interaction design products or services, and can be referred to, like interaction, action, sensor and communication.

Table 1. First edition of fundamental cards

Card Level	Color	Card 1	Card 2	Card 3	Card 4	Card 5
Form	Blue	Metaphor	Shape	Style	Material	Action
Aesthetics	Red	Color	Sense	Poetry	Kansei	Subjective
Value	Green	Achievement	Resource	User	Vision	Fun
Interaction	Yellow	Tangible	Interface	Medium	States	Random

Level lets participants choose the field they excel in to form concepts and new concepts will be added to a specific card to become a new card. These output ideas are saved like designer's collections with the mode of digital cards. So far, there are twenty fundamental digital cards and will be extended to eighty in the future (Table 1). New level remains unfinalized and cards produced by designers will possibly become even more through using. However, the system is reading and saving cards' information through database, the number of digital cards can increase in simple ways.

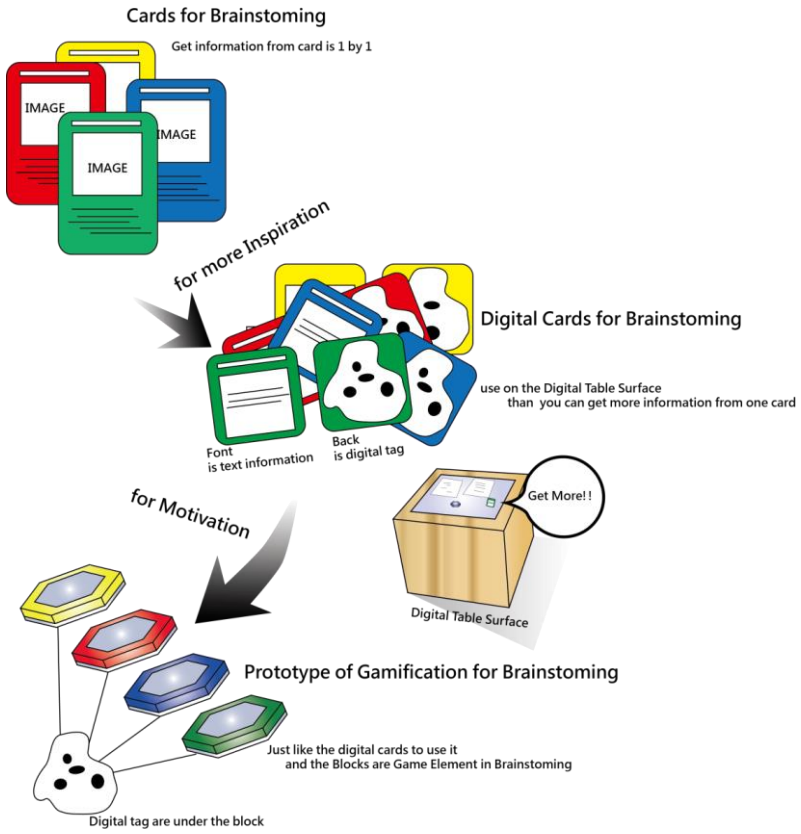

Figure.5 Block cards developing process

5. Using scenario and interaction

5.1 Using scenario

The using method of block cards is as same as digital cards. In designing, we embedded digital tag under the block. The designing of digital tables' interface is divided into two parts: display zone on the top and card zone below.

The card zone below has many hexagons that can respond to block cards. When putting cards in hexagon, the surrounding six hexagons will show the name and level of the block cards and its relevant cards, and then the corresponding cards will change colors. In the present design, a block card contains five cards.

In addition to the pictures showing in the hexagon, clicking the picture in interest on the table, the display zone on the top will show bigger and clearer picture with illustrative contents on the right and give prompted contents about designing.

Users can also randomly move cards to other hexagons to put or arrange in order and can add other cards to show on tabletop together. On the scene, many hexagons with different colors crisscross and you can sense the obvious differences through colors of these cards. Besides, users can freely arrange these cards whenever they like to gather their thoughts and keep track of them.

