Computer Usage and User Experience in Jordan: Development and Application of the Diamond Model of Territorial Factors

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Abstract. The Diamond Model structures territorial factors of relevance to Interaction Design into five segments with objective and subjective facets. The initial structure and content was derived iteratively on the basis of a literature survey. Three field studies were then used to populate the model with Jordanian instances of cultural and other territorial variables, and to add new variables to the model. The model can act as design resource that combines concerns from HCI4D (HCI for Development) with cultural variables that extend beyond the acceptability and suitability of user interface elements. The derivation and evolution of a Jordanian instance of the model is presented, with brief suggestions on how it could be used by software development teams.

Keywords: HCI4D, Diamond model, cultural differences, geographical differences.

1 Introduction

Interaction Design, supported by HCI research, has to balance and integrate choices of software and media features with understandings of users and other stakeholders. Stakeholders vary in their capabilities, aspirations, aversions, needs, wants, and preferences, interpretations, to highlight only a few forms of differences among people. While many differences are very individual and idiosyncratic, we tend to design for groups of people, rather than for individuals. We design for what stakeholders have in common. Such similarities are often cultural, that is, they reflect the social environments that shape phenomena such as motives, values, meanings, obligations and expectations. However, not all differences are cultural. Economic, political and geographic factors also influence the suitability and acceptability of designs. The field of HCI4D (HCI for Development, Chetty and Grinter 2007) contrasts with earlier work on *culturability* (Barber and Badre 1998), by taking a broad view of the territorial factors that influence the suitability and acceptability of interactive systems. Culturability combines usability and cultural sensitivies to design user interfaces that are appropriate and acceptable for specific cultures. However, this may not be all that is required to successfully localize interactive software for specific geographic territories.

Target markets for software design are often territorial. This is much more the case with software localization, although often language is the main focus here (e.g., for Francophone, Hispanic or Arabic markets). A focus on culture alone is thus inadequate. HCI4D in particular needs to consider economic, political and geographic factors to make software, for example, affordable for buyers, compatible with government policies, and suitable for the climate, country/region size, and technological infrastructure. A territorial focus also makes it possible to consider the range of cultures within a country or region, e.g., youth and organizational cultures.

A further advantage of considering a broad range of territorial factors is that national differences do not all need to be attributed to culture. Discussions of national culture often arouse concerns about stereotyping, overgeneralization, bias and even racism. Consideration of a broad range of territorial factors reduces concerns here. Even so, culture remains important, even though it has been defined in many ways in different disciplines. Within anthropology, Kluckhohn's definition has been influential. Kluckhohn (1951) defined culture as consisting in patterned ways of thinking, feeling and reacting, acquired and transmitted mainly by symbols, constituting the distinctive achievements of human groups, including their embodiments in artefacts; the essential core of culture consists of traditional ideas and especially their attached values. Such patterns are relevant to Interaction Design, because users act, evaluate, feel, think, and achieve when using computers. The central role of values in culture indicates that software features and usage could draw positive or negative reactions according to users' culture. While economic, political and physical geographic factors are often emphasised in HCI4D, the values shaped by cultural variables also shape suitability and acceptability.

Therefore, designers of new technologies or localizers of existing ones need to consider cultural and territorial factors. Currently, when designing for developing countries, designers need to combine findings from HCI4D with culturability research. To reduce the effort needed here, we have developed a new model called the "Diamond Model" which can guide designers and developers to consider how users may think, react, behave when using a design, as well as the economic and other resources and constraints that apply, especially in developing countries.

The Diamond Model was developed in four stages. A literature review of culturability research and general sources on culture provided the bases through a process of iteration for the model's structure of five segments of variable groups. We then added instances of variables through three studies. In the first initial exploratory study, interviews with IT support and developers highlighted the more common types of IT usage problems. We chose IT support experts for this pilot study because they have extensive experience of problems that face Jordanian users, were easy to access, and could offer a rapid overview of usage problems.

