Reasoning patterns in team-based idea generation

New products and services are developed by teams that often consist of designers, technicians, engineers, and other experts - depending on the type of products being developed. A critical stage of such design activity is the idea generation phase where groups of relevant people meet and create ideas for new solutions. Ideas developed here often have a major impact on the final product, as it is at this time that the space and frame for continuing design work is defined. Therefore, it is important to understand the activity that occurs when ideas are developed. What is the basis for developing and selecting ideas? What thoughts, arguments, and experiences are brought into play? My approach in this dissertation is to investigate the reasoning patterns in the arguments used and the significance of such patterns for the idea generation activity and for ideas being chosen for further development, thus adding value to the overall design process.

Reasoning is a central cognitive function that determines how people make decisions and interpret the world. Since the 1970s, researchers have been interested in reasoning during design activity. They have used formal logical models to describe the patterns of thought by dividing them into so-called deductive, inductive and abductive types. Of these, particularly abductive reasoning is considered to be central to design activity, as this type allows to propose something new that by definition is central to design.

In the dissertation, I analyse how reasoning types appear in patterns when looking into what is being said in the team as they develop ideas and whether there is a correlation between these patterns and the quality that the design team later determines the ideas to have. I do this with conversational material taken from two development projects with five and four teams in each. The results of the analysis show that robust abductive-deductive patterns occur when oscillating between on the one hand introducing new perspectives and possibilities for solutions and, on the other hand, exploring these perspectives to create concrete solutions. Other patterns, such as the proportion of abductive reasoning, and the amount of reasoning, also influence the assessed value of ideas. Simple reasoning patterns have the greatest importance for short term design activity, i.e. when the individual idea is created. Conversely, patterns with several types of reasoning and interactions have the greatest impact in the long term through the influence of how the later idea development unfolds.

The results confirm that reasoning can be analysed empirically as consisting of chains of micro-inferences including different types of reasoning that together characterise design activity. In practice, this means that the patterns found can be used in the development of techniques to improve the way a team performs in design activity. In the future, the results can be used to develop automated tools with artificial intelligence that can "listen in" on design activity, and, based on the reasoning patterns found, can suggest ways to adjust activities to achieve a better performance. An important advantage of the developed analysis method is that there is only a limited need to understand the specific details of ideas being generated, as the method allows identifying the reasoning patterns from the words used in combination with some insight into design activity. Hence, the method is suitable for either automated tools or to design facilitators that may not hold specific in-depth knowledge about a design task. The limitation of the method is that it does not reveal specific influencing factors in design activity, such as personal attitudes, values and desires of those who partake in the design activity.