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What Are Students' Perceptions of Design Research and Approaches?

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ABSTRACT

Approaches and methods used in the design research process have been discussed over the years. Yet, most of the discussions did not take into account the perceptions of the students. While a fundamental understanding of design research may assist students in the real world, those students may fail to apply the foundations to a complex design problem or only use those methods they feel comfortable with and deem useful. To offer insight on this particular area, a paper questionnaire was distributed to more than one hundred design students in order to understand students' perceptions on design research and their habits. Findings showed that design students felt that research was important to their design process and they spent more than 40% of time on researching in their design process. In general, students believe that more research is necessary at the beginning of the design process, such as the stages of planning, defining problem and parameters. In addition, undergraduate and graduate students viewed various research methods in different regards. The understanding of the perceptions of current undergraduate and graduate students regarding design research will provide teachers with a better understanding of the influence of the students' background on the design process and how to cope with those influences. The results can be used to improve the design education.

Keywords: Design Education, Design Research and Approaches, Student Perceptions

1. Introduction

Design research and approaches take an important role in design education. Discussion of the importance of teaching design methodologies at universities has been around for decades (Simon, 1969; Cross 2001). Understanding the perceptions of the students on academic topics could assist in improving teaching. This is especially true in the area of design research processes and methodologies. There are many different areas in which professors can focus on this topic which stem from different schools of thought on the applicability of quantitative and qualitative methods to various areas of design (Findeli, 2001; Laurel, 2003). Students may gain a fundamental understanding of the use of various methods and grow these concepts into developed skills through work experience. Yet, they may also continue to solely use the methods they perceive as more useful and are more comfortable using during their design process. Students may also not be prepared to meet the goals of complex

design situations with simple technique instruction (Stolterman, 2008). While new approaches may be introduced to explore the opportunities, a better understanding of how to instruct students in the methods they perceive as most useful to the design process will allow professors to supply students with a more in-depth understanding of how to appropriately conduct the methods and apply their findings during the design process. The understanding of the perceptions which current undergraduate and graduate students have regarding design research will also provide instructors with a better understanding of the influence of the students' background on the design process. To offer insight on this particular area, a paper questionnaire was distributed to over one hundred design students. The objective of this questionnaire was to understand the role of research in the design process from the students' point of view.

2. Method

A mixture of graduate and undergraduate degree seeking students were randomly selected to take part in the research. The questionnaire set to meet the objective by gaining a better understanding of the students' prior knowledge, experience, and their perceived usefulness of common design research methods.

Students were asked about their experience with conceptual and production designs, their impression of the importance of research in design and which design fields and processes they felt needed more research, and the usefulness of some research methods. This information was elicited using several questions.

The first question which informed this was *Do you think research is important for design?* Answers to this question were based on a 5-point Likert scale where "1" was strongly disagree, "3" was neutral, and "5" was strongly agree. The second question was a simple ranking which asked respondents to *Rank the part of the design process that needs research.* Students were given a choice of seven items during the design process and the option to fill in other. The seven options were as follows: 1) *Planning, defining problem and parameters*, 2) *Information collection*, 3) *Exploration, analysis, design implication*, 4) *concept generation*, 5) *Prototype iteration and testing*, 6) *Evaluation and production*, and 7) *Launch and monitor*.

The final question which informed this area was also a ranking question which asked respondents to *Rank the usefulness of the following research methods.* Students were presented with 14 methods to rank. The methods are as follows: 1) *Observation*, 2) *Field visit*, 3) *Exploratory research*, 4) *Interview*, 5) *Role playing*, 6) *Card sorting*, 7) *Case studies*, 8) *Experiment*, 9) *Ergonomics studies*, 10) *Questionnaire*, 11) *Focus group*, 12) *Participatory design*, 13) *Heuristic evaluation*, and 14) *Task analysis*.

Respondents were then asked about their research habits during their individual design process. This was done

through the following questions: *How often do you conduct research in your design process?* and *How much time do you spend on research in your design process on average?* The first question was a 5-point Likert scale where "1" was all the time, "3" was sometimes, and "5" was never. The second question was a continuous scale question from 0 to 100%. Finally, their demographic information was elicited including their prior work experience, expertise, age, and gender.

3. Results

The quantitative data gathered from the questionnaire was then analyzed to determine which methods students preferred, their experience level with various research methods, and the effect of their education level on the results.

3.1 Demographic information

A total of 141 design students responded to the questionnaire. 64 of those respondents were male and 77 were female. Of those 141, 47 of the respondents were graduate students (33%) and 94 were undergraduates (67%). The average age of all respondents was 23 ± 6.4 . The average age of graduate respondents was 30 ± 7.6 and average age of undergraduate respondents was 20 ± 1.5 .

3.2 Students' perception on design research

When investigating the perceived importance of research in design on a 5-point Likert scale, overall students reported they agree (4.1) that it is important. Graduate students, on average, reported feeling neutral

Table 1. Mean rank of design processes needing research (Mean \pm SD, $N=141$).

