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EVALUATING DESIGN FOR SPECIFIC USER GROUPS – DEVELOPMENT OF CRITERIA FOR A DESIGN AWARD

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ABSTRACT

In this paper, we present a design research approach to measure quality of design targeted towards specific user groups. In our efforts to increase the focus in design on specific user groups, here exemplified by children and elderly people, we have established the European DEVICE Design award. The paper report from our efforts of iteratively developing a common set of criteria for evaluating design targeted to these user groups. It is illustrated how iterative development and design of an award can be used as a method and driving force for defining a set of criteria for judging design quality for specific user groups. Three iterations of the DEVICE Design Award and the criteria are presented together with the main lessons learned. The lessons focus on 1) how to balance the value of theoretical and methodological contributions equal to design practice, 2) how to align different design disciplines in one award under the same criteria, and 3) the value of evaluating criteria in order to improve the quality of the award. The contribution of this paper is the lessons learnt in the process of defining criteria, as well as the final criteria themselves, which can be useful for others involved in evaluating design for specific user groups or interested in setting up a design award.

Keywords: Specific user groups, children, elderly, design quality, design award, criteria

1 INTRODUCTION

Design quality is hard to measure, and consists of both objective and subjective components. Some indicators of design can be measured objectively, while others are more intangible and dependent on subjective preferences. Also, different design communities have different views on what design quality is. In an attempt to overcome this, Gann et al (2003) propose three general features of good design: 1) it derives from complex and uncertain starting points; 2) the process is non-linear involving interdisciplinary approaches; 3) it results from iterative cycles of cumulative development, where satisfying results are acceptable, rather than optimal results. These three features can serve as a guide when defining criteria for judging design quality. However, when setting up criteria for a design award targeted towards specific user groups, these general features need to be complemented with more specific criteria.

In the recently completed DEVICE project (DEVICE, 2014), the focus has been on raising the quality of design for the emerging consumer groups children and elderly people. As the population is aging quickly, it becomes increasingly important to design products that take into account the limitations and wishes of elderly people, and are comfortable and safe to use. Likewise, while parents are spending more money on their children than ever before, children still seem to raise little consideration among designers, and issues such as adjusting to levels of development and aspects of safety should be taken into account. Design and innovation can lead to the introduction of new products that meet changing

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consumer needs and be a powerful tool to increase the well being of children and elderly people. In DEVICE the term *vulnerable generations* is used to denote the groups of children and elderly people. The motivation is that in many cases, these groups have less control of their lives and may also have various kinds of cognitive and physical restrictions and can therefore, in a broad sense, be considered vulnerable.

There has been an increased focus on universal design and to design for all. For instance, EU initiated an innovation prize in 'design for all' and 'assistive technology' (EU, 2003), and established the Enable awards, focused on the use of information and communication technologies to support lifelong learning by disabled adults (Enable awards, 2014). In line with this, and in order to increase the focus on design for children and elderly people, the new DEVICE design award was established by the DEVICE project.

Initiating a design award involves much research, especially when selecting suitable evaluation criteria. The strategy chosen to develop the DEVICE design award is the same as in many design projects, i.e. to research, design, prototype, test and iterate. This paper describes the process and lessons learnt from developing the DEVICE design award. The paper discusses what criteria are relevant when judging design for specific user groups, and what difficulties there are when evaluating criteria, based on the analysis of the work behind the development of the award. This includes both issues concerning what criteria are suitable to take into account to be able to evaluate different kinds of contributions, and issues concerning phrasing and problems resulting from ambiguous or hard to understand criteria.

2 BACKGROUND

The DEVICE project was initiated by a consortium of researchers and professionals from seven research institutions in five countries. The aim is to modernize and improve design education with a focus on design for children and elderly people. The main steps have been to investigate state of the art, define training needs, and finally develop and pilot teaching modules for designers. Another result of the project is to initiate the DEVICE design Award of excellence targeted towards professionals, researchers, and students in designing for children and elderly people.