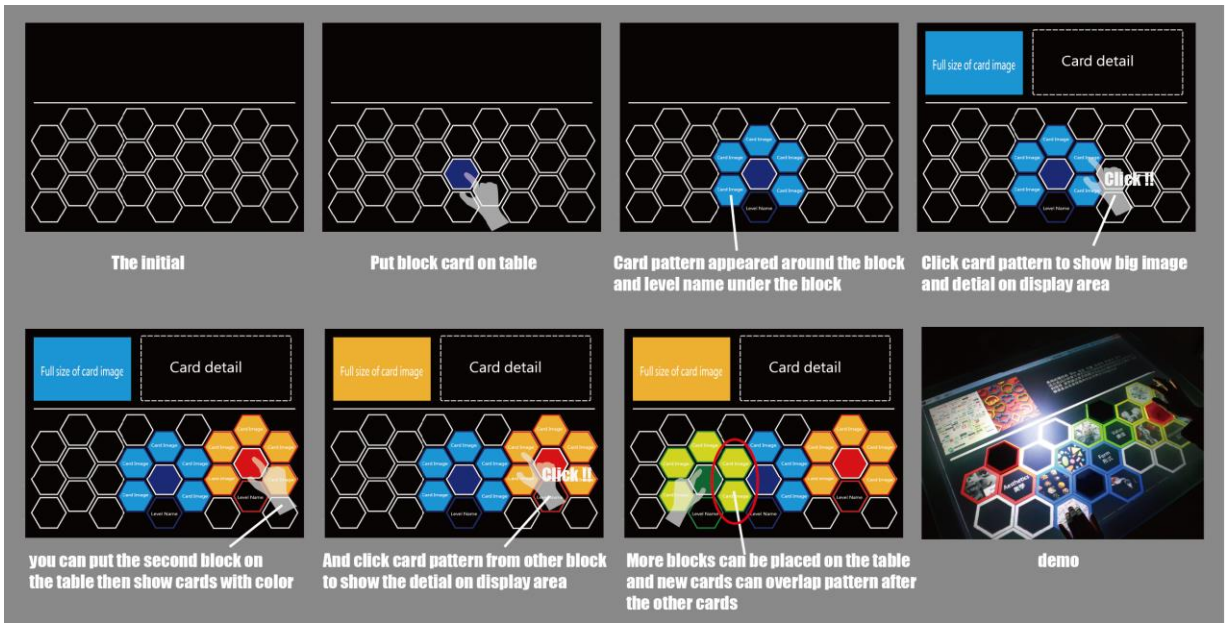

Figure.6 First edition interface prototype and demo

5.2 Pilot Study

We want to understand the first impression of the system. Eight students from design department were recruited to conduct a preliminary experience. All participants had not used the digital cards before, and therefore the first impression was that this table is very interesting.

- "Very cool, I have not used the tools to do the creative thinking, but this is the desktop that makes people want to play. If a group of people to each other on the desktop, moving blocks must have a lot of fun. " Participant3 said.
- "Visually quite attractive, beautiful cards arranged. " Participant4 said.
- "Block compared with the card, this desktop feels like more lively, and the block card seems to introduce itself. " Participant2 said.

The preliminary results from experiencing this prototype were averagely good. It was novel for participants, who provided positive responses and constructive suggestions.

- . "A paper card needs flipping to read, while the block shows messages directly and the desktop displays faster. " Participant1 said.
- "Interface format is probably not necessary to be limited. " Participant2 said.
- "Card merging on interface would allow more diversified use. " Participant3 said.
- "Traditional stickers feel like a waste of resources. With this table, we do not need to imagine the pictures conceptually; we do not need to waste time painting draft; it can be used directly. " Participant4 said.

Level in the game elements applied to color block cards also gets a lot of very positive feelings.

- "I can tell by the color of the card categories, and they can be clearly classified and arranged. " Participant1 said.
- "These categories on the desktop look very easy to recognize by color; hexagons with a same color around the corresponding block seem very organized and neat, comparing to the previous version of digital cards. " Participant4 said.

Although the experience we first explored did not employ gameplay participants have regarded it as interesting, and imagined the scenarios of a group of people around the desktop playing card games.

From these interviews, the first version of the design has been made in the first step of success.

Figure.7 The using scenario of block cards

6. Discussion and future work

This essay brings up that the element of gamification could be applied in novel brainstorming, turning thin cards into block cards with gamification features and fully making use of the characteristic of digital cards to show the content with more various ways.

Speaking of the system, the function will continue improving and so does interaction methods, such as dragging cards to wherever you like, rotating cards to display more categories and cards, and crisscrossing cards on the screen to connect with new concepts or related cards' link.

The contents of cards can be established and saved by database and this method can make it easy for supervisor to renew contents and pictures, or even to create a new category. Cards can be modified through editing database instead of reprinting like tangible cards. Considering the future development of establishing collections through system, the database has remarkable opportunities to transfer to the Internet platform.

So far, our contribution is to build a fundamental functional frame-work. The future work is to make use of this system to create gameplay scenario and we will further probe into the issue whether the system gives more intentions to the participants of the meetings or improves their experiences.

Reference

[1] Deterding, S., Dixon, D., Khaled, R., Nacke, L. (2011) *From Game Design Elements to Gamefulness: Defining "Gamification"*, In Proceedings of MindTrek2011, ACM Press, pp 9-15.

[2] Deterding, S., Sicart, M., Nacke, L., O'Hara, K., Dixon, D. (2011) *Gamification: Using Game Design Elements in Non-Gaming Contexts*, In Proceedings of CHI EA 2011, ACM Press, pp 2425-2428.

[3] Garrahan, D., Shaer, O., Piplica, A, and Gold, K. (2010) *Leveraging gesture and voice data to improve group brainstorming*, In Proceedings of CHI 2010 Extended Abstracts, ACM Press, pp 3901-3906.

[4] Hornecker, E. (2010) *Creative idea exploration within the structure of a guiding framework: the card brainstorming game*, In Proceedings of TEI 2010, ACM Press, pp 101-108.

[5] IDEO. (2003) *IDEO Method Cards: 51 ways to Inspire Design*. Available at <http://www.ideo.com/work/method-cards > [accessed March.2013]

[6] Liikkanen, L., Kuikkaniemi, K., Lievonen, P., Ojala, P. (2011) *Next Step in Electronic Brainstorming:Collaborative Creativity with the Web*, In Proceedings of CHI 2011 Extended Abstracts, ACM Press, pp 2029-2034.

[7] Lockton, D. (2010) *Design with Intent toolkit: 101 Patterns for Influencing Behavior Through Design*. Available at <http://www.danlockton.com/dwi/Main_Page > [accessed March.2013]

[8] Ocnarescu, I., Pain, F., Bouchard, C., Aoussat, A., Sciamma, D. (2011) *Improvement of the industrial design process by the creation and usage of intermediate representations of technology, "TechCards"*, In Proceedings of DPPI 2011, ACM Press,pp 1-8.

[9] Raybourn, E. and Bos, N. (2005) *Design and Evaluation Challenges of Serious Games*, In Proceedings of CHI 2005 Extended Abstracts, ACM Press, pp 2049-2050.

[10] Spencer, D., and Garrett, J. J. (2009) *Card Sorting: Designing Usable Categories*, Rosenfeld Media, New York.

[11] Stapleton, A. (2004) *Serious Games: Serious Opportunities*, In Proceedings of AGDC 2004, pp 1-6.