A Culturally Driven Approach for the Development of Innovative User Interface Design Concepts

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Abstract. This article attempts to argue that social, political and economic perspectives supported by a cultural understanding of societies and regions are the cornerstones for a more comprehensive external analysis. Extreme trends and developments in nations´ political, economical and social situation are a source for innovation in the development of user interface designs. As social, political and economical developments in a society are difficult to change overnight; various case studies have illustrated the potential role of interface design in improving the negative aspects of these developments, usually represented by extreme cultural trends. A bottom-up analysis of the case studies resulted in the six (6) preliminary categories, which function as a guide for a broader approach in terms of future external analysis and goal finding. However at this moment, it cannot be guaranteed that design concepts generated from a cultural difference perspective are more innovative than others.

Keywords: Cultural Dimensions, External Analysis, Radical Innovation, User Interface Design.

1 Introduction

From a product sustainability perspective, incremental improvements will not suffice anymore. Radical or systemic innovation is needed, whereby a change in the approach in the searching for new solutions is essential [1].

In a world where interface design is both more in demand and profitable than ever before Culture-based user interface design is a new field in interface design, crucial for designers of all disciplines [2]. Reiterating the importance of "Technology Push" and "Need Pull" in search of innovation, many case studies discuss the effects of cultural differences on artefacts or even design of some culture-specified products, however, it is not easy to find models or processes about connecting culture to designing for radical innovation. The closest research activities in this area pertains the works of Marcus [3], where user interface components have been mapped against Hofstede's cultural dimensions. This mapping then has been translated to a number of patterns for each cultural dimension. This is followed up by the development of culture-oriented human machine systems [4], whereby a detailed model has been applied to analyse intercultural variables and cultural factors (dimensions) in a systematic process. Findings of this process, which can be different components of the design, are then integrated with design requirements (Figure 1).

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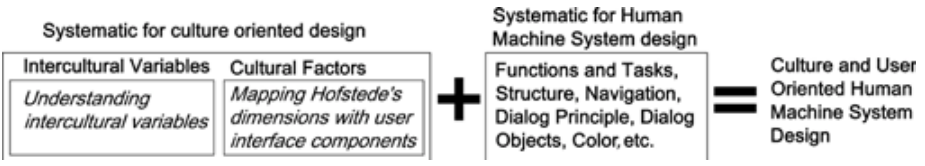

Fig. 1. Integrative Approach of the Culture-Oriented Design [4]

When widening the scope to designing products in general, it is concluded that one of the key attributes that distinguishes breakthrough products from their closest followers is the significant value they provide for users [5]. After all, as Drucker has pointed out, "customers pay only for what is of use to them and gives them value"[6].

Sanders and Simons [5] identified 3 types of values related to co-creation, which are inextricably linked. These values are monetary, use /experience and societal. Bringing in the cultural component, relationships between culture and design have been viewed from different perspectives in literature. From a value creation perspective, three main aspects have been suggested, which make culture an important parameter in product design; “Usability and Ergonomics”, “Business Advantages”, “ Social Sustainability and moral values” [8]. However, referring to Cagan and Vogel’s positioning map [5], culture has not been addressed as a value creation dimension.

2 Methods and Paradigms for Innovation

Within the context of value creation and integrated product development, the level of innovative success in formulating an effective product strategy and a design goal is highly dependent on how thorough ”Product Planning and Goal Finding” processes were carried out in the Front-end of Innovation (FEI) [9]. Effective management of unknown and uncontrollable factors in the front end may result in a sustainable competitive advantage. In this sense, the focus on the front end is mainly one of opportunity identification and analysis [10]. Hereby, both internal and external sources are important for idea development and goal finding, but, the designer’s approach towards the execution of the external analysis determines the level of innovation targeted [11].

In practice, external analysis focuses mainly on market, competitor’s and stakeholder’s analysis, leading to incremental innovation, where new products were created for existing markets or new markets for existing products confining itself to current product or service portfolios of the respective company [12]. To achieve diversification / radical innovation, a broader approach towards innovation processes is needed to obtain a maximum number of innovative product and process ideas. However, there has been little research done on the issue so far [13].

