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Continuing Education and Personalization of Design Methods to Improve their Acceptance in Practice – An Explorative Study

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Abstract

One possibility to establish and foster efficient method transfer from academia to industry is via the heads of professional designers and design students. The transfer and use of design methods in a sustainable way is related to the methods' acceptance by the user which is accompanied by many challenges. Educational concepts and design method adaptations have been chosen as decisive control parameters among many others in order to understand and evaluate how these can influence the acceptance of design methods in industry. An interview study to gain an understanding of the rationale of educational needs of engineers has been conducted to enrich existing literature in this area. The evaluation of feedback from academia-industry cooperation revealed specific challenges accompanied with educational concepts for modularization design methods. Based on these findings, an adaptation was developed and an experiment study was conducted with students as future designers to decode variable factors in design training, gain qualitative feedback to a specific adaptation and gain an understanding for the conditions and limitations of an experimental study. Joint conclusion reveals the need for improved education in method transfer and adaptations of the design methods to user-specific needs and paved the way for a series of experiments with various treatments of study participants regarding different personalized adaptations in design methods.

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1. Introduction

Although the development of design methods is a major topic in design research [1] and specific methods proved successful in case studies [2], their use in industry is still limited. In research, various reasons are discussed, for example the performance of new methods or the prototype character of developed tools. Besides, human factors play a major role in acceptance. Methods are often not adapted to typical work practice of a company or the individual needs of the users [3]. Other researchers point out, that efforts are missing to transfer methods e.g. by long lasting industry and research cooperation [4] or education, because the benefits of design method application evolve with time due to training outcomes [5]. Continuing design education is seen as an important variable to maintain and professionalize design behavior [6].

Existing literature reveals that teaching design methods have to be adapted and consider aspects of learning [7].

This paper focuses on the impact of human factors on method acceptance and aims at demonstrating that enhanced teaching concepts as well as personalization of design methods can improve design method acceptance. This explorative study will demonstrate which factors in training and how concepts in continuing education can be adapted and personalization of methods can be made to increase the acceptance of design methods.

This explorative study analyzes the method transfer through designers in industry as well as future designers in higher education, as students represent one "channel" of transfer for design methods.

This study proceeds as follows (Fig. 1). Literature findings about design method transfer from academia to industry and human factors in product development (section 2) form the

basis for an interview study on expectations towards continuing education in mechanical engineering to explore students' as well as engineers' perspectives, especially their rationale on certain learning motivational drivers and preferences on teaching concepts (section 3). These general findings are extended with specific evaluation of feedback collected from industrial workshops and teaching product development at the university about modularization and reveal experienced challenges (section 4). Based on these challenges experienced by the method transporters, an experimental study was conducted with future designers to assess the impact of an adaption made in accordance with the users' needs and identify and enhance comprehension of influencing factors for further experimental research (section 5). Resulting implications for research and practice will be illustrated (section 6) and the conclusion of this explorative study (section 7) will form the basis for an outlook on future research.

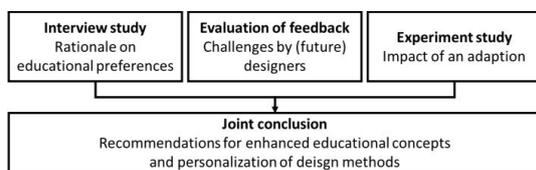


Fig. 1. Procedure of this explorative study

An understanding gained through this work with regards to the possible parameters which influence design method acceptance should finally create a basis to design a series of experiments which help to assess designers' design method acceptance. The main research question therefore is "How can teaching concepts for design methods be improved in order to enhance acceptance in industry?"

2. Background

2.1. Design method transfer from academia to industry

To bridge the gap between academia and practice and thus increase the acceptance of new methods in practice, models and approaches to support transfer projects of methods have been developed in the design research community, e.g. [8], [9] and [10]. Basis for these are e.g. ideas of change management or surveys in industry regarding shortcomings of methods and requirements on the implementation of methods into daily business. Shared success factors of the mentioned works (for detailed summary see [10]) are the need to understand the company needs, providing simple and individual fitting methods, convincing and involving people in the change process and not least suited training and provision of support during the methods implementation and its use. Within these transfer projects continuing education of the work force is needed, not only to train the methods, but to change the mindsets of the relevant designers and managers.

Beside the described support of transfer projects, the education of students during their studies plays a major role to change the practice on the long run. Students, well trained in

new methods, take up relevant positions (e.g. designers or managers), and change companies from within [11].

2.2. Human factors in product development

The efficient use of design methods is dependent on various factors, among which the designer can be mentioned. The individual designer with his/her personality, attitudes, well-being, motivation, perception and emotions within a social environment in which a technical task needs to be solved can greatly impact the design process.

Besides personal factors such as experiences, the designers' educational background plays an important role in the design process [12]. Research into the learning process and the application of design methods has illustrated a gap which can be bridged by a consistent teaching concept adapted to the students' needs for an enhanced design method understanding [13]. Existing literature in continuing education and design method transfer as well as design method adaption is extended through this explorative study by a joint analysis of findings in these areas based on hands-on experience analysis with modularization methods and accordingly specific adaption development.

3. Interview Study

3.1. Planning and conditions

The goal of this interview study was to find out motivational factors and learning problems in general and expectations towards continuing education in engineering both for students and engineers in industry. The focus of this explorative research lies on exploring the mindset and reasons behind answers; therefore conducted qualitatively. Face-to-face interviews were conducted with 7 students studying mechanical engineering and 4 engineers in industry. Interviewees were recorded and notes were taken during the interviews. The collected data was analyzed through a content analysis.

3.2. Opinions and requirements of interviewees

Interviewees were asked about their general motivation to learn, during which activities they learn the most frequently and to reveal their opinion about the composition of the continuous education learning group – should there be shared courses of students and industry representatives or should the events be offered separately?

Interviewees mentioned that the *need to know* and the received *feedback associated with the learning process* were motivating. They have added that the need to know arises by intrinsic curiosity in the subject-matter and interest into the respective area and by relevance and usefulness of the subject-matter for professional life. This aspect was mentioned with regards to acquiring knowledge and skills which enable to solve the given tasks and was associated with regards to competitiveness towards others.

Different forms of feedback in connection with the learning process and outcomes were another motivating factor for

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