2.1 RELATED WORK

Zimmerman et al (2007) propose a set of criteria for evaluating an interaction design research contribution: process, invention, relevance, and extensibility. Regarding *process*, part of the judgment of the work examines the rigor applied to the methods and the selection of specific methods. It should be possible to reproduce the process, even though there is no expectation that the results will be the same. When it comes to *invention*, a novel integration of various subject matters to address a specific situation must be produced, by situating the work and demonstrating how the contribution advances the current state of the art. Instead of validity, design research should be judged on *relevance*; the motivation, the detail on the current situation and on the preferred state the design attempts to achieve must be articulated, along with why the community should consider this state to be preferred. Finally, *extensibility* means that the design research should be described in such a way that the community can leverage the knowledge derived from it (Zimmerman et al, 2007).

Design is becoming a strategic approach to product development and has impact at multiple business levels, why there is a whole area dedicated to design measurement. Since design and innovation are hard to define and quantify, it is not just about considering the desired outcomes or measuring design's impact

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on business, but rather to use design as a strategic tool. Wakid et al (2011) propose to define metrics for design and innovation based on communicating value and quality by linking the innovation actions and efforts to the outcomes achieved. They further support that the metrics should add value to the project work itself, such as help organization, allocate resources and activities (Wakid et al, 2011). However, not all important factors in design can be measured and accounted for in economic terms. In designing for specific user groups, we must incorporate the immeasurable values of users' lives throughout the process. The qualitative "soft" values need to be balanced against more quantifiable "hard" parameters, where values such as health, equality, justice and safety, need to be balanced with technological and tangible qualities in the measurement of design. Quantifiable basic qualities such as e.g. temperature and ergonomics tend to be more common than softer socio-psychological aspects like privacy and human interaction in universal quality measure standards for design. While design should have the appropriate ergonomics and functionality etc. such measurements fail to address the more "soft" and intangible aspects of quality (Dewulf & van Meel, 2004). Conventional quality measurements, based on quantifiable variables, can hardly explain e.g. individual preferences and delight.

In the ACM interactions design awards, the criteria consist of the subcategories: Understanding of users, Effective design process, Needed, Appropriate, Learnable and Usable, Aesthetic experience, Mutable, and Manageable, (Alben, 1996). The criteria mainly fall into two categories. The first group makes a direct contribution to the user experience, while the second kind of criteria concerns the development process used by the product's designers, which indirectly affect the user. All the criteria emphasize the user's experience from interaction with the product, which is only partly transferable to the DEVICE Design Award, as it addresses design in general. More similar is the Red Dot Award, where the concepts are judged based on the criteria: Degree of innovation, Aesthetic quality, Realisation possibility, Functionality and usefulness, Manufacturing efficiency, and the Emotional content of the concept (Red Dot, 2014). The selection criteria aim to ensure that each winning concept is an embodiment of functionality and exceptional design mastery. The DEVICE Design Award presented in this paper differs from the ACM and Red Dot awards in that 1) there is a category for students along with professionals, 2) it includes research and industry 3) it is directed towards children and elderly people as user groups, and these factors will be reflected in the criteria.

3 DEVELOPMENT OF THE DEVICE DESIGN AWARD: METHOD AND PROCESS

Great design is complex and difficult to define, but when establishing an award, some criteria have to be defined. The criteria set for a design award serve as the foundation, and make sure that the results are not solely a reflection of the personal interests of the jurors. In our attempts to define criteria for the DEVICE Design Award, we strived for being specific, emphasize certain aspects and to include what we believe has an impact on quality of design. The goal was not to define the final set of criteria aimed at design for children and elderly people, but rather start a discussion that can help us refine the criteria. The research team was inspired from experiences from developing existing awards (e.g. Alben, 1996), design quality indicators (e.g. Gann, 2003) and from literature on user-centred design (e.g. Preece, 2007).

