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Introducing New Methodologies for Identifying Design Patterns for Internationalization and Localization

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Introducing New Methodologies for Identifying Design Patterns for Internationalization and Localization

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Abstract. This paper describes a new methodology for deriving interaction design patterns from an analysis of ethnographic data. It suggests using inductive and deductive analysis processes to identify and articulate patterns that address the needs of culturally diverse users of interactive, collaborative systems. This might inform the internationalization and localization process of computer supported collaboration systems.

Introduction

A growing number of design and usability researchers and practitioners are beginning to take an interest in design patterns as a method to capture and communicate effective design solutions. The practical format of patterns enables designers to reuse and share design knowledge among various stakeholders in the design process. The concept of design patterns has received less attention in the field of internationalization and localization of products and systems than in other related areas of research. This might be due to the uncertainty as to whether or not patterns are an appropriate method to capture and communicate appropriate design solutions to support the use of interactive systems by culturally diverse users. Generally, the process of enabling localization of systems for different cultures starts with the development of a core interactive system, which is considered international. The core system is designed to receive local specific data, when it is localized. This paper introduces a methodology for studying and analyzing designs in culturally varying contexts in order to represent the findings in the format of design patterns that support the localization of collaborative systems.

Background

Since Alexander (1979) introduced the design patterns format into the field of architecture and Gamma et al. (1995) developed patterns to communicate reusable parts of computer engineering knowledge, a discussion among interaction design researchers has evolved regarding which role design patterns could take in the

usability and interaction design process (Borchers 2001), (McInerney 2002) (Tidwell 2005) (Erickson 2000). Two teams of researchers are currently investigating the possibility of patterns-supported cross-cultural usability in the field of internationalization and localization (Alostath and Wright 2004), (Mahemoff and Johnston 2001). Mahemoff and Johnston (2001) suggest design patterns that are closely related to usability standards for internationalization and localization. These researchers' patterns offer support for the design process of internationalization of computer systems but do not give consistent advice as to which cultural differences and models need to be considered and communicated in different design and development contexts. Some patterns reference cultural dimensions (i.e. Hofstede 1997) to describe culturally varying forces that determine the usability problem. However, this information is not provided consistently throughout all patterns.

Researchers have discussed the importance of context descriptions and appropriate naming of design patterns (Alexander 1979), (Borchers 2001), (Hall 2003), (Tidwell 2005). Based on their research in the area of internationalization and localization of products, Hall et. al. (2003) suggest that the same problem can have a different solution depending on the culturally varying context of use. A design pattern is a description of a solution to a problem in a certain context (Alexander 1979). The depiction of conditions that lead to a successful design solution in this context is very important in order to communicate the purpose and scope of an interaction design pattern. Suitable choices of terminology, writing style and graphical representations of design patterns contribute to the understanding and correct of use of a pattern. In this view, the author believes that the way patterns are articulated is greatly influenced by the methodology by which patterns are identified. In the past, pattern researcher accepted that pattern identification is based on the long term work and research experience of the composer. Although, literature provides information how to construct a pattern language (Meszaros and Doble 1999) or how to improve patterns in a shepherding process, researchers criticize that there are few concrete descriptions of methodologies to identify design patterns (Baggetun et al. 2007). Therefore, this paper introduces a qualitative methodology for identifying design patterns in ethnographic data of cross-cultural computer-supported collaborative interactions.

