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## Outdated ideas of the design process and the future of formal models/methods/notations

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This topic implies that the future of formal techniques is tied to outdated ideas of the design process, perhaps of the ‘waterfall model’ variety, in contrast to more informal, fast and iterative techniques such as agile methods, which tend to be prototype-centric and less analytical. Indeed, these more agile techniques appear to be gaining importance where industry is moving towards more mobile and ambient technologies. A future challenge of formal techniques is how they could contribute to these areas, and how they can fit into the less formal conceptions of the design process. It is also important to understand industrial design contexts and fit with their conduct rather than trying to impose radical changes.

In considering the topic in more detail three important themes emerged:

1) **The diverse toolbox of formal techniques** can be used to add value in design. Formal techniques differ in the extent of their formalness, from strict mathematical models to less formal notations and diagramming techniques. There is wide variation both in their application to different contexts and in the investment in terms of the formalness involved in applying a particular technique. Both of these should be considered by the designer when choosing a technique to add value to a design process. It was recognised that a future challenge was to better communicate when to use a particular technique, what bits of it and how much.

2) **Formal techniques can be used for a variety of different purposes**, including model checking, developing an understanding of a situation, and communication within design groups and stakeholders. Each plays a part in different design contexts, and it is up to the designers to deploy these techniques correctly. Importantly, the process of applying a formal technique develops an understanding of the situation in the designer, beyond any representation they may create. The application of the model/method/notation by the designer necessarily shapes the situation somehow; this interplay between the designer, situation and representation leads them to reconceptualise the situation by noticing certain properties and features within it, which ultimately develops their understanding of it.

3) **The value of formal techniques is likely to be realised differently in different contexts**, and so their potential is tied to the values of the context in question. For example, the value of guaranteeing the safety of a system will be higher in critical environments than in website development. It is therefore likely that formal methods will be successful in some contexts and less so in others. Adding value in different contexts is no doubt a critical factor for potential adoption. In addition, the value of formalisms tend to be evident only long after use; getting more immediate perceived/actual benefit is critical to future adoption of formal methods.

The extent to which formalisms will be utilised continues to depend on the values of the design context and the value they can give to the design process and designer. It appears there is still work to be done in adapting, developing, and communicating these techniques to increase the perceived/actual value they provide.