

Using Agile Methods in Intercultural HCI Design Projects

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Abstract. In this paper, examples from intercultural HCI design projects are presented and analyzed with regard to applying agile methods to expedite the HCI design process while reducing resources. First, the products and the processes are considered with regard to culture. Then, the reasons of paradigm-shift from Waterfall/V-model to the application of agile methods are put forward. At same time, the benefits of using agile methods (SCRUM) in the user-centered design process are identified.

Keywords: Agile, SCRUM, User-Centered Design, ISO 9241-210, Culture, HCI, Approach, Process, Structure, V model, Waterfall model, Product, Cultural Dimension, HCI Dimension, HCI Style, Intercultural, Intercultural User Interface Design, Standard, Usability Engineering, Intercultural Usability Engineering.

1 Introduction

With competition in mind in the search for flexibility and overall effort reduction in standard (static and rigid) HCI design projects, there have been endeavors in the past exhausting all customization possibilities up to the customer's written approval (cf. [1]). But the standard V-Model process based on a waterfall model does not fit well when 1) the product requirements are not clear in the beginning (which is even more certain in the case of pre-development projects), and 2) the requirements get developed during the development phases and therefore the requirements change more often than not (which is always the case for Human Computer Interface Design/Development even up to the last phase of development) (cf. [2]). The customer project in question has both the characteristics of a HCI concept development project as well as those of a high-fidelity prototype (demonstrator) pre-development project (cf. Figure 1).

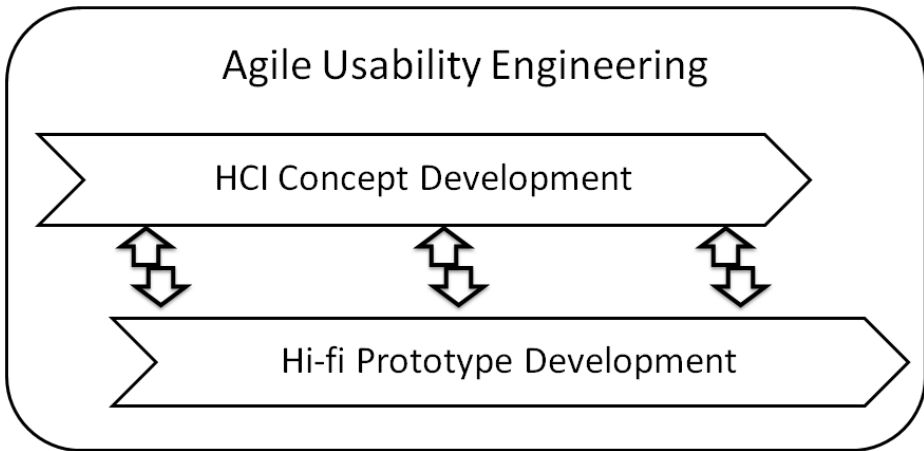


Fig. 1. Integrated Agile Usability Engineering Process

2 Products and Processes

The intercultural HCI design projects mentioned above are normally executed by multicultural teams (cf. [3]) (in our case members from Pakistan, India, the Czech Republic, Germany, Romania, England, Mexico, Nepal and China). The typical products are automotive driver information and infotainment systems such as instrument clusters, secondary displays, head-up displays, multimedia systems and rear-seat entertainment systems (cf. [4]).

All phases in the development process are affected (analysis, design, implementation and evaluation phases). For instance, on the one hand, the colleagues coming from a certain type of culture demanded a great amount system engineer's time until they grasped it, but that only concerned the part of, the task they could do. At this point then they worked through it like a robot (without thinking about the overall task). Moreover, they worked on the current tasks rather narrow mindedly and therefore missed the overall view of the task and the system. In fact, short before delivery of the system to customer, integration tests revealed a show stopper requiring necessary system design changes: certain aspects of the system were completely overlooked because of the inability to think of the system at the abstract level and they were therefore unable to inform the team in time, possibly because of high power distance (cf. [5], cf. Figure 2).

Furthermore, some tasks were even unexplainable to these colleague because of different world views. Nevertheless, after several attempts, they accepted the task without knowing why and executed the task correctly because of their hierarchical thinking (cf. [5]). On the other hand, this was not the case with other colleagues because they only do things if they know why in order to be sure of the benefit of their efforts. This is because of their individualistic behavior (cf. [5]). These are just some examples of process hurdles that can arise in multicultural teams of intercultural HCI design projects without having to generalize it.