This article attempts to argue that social, political and economic perspectives supported by a cultural understanding of societies and regions are the cornerstones for a more comprehensive external analysis, increasing the chances for diversification.

3 Culture and Its Cultural Dimensions

Culture has been defined in a number of different ways because of its multi-dimensional characteristics. For example, culture is cross disciplinary defined as "transmitted and created content and patterns of value, ideas, and other symbolic-meaningful systems as factors in the shaping of human behaviour and the artefacts produced through behaviour." [14]. Hofstede defines culture as the collective programming of the mind that distinguishes the members of one group or category of people from another, based upon a constellation of psychological traits, attributes, and characteristics [15].

Identifying cultural characteristics is difficult because it lacks a robust measure that can identify the implicit levels of culture [16]. In an effort to address this issue, many researchers have dissected culture as a set of 'dimensions' that provide a framework for cross-cultural comparisons of user behaviour. A Model is developed based on a survey of IBM employees in 40 different countries, describing national cultures that entailed four dimensions: uncertainty avoidance, individualism vs. collectivism, masculinity vs. femininity, and power distance [17]. Hofstede and Bond [18] subsequently added a fifth dimension to their model, long-, vs. short-term orientation.

4 A Cultural Perspective on Innovation and Interface Design

Considering cultural driven innovation, strategists and designers should acknowledge that numerous societies believed that their habits, ideas and customs determined the shape of their political and economic arrangements, and were the source of their uniqueness. When Hofstede´s five dimensions [15] were associated with manifestations of cultural difference, thus linking cultural parameters to cultural behaviour, it was observed that the potential for radical innovation is neither biggest in leading nor developing countries. The feeding ground for radical innovation is the understanding of the status quo of a nation's cultural, political, economic and social atmosphere, followed by the acknowledgement that drastic improvements in quality of life, service quality or minimizing inequalities within societies, are almost impossible to be achieved through political governance.

In terms of thinking, acting and communicating, people adopt patterns from living in a specific social environment, normally typified by national culture [19]. As such, culture partially predetermines a person's communication needs, preferences and behaviours. Hereby, the overall patterns and values of a culture are reflected by the communication style of how a person sends and interprets messages.

Mainstream user interface design research focuses on the means by which the user and ICT products interact. It has been discussed whether or not that the interface should facilitate users to use their particular communication styles [19]. However, it has become clear that user reactions become more predictable and understandable when the user's cultural perspective is taken into account [21, 22]. For example, websites need to be designed to accommodate the cultural preferences and biases to increase the culture-based interface in the product [20].

However, a user-centred and culture driven innovation approach with the aim to achieve diversification is difficult to find. This calls for a design-driven innovation approach, whereby service-oriented, strategic design concepts are proposed to solve cultural extremes at the bi-polar scale of Hofstede´s dimensions [19]. Design-driven innovation embraces a *reconstructionist* or *social-constructionist* view of the market [23, 24], where the market is not "given" a priori, but is the result of an interaction between consumers and firms. Hereby, users, designers and other stakeholders need to find new connections to their socio-cultural context by exploring new values and patterns of interaction with the product.

5 Research Focus and Method

Prior to the research questions below, an assumption is made that extreme trends and developments based on Hofstede´s five cultural dimensions, represented by certain nations are unfavourable. A hypothesis is formulated based on the assumption that unfavourable conditions are a potential source for design innovation, as it is difficult and slow to change a nation's cultural, political, social and economical disposition. Related research questions are:

- Can areas for "quality of life" improvement for certain groups in respective societies be identified and elevated through design by mapping case studies from a social, political and economic perspective on a bi-polar scale, supported by Hofstede's "Cultural Dimensions?
- Is there a potential to develop a methodology for strategic goal finding based on social, cultural and political differences on a bi-polar scale?
- Will the development of innovative design concepts then be more radical by understanding the extremities on the bi-polar scale?