Methods

In the context of a long-term ethnographic study over a period of three years, inductive and deductive qualitative analysis methods were explored and developed for supporting the identification and articulation of interaction design patterns. In the inductive approach to data analysis all findings are grounded in the data. The deductive approach to ethnographic data analysis uses scientific theories to structure, code and report the data to test or extend an existing theory or hypothesis. (Tesch 1990)
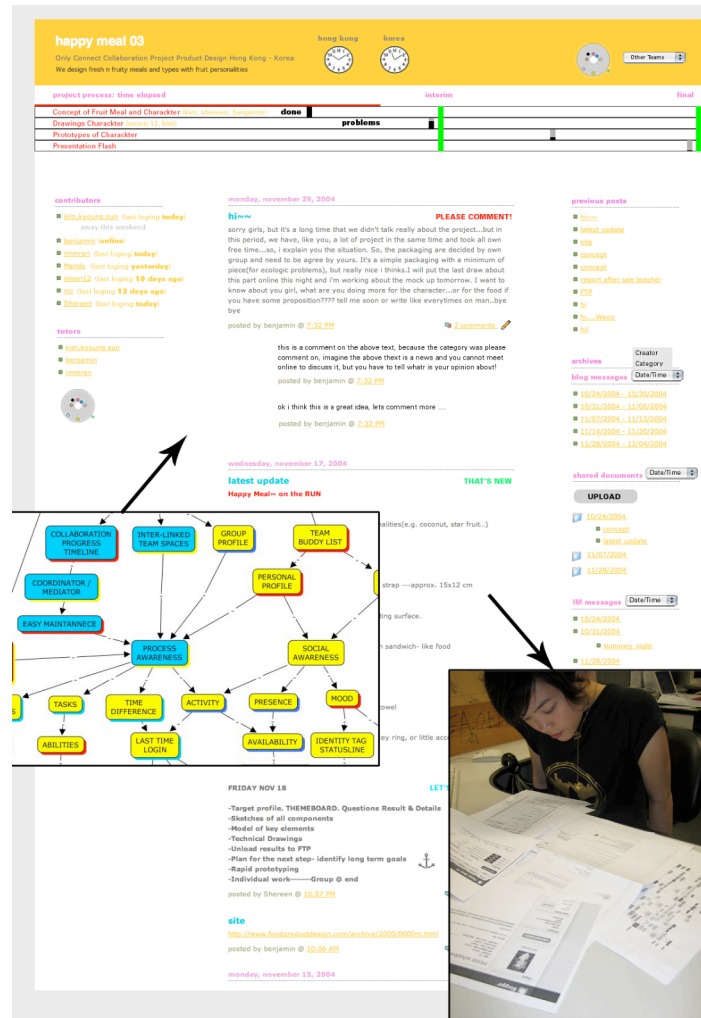
Fig. 1. Development Cycle of Interaction Design Patterns: from Deductive Mapping to Prototyping and Testing of the Prototype.

From September 2003 to December 2005, I observed an undergraduate university design studio subject entitled "Only Connect - international collaboration project". This was a 6-7-week course organized by the School of Design at the Hong Kong Polytechnic University and taught in collaboration with partner universities and design schools in Korea, Austria and Taiwan. Each year, teams of 2-4 second year Hong Kong students from product, visual communication and environmental design were paired up with partner teams of 1-3 students from a similar design discipline and from another country. Each time, there were approximately 110 Hong Kong participants and 50 international partners. Each discipline had 2-3 tutors from Hong Kong and from the respective partner university. Though distributed geographically,

students collaborated using various communication technologies. Teams utilized synchronous communication tools like MSN or ICQ chat systems or Video-chat. In addition teams used asynchronous communication media like email, shared documents and different community and group websites like weblogs or Yahoo! Groups. Data about the collaborative interactions between distributed international design teams were collected using naturalistic observation, in-depth and informal interviews, as well as online conversation protocols.

The research project consisted of three phases. In the first year data were gathered to discover similarities in the teams' interactions and communications in order to identify reoccurring issues in intercultural computer-supported collaboration. Those identified issues were used as guidelines to carry out observations and conduct interviews with the participants during the second year.

The data from the second year of the observations were analyzed in cycles of inductive coding and deductive mind mapping. The emerging design patterns were mapped into a hierarchical graph to discover possible connections among individual design patterns. While patterns in the upper hierarchy informed about concepts of cross-cultural differences in interaction design, patterns lower in the hierarchy related possible design solutions to those concepts. A few emerging solutions were tested in design scenarios and paper prototypes. A cycle of the process is displayed in Figure 1. These activities produced 14 design patterns, which were evaluated in design pattern workshops with novice and expert designers. After this evaluation, patterns were further developed using a deductive analysis of the interactions between Hong Kong and remote (in this case Korean) participants.
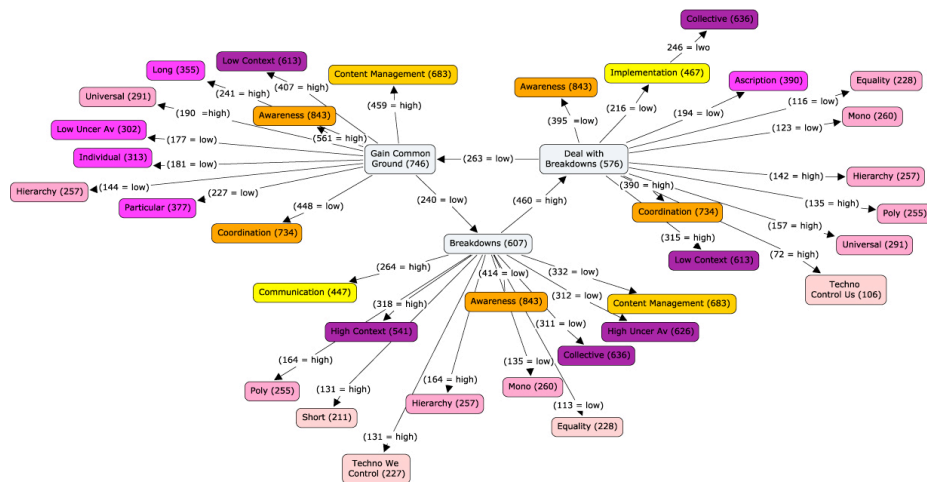
Fig. 2. Network Design Patterns Map to Explore Relations between the Data.