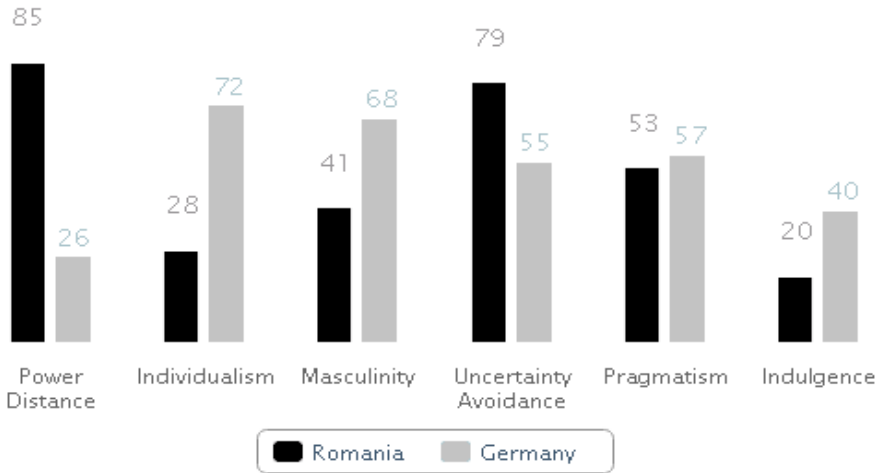


Fig. 2. Hofstede's Indices for Romania and Germany

3 From Waterfall/V-Model to Agile Methods

While trying to avoid such problems arising from strict hierarchies and inflexible process models in our intercultural innovation/platform projects, we had positive experience of with practically using and deploying some of the agile principles and methods (cf. [6]) focused on getting (iteratively and incrementally) 'right things' done (to increase product quality) rather than getting things done right (to increase process quality).

Having lost a precious 20% of resource capacity and time in the "analysis paralysis" of the product requirements, which were neither complete nor final, it was decided to introduce agile development methods in order not to fail to deliver the values matching the customer's high expectations and to avoid losing the customer for ever. Customers do not trust you as supplier anymore. The supplier loses face (cf. [7]). Different interpretations of the agile manifesto are represented by various methodologies such as SCRUM, XP, Lean Driven, Kanban, and others (cf. [8]).

All of them have risk management, test and customer validation and acceptance as a major value. Furthermore, they all have artifacts – customer requirements, tests, working software as well as engineering processes that are repeatable and similar companywide: for instance rules the methodology and the customization done in the company (cf. [9]). Since the agile methods require a culture and mindset change, initially there was great resistance from the team/stakeholders.

To overcome the barriers for increased flexibility and adaptation to change was yet another hurdle. As the expectations of transparency and accountability were being raised there was a great amount of insecurity and the increased sense of being continuously monitored (cf. [10]). Most of the team members were not used to continuous and high volume communication. This changed significantly after on the

job training and tips from the Scrum Master, the Product Owner and the Quality Assurance Engineer.

Most interestingly, Romanians refused to adopt agile methods in general. This is indebted to their culture: hierarchical thinking; waiting for and following commands; only after consulting the boss were employees willing to hear others. It is not possible to talk directly to employees to steer them, you must go via the boss. Employees do only what they are instructed to do and lack the courage to try out new things; they hold on to well established and introduced methods and processes ("not invented here"-behavior). This means risk aversion because of high uncertainty avoidance and individualistic selfishness (cf. [5]). This behavior is mirrored in the HCI style (cf. [11], cf. Table 1).

Table 1. HCI Styles around the World

HCI Style	Cultural characterization using Hofstede's Indices	HCI Style Score
Asian	PDI high, IDV low, MAS middle, UAI low, LTO high	90
Indian	PDI high, IDV middle, MAS middle, UAI middle, LTO middle	70
African	PDI high, IDV low, MAS middle, UAI middle, LTO low	60
Scandinavian	PDI low, IDV high, MAS low, UAI middle, LTO low	40
Slavic	PDI high, IDV middle, MAS middle, UAI high, LTO low	30
Angle-Saxon	PDI low, IDV high, MAS middle, UAI low, LTO low	20
German	PDI low, IDV middle, MAS high, UAI middle, LTO low	10

3.1 Phases of the HCI Design Process According to ISO 9241-210

Agile usability (cf. [12]) is a reasonable approach to optimize the process of HCI design. In the following, we describe our experiences in the main phases of the HCI design process according to ISO 9241-210.