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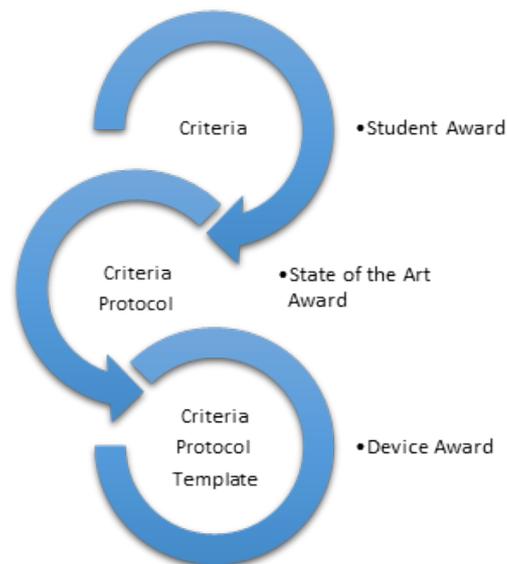


Figure 1. Model of the development process of the DEVICE Design Award

The development of the award was designed as an iterative design process, illustrated in Figure 1. First needs and requirements were investigated, including a survey of other rewards in similar areas. Then a first set of criteria was established and tested in the DEVICE student design award. After evaluation of the criteria these were refined into a new set used in a State of the Art Award and finally a third iteration was made for the DEVICE Design Award. The process can be seen as a form of action research (Costello 2003) where the ultimate goal was to learn more about suitable criteria for judging design for specific user groups and how to use them in a design award for children and elderly.

3.1 ITERATION 1: THE STUDENT AWARD

The DEVICE student award was announced at the 9th Student Interaction Design Research conference (SIDeR'13), an interaction design research conference for students. The work considered for the award was judged in terms of innovation, and human-centric approaches to design, along with the

conference theme of empowering people through technology. All contributions were submitted using the same ACM paper template.

The following criteria and sub-criteria were used:

PROMOTING INNOVATIVE OR CREATIVE DESIGN:

- Were innovative practices used in the construction and/or design?
- Were users (children or elderly) involved in the design process?
- Is the method clearly described?
- Are the key messages clear and are they immediately accessible to the audience?
- Is it immediately clear what is investigated?
- Have they sought to explore new and interesting materials or possibly determined to use traditional materials in a more imaginative and interesting way?

RECOGNITION VALUE & SOCIAL RELEVANCE:

- Does the work make a lasting impression?
- Does its realisation reflect a socially relevant issue?

DESIGN QUALITY:

- Do realisation and the medium chosen match?
- Is there a conscious decision to do without superfluous details?
- Are smart materials used?
- Do the materials chosen support the purpose?

PROVIDING A GREATER RANGE OF FACILITIES OR SERVICES:

- Does the design connect well to its surroundings?
- Has the development added to the range of facilities or services?
- Does the development provide access for people with different types and levels of ability?

A jury consisting of three members from DEVICE selected the winners. Two projects out of 12 were selected; one for elderly people (Fig. 1a) and one for children (Fig. 1b), and the authors received a diploma at the conference (Fig 1c). The winner for the category elderly people was a system aimed at motivating elderly people to be more active using messaging and progress tracking. An excerpt from jury's motivation: *The prototype is clearly a result of a thorough process in which the elderly residents' challenges regarding exercise and new technologies have been taken into serious account and are met in a convincing manner, and is innovative by involving elderly in the clearly described design process, and by exploring new ways and interesting materials.*

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Figure 1. a) Winner of category Elderly people, b) Winner of category Children, c) Prize ceremony

The winner of the children category was a physical-digital drawing installation for children. An excerpt from the jury's motivation: *The project promotes innovative and creative design, where children were involved in the clearly described design process, and new and interesting materials have been creatively used for design explorations in an imaginative way.*