The second study repeated Lazar and colleagues' (2006) US study in Jordan, and compared their results with results from Jordan to identify differences between the two countries in levels and patterns of frustration and anxiety. Lazar and colleagues' (2006) study was published as our initial exploratory study completed. Repeating it provided a good opportunity to explore reactions to computer usage in Jordan, since Lazar and colleagues' reports appeared to be very different to the situations reported in our first study. We could explore if frustration levels differed between the US and Jordan and, if so (as expected), we could then explore reasons for them through

triangulation interviews. The aim of our second study was thus not to show that we would get different frequencies to Lazar and colleagues, but to use any differences here as a basis for exploring whether Jordanian users believed any of the revealed differences, how they evaluated these differences, and most importantly, how they explained them. Thoughts and feelings here would be shaped by culture, but there may also be economic or political explanations for differences in user experience between samples from two countries.

The third study studied computer usage experiences in Jordan through semi-structured interviews in the work place, which included open questions. The interviews had three parts: the first part was about the current software programs that they used and the main purpose of using a computer at work, home, and in public places such as internet cafés. The second part explored what participants thought their future computer should be and what they need from it: what type of changes do users need? The third part asked for suggestions as to what motivates them to use computers. For example, what could make computers easier for use? As part of this, participants were also asked to give their explanations for causes of computer problems in Jordan identified in previous studies.

All three studies provided Jordanian instances of cultural variables in the initial Diamond Model; however, they also revealed new cultural and other territorial variables that had not been considered in the literature in 2005. Many of these new variables were related to how users evaluated their usage experience, rather than the main focus within culturability research on the acceptability of user interface design elements. Also, for some cultural variables that are stressed in the literature, no Jordanian instances were found in any of our three studies.

2   The Diamond Model

Four meta-models of culture guided early research on software localisation (Del Galdo and Nielsen 1996). In theory, meta-models make it easier to compare cultures, but each of the four is an inadequate foundation for design work. Hofstede's (1980) *Pyramid Model* locates culture between individuals and nature, and is little more than a diagrammatic definition. The *Objective and Subjective Model* (Triandis 1972) provides a useful distinction between observable objective and often persistent manifestations of culture (Kluckhohn's *transmitting* symbols) and an implicit subjective core (Kluckhohn's *transmitted* values). The *Onion Model* (Trompenaars 1993) uses a physical analogy to relate an objective outer layer of cultural artefacts to inner layers of subjective norms, values and longstanding environmental adaptations. The *Iceberg Model* (Victor 1992) uses an alternative physical analogy to contrast an objective visible surface with subsurface subjective unspoken and unconscious rules. Both physical analogies are inappropriate as the subjective components are too opaque or occluded. Neither captures the dynamic relationships between objective and subject aspects of culture. A more appropriate physical metaphor appears to be a *diamond*.

Like onions and icebergs, diamonds have a visible upper surface (over their *crown*) and an occluded lower part (the *pavilion*). However, unlike an opaque onion, light emits from the crown, having entered via it, and then been reflected within the facets of the pavilion. This better captures the dynamics of the relationships between objective and subjective aspects of culture. Light takes paths that pass through all parts of the diamond.

The diamond metaphor was extended to include vertical *segments* that could group related objective and subjective cultural variables. Figure 1 shows the relation between variables and their objective and subjective sub-segments. The literature survey identified five large segments of culture. Each sub-segment contains groups, and each group contains specific variables, for which actual instances will vary across cultures. Each group could impact both design preferences and how usage is evaluated. Some example groups are labelled in Figure 1. For example; semiotics and language in Jordan reflect the Arabic language and its Jordanian dialect. Arrows show light paths through the diamond, e.g. from thought and feelings to social interaction, or via semiotics to language.

In Figure 1, the top (crown) of the diamond contains objective variables which are observable and the bottom (pavilion) contains subjective variables which become deeper and decreasingly obvious. Segments are ordered from the left from the most obvious to the more subtle. It may help here to think of light coming from the left, and thus more strongly illuminating the leftmost segments, which are more obvious due to the nature and extent of their objective sub-segment, e.g., material culture is explicit and obvious to any visitor, as is language. Politics, economics and social behaviours are progressively less obvious. A visitor may not even notice a social behaviour, still less be able to understand its underlying thoughts and feelings. The five segments of territorial factors in the Diamond Model are now briefly described and discussed.
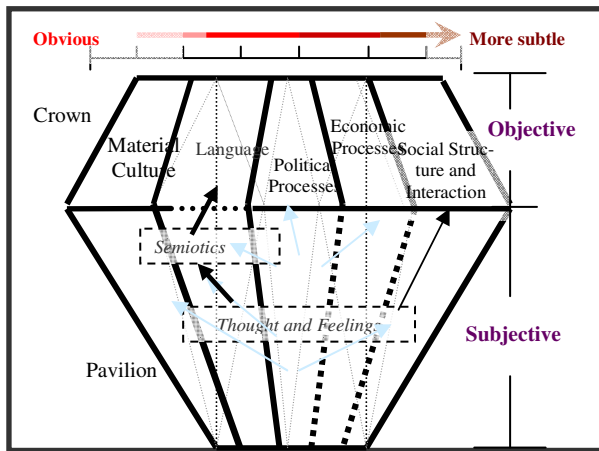