For this development, a coding scheme informed by theories from intercultural and cross-cultural communication, and collaborative learning and design was utilized in

the third stage of the study (Hofstede 1997), (Gunawardena, et. al. 1997), (Preece 2002). The computer-assisted analysis software package TAMSAnalyzer^{TM} and GraphViz were used to view, sort, code and analyze the data. In this deductive analysis code frequencies and co-coding frequencies were used to compare the data, find patterns and explore relations among the patterns. The deductive analysis process was more rigorous than the previously-used, inductive analysis process. Due to the differences in the values of coding frequencies, dominant patterns in the data could be captured without difficulty. Moreover, patterns of stronger and weaker relations were acquired comparing the co-coding frequencies with other codes. This could be mapped and explored visually. The exploration of relations was accomplished mainly through mind mapping activities as shown in Figure 2. In comparison to the previous analysis technique, the emerging patterns were not structured in a predetermined hierarchical map; instead a network map evolved through inherent relations in the data. As a result, 18 design patterns for cross-cultural computer-supported collaborative design learning were written.

Having compared the methodologies for writing design patterns, I will now turn my attention to presenting findings from each stage of the study to demonstrate the evolution of the process of identification and articulation of patterns.

Findings

In this long-term ethnographic study, knowledge about intercultural collaborative activities and how they could possibly be supported by the development of interactive systems in the internationalization and localization process evolved gradually. The results of the first stage of the research project produced guidelines for the further study. Measures such as the coordinated use of synchronous and asynchronous communication tools, collocated intensive workshops, online tutorials, and indicators supporting the presence and background information of other participants emerged among others as central topics in intercultural collaborative design learning. Building on these findings, the second stage of this research generated 14 fully articulated patterns and an abundance of pattern beginnings. It is beyond the scope of this paper to present all fully articulated patterns. Nevertheless some design pattern thumbnails are detailed below:

- Blended Collaboration: This pattern suggests blending local and remote teamwork activities seamlessly into one collaboration process.
- Community Workshop: This pattern builds on the previous pattern, recommending running a collocated community workshop to start the project and establish trust through a mix of social and task-related communication.
- Community Portal: The design solution in this pattern advises setting up a virtual community portal to strengthen the relation of the members in the newly established virtual team and the entire learning community.
- Personal Profile: This pattern details the use of a personal page to represent information on each member in the team and community.

- Awareness Indicator: This pattern suggests conveying information about past activities, present states and possible future events of the artifacts used and members represented in the project.