A "Multiple Case Studies" research approach was used to gather findings [25]. Sources of evidence were mainly based on literature studies and observations followed by interviews. The analysis of case study evidence was carried out through a procedure of "Explanation Building". Each case study was summarised and tabulated, according to the following topics: "Context", "Cultural Explanation", "Dominant Cultural Dimension", "Design Problem" and "Design Concept". Thereafter, a comparative analysis was done among the case studies.

6 Summary and Analysis of Case Study Results

Seven (7) case studies were summarised and analysed. On the basis of "Context", all case studies illustrate a clear contradiction based on cultural differences. The "Cultural Explanation" shares more in-depth knowledge on how these cultural differences affects society and human interaction from an economic and political perspective. All Hofstede's cultural dimensions were covered by the case studies; however "Power Distance", "Masculine versus Feminine" and "Collective versus Individual pre-dominantly appear and can be recognised as the main building blocks in determining whether a society is capitalistic or social-democratic. The building

blocks were also regrouped as “Large Power Distance – Masculine – Individual” and “Small Power Distance – feminine – Collective” and positioned on the extremes of a bi-polar scale. All “Problems” describe a need for improvement in the area of Interaction / Interface Design from one nation´s contextual perspective in comparison to the opposing nation´s political, social or economical state on bi-polar axes.

The following examples illustrate how comparative cultural case studies have led to potential innovative design concepts.

Health Care, Denmark versus USA
Context: Accessibility of health record systems is greater in social democratic societies, such as Denmark compared to USA. In USA, healthcare is not subsidised and an emphasis is placed on the patient’s privacy.

Cultural Explanation: In the Danish society, the cultural ideology is that all should have equal rights to healthcare, especially the weaker in society. However, protection of personal medical records is lesser emphasised in Denmark than the USA, as the former is capitalising on the prevalence of “human trust”.

Dominant Cultural Dimension: Masculine versus Feminine, Power Distance.

Design Problem: How can the American health service be made more efficient and user-friendly in terms of administration from both governing and professional bodies as well as the patient him / herself? How can personal medical records be managed and controlled as to prevent frequent misuse?

Design Concept: A secure and personal website where people can administrate medical records, compare payment models, insurances, make appointments, as well as extract objective medical information. This website is linked to security number and only made accessible to authorised parties.

Education - India versus Norway
Context: The current literacy rate in India is above 60% and growing steadily. In the year 2005, the total public expenditure on education as a percentage of Gross Domestic Product (GDP) for Norway and India were 7.2 and 3.2 respectively. The difference in percentage of tertiary education is small compared to the literacy rate between the two countries. India is the 3rd largest TV market in the world and the cost of single television set is a fraction of yearly salary of semi-trained teacher.

Cultural Explanation: India is facing a tough challenge to increase the literacy rates and improve the quality and accessibility of their education system. The education system is hierarchical and competitive at all levels. An emphasis is placed on performance and the better students are favoured and mentored to take future key positions in industry and society. In Norway, basic education is accessible for all. Performance is only emphasised in the final 3 years of secondary education and University.

Dominant cultural Dimensions: Power Distance, Collective versus Individual, Feminine versus Masculine.

Design Problem: The Indian education system struggles with issues such as high cost of providing education, lack of infra-structure, training, governance and supervision teaching staff.

Design Concept: An interactive audio-visual interaction aid to be made accessible to all students in India. The medium of transmission and communication is based on the existing television network.

Mobility of women, Jeddah (Saudi Arabia) versus London (United Kingdom)
Context: Women in Jeddah are not allowed to drive any vehicle nor ride a bicycle by themselves. To get around a woman either has to sit in her husband's or relative's car or walk. She is allowed to take public transport, but the public transport does not offer the same levels of efficiency, comfort, security or status as a private car.
In London, most people choose to go by public transport. The public transport system is among the best in the world, consisting of an extensive network of tubes, buses, trams and trains.

