

Are User Interface Pattern Languages Usable? A Report from the Trenches

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Abstract. Pattern languages for interaction design have been an active research field in the area of Human-Computer Interaction. However, only few researchers have explored the impact of pattern languages in real application domains. This work reports a field study on acceptance and adoption of pattern languages by development teams in industry. Our results show that pattern languages should take into account the idiosyncrasies of the application domain and results show that pattern languages can be a great leverage to improve usability culture in industry.

Keywords: pattern languages, field usability study, acceptance.

1 Introduction

Design patterns were first introduced in the field of Architecture as a way to describe design solutions in an understandable and generalized way. In recent years design patterns have received considerable attention in the field of Software Engineering and in Human-Computer Interaction (HCI) [1] for their potential for recording and communicating design options and for supporting knowledge reuse during the design process. Contrary to other strategies such as guidelines and heuristics, design patterns focus on concrete solutions of problems rather than on general recommendations. A design pattern can be defined as ‘an *invariant solution* to a *recurrent problem* within a *context*’. Despite the fact that patterns can be described single standing, they quite often appear in a set of interlinked patterns for a specific domain. Such a collection of patterns is called a pattern language. Although many patterns and pattern languages have been published by the software engineering and the HCI community, little has been reported about their actual use in industry [3]. In order to understand how design patterns are actually used by development teams in industry we realized an empirical evaluation of the usage of a pattern language. This study was carried at SmalS-MvM¹, a non-profit organization employing more than 1.000 persons (mainly administrative and information technology experts) devoted to the design, development, deployment and handling of public e-Government applications in Belgium. Based on the very general nature of the web-service development in that area, we assume that lessons from this study can be generalized to other web-oriented domains.

¹ <http://www.smals.be/>

2 The Usability Study: Participants and Procedure

SmalS-MvM started developing a pattern language in 2006 as a means to support the discussion of solutions with stakeholders (many and with different background) and to finally introduce a standardization of the user interface for all applications (which are produced by different teams in the organization). The User Interface (UI) patterns have been identified by browsing existing applications designed by SmalS-MvM. They were organized in three different levels of granularity covering: screen flow (e.g. sequence of pages), web page (e.g. layout), and basic components (e.g. form fields).

The description of the UI patterns is rather classical (advice on implementation and rationale around a given UI design problem) but it also includes wireframes for supporting low-level fidelity UI prototyping using design patterns. According to the level of granularity, wireframes feature a schematic representation of the layout and the disposition of an UI element (e.g. a page or a form). Navigation diagrams are depicted using a formal description technique named StateWebCharts (SWC). Individual patterns also offers pointers to user interfaces components (e.g. MS Visio templates, style sheets) supporting the implementation phase. Design patterns are available in the form of an intranet web site.

To investigate the usage of this pattern language in a real application domain, a pre-questionnaire was used to recruit participants among 34 employees that are (expected to be) working with the pattern language. Only eight participants agreed to take part in the expert interview (6 M, 2 F), aged 24 to 31. Five participants indicated to work mainly as analysts; two indicated to be mainly leading projects, and one was mainly working as a system architect. Three participants were working more than three years at SmalS-MvM, two participants up to two years and three participants were at SmalS-MvM for 3, 6 and 9 months respectively. The pattern language was used in projects by six participants; two participants did not use the pattern language within their projects. One participant reported to never have looked at the pattern language before, six mentioned looking up solutions for specific problems, one added comments to improve the pattern language, four used personalized wireframes and five used the pattern language to argue for solutions in their projects.

The study consisted of three tasks participants conducted at their workplace, followed by a final interview about possible improvements for the pattern language. Users were given the following problem: *“Your goal is to set-up a webpage for the lunch distribution of a school with a personal identification for parents and the possibility to select the weekday lunch taken by the kids. Parents should have the possibility to cancel lunch three days in advance and the school staff to look up the number of ordered lunches”*. Task 1 was to find a general solution for the lunch web page using the pattern language by selecting a wireframe page (T1/a) and producing an html page incorporating the solution (T1/b). Task 2 was to compare the solution of the participant with the proposed pattern language solutions and describe how to modify the pattern language if necessary. Task 3 was to develop a solution for paying the lunch fee by credit card. The pattern language does not provide a complete solution to this problem so it should evoke the need for updating the pattern language.

