

Assumptions Considered Harmful

The Need to Redefine Usability

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Abstract. A cultural evaluation of Usability Engineering in the Namibian context reveals a number of good practices as well as locally inadequate methods. One major challenge in cross-cultural Usability Engineering is the implicit western understanding of usability and its associated assumptions which often lead to a locally inappropriate usability evaluation. Conceptualisation sessions held with different Namibian user groups confirmed a deviating perception of the term "usability". None of the groups mentioned terms "commonly" associated with "usability" such as speed, learnable, or memorable. Thus standard usability testing comprises a dual bias through the western definition of usability and the related choice of methods which aim to test an already biased objective. We therefore suggest an ethno-centric software development framework which incorporates a contextual redefinition of usability.

1 Introduction

Usability Engineering (UE) has become an increasingly important aspect of local and international software development. Software engineering paradigms like user-centred and agile development, interaction and participatory design, established the relevance of user concerns and so-called user-friendly systems. However UE, considered a subset of development processes, is often reduced to a few distinct activities and is expected to deliver specific results. Moreover, the basic idea of tailoring software to be effectively and efficiently used by a specific group of end-users has so far only been based on assumptions and experiences from the western culture's point of view. Thus in the early days internationalisation encompassed only the customisation of a fully developed application to national requirements such as language, measurements and other units. Further research indicated a deeper relation between culture and User Interfaces and system usability. However "a major impediment in global user interface development is that there is inadequate empirical evidence for the effects of culture in the UE methods used for developing these global user interfaces" [1].

'We should recognise another inherent limitation of UE, that is it provides a means of satisfying usability specifications and not necessarily usability" [2]. Thus

more attention should be paid to the validity of the specification. Especially in a cross-cultural setting it seems that the discrepancy between the specification and the understanding of usability is high and often leads to the development of unusable systems.

In this paper we provide empirical support for a cultural adaptation of UE methods and processes based on a Namibian case study. We further suggest a software development framework which incorporates a contextual redefinition of usability to extend current internationalisation efforts.

2 Internationalisation Efforts

Much research has been done in internationalisation of software, yet this is mostly aimed at a first level: fast product adaptations rather than analysing underlying development processes. Thus in the 1990's localisation efforts merely concentrated on national customisation. What has become known as Interna-

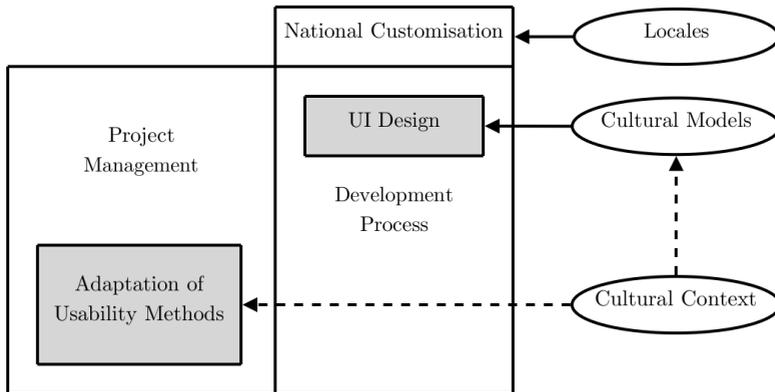


Fig. 1. Current Internationalisation Efforts

tionalisation and Localisation is often a marketing tool rather than an attempt to narrow the cultural gap between an application's potential user groups. It was soon realised that this was insufficient to gain local acceptance. Del Galdo and Nielsen [3] suggested two additional levels for consideration: the adaptation of usability methods to specific countries and the design of user interfaces to fit cultural models of how people work and communicate. In figure 1 we summarise current internationalisation efforts as described above.