Cultural Explanation: In Saudi Arabia, there are strong conceptions within society concerning gender roles. In addition, Islam is often used as an excuse for the strict limitations to women's rights in Arab countries.

Dominant Cultural Dimensions: Masculine versus Feminine, Power Distance, Uncertainty Avoidance.

Design Problem: How can women in Saudi Arabia be given the possibility to get around in Jeddah on their, own in a comfortable, safe and fashionable way, without violating the strict laws and moral judgements limiting their freedom?

Design Concept: A comfortable, safe and moral proof public transport network of exclusive women's mini buses. The buses are equipped with spyglass windows to prevent men on the outside form seeing the travellers. An automatic payment system is put in place to avoid "indiscrete" interaction.

Making Contact, France versus Norway
Context: In Norway it is normal to pretend you don't see people you don't know when you pass them on the street. Sales representatives pretend they aren't there so that customers will not feel disturbed or embarrassed. Conversation in shops is usually limited to the strictly practical and polite phrases are not widely used. In France smiling, hugging and talking to people you don't know is perfectly normal.

Cultural Explanation: Norwegian culture is more diffuse than French culture, meaning that Norwegians will act reserved towards strangers, and let relatively few people into their "public space" of interaction. However once inside the sphere there is a lesser distinction between close and distant friends. French culture is more specific, meaning that people are more open to strangers but that fewer people will be let into the inner sphere.

Dominant Cultural Dimensions: Masculine versus Feminine, Power Distance, Collective versus Individual.

Design problem: How can Norwegians be helped to make contact with each other without making them feel embarrassed? How to give them an excuse to cross the line of shyness and make contact with strangers?

Design Concept: Based on the mobile phone network, everyone who would like to get to know new people adds a new application on their mobile phone. Each user

registers personal information and preferences, e.g. what kind of contact they like to make, on their device. Whenever you come close to another person with matching preferences, both devices will make a little sound or a vibration. Knowing that the device has matched each other interests, you have an excuse to start a conversation.

Waste Collection: Norway versus Singapore
Context: When it comes to efficiency on a macro level, Norway has a slightly better waste collection system than Singapore, but is experienced less convenient by the end-customer. For example, in Singapore the waste is collected everyday and complete sorting is done by workers at a waste plant. In Norway the users have to pay high taxes for the service, which is run by the local authorities

Cultural Explanation: In Singapore immigrant workers do not have citizen rights and minimal wages do not exist. For this reason labour-intensive low-skill's operations like manual waste sorting can be done at a low cost. In Norway garbage collectors are organized in a union, and protected by "anti social dumping " laws. They can leverage a relative high salary, without the pressures to continuously improve their service quality.

Dominant Cultural Dimensions: Power Distance, Long- and Short Term Orientation.

Design problem: How can clients of the Norwegian waste collection system experience a similarly effortless and pleasant situation as those in Singapore? How can collection be made more efficient, while paying waste collectors a decent salary?

Design Concept: A flexible waste collection system, which is based on need. During certain periods and for certain private households, waste containers are not always full. A transmitting indication system integrated in the waste container, which can signal the remaining volume to the garbage collection truck. Upon detection of the signal, a decision can be made to collect or skip the collection. In this way, waste collection trends can be analysed and predicted to optimise its efficiency and savings.

Food retail Shopping Experience, India versus Norway
Context: A large percentage of retail food is imported and sold through grocery retail chains. These retail chains control practically all of the retail stores in Norway. The food retail sector in India is based on traditional grocery shops known as 'Kirana', bazaars, home supplier vendors. They have a good knowledge of the products they sell.

Cultural Explanation: The extended family is a single unit. One of the primary roles of the housewife is feeding the family. Women do most of the shopping and make most food purchasing decisions. Buyer-Seller relationship may remain unchanged from generation to generation and are based more on mutual trust. In Norway, family structures are flexible and nuclear. Social mobility is comparatively higher. According to law, food retailers are responsible to provide formally documented quality products to their customers.