3 Results

The evaluation showed various aspects on how to improve the usage of patterns in a user-centered development process. Due to space constraints, Table 1 summarizes the main findings from the expert interviews.

Table 1: Results for the three working hypothesis.

Task	Investigate Topic				
T1/a: Designing with Wireframe	pattern language usage +	integration in MS Visio ++	user satisfaction +++	adequacy of pattern language +++	method take-up ++++
T1/b: Designing with SWC	knowledge of SWC +++	hypertext modeling +++	usage of SWC +	user satisfaction with SWC +++	
T2: Discussing alternatives	readability +++	usability culture +++	adaptability of patterns +++		
T3: Updating	(because) pattern is missing +	resources used -	agility ++	gratitude ++++	motivation +++

Legend: ++++ very frequently, +++ frequently, ++ sometimes, + rarely, - never

H1: The pattern language is usable and helps to find solutions within the conceptual phase. The usability of the pattern language is acceptable but leaves room for improvements. User reported to be satisfied with the pattern language in general but they rarely looked up the pattern language for performing task 1a and 1b. Some difficulties were observed especially for subjects that have little training with MS Visio and SWC; This finding suggests that the users background may affect the general understanding of the solutions provided by the pattern language.

H2: The wireframe and the hypertext structures are helpful to reach consensus for the user interface solutions in the project. The pattern language itself is well perceived in terms of usefulness, it is valued in terms of readability and that it can be adapted and modified if necessary. The general usability culture of the enterprise shows that the patterns are used to reach consensus in discussion and during project development.

H3: The pattern language helps to support the reuse of solutions made during the conception of user interfaces. The pattern language is helping to reuse solutions but tight project schedules limit their usage as a leverage to create a usability culture. Problematic in the use of the pattern language is the missing knowledge of what patterns/solutions are already available and what patterns are missing. The success of a pattern language in a real application domain will depend on the ability to keep the language a living document, as pointed out by participant 4: *“I feel concerned by the evolution of the pattern language, because if it does not evolve it will become unusable soon”*. Time constraints stemming from the various projects may affect the evolution of the pattern language as stated by participant 6: *“I understand the importance of this issue [about the evolution of the pattern language], however project deadline is our priority”*. From the perspective of a general usability culture, the pattern language is accepted by the analysts.

4 Discussion and Conclusion

The contributions of this work are two-fold: based on this qualitative study we can compare theoretical claims on the use of patterns and their actual use in industry; in addition, we report many of the difficulties one can encounter when evaluating pattern languages which stem from the absence of sound quality models for describing pattern languages. In fact, despite abundant literature on HCI pattern languages, very few patterns authors' clearly state rules for ensuring a certain level of quality for their pattern languages [6]. Few reports of empirical validation of pattern languages exists, however they are limited by artificial testing conditions with users that have never experienced pattern language in their real projects [2]. Moreover, quite often the participants are students and/or researchers which are not representative for a real user group from industry [4]. An exception for this rule is the work of Malone et al. of the Yahoo! pattern language validation by an open (web) community [5].

The originality of the present study is to assess the use of design patterns in an organization that has formally adopted pattern languages as a solution for improving its usability culture. As we learned, the formal adoption by the company does not mean that employees easily integrate the pattern language in their daily work.

As we have seen at SmalS-MvM, pattern languages are a good solution to leverage the usability culture into organizations but, as living documents, pattern languages should evolve to meet organization needs (in particular stakeholders' needs for their projects). Otherwise pattern languages do have limited credibility and lose their added value to support the communication and to generate ready-made solutions. Due to several constraints, this study focused on only one category of stakeholders (i.e. the analysts) and their activity in a specific design phase of the development process (i.e. design of prototypes). We suggest that further investigation should be performed to understand if the pattern language available fulfills also other stakeholders' needs. Moreover, it would be interesting to observe different stakeholders at different stage of the development process.

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