3.1.1 Development of the first set of criteria

As the Student award focused on interaction design, we started with the criteria from Zimmerman et al (2007). *Process*, which examines the rigor applied to the methods and the rationale for the selection of methods, is addressed in the category "Promoting innovative or creative design". *Invention*, situating the work and demonstrating how the contribution advances the current state of the art, is addressed in "Providing a greater range of facilities or services". *Relevance*, to have a real impact on the world with support for why the community should consider this state to be preferred, is addressed in the category "Recognition value & Social relevance", which in a sense addresses the "softer" values. The final criterion *Extensibility*, that the design research has been documented in a proper way, is in a sense addressed in the category "Promoting innovative or creative design", but is weighted lightly as this is a student award. Further, the category "Design quality" was added, in order to judge the more tangible or "harder" aspects of the design. This resulted in the four main categories, which were then refined into a number of sub criteria.

3.1.2 Reflection Iteration 1

The intention behind the student award was mainly to test the development of the DEVICE Design Award, what criteria to use for evaluation, and most importantly the possibility to try out the criteria on a real set of contributions closely related to the area of the award.

The overall impression from the process was that the criteria were useful, with room for improvement. The intuitive opinion of the jury members regarding who should win the awards matched the results given by using the criteria, which suggests some validity. One obvious problem with the selected criteria was that the number of sub-criteria in each category is different, which resulted in that certain categories were weighted more. Of course, one could argue that one

category should be more important than the other, but then that should have been more of a conscious design decision than what was actually the case.

3.2 ITERATION 2: STATE OF THE ART AWARD

In the early phases of the DEVICE project, a desktop review of innovative and best practice was carried out, where about 100 examples of contributions were gathered in an online open database. Based on the contributions in the database, candidates for a State of the Art award were selected.

Based on the evaluation of the student award, the number of criteria was reduced and more focused for the State of the Art award:

Is there a focus on:

1. Contributing to the development of design for vulnerable generations?
2. Involving vulnerable generations in the design?
3. Innovative and explorative approach towards materials / methods?
4. The connection between the vulnerable generations and their context?
5. Improving or adding to facilities, products or services for vulnerable generations?
6. Method development for vulnerable generations design?

A seventh parameter is to supply a motivation for the assessment. Each project partner nominated three candidates from the database by voting using an online protocol consisting of the criteria listed above. This resulted in 21 nominations from the set of about 100 candidates. No less than 16 unique candidates were suggested illustrating a wide range of different judgments. The winner was chosen through a second round of voting where each partner voted for one nominated candidate.

The winning contribution was a joint effort from Canada and the Netherlands, and the authors were invited to the prize ceremony at the final conference of DEVICE. The contribution is a design tool for making theory on child development more accessible for designers. An excerpt of the motivation from the jury: *A design tool that makes age specific information about children's development readily accessible for designers, it is a useful and easy to apply design method, that considers the needs of the end user in the design process.*

3.2.1 Development of the criteria

The criteria from the first student award were useful to start with, but considered heavy to work with for the jury. There were too many sub-criteria, and several were too similar. Also, there was overweight for design contributions over more theoretical contributions. In order to address this, we grouped the sub-criteria and reduced the number. Also, as this award was targeted to all types of design and not just interaction design, some adjustments were needed.

The first criterion "contributing to the development of design for vulnerable generations" is open-ended enough to support both theoretical and practical design contributions, and supports the practice of design both as theory or best practice. The second criterion regarding involving the users in design was kept and highly prioritized. This supports our ambition to modernize design education, as involving users as partners in design is an emerging complement to user-centred design in all design fields (Sanders & Strappers, 2007). The third criterion, based on an innovative and explorative approach is open-ended enough to support either hard parameters such as materials, or more theoretical such as methods. The fourth and fifth criteria, about relating to context and adding to existing products, facilities or services, support the more soft socio-

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psychological aspects that might be hard to measure, as well as more tangible aspects. The fourth criterion is highly relevant when working with design for children and elderly, as the relation to context is important especially for safety reasons as well as for individual preferences. The fifth criterion is to ensure that proper research is made, and to demonstrate relevance (Zimmerman et al, 2007). The sixth criterion is about method development, in order to make sure that theoretical contributions have a fair chance compared to design, and also to point out that an interesting design process can be a contribution in itself. Finally, "motivation", is any motivation needed in order to clarify some of the other criteria or for general comments.