Design Process	All Students ($N=141$)	Graduate Students ($N=47$)	Undergraduate Students ($N=94$)
Planning, defining problem and parameters	1.8 \pm 1.3	2.1 \pm 1.6	1.6 \pm 1.0
Exploration, analysis, design implication	2.4 \pm 1.7	2.7 \pm 1.9	2.3 \pm 1.6
Information collection	2.6 \pm 1.5	3.1 \pm 1.6	2.3 \pm 1.4
Concept generation	2.9 \pm 1.9	3.6 \pm 2.1	2.6 \pm 1.7
Prototype iteration and testing	3.9 \pm 1.7	3.8 \pm 1.7	3.9 \pm 1.7
Evaluation and production	4.0 \pm 1.8	4.3 \pm 2.0	3.8 \pm 1.7
Launch and monitor	4.7 \pm 2.1	5.0 \pm 2.1	4.5 \pm 2.1

Table 2. Mean rank of usefulness of research methods (Mean \pm SD, $N=141$).

Research Methods	All Students ($N=141$)	Graduate Students ($N=47$)	Undergraduate Students ($N=94$)
Observation	2.2 \pm 2.6	3.1 \pm 3.5	1.8 \pm 1.9
Exploratory research	3.0 \pm 2.5	3.8 \pm 2.6	2.6 \pm 2.3
Field visit	3.1 \pm 3.0	3.8 \pm 3.0	2.8 \pm 2.9
Case studies	3.2 \pm 2.3	4.4 \pm 2.7	2.5 \pm 1.8
Interview	3.2 \pm 3.0	3.1 \pm 2.2	3.2 \pm 3.4
Experiment	3.3 \pm 2.8	4.5 \pm 2.8	2.7 \pm 2.6
Ergonomics studies	3.5 \pm 3.0	5.1 \pm 3.6	2.8 \pm 2.5
Focus group	3.5 \pm 3.3	4.9 \pm 3.5	2.7 \pm 2.9
Participatory design	3.5 \pm 3.5	4.2 \pm 3.6	3.2 \pm 3.5
Questionnaire	4.0 \pm 3.3	5.0 \pm 3.3	3.3 \pm 3.1
Task analysis	4.0 \pm 3.9	4.4 \pm 3.5	3.8 \pm 4.1
Heuristic evaluation	4.1 \pm 4.3	5.0 \pm 4.3	3.7 \pm 4.3
Role playing	5.4 \pm 4.3	6.5 \pm 4.1	4.7 \pm 4.3
Card sorting	5.6 \pm 4.5	7.0 \pm 4.4	4.8 \pm 4.4

about the importance of research (3.7) and undergraduates reported that they agreed (4.2) that it was important. An Independent-Samples Mann-Whitney U Test found that the difference in responses across education level was significant ($p = 0.021$).

When students were asked which part of the design process necessitates research, overall the planning, defining the problem, and setting parameters stage ranked highest and launch and monitor ranked last (see Table 1). Overall, rankings were similar between the graduate and undergraduate respondents with prototype iteration and testing, and evaluation and production switching places.

The ranking for the usefulness of the research methods showed more changes between the two groups of students (see Table 2). Graduate students reported that observations,

interviews, exploratory research, and field visits were the most useful research methods, respectively. Undergraduate students reported observations, case studies, exploratory research, and experiments as the most useful research methods, respectively. Both groups felt role playing and card sorting were the least valuable, respectively.

Student research practices were investigated with the self-reporting of how often they conduct research in their design process and what amount of time was spent on research during their design process. Overall, students reported conducting research very often (2.1) in their design process on the 5-point Likert scale. Graduate students and undergraduate students also reported researching very often (2.4 and 2.0 respectively). A Mann-Whitney U Test found that the change in distribution between undergraduate and

graduate students was significant ($p = 0.021$).

When asked for the percentage of time students spent researching in their design process, they overall reported to researching 46% of their time. Graduate students reported researching 43% of their design process while undergraduate students researched 47% of their time. A Mann-Whitney U Test found that there was no significant change in distribution ($p = 0.142$).

4. Conclusion

A questionnaire study has been conducted to collect design students' perceptions on design research and their habits from more than one hundred design students. Both undergraduate and graduate students were investigated. In general, students believe that more research is necessary at the beginning of design process, such as the stages of planning, defining problem and parameters, than at other points in the design process. Some research methods are applied more often than others, including observation and exploratory research. Findings showed that undergraduate students conduct research more often in their design process than graduate students and they also gave a significantly higher value than graduate students on design research importance. Although there was no significant difference, undergraduate students spend slightly more time on research in their design process than graduate students on average.

In the future, the trends identified in the survey can be used to improve the structure and content of design education. The instruction of design research should be structured differently based on students' background and education level. Through the questionnaire, it is also found that students tend to use a limited number of methods which they are more comfortable utilizing during their design process. Various approaches should be introduced in the design research education and a selection of appropriate approaches is also needed.

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