Research problem

- How are design methods currently being developed?
- Does a systematic method exist to develop design methods?

Case study

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Methods/tools developed</th>
<th>Approach followed categorized into phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse engineering</td>
<td>Connectivity analysis, FMEA, Inter-relationship matrix</td>
<td>High-level function identified, concepts generated, combined and selected</td>
</tr>
<tr>
<td>Requirements modeling</td>
<td>Requirements modeling</td>
<td>Graphical, textual, CAD-based, and matrix-based model, and selection of one from among the variants</td>
</tr>
<tr>
<td>Affordances based design</td>
<td>Method for creating affordance structures, Method for designing individual affordances, Method for reverse engineering</td>
<td>No single theory that could unify existing approaches to design</td>
</tr>
</tbody>
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- Systematic method(s) is not used while developing design methods/tools in these projects.
- The activities of the team/individuals can be categorized into specific phases identical to a generic design process.

Survey

- Looked at publications developing a design method/tool and identify a systematic approach followed by the authors, if any. All 49 papers published in DTM were studied as part of this strategy.
- 25 out of the 49 papers dealt with development of a method.
- It can be seen that all the publications had a distinguishable phases of development identical to generic design process.
- Use of inconsistent terminology was found in the papers that were studied.
- The developers of design methods/tools recognize the importance of a systematic validation method.
- Most of the papers in this conference are driven by an industrial project.

Conclusions

- Since there is no systematic approach, every design method is developed in a different way, mostly by trial and error.
- In these circumstances, the efficiency of a design method/tool depends upon the developer’s ability.
- There is little provision for feedback from the artifact or industry and hence it becomes difficult to make iterations.
- Since the process of developing design methods is not documented in a systematic way, chances of collaboration and knowledge reuse are minimal.

Future work

- The patterns can be considered as a framework for research and development of systematic methods.
- It is intended to use the systematic product design methods currently available to develop design methods.
- Case studies are being carried out with the aim of understanding the process of developing design methods and rationale behind it.
- This understanding and findings from the studies would be used to formulate a set of guidelines that would aid design researchers.
- A formal systematic method for developing design methods could evolve into a generic ‘design research’ method.