3.2.2 Reflection Iteration 2

The criteria used in this second iteration provided a better support for the jury. The number of criteria was lower, and more clearly divided, which simplified the jury process significantly. However, the second iteration of the award was based on very different contributions, 100 posts in the best practice database ranging from papers to products. For the third iteration it was decided to stay with these criteria, but add a proper template to harmonize the contributions and simplify the decision process.

3.3 ITERATION 3: THE EUROPEAN DEVICE DESIGN AWARD

There was a consensus among the members of the jury that both the criteria and the online form worked well for the second iteration, why these were kept for the final award. It was further decided to create a submission template, similar to what was used in the first iteration. The template was based on the ACM CHI extended abstracts template, and adjusted to fit the award profile. The announcement of the DEVICE Design Award was published at different websites, conferences and communities, and targeted towards students and professionals in different design fields like industrial and interaction design. Submissions describing innovative products and services or design methodology for working with children and elderly people were equally welcome.

Originating from Sweden, UK, USA, The Netherlands, Italy, France and Denmark, there were 18 submissions in total, 8 for the professional category and 10 for the student category. 1st, 2nd and 3rd prizes were awarded in both categories. The selection process was divided in two steps: First all partners graded all the submissions according to the criteria listed above using an online form, resulting in an overall score for each submission. Each criterion was ranked using a 3-point scale, consisting of the terms *to a small extent*, *to some extent* and *to a large extent*, corresponding to the numerical values 1, 3 and 5. A jury consisting of five members from the project consortium then selected the winners.

The winner of the student category was a contribution from Sweden on emotional design in a hospital context from a child perspective. Excerpt of motivation: *"The design is innovative and very useful for children, and there is potential for improved health through the intention to reduce pain. The methods used to develop the idea and design are well explained, using children, parents and staff in its development, and there was good identification of context of use."* The second prize was also from Sweden; a tablet application for educational use in preschools, and the third prize from the UK, on tableware developed for people with Parkinson's disease.

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Figure 2. Winners of the DEVICE Design Award: a) professional category b) student category

In the category for professionals, the first prize went to a contribution from Denmark for developing a tangible system for supporting home-based vestibular rehabilitation. Excerpt from the motivation: *“The design is innovative and is adaptable to the user needs, and the design considered the person, the task and the environment, and the participatory design based development process is clearly described.”* The second prize went to a bilingual storybook app designed for deaf children, the winner of the third prize was a card game developed in order to address youth violence, both from USA.

The winners of the DEVICE Design Award were announced on the DEVICE website, and the authors of the first prize-winners were invited to the prize ceremony at the final conference of DEVICE.

3.3.1 Reflection Iteration 3

The motivations from the jury are much relying on the description of the design process, in line with the three general features of design proposed by Gann et al (2003); 1) complex starting point; 2) non-linear interdisciplinary process, 3) iterative cycles. Further, due to the user groups in question for this award, the more qualitative “soft” values were in a sense weighted more than quantifiable “hard” parameters. Factors such as health, social equality and human interaction come hand in hand with the criteria of involving users in the design process. Though, the technological and tangible qualities are also considered, e.g. regarding the connection to the users’ context, use of materials, and adding to the facilities and products for these user groups.

4 DISCUSSION

Generalized to be transferable to other user groups, we here present lessons learnt during the process of defining a design award targeted towards specific user groups, exemplified by children and elderly people.