Analysis. Use agile methods in HCI projects from the very beginning where the uncertainty is very high regarding contractual requirements and thereby commit to a mid-to-long term contract. In agile risk and contract management, bravery and self confidence comes from manageable refactoring cycles. This ensures robust system architecture by allowing change requests by end users and stakeholders. Due to

unclear contractual requirements from the customer it is also difficult for the supplier to calculate a realistic and competitive offers. Therefore the supplier is compelled to add a risk premium which makes the offer costly for the customer. Using agile methods generally reduces the risks for both because of iterative and incremental risk management and contracting. Further from the process point of view, as mentioned above, the requirements development has become more effortless with customer's involvement and early feedback.

Design / Implementation. Since from the beginning the focus has been on doing right thing, the first tasks/user stories that were taken up were of SW/HCI system architecture (System User Stories) (cf. [13]). In the first six weeks of development refactoring has already been done twice. Implementation (extreme) reviews are also being practically implemented with the focus on improving the design for future flexibility and also for testability/maintainability (cf. [8]). As shown in Figure 1 above, the analysis sprints, the design sprints and the evaluation sprints of the HCI concept development process are running in parallel to the implementation sprints of the Hi-fi prototype development process with certain predefined synchronization stages between these two processes.

Evaluation. Tests have been planned for each iteration at the unit test level as well as at the system test level (cf. [9]). There is still much scope for improving and automating tests. The focus changed from extensive documentation to working software, from processes to people and interpersonal skills and from following a plan to being able to respond to changes. Customer satisfaction increased through continuous delivery. The whole development was accelerated through continuous customer involvement and early feedback. This also helped in finalizing the requirements faster and earlier. Since the development got broken down into smaller incremental iterations, there were no inhibitions in documenting and analyzing the requirements under discussions. And those few requirements were also immediately implemented and were delivered to the customer for final acceptance.

3.2 HCI Concept Process Management

Supplier processes regarding product release and product acceptance are executed by the product owner. Engineering processes such as requirements analysis, software design and software construction as well as software/system integration and testing are at the core of the agile methodology done by the cross-functional core team and managed by the product owner at the system level. Resource management, training and project infrastructure is an intrinsic demand on agile methods managed by the product owner, the scrum master and the stakeholders. Process improvement is continuously in focus in agile development prescribing the continuous monitoring of the learning curve and efficiency. Product evaluation and change management (including problem resolution management) is enhanced by reviewing and re-prioritizing requirements and errors within the sprint planning. Process related

documentation and configuration management must be done only to the extent that it satisfies the fulfillment of a desired maturity/capability level.

If we map ASPICE (cf. [14]) to SCRUM in intercultural HCI design projects in the automotive context, some of the generic practices of the Process Attributes 3.1 and 3.2 can be mostly ("largely") or fully ("fully") achieved. However, to fulfill all process attributes up to ASPICE level 3 in all process areas, extensive additional documentation as well as intelligent extension of existing SCRUM templates would be necessary (e.g. to achieve bidirectional traceability at level 1).

4 Implications and Discussion

The team is slowly getting adapted to the new culture and mindset necessary for using agile methods within an intercultural HCI design project. The team's creativity has increased. Helping each other is taking the first place. It can be felt that everyone is becoming more and more pro-active. The team's speed is also slowly improving. New ideas are getting generated almost every day. Everyday something new gets tried out. There is no fear of failure. Failures are seen as learning opportunities. It appears that the team has started enjoying a certain freedom for creativity, experimentation, exploration, and learning new things with and from each other. There are signs that team members are starting to take up the collective responsibilities and slowly self-organization is creeping in.

However, the retrospective review revealed that the version and change management system used was not directly compatible (due to its complexity and inflexibility) with the SCRUM methodology being deployed. Nevertheless, that the SCRUM methodology does work in a distributed development setup has been proved once again in this project.

Furthermore, if the agile development processes are supported by some auxiliary processes, it is possible to achieve up to capability level 3 for most of the process areas according to an ASPICE HIS scope¹, which is very important for intercultural HCI design projects in the automotive context.

The principles of the agile manifesto: individuals and interactions over processes and tools; working software over comprehensive documentation; customer collaboration over contract negotiation are applied at the same time and thereby staying compatible with the process capability model of ASPICE.

From this point of view, it is reasonable to determine to what extent the implemented agile development process in this project covers ASPICE process capability levels and that it is deployable in projects with high demand for certified quality.

¹ Reduced ASPICE scope agreed by certain car manufacturers
(cf. URL=<http://portal.automotive-his.de/index.php?lang=english>,
last access 02/24/2014).

5 Conclusion

Using agile methods in intercultural HCI design projects works from our point of view and will definitely be pursued in our future intercultural HCI design projects.

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