Dominant Cultural Dimensions: Long- and Short Term Orientation, Masculine versus Feminine, Collective versus Individual.

Design Problem: A customer in Norway has most of his food requirements met at a single place. However, expert advice suited to his needs is often lacking, as it is practically impossible to employ a person who is knowledgeable of all products.

Design Concept: A system to capture all necessary details in a user-friendly manner to help the buyer to make purchase decisions. The Camera Culture group at MIT has developed Bokodes that can carry much information, such as Name of Product, Date of Manufacture, Date of Expiry, Contents, Nutrient Value, and Cost etc., and be read by a standard camera.

Elderly Care, Norway versus India

Context: In Norway, senior citizens, who are not able to take care of themselves move to an institution for elderly. In India, elderly will stay traditionally with their oldest son and grand children. While in good condition, they help out with looking after their grandchildren. In case they no longer can take care of themselves, their family will take care of them. Family members, especially their daughter-in law, are responsible for providing physical, medical, financial and emotional support.

Cultural Explanation: In Norway, the society as a whole is responsible for taking care of individuals. Despite this collectivistic thinking, individualism is strong in Norway. Freedom and independence is an ideal for people in need of care as well as their families. In India individualism is less emphasised, making it more likely that extended families will live under one roof. This natural progression in family relationships may limit member's personal freedom and cause conflict.

Dominant Cultural Dimensions: Collective versus Individual.

Design problem: How can elderly people in Norway, who are living on their own or in an elderly home still feel that they are part of their families? How can they maintain contact and not be seen as a burden to their family members and relatives? How can they still participate in the upbringing of their grandchildren?

Design Concept: An interactive easy-to-use photo frame with which you could share pictures with others from a distance. With such an electronic photo frame elderly can keep in touch with their families on a daily basis without feeling like a burden.

The "Design Concepts" were a natural progression of the design problem. However not all solutions could be classified as radical. A bottom-up analysis of the case studies has resulted in the six (6) preliminary categories, which can function as a guide for a broader approach in terms of future external analysis and goal finding. Table 1 classifies the 7 case studies according to the 6 categories.

Referenced to Maslow´s hierarchy of needs [26], the six categories can be classified under the first three level of needs of the pyramid; Physiological, Safety, Love / Belonging. This indicates that a cultural approach towards external analysis and product idea generation in the FEI can be instrumental in the generation of innovative system and or product ideas to improve quality of life and service not only in developing but also developed nations.

Table 1. Classification of case studies according to categories

Categories	Case Studies
Healthcare and elderly care	• Health Care, Denmark versus USA • Elderly Care, Norway versus India
Working and living	• Waste Collection: Norway versus Singapore
Education and manpower development	• Education - India versus Norway
Purchase of food, products and services	• Food retail Shopping Experience, India versus Norway;
Mobility /Transportation of goods and people	• Mobility of women, Jeddah versus London;
Interaction and Communication	• Making Contact, France versus Norway;

7 Discussion and Future Studies

The diversity of case studies, each leading to a proposed design concept, has demonstrated that a cultural and contextual approach towards strategic design should be further explored in the development user interface system and products in the FEI.

As social, political and economical developments in a society are difficult to change overnight, various case studies have illustrated the potential role of design in improving the negative aspects of these developments, usually represented by extreme cultural trends, through innovative design concepts. Potential areas for innovation can be identified by mapping case studies, illustrating extreme trends and developments in certain societies, on a bi-polar scale, supported by Hofstede's "Cultural Dimensions.

Given the potential for a methodology for strategic goal finding based on social, cultural and political differences on a bi-polar scale, future case studies are expected to refine and update the present categories from time to time. However, future case study development needs to be more diverse in context to be able to ascertain that a categorical top-down approach can be applied as a source for external analysis in the generation of innovative system / product ideas, while considering prevalent economic, social and political status quo of their cultures.

At this moment, it is difficult to assess whether design concepts are more innovative by addressing the potential gap of extremities on the cultural bi-polar scale as source for innovation.

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