4.1 HOW TO BALANCE THEORETICAL AND METHODOLOGICAL CONTRIBUTIONS EQUAL TO DESIGN PRACTICE

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Something that should have been clearer before the formulation of the criteria was a more conscious decision regarding what kind of contributions to reward. With the criteria listed above, papers that dealt with the development of some kind of new artefact using user-centred and participatory design were clearly favoured. This meant that for instance theoretically valuable papers could not really win the awards. Likewise, really innovative design without user-involvement and some form of evaluation did not have an equal chance. That the award favoured design over methodological or theoretical contributions is not a problem per se, but illustrates that both the call and the criteria used really must match conscious design decisions taken by the initiators of the award.

4.2 HOW TO ALIGN DIFFERENT DESIGN DISCIPLINES UNDER THE SAME CRITERIA

The lesson addresses both the submissions as well as the jury. Different design fields have different criteria, and the perspectives of industry and academia differ as well. The jury consisted of both researchers and practitioners from different fields, such as interaction design, product design and engineering design, and the contributions varied over a wide range of fields as well. Our different conceptions were widely discussed when formulating the criteria, and are also a reason for why we developed a template for submissions that had to be used. The template consists of both images and text, so that designers with different backgrounds and skill sets could compete on equal conditions.

4.3 THE VALUE OF EVALUATING CRITERIA IN ORDER TO IMPROVE THE QUALITY OF THE AWARD

It was noted during the evaluation process that one really must think about the meaning of each specific criterion used. A phrase might sound good and seems useful but how should it be applied? For instance "Do realization and the medium chosen match?" for this to be useful requires certain properties. If the contribution represents a desktop application it is highly likely that the realization matches the area of desktop applications, and doing so is not a great achievement in itself as it only meet with the base level of design knowledge. Similarly, "Are smart materials used?" is not meaningful for a large category of application areas dealing with software only. Therefore each criterion must be tested specifically for the correct context.

4.4 FINAL REMARKS:

The final reflection concerns the strategy chosen for developing the award. The iterative development process provided us with adequate experience in order to be able to improve the announcement, evaluation criteria, and format and assessment process. For future iterations of the DEVICE Design award, the difficulty of using the same criteria for evaluating a wide range of contributions indicates that dividing the final awards into the categories *best theoretical contribution* and *best design* can be a good idea.

5 CONCLUSION

We have described the process of iteratively establishing an award for design targeted to specific user groups, here exemplified by children and elderly people. In this process a number of criteria were iteratively defined and tested through a series of three design awards. The outcome of the work described in this paper are a number of criteria for evaluating design targeted at specific user groups, that hopefully can serve as inspiration to others. It is the hope of the authors

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that the lessons learnt in this process will stimulate further discussions in the community regarding judging and defining design for specific user groups.

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7 REFERENCES

- Alben, L. (1996) Defining the criteria for effective interaction design. *Interactions*, May+June 1996, volume 1113.
- Costello, Action Research, Continuum Books, 2003.
- Dewulf G. & van Meel J. (2004) Sense and nonsense of measuring design quality. In *Building Research & Information*, 32:3, 247-250, DOI: 10.1080/0961321042000189662
- DEVICE. (2014) <http://www.deviceproject.eu/>
- Enable (2014) <http://www.jisctechdis.ac.uk/techdis/events/detail/2014/enableconf2014>
- EU - European Union. 2003. "2010: A Europe accessible for all". Report retrieved October 22, 2014 from: http://www.accessibletourism.org/resources/final_report_ega_en.pdf
- Gann D., Salter A. & Whyte J. (2003) Design Quality Indicator as a tool for thinking, *Building Research & Information*, 31:5, 318-333.
- Mrazek D., Lucente S., Wakid K., Sato S., Wai C., Menter A, and Hartley P. (2011) The Holy Grail of Design Measurement. The Design Management Institute.
- Red dot award (2014) <http://en.red-dot.org/>
- Sanders E. & Stappers P.J. (2008) "Co-creation and the new landscapes of design". *CoDesign*, Vol 4, Issue 1, Pages 5 - 18
- Zimmerman J., Forlizzi J., & Evenson S. (2007). Research through design as a method for interaction design research in HCI. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '07)*. ACM, New York, NY, USA, 493-502.