Essay Design <> Research
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This essay's main aim is to answer the question "What are the aims and principles of design research?". Going in depth about the difference of design research with other studies, the role of prototypes in design research and the role of theory in design research, to eventually articulate the aims and principles of design research.

The original notion of designing is to design a thing, product or service to solve a problem. Whether that makes the market or not is a second. However, what remains is that the knowledge to solve that problem is usually too specific to be used by other designers [5].

Research through design is indicating design activities that play a formative role in the generation of knowledge [5]. For example, for design activities. Such as gaining understanding of a complex situation, framing and reframing it and eventually designing prototypes to address this situation [5]. With the goal of building a bridge between the product and the user. This involves an interaction between the prototype and the user during a user test [4]. Qualitative data can be conducted during a user test which can be analysed for the results of a report. This analysis of data brings us to *research for design*. Research for design is paying attention to gathering and applying scientific and technological information and conducting studies to learn specific information about the complex situation for which the design is made [5]. Observation, measurement, interview, literature review, analysis and validation are the 'research' part of the design.

Theory in design research. In quantitative research, the theory is an interrelated set of variables formed into propositions that specify the relationship among variables [2]. It can be seen in a research study as an argument, discussion, figure or rationale. In qualitative studies, theory occurs in the opening of the study and can be modified or adjusted based on participant views [2]. Theory in mixed methods studies may use theory deductively, in quantitative theory testing and validity, or in using it inductively as in qualitative theory [2]. Where researchers collect, analyse, and integrate quantitative and qualitative data into mixed methods design.

Design research focuses during the exploration on the method that is used. The method can be quantitative, qualitative or mixed methods. Where *quantitative research* invokes the postpositivist worldview, including true experiments and less rigorous experiments [2, 8, 9]. Quantitative data includes closed-ended responses, such as questionnaires. *Qualitative research* existing out of narrative research, phenomenological research, grounded theory, ethnography and case studies [2, 7, 10]. Qualitative data tends to be open-ended without predetermined responses [2]. *Mixed methods* combine or integrate both qualitative as quantitative research and data [1, 2]. In reports, qualitative methods use fewer pictures for

data analysis [3], where quantitative methods use a lot of pictures to visualize the numeric data [6], “‘eyeball’ your data” (Daisy Yoo, 2020).

[472 words]

Reference:

[1] Angela Chang, Sile O'Modhrain, Rob Jacob, Eric Gunther, and Hiroshi Ishii. 2002. ComTouch: design of a vibrotactile communication device. *In* Proceedings of the 4th conference on Designing interactive systems: processes, practices, methods, and techniques*(DIS '02). ACM, New York, NY, USA, 312-320.* Retrieved January 16, 2021 from https://dl.acm.org/citation.cfm?id=778755

[2] John W. Creswell. 2021. *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (4th ed.). SAGE Publications, Inc. Retrieved March 19, 2021 from https://www.pdfdrive.com/qualitative-quantitative-and-mixed-methods-approaches-e91943566.html

[3] Laura Devendorf, Joanne Lo, Noura Howell, Jung Lin Lee, Nan-Wei Gong, M. Emre Karagozler, Shiho Fukuhara, Ivan Poupyrev, Eric Paulos, and Kimiko Ryokai. 2016. "I don't Want to Wear a Screen": Probing Perceptions of and Possibilities for Dynamic Displays on Clothing. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*(CHI '16). ACM, New York, NY, USA, 6028-6039. Retrieved January 16, 2021 from https://dl.acm.org/citation.cfm?id=2858036.2858192

[4] Joep Frens. 2020. DDB100: Week #1 Design <> Research, research through design [Powerpoint slides]. Retrieved January 16, 2021 from https://canvas.tue.nl/courses/14753/files/folder/Lectures%202020-2021?preview=2704843

[5] Pieter Jan Stappers & Elisa Giaccardi. 2017. Chapter 43 - Research through Design. In Soegaard, M. & Friis Dam, R. (eds.), *The Encyclopedia of Human-Computer Interaction, 2nd Ed.* (2nd ed.). Retrieved March 19, 2021 from https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/research-through-design

[6] Lesley Xie, Alissa N. Antle, and Nima Motamedi. 2008. Are tangibles more fun?: comparing children's enjoyment and engagement using physical, graphical and tangible user interfaces. In *Proceedings of the 2nd international conference on Tangible and embedded interaction*(TEI '08). ACM, New York, NY, USA, 191-198. Retrieved January 16, 2021 from https://www.researchgate.net/publication/221308791_Are_tangibles_more_fun_Comparing_children's_enjoyment_and_engagement_using_physical_graphical_and_tangible_user_interfaces

[7] Daisy Yoo. 2020. DDB100: Week #6 Design <> Research, design research methods [Powerpoint slides]. Retrieved March 19, 2021 from https://canvas.tue.nl/courses/14753/files/folder/Lectures%202020-2021?preview=2882923

[8] Daisy Yoo. 2020. DDB100: Week #5 Design <> Research, quantitative methods [Powerpoint slides]. Retrieved March 19, 2021 from https://canvas.tue.nl/courses/14753/files/folder/Lectures%202020-2021?preview=2863863

[9] Daisy Yoo. 2020. DDB100: Week #6 Design <> Research, quantitative analysis [Powerpoint slides]. Retrieved March 19, 2021 from https://canvas.tue.nl/courses/14753/files/folder/Lectures%202020-2021?preview=2863864

[10] Daisy Yoo. 2020. DDB100: Week #6 Design <> Research, what is qualitative data? [Powerpoint slides]. Retrieved March 19, 2021 from https://canvas.tue.nl/courses/14753/files/folder/Lectures%202020-2021?preview=2882924

Appendix:

Appendix A:

Changes I made;

- I changed the order of the referencing
- Corrected the referencing
- Corrected spelling and grammar mistakes
- Rewritten the text as you can see in this color

Appendix B:

Old essay;

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This essay is defided in a main question and three subquestions summarizing everything in a last paragraph. The main question; What are the aims and principles of design research?. With the belonging subquestions; How is design research different from other studies?, What is the role oprototypes in design research?, and What is the role of theory in design research?.