Fig. 1. The diamond model with five segments

2.1   Material Culture

Material culture covers the most obvious objective variables. In the crown of the diamond, they are instantly recognizable and easy to encounter. Material culture also includes media such as newspapers and television, as well as digital artefacts. Its subjective sub-segment is largely concerned with symbolism for example; the culturally preferred meanings and qualities of artefacts. Much of this overlaps with the semiotics of spoken and written language; hence the semiotics group of subjective cultural variables span two sub-segments. Material culture includes arts, building, houses and monuments, crafts and decorative arts, food, and literature.

2.2 Language and Semiotics

Language gives rise to objective variables such as vocabulary, grammar, dialect and accent, accessible and clear in the crown of the diamond, but semiotics are subjective variables in the pavilion and as such are deeper and harder to reach, and not immediately obvious to outsiders.

2.3 Political Processes

Some political variables are objective and thus easy to describe, such as political institutions and public authorities. The subjective sub-segment covers political attitudes, for example, to democracy, authority and use of violence. As a concrete example of variables within this segment, HCI research had already recognised the relevance of political contexts (Smith and Yetim 2004) and the political status of the English Language (Del Galdo & Nielsen 1996).

2.4 Economic Processes

Economic variables include wealth and material resources, which are objective and thus in the crown sub-segment. Subjective variables in the pavilion include conceptions of worth, value and affordability. These reflect consumer choices, and extend to free goods and services such as e-cards for birthdays etc. As such, economic processes overlap with social and political processes via the broadest subjective variable group of thoughts and feelings.

2.5 Social Structure and Interaction

Social interactions give rise to objective cultural variables that include observable behaviours in religion, social communication and family customs. All these variables will be in the crown, and thus easily recognizable. Thought and feelings are common to all subjective sub-segments, but they are most frequently associated with social structure and interaction in the literature on culture. We thus associated the social sub-segment of 'thought and feelings' with social structure and interaction but recognise that all subjective sub-segments overlap extensively.

2.6 Summary

Following the literature survey and finalisation of the structure of the Diamond Model, the segments were judged to be relevant to Interaction Design for developing countries in the following order, taking into account the relative attention to each within the literature on HCI and culture.

1. Language and semiotics.
2. Material culture.
3. Social structure and interaction.
4. Political processes.
5. Economic processes.

As we populated the model with Jordanian examples during our studies, we were interested whether this ordering would change on the basis of empirical evidence of frequency and impact of territorial variables from each of these five segments.

3   Extending and Populating a Jordanian Instance of the Diamond Model

All three studies added new territorial variables. For example, only two disjoint political variables had been noted in the existing HCI literature on culture and localisation, but the first study with IT experts identified the importance of government educational policy on IT literacy, and the provision of local community IT training centres. Five further social variables (age hierarchies, attitudes to work, religious beliefs, and IT literacy in specific job roles) were identified, as well as two economic variables (support for local currencies, availability of international products and services). Note that, for example, IT literacy in specific job roles is a cultural variable, and thus is relevant in different ways in different territories. There will be occupational differences in IT competence in all countries, but the distribution of expertise will not be the same in all of them.

The first study used semi-structured interviews with 19 IT support, and web developers and designers in Jordan from three sectors: education, telecommunication, and banking. Analysis of interviews was in three phases. The first quickly formed a descriptive overview of computer problems that face users in the university, telecommunications and banking. The second formed a list of common problems across all three sectors. The third phase constructed an affinity diagram of all the reported problems. The three phases of analysis were chosen to explore how the impact of cultural variables could be exposed and analysed.