2.1 Cultural Models and User Interface Design

It is widely recognised that User Interface features carry cultural values. The way signs, symbols, and colours are interpreted differs from culture to culture. How users relate to navigational structures and classification systems depends on the

way their society organises and models the world. Skills and associated assumptions about reading and sources which have been built up over a lifetime often prevail. Web site design is thus inconsiderate toward oral cultures. Walton and Vukovic have demonstrated a cultural dimension for web-information-seeking practices [4]. Among other findings they observed South African students unable to operate tree structures and breadcrumbs, concepts unfamiliar to their culture. They conclude that *"in developing contexts, the user's goals and practices may be vastly different from our assumptions, and they may not be able to crack the many codes by which we have encoded the scent"* [4].

Trillo points out that developers need a methodology to select an appropriate cultural model to guide the international user interface design [5]. Among the most popular has been Hofstede's cultural model [6] in which he distinguishes cultures along the following dimensions: Power-distance, Collectivism vs. Individualism, Femininity vs. Masculinity, Uncertainty avoidance, and Long- vs. Short-term orientation. Marcus and Gould illustrate the inference of those dimensions and User Interface characteristics with a set of selected Web sites [7]. Furthermore they attempt to derive general guidelines for user-interface and Web design, e.g. the level of power distance should be aligned with the information structure, use of hierarchies and security features. Anticipated derivations of cultural dimensions into specific user interface design rules often lead to inadequate generalisations. Ford and Gelderblom found no correlations between South African users' performance and the use of websites displaying dimension-specific characteristics [8]. Fitzgerald concludes that cultural dimension models seem to be aimed at a description of culture rather than as a prescription for best user interface design [9]. Yet we consider cultural models to be valuable sources of information for the local appropriation of usability methods. Similar opinions have been raised in the literature, where Hofstede's cultural dimensions model is suggested to inform the selection of usability assessment techniques in cross-cultural user testing [1].

2.2 Cultural Validity of Usability Methods

The success of a method depends in part on its compatibility with the context of application. There are many accounts of usability engineers having crossed cultural borders and encountered unexpected situations which can be found in the literature. E.g., the usability expert who was flown in from New York to Tokyo and would not understand why the females in his focus group were not participating [5]. The choice of method was obviously inappropriate. We have had similar experiences especially with the use of questionnaires as a valid data gathering method. Most Namibian nationals fill in questionnaires with the assumed expected answers rather than the personal truth [10]. In oral communications similar conventions can be observed. We believe that it is motivated by a cultural listener-satisfaction and conflict avoidance habit. An ingenuous interaction is further hampered by an unusual high power distance. Vatrappu

and Pérez-Quiñones experienced that when the usability expert and the user are from a different culture, usability problems may be masked rather than uncovered within a structured interview session [1]. Cultural influences on the use and success of well established methods, such as Think-Aloud task analysis and metaphors have also been reported [1].

Consequently, once the cultural determinants are known, the methods can be adapted or entirely different methods can be chosen. For example, Vatrapu and Pérez-Quiñones suggest that interviewers from the same culture might be more effective in eliciting usability problems especially when users come from hierarchical cultures [1]. In terms of Hofstede's dimensions Namibia can be characterised as a high power-distance and a rather high collectivistic culture. Elders have to be respected; this includes strict obedience towards parents, teachers and bosses. Many grass roots projects have failed because the village elders were not involved and to get employee participation employers will have to support or even order it. In terms of collectivism, large family bonds are in place supporting individual members but also demanding responsibilities. Outcomes obtained in our evaluations confirm results reported in the literature, for e.g. better qualitative feedback in interviews are obtained if usability evaluators and users belong to the same ethnic groups [11]. We have further successfully introduced a collective usability evaluation method in the form of workshops rather than individual user evaluations to reflect local community habits. Similarly can African traditional story-telling be mirrored to design task-analysis evaluations as it creates the necessary contextuality for users to relate to a task.