In 2005, the author conducted an evaluative pattern workshop to investigate how the identified interaction design patterns were perceived and used in the design process. A set of interaction design patterns from the first analysis was handed to groups of experienced and novice designers for comment. Some workshop discussion results suggested that while design patterns were instructional, the writing style was slightly too prescriptive. For more experienced practitioners the patterns' contents were perceived as being "too close to the data" and not descriptive, inspiring or revealing enough. Also, the relation of cross-cultural concepts and internationalization and localization of systems was judged to be too weak. To address this problem, the first group of workshop participants suggested the grouping of patterns into domain-specific clusters such as cross-cultural dimensions or technological concepts, whereas the second group proposed less generic pattern names to increase curiosity while browsing the patterns map. After the first workshop I concluded that giving usable problem-solution description was difficult without explaining concepts of cross-cultural and intercultural communication as contextual information. Hence, for the further development of the patterns I decided to use intercultural and cross-cultural communication concepts throughout my patterns to achieve a less, prescriptive more descriptive and informative writing style.
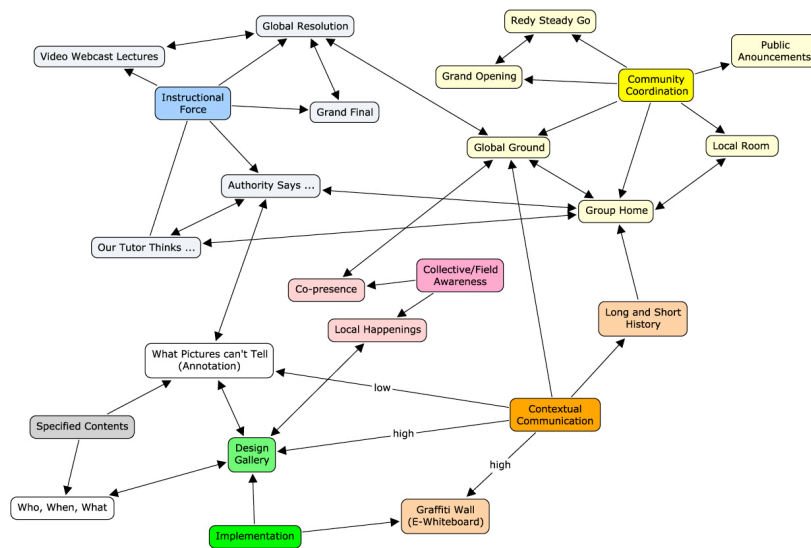
Fig. 3. Hierarchical Design Pattern Map of the Inductive Analysis

Some patterns were followed-up in the second deductive analysis. While a few patterns proved not to be as good as initially thought and were hence disregarded after the second analysis, other findings seemed to propose entirely new patterns that were

not identified in the first, inductive analysis. Patterns were grouped around concepts of "Instructional Force", "Community Coordination", "Collective Awareness", "Contextual Communication", "Specified Context" and "Implementation" as presented in Figure 3.

The formerly identified pattern ""Personal Profile" could not be confirmed as a successful solution to represent an individual in collaborating collective cultures and was not further developed. Patterns that evolved from previous ideas were "Grand Opening", which takes up the idea of the previously identified solution of "Community Workshop" and contextualizes the solution within the need for a public display of a strong community in collective cultures. A further development of the "Awareness Indicator" pattern produced the design solution "Co-presence", which builds on the idea of a local team sharing one online chat account, even though the actual individuals who are chatting might change. This addresses strong collective community orientation and suggests the development of co-presence indicators of locally nearby collaborators for one chat account. The following is example of an entirely new pattern that derived from deductive analysis:

PATTERN: "GLOBAL RESOLUTION" ***

Thumbnail: Visually and textually supported synchronous tutorials help in gaining common ground among culturally diverse distributed learning teams and their tutors.

Breakdown: *After a local, face-to-face tutorial, students discuss remotely the options for the development of the designs but cannot gain common ground about the direction they want to follow. This might be due to differences in the local and remote tutors' advice or because some students do not want to adopt the tutor opinion without discussing the feasibility. However, since local teams are assessed locally, the local tutors' opinion has a high significance for students. A breakdown between the local and remote teams occurs because the possibly contradictory instructions of the tutors cannot be resolved in the global team. Hence, instructing distributed design-learning teams exclusively in local face-to-face tutorials causes breakdowns in the coordination and decision-making process of the global virtual team.*

Forces: Collective and hierarchically oriented cultures have a tendency to follow the tutor's advice without question. Maintaining harmony in the global virtual team is also important. However, if tutors give different advice in separate local tutorials, the harmony in the global virtual team is disturbed and can only be restored if both tutors'

views are balanced and a decision is ether imposed from above or negotiated between all participants.