The second study repeated an existing HCI study (Lazar et al. 2006), not to replicate it, but to use it as a *probe*. The number of participants in Jordan was 109 students, and 52 employees. In the US study were 107 students, and 50 employees. Lazar and colleagues' research used pre- and post-session affective questionnaires and an incident reporting form to study anxiety, frustration and related affective responses during computer usage. Differences in self reported anxiety and frustration (Qirem, Cockton and Loutfi 2007) between the US and Jordanian samples provided a focus for triangulation interviews, where these differences were discussed.

The third study was less focused than the first two, with the result that its open interviews and user participants (as opposed to experts) identified a wide range of new territorial variables for the Diamond Model. There were 24 participants (16 IT support and software developers, 8 non-IT people) from Al-Zaytoonah university of Jordan, all computer users. The data was analysed in detail by constructing an affinity diagram to support identification of instances of cultural variables and the new variables that can be added to the Diamond Model. Within the material culture segment, a specific variable on colour preferences was added (NB this is not the same as cultural differences in the *meanings* of colours). Within the language segment, a variable was added for the impact of overly direct translations, which although intelligible can be annoying. Within the political segment, three variables were added: corporate policies (e.g. on language use), government policies on language education, and trade sanctions. The last was identified through comments on Syria, where trade sanctions have resulted in a strong Arabic language software industry, in contrast to Jordan, which has close relations with the UK and no imposed trade embargo. Within the economic segment, a group of three variables were added for affordability of IT access, i.e., affordability of computers, internet access and training. Within the social segment, a

specific variable was added on gender roles and groups of variables on software and identity, and attitudes to Western IT products and services.

As a result of extensions to the Diamond Model, as well as the relative impacts of specific variables, the relevance of segments to Interaction Design for developing countries was given a revised order on the basis of their frequency and strength of influence (numbers in brackets are the initial rankings, as above):

1. Social Structure and Interaction (3)
2. Language and Semiotics (1)
3. Economic Processes (5)
4. Political Processes (4)
5. Material Culture (2)

Two segments were thus raised by two positions in the ranking, and two dropped by one or three places. Much of this was due to the importance of social factors in shaping how users evaluated their experiences, with the economic factors in a developing country having a strong impact on access to IT and associated IT literacy. Material culture and the cultural preferences associated with features such as colour, icons and layout was a minor factor, in contrast to much of the HCI work on culturability.

Figures 2, 3 and 4 show the Diamond Model as extended after the three Jordanian studies. The Diamond Model is presented as a hierarchy of segments that contain objective or subjective groups of variables, and these groups in turn contain territorial variables. A three level numbering system relates variables to their segments and groups. In Figures 2, 3, and 4 a rectangle indicates a cultural or territorial variable that had been identified before in the literature, and an oval indicates a new variable that we did not encounter in our surveyed generic or HCI literature on culture. There are three colours of the ovals; each colour according to the three studies by the authors: white for variables added in first study, dark grey for variables added in the second study, and light grey ovals for variables added in the third study. No Jordanian instances were found for groups or variables in italics. Most of these had their origins in the general literature on culture (e.g., Hofstede 1980). The relevance of these cultural variables to HCI is open to question, as many originate in research that predates the emergence of interaction design. Del Galdo and Nielsen (1996) drew attention to many of these cultural variables, but the relevance of their comprehensive general survey 15 years on appears to be diminishing.
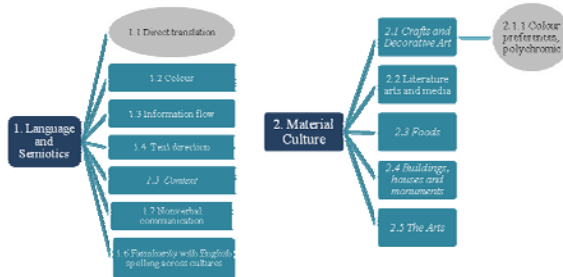

Fig. 2. Language and semiotics and material culture variables in the Diamond Model
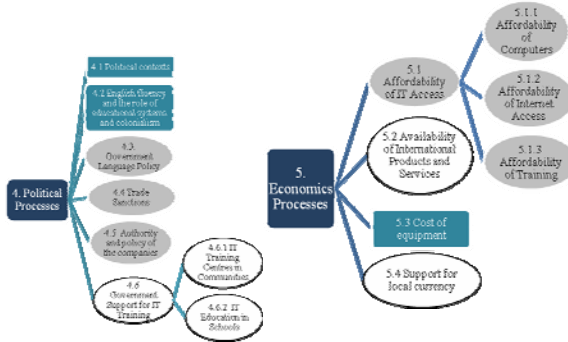
Fig. 3. Political and economic process variables in the Diamond Model