2.3 Invalid Assumptions – A Cross-Cultural Challenge

Besides the need for a cultural adaptation of usability evaluation methods major discrepancies between our and the users' assumptions in regard to the concept of Usability became evident. For example, most users did not complete their tasks however they felt they had mastered the system quickly and easily, and were therefore satisfied with the system. The widely presumed correlation between user satisfaction and efficient and effective task completion does not hold in the Namibian context. We were therefore surprised when we observed Namibian participants evaluating information systems by measuring the system content against their own knowledge and once they discovered the system lacks information they lost trust in the system and rejected using it [11].

Thus a consideration of the semantics of "Usability" in each context of use becomes a necessity. Allen and Buie have looked how different frequently used terms in UE, such as intuitive, user-friendly, logical, tester could be compromised [12]. They conclude that the terms must be used with care in order to hold their value and ensure a common meaning among the concerned group otherwise they can create a reality that is different from the one intended. Moreover if the group consists of people with different cultural backgrounds a mutual understanding needs to be explicitly established.

3 What Really Does "Usability" Mean?

Only few authors explicitly have defined "usability", thereby contributing to the establishment of a common assumption of its meaning. Yet concepts are hardly static entities. They evolve over time with their properties and meanings being subject to change. Over time, any concept's enclosing context evolves and in turn influences the definition of the concept itself.

3.1 The Origin of "Usability"

Usability engineering is rooted in the modernist or enlightenment tradition which values rationalism, individualism, information, performance and efficiency anchored in the definitions and measurements of "usability". According to Shneiderman "usability" can be quantified in terms of time to learn, speed of performance, error rate, retention over time and subjective satisfaction [13]. Shneiderman refers to an early US military standard MIL-STD-1472 for human engineering design criteria, in which the achievement of effectiveness, simplicity, efficiency, reliability, and safety of system operation, training, and maintenance is spelt out [14]. Similarly does Dix refer to effectiveness, efficiency and satisfaction [2]. Preece breaks usability down into the following goals: effectiveness, efficiency, safety, utility, learnability and memorability [15]. Leaving the central definition of usability untouched, Preece complements it with user experience goals, such as satisfying, enjoyable, motivating. She considers usability goals to be central to interaction design and operationalised through specific criteria while user experience goals to be less clearly defined. Most other definitions found in the literature either refer directly or indirectly to the above mentioned or just rephrase usability to be "ease of use" or "user-friendly" which does not contribute to the understanding of the term. Thus most researchers and practitioners do not question or attempt to widen the concept itself but focus on the evaluation methods. However these methods are implicitly linked to the perceived understanding of the concept. Industry-recognised methods for evaluating a system's usability, such as GOMS, focus on efficient and accurate performance [16]. Task-analysis methods intend to measure the effectiveness of the user working with a system. In other words the Usability engineering community works with a vague and implicit culture bound understanding of usability and its associated methods. While it might seem logical for US military personnel to expect effective and efficient use of systems, it must be doubted that this perception of usability is generally valid across professional or (sub)cultural boundaries.

3.2 A Conceptualisation of Usability in Namibia

Usability Engineering is still in its infancy in Namibia. There are neither usability laboratories, nor usability experts or established UE phases as part of the development processes used. Especially large scale development projects such as governmental and parastatal management systems omit the design for and evaluation of usability all together. Only individual software developers integrate

selected usability tasks, such as user prototype evaluations and questionnaires [17]. Considering the low priority of usability as a quality criteria from the developers side, leading to excessive user training and long term help desk activities, it is of utmost importance to establish locally valid UE standards and guidelines. Firstly, the meaning of "usability" in the Namibian context has to be established. Secondly, valid methods have to be evaluated and determined.

In an attempt to ascertain a local meaning of "Usability" a number of investigative sessions with different Namibian user groups were run. The user groups consisted of a number of three to six participants, with variations in gender, age, profession and ethnic background. The participants were grouped according to the software they are working with i.e. two ministry payroll system, two university management system, one agricultural decision support system. Additionally two non-software specific group sessions were held. All sessions were structured in the same manner: First, participants were asked to brainstorm on associative and related terms/concepts of the word "usability" in general. Second, participants elaborated on general characteristics of a "good working environment". Third, participants selected only the appropriate terms from the two previously produced lists which should apply to their software systems, for it to be considered "usable" [17].