Design research focusses during the exploration on the method that is used, this way the report is written as well. The method can be quantitative, qualitative or mixed methods. Where quantitiative means the data is gathered is obtained in a large scale to get more reliable answers and the answers are written down in words with numbers [7, 5, 6], qualitative means that the data is gathered is based on a test that is done by the researchers and is shown without using numbers [7, 8, 9] and mixed methods uses both quantitative data aswell as qualitative data [4]. In reports qualitative methods use less pictures for data analysis [2], where quantitative methods uses a lott of pictures to visualize it the numeric data [3], "'eyeball' your data" (Daisy Yoo, 2020).

Both methods, design research and studies, try to higlight something new, doing this by activities written down. The way the activites are organized in those two methods can be different as well as the way the data has been analyzed [1].

Design Research exists out of two words, design and research. Two words that on their own have different definitions. When people design they make for example a product but doesn't bring it to the market, although they might almost have finished the product and process. People doing research conducting a study focused on a problem, trying to solve that by

doing user tests for example, but at the end didn't find a solution to bring to the market as well [1].

By making prototypes with for example cardboard it makes it easier to conduct a user test. A user test where the participant is able to interact with the prototype and explore the possibilities of it [10]. The interaction is the core of the user test with a prototype. After the user test with a prototype a qualitative data analysis can be written down. Writting about the interaction the observer saw during the interaction.

role of theory in design research

With theory in design research researches try to define things abstract or concrete. Giving during user tests people a small amount of numbers to keep it simple or to use easy objects as examples [1]. The only harder thing of using other example objects to keep it simple is that the translation to the real object or product can go wrong. Researchers can use existing theories or generate [7].

Design research uses qualitative, quantitative and mixed methods. Making use of prototypes and theories for the best end result, a 'good' report with reliable results.

Reference:

[1] Stappers, P. J., & Giaccardi, E. (n.d.). *The Encyclopedia of Human-Computer Interaction, 2nd Ed.* (2nd ed.). Retrieved January 16, 2021 from https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/research-through-design

[2] Laura Devendorf, Joanne Lo, Noura Howell, Jung Lin Lee, Nan-Wei Gong, M. Emre Karagozler, Shiho Fukuhara, Ivan Poupyrev, Eric Paulos, and Kimiko Ryokai. 2016. "I don't Want to Wear a Screen": Probing Perceptions of and Possibilities for Dynamic Displays on Clothing. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*(CHI '16). ACM, New York, NY, USA, 6028-6039. Retrieved January 16, 2021 from https://dl.acm.org/citation.cfm?id=2858036.2858192

[3] Lesley Xie, Alissa N. Antle, and Nima Motamedi. 2008. Are tangibles more fun?: comparing children's enjoyment and engagement using physical, graphical and tangible user interfaces. In *Proceedings of the 2nd international conference on Tangible and embedded interaction*(TEI '08). ACM, New York, NY, USA, 191-198. Retrieved January 16, 2021 from https://www.researchgate.net/publication/221308791_Are_tangibles_more_fun_Comparing_children's_enjoyment_and_engagement_using_physical_graphical_and_tangible_user_interfaces

[4] Angela Chang, Sile O'Modhrain, Rob Jacob, Eric Gunther, and Hiroshi Ishii. 2002. ComTouch: design of a vibrotactile communication device. *In* Proceedings of the 4th conference on Designing interactive systems: processes, practices, methods, and

techniques*(DIS '02). ACM, New York, NY, USA, 312-320.* Retrieved January 16, 2021 from https://dl.acm.org/citation.cfm?id=778755

[5] Yoo, D. (2020). Quantitative methods [Slides]. Retrieved January 16, 2021 from https://canvas.tue.nl/courses/14753/files/folder/Lectures%202020-2021?preview=2863863

[6] Yoo, D. (2020). Quantitative analysis [Slides]. Retrieved January 16, 2021 from https://canvas.tue.nl/courses/14753/files/folder/Lectures%202020-2021?preview=2863864

[7] Creswell, J. W. (2021). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (4th ed.). Retrieved January 16, 2021 from https://www.pdfdrive.com/qualitative-quantitative-and-mixed-methods-approaches-e91943566.html

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[9] Yoo, D. (2020c). What is qualitative data? [Slides]. Retrieved January 16, 2021 from https://canvas.tue.nl/courses/14753/files/folder/Lectures%202020-2021?preview=2882924

[10] Frens, J. (2020). Research through design [Slides]. Retrieved January 16, 2021 from https://canvas.tue.nl/courses/14753/files/folder/Lectures%202020-2021?preview=2704843