4 Culture, Territory and Technology

In the Middle East, Information and Communication Technologies are spreading very quickly and developing more rapidly than previously. Some usage problems that arise are specific to Jordan, but many probably apply to much of the Middle East and other developing countries too.
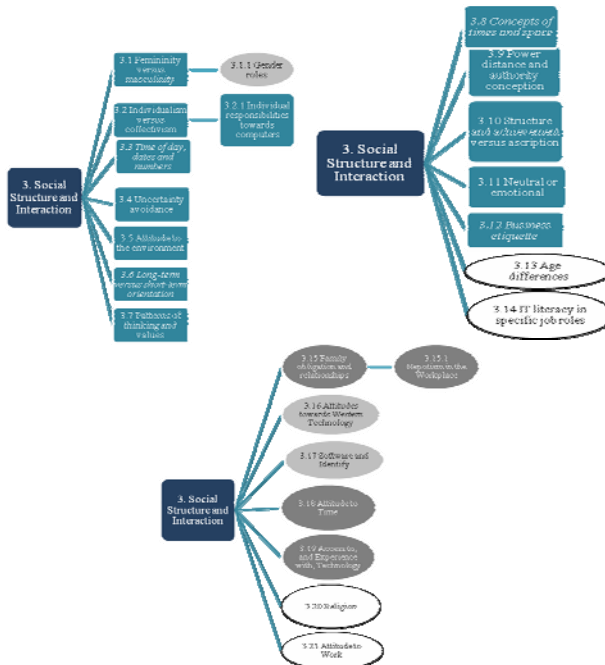

Fig. 4. Social and structure interaction variables in the Diamond Model

Designers of systems for these territories need to understand the broad range of cultural and other territorial factors that shape acceptability. For example, political issues in Saudi Arabia (KSA) and United Arab of Emirates (UAE) have caused problems for Research In Motion's Blackberry mobile products and services, which required some changes in operations. This adds to the evidence that a narrow focus in HCI on cultural factors is inadequate. However, some HCI4D work may be focused too much on economic factors, and not enough on cultural or political variables.

Designers and developers aim to introduce new technologies that can be easy to use and meet users' needs and preferences. As the Diamond Model has expanded and been populated, it has become clear that cultural preferences for user interface features have less impact less frequently than cultural variables that influence users' evaluations of their usage experiences. We should not transfer Western expectations on the relationship between usability and users' affective responses to other cultures. Culture differences result in different responses to usage difficulties, which in turn are due to complex interaction of cultural variables relating to attitudes to IT, attitudes to work, reward systems, attitudes to time, social relationships within the workplace, and further sociocultural factors. Where cultural values are similar between the West and Jordan, as with the impact of students missing deadlines for handing in assessed work, then usage difficulties can have similar adverse impacts. However, our second study revealed that our larger sample of Jordanian students were much more likely to be angry with themselves, rather than angry with an inanimate computer, when compared to Lazar and colleagues' (2006) US sample.

Designers need to understand users deeply by understanding their culture and their motivations and behaviors when using technology. A Diamond Model populated with territorially specific instances provides a basic form of comprehensive information for designers, but we have experimented with *dramatic sketches* as resource for more effective communication of cultural differences to interaction designers. The hope is that a small set of dramatic sketches can cover most instances of cultural variables for a territory, with the remainder covered by briefer micro sketches. We feel that this could be a more effective way of communicating relevant territorial factors to designers than the academic presentation of the Diamond Model in the figures.

5   Conclusions

The main aim of our Diamond Model is to support designers and software developers in the future to understand the difference between users from different cultures and how cultural and other territorial variables can affect not only design preferences, but their usage behaviours and their evaluation of their own user experiences. The Diamond Model is based on a more appropriate physical metaphor than existing meta-models of culture, and extends beyond culture to a relevant range of territorial variables. The model can be readily extended and populated with examples from literature surveys and field studies in relevant countries. The Diamond Model is also a basis for innovative design resources such as dramatic sketches that can combine concrete examples into contextualised narratives to efficiently communicate the impact of cultural differences on the user experience.

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