Solution: *Establish several synchronous communication sessions over the project period involving local and remote instructors and students of the global team in computer-supported peer tutorials.* To schedule at least three sessions, one at the beginning of the project, one interim and a final presentation, is a minimum requirement for establishing common ground within the design learning community. Synchronous peer tutorials involving local and remote tutors and teams are major project milestones and offer full awareness of the team's progress and of the opinions and suggestions of both tutors. Design decisions can be made instantly. Possible conflicts in advice can be discussed on the spot. In textual synchronous communication tutors can refer to representations of the designs stored in the DESIGN GALLERY as references for the discussion. However, video-supported presentations of the teams' designs are especially successful. In the discussion and comparison of local implementations, students and tutors can communicate in reference to shared physical design artifacts. Since sound quality is sometimes a problem, textual synchronous communication can be used to support the visual demonstration of the design artifacts.
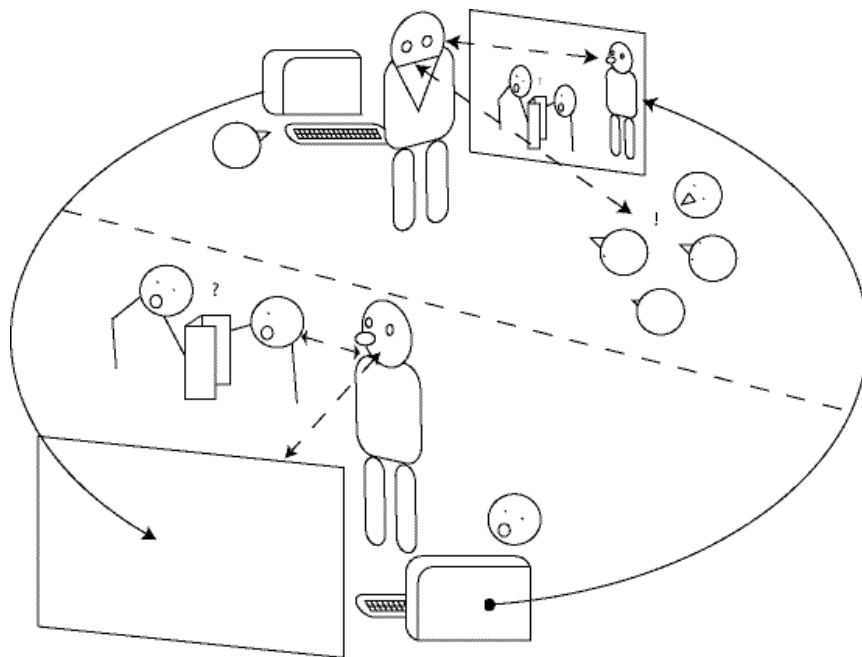
Why: In visual and textual supported synchronous discussion and tutorial sessions, students explain their design implementations in detail by means of sketches and prototypes. The discussants can immediately check and clarify misunderstandings in the design process. Both teams share and explain the design process from their local point of view, which fosters equality among the teams. All attending students and

tutors gain awareness and common ground through high contextual communication. Having gained an understanding of the entire picture of the global team's process and progress, tutors can discuss the proposal among themselves and communicate their decisions and instructional advice immediately and in unity to the global team. High contextual and multi modal information about the designs enables tutors to give low contextual, clear and direct advice. Due to the strong hierarchical orientation of the students the advice is taken without objection. This resolves possible uncertainties among the students and restores harmony in collective oriented cultures. While the conclusion of the discussion satisfies achievement-oriented cultures, the involvement of the entire community reassured ascription-oriented cultures that they are aligned with the projects values and goals, too. Therefore, global resolutions given by the tutors may address universal goals and directions, but tutors should refrain from giving concrete tasks for the teams. Even if the teams' abilities and skills do not match the assignment or task, students from collective-oriented cultures would not object to the tutors' instruction, not wanting the tutor to lose face. Afterwards, while discussing the new design direction, teams can clarify new tasks and roles that emerged from the tutorial.

The identification of this and similar patterns was strongly influenced by the deductive coding scheme used in the second analysis. Since it was informed by ideas from collaborative learning and design, collaboration support and intercultural and cross-cultural communication theories, the terminology used to describe the phenomena and scope of the patterns were more consistent. The format of the developed patterns is descriptive and informative rather than prescriptive. The descriptions of breakdowns that cause a design problem and the forces that can resolve this problem suggest efficient design solutions that are embedded in the context of cross-cultural computer-supported design learning. Designers, educators and system developers who use such patterns are not only informed about possible solutions but also about the socio-cultural principles that underlie the solutions.

Conclusions

This paper has presented a qualitative methodology for identifying and articulating cross-cultural computer supported design-learning patterns in ethnographic data. It suggests a combination of inductive and deductive data analysis to articulate design patterns that take a cross-cultural context into consideration and aim at informing designers and developers in the process of internationalization and localization of products and systems. In addition to several pattern thumbnails, one fully articulated pattern called "Global Resolution" was presented in this paper. Based on these examples, I suggest that an inductive analysis of ethnographic data to establish pattern categories followed by a deductive analysis of this data to compose patterns with consistent style is an suitable process to identifying and articulating interaction design patterns for cross-cultural computer-supported collaborative design learning.

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