Terms that were named most often were: easy, safe, comfortable, specific, reliable, right pace, goal-oriented, and conducive. Interestingly none of the groups mentioned terms commonly associated with usability such as speed, learnability, memorability, or error rates. However a diversified understanding of satisfiability was expressed such as: beneficial, transparent, stress-free and flexible.

This confirms our hypothesis that usability has a completely different connotation in Namibia. However the currently available data is insufficient to determine whether there is a Namibian concept of usability or a user group specific or even individual only. Further data will be collected for more detailed statistical evaluations.

Furthermore, this investigation shows how differently assumed-to-be-usable systems should be designed and evaluated. Developers can no longer rely on their professional intuition and assumptions but actively and explicitly have to confirm the contextual meaning of the quality criteria with the relevant stakeholders. We have successfully run one of the conceptualisation sessions as part of a participatory design workshop with the client to determine valid evaluation mechanisms. This will support the development of a usable system in the terms of the client.

4 Culture-Centric Development (CCD)

Commonly seen as part of globalisation efforts, UE is mistakenly understood to be responsible for a last phase application make-up for foreign markets. This usually encompasses solely the translation of units and layout features, evaluated by

some – if any – cultural representatives residing in the country of development. In few cases the system is evaluated in the local context with real end-users and standardised, predefined methods. However such a small and late involvement of end-users has been long criticised. New Software Engineering paradigms like user-centred and agile development, interaction and participatory design, established the relevance of user concerns and early involvement. Thus UE activities should commence in or before the first phase of software development processes.

Especially in a cross-cultural development a thorough understanding of the cultural context has to be acquired to guide the development process as well as design decisions [10]. As culture is subject to constant changes within its defining environment, we need to account for this fact by adjusting the applied methods and evaluation tools. While the need for such adjustments is well-accepted in SE, the same has to apply to UE as well. We are therefore proposing the incorporation of arbitrary SE process models in an extended framework, embracing the underlying culture at all times (figure 2).

4.1 A Framework for Culture-Centric Design

Definition of Quality (Usability) Criteria: In the first contact phases with the client the quality criteria of the system should be negotiated. This includes the explicit definition of usability within the context which involves intensive user participation. An example which we have already successfully applied are conceptualisation sessions in the form of workshops as described in 3.2.

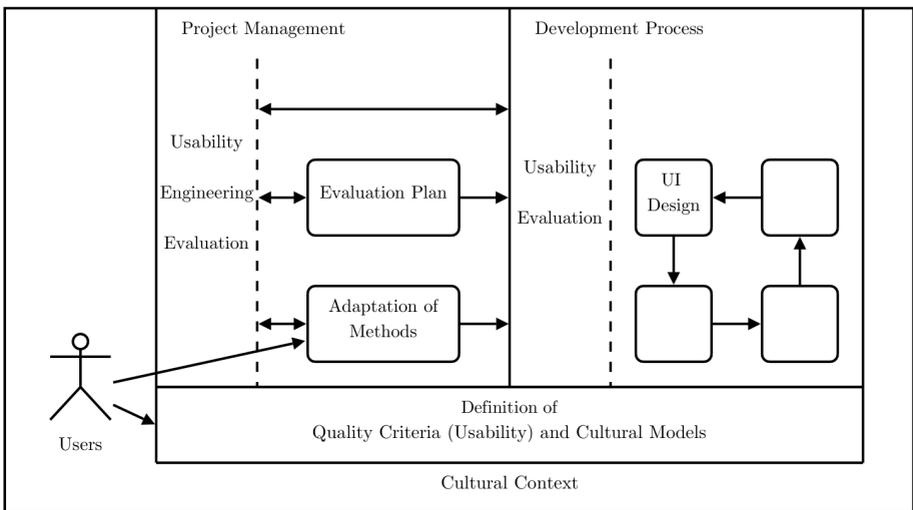


Fig. 2. The CCD framework is connecting Project Management and the Development Process (using an arbitrary development process model) through continuous usability evaluations within the cultural context

4.2 Project Management

Adaptation of Evaluation Methods: In an early design phase, an assertion of explicit quality metrics to judge the system once delivered needs to take place [2]. Based on the identified metrics and evaluation criteria, a local acculturation of methods will have to be done. Again, this acculturation must incorporate user input as well as cultural models.

Evaluation Plan: Based on the identified evaluation methods, an evaluation plan is established, stating implementation details and the assessment criteria to be applied during the evaluation within the development process.

Usability Engineering Evaluation: While software development processes are already subject to project-specific selection and customisation, the additional UE tasks as proposed are designed to be independent of the SE process model as such. Thus, the complete UE process should be evaluated in the scope of a higher-order evaluation taking place within the project's management. Although we deem the suggested CCD framework applicable and highly useful in its current form, it shall be subject to continuous improvement. Results acquired from the UE evaluation will therefore be a valuable source of information for future enhancements and refinements.

4.3 Development Process

While development process models are usually chosen on a per-project basis, we suggest to prefer models embracing change in all its varied forms and allow for high frequency iterations. Agile development, Extreme Programming and prototyping in general seem more applicable in the CCD framework as they give users a deeper insight and thus allow for a closer co-operation throughout the development.

Usability Evaluation: As phases and cycles in a development process are followed as necessary, a continuous evaluation according to the defined usability evaluation methods is taking place, feeding the outcomes back into the process. Furthermore, the evaluation process itself provides input to the UE evaluation controlling the overall applicability and appropriation of the selected methods.

User Interface Design: The design of user interfaces needs to be derived not only from cultural models of how people work and communicate, but also from project-specific guidelines and other locally applicable principles.

4.4 Culture-Centric Development in Western Cultures

The application of the proposed framework is by no means limited to non-western countries. In fact, we suggest its establishment in western settings as well. So far,

usability engineers tend to consider culture as an important factor only if it is not a western one. This leads to the paradox that, although most research in the field of cultural impacts on Software Engineering is done in western countries, developments within these cultures hardly ever incorporate any of the findings of this research. Thus we deem this approach a very valuable one as it would allow to either validate or falsify many of the assumptions used in the majority of Software Engineering projects world-wide. A valid re-definition of usability in developed countries may prove more difficult as most computer literate people already have a heavily influenced concept of usability in mind. Therefore, conceptualisation sessions might not be adequate tools in developed countries.

5 Conclusion

Current internationalisation and localisation efforts are still unsatisfactory in terms of facilitating the design of locally adequate and usable solutions. The lack of empirical studies to inform cultural adaptations of methods and user interface design has to be pursued by the international Usability Engineering community to establish a catalogue of best practices.

Besides, standard usability evaluation encompasses a twofold bias: Initially, through the definition of usability according to western standards, and secondly, through established methods which aim to test an already biased objective. The very foundations and universality of "usability" as it is understood today is doubtful. Conceptualisation sessions held with different Namibian user groups confirmed a deviating perception of the term usability. Thus the concept itself has to be redefined in conjunction with the users to fit the cultural context of the software development and application.

The incorporation of these newly defined UE tasks into existing Software engineering models however leaves us with new challenges, namely the evaluation of the new process. How can we assure that the methods chosen and adapted measure the usability as newly defined and specified within the context, and how can we obtain feedback other than through the long run use of the deployed system?

As Aaron Marcus observes, "*we have barely begun to discover the startling and currently unresearched assumptions about metaphors, mental models, interaction, and appearance. [...] We have an interesting and challenging time ahead of us as we explore the full meaning of cross-cultural user-experience development*" [18].

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