

Culture Sensitive Design for Information Systems

Reliable data collection by people with diverse backgrounds

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ABSTRACT

Over the past decades, globalization and international business made cross-cultural communication a daily habit. People are widely aware of the challenges for collaboration and leadership. Culture sensitive management is an established field of study and tools and applications are localized by default.

Data-driven decision making requires high quality information on factors influencing a decision. Cultural diversity influences the quality of data collection, and therefore complicates decision making. Data collected by people with diverse cultural backgrounds cannot always easily be aggregated. Cultural diversity in this context includes national background, professional background, age and digital literacy.

This paper proposes a methodology for designing culture sensitive data collection systems to enable high quality data collection by people with diverse cultural backgrounds. The resulting design guidelines have been applied and validated at a major anti-trafficking NGO with highly localized offices around the globe. The improved quality of globally aggregated data can make data-driven decisions more reliable and is expected to improve the quality of globalized work. The resulting Culture Sensitive Design methodology can be further improved by more objective validation and by application in different organizations.

Keywords: culture sensitive, cross-cultural, communication, data collection, information systems design

1. INTRODUCTION

Current day information technologies further increase the pace and scale of globalization, an already ongoing trend for at least several decades. Increased flows of capital, goods, labor and information leads to an increased number of cross-cultural encounters (T. L. Friedman, 2016, Chapter 5). Since culture shapes the context for worldview, behavior and language, *cultural diversity* adds a layer of complexity to all these interactions. The concept of organizational culture can be interpreted in many ways (Alvesson, 2002). The working definition in this paper will be: ‘the mix of external contextual influences on a person’. This mix of (national) background, ethnic influences and the influence of globalization on collaboration creates a breeding ground for an entire field of study. Cross-cultural communication, leadership and management has been the subject of numerous studies over the past years (Bird & Mendenhall, 2016; Epstein et al., 2015; Kase et al., 2011; Meyer, 2014).

Another thriving trend is the increasing influence of data driven decision making. Decreasing prices of sensors, computing power and data storage creates an exponentially increasing stack of data: uninterpreted numbers and figures. This ‘trail of everything’, when analyzed and interpreted, potentially provides valuable insights for corporations, governments and individuals (Brynjolfsson et al., 2011; Provost & Fawcett, 2013; Storey & Song, 2017).

Multinational organizations could gain potential value of obtained data to inform decisions. But, especially when these organizations are highly localized, data collected by people with diverse cultural backgrounds can be impacted by this cultural influence. Therefore, when data is biased towards a local background, it cannot inadvertently be aggregated with data biased by other backgrounds. This creates the need for culture sensitive data collection.

The goal of this study is to provide guidelines for designing information systems for culture sensitive data collection. This increases the validity of globally aggregated data for better informed decisions by multinational organizations and people impacted by those.

The research questions for this study is: *How can a structural approach to cultural background be translated into guidelines for designing information systems that facilitate culture sensitive data collection?*

This translation will be performed in three steps. Firstly, the existing methodology of Value Sensitive Design (VSD) will be specified into the proposed Culture Sensitive Design (CSD) methodology to accommodate for cultural values. Secondly, the culture model by Hofstede et al. (2010) will be translated into design guidelines according to this CSD methodology. The third part provides an example of this process in the case of a major anti-human trafficking NGO, which employs several highly localized offices across the globe.

The background of this research will be discussed next by a literature review and a research question formulation. The methodology will be discussed in chapter 3, followed by the proposed Culture Sensitive Design approach in chapter 4. An example application in a case is presented in chapter 5, followed by a conclusion and recommendations in chapter 6.

2. BACKGROUND

Recent relevant literature is discussed in this chapter to provide a background and definitions of the concepts used. The discussed topics are respectively ‘structured culture’, ‘information systems & data collection’ and ‘culture sensitivity’.

2.1 Structured culture

Hofstede et al. (2010, pp. 7–10) define culture as “everything that is learned by someone as part of a group or collectivity”. This definition distinguishes culture from human properties (like having to eat) and personal learning (acquiring a skill). Within this demarcation, still multiple sets of dimensions can be used to measure what a person’s cultural background is. Examples include axes of value tradeoffs (Hofstede et al., 2010), axes of habits in communication (Hall & Hall, 1990), a combination of these in professional habits (Meyer, 2014), abstract values describing a country’s development (Inglehart &

Welzel, 2010) or much more specific the culture around information usage within a country (Curry & Moore, 2003).

The Hofstede dimensions constitute the by far most often used framework in information systems research (Ali et al., 2009), though the model of Hall & Hall is often used as additional model in communication related studies. Using Hofstede's model in a design study, however, implies three scope-related issues: space, time & abstraction.

Hofstede et al.'s model (2010) measures culture as a national phenomenon. Therefore, when a sufficient large target group in all compared countries is found, the questionnaire and analysis can be conducted to compare the scores of those countries. However, culture tends not to be constrained by national borders. E.g. ethnic influences, regional differences and socio-economic diversity determine a person's cultural context too. Another parameter left out is the temporal component of how a culture shapes a person. Thirdly, cultures are not just made up from a bunch of people, like forests are more than a bunch of trees (Hofstede & Minkov, 2013, p. 3). Cultural backgrounds can be used as a predictor of an individual's personality type, but these relationships should be explained with caution (Hofstede & McCrae, 2004).

Still, since Hofstede et al.'s dimensions can be used for exploring value tradeoffs and other considered models mostly have similar drawbacks. In this research, Hofstede will be used as the structural approach to culture. As a result of the drawbacks described above, individual outcomes in the case study phase should be considered exploratory and qualitative rather than solid data for country comparison.

2.2 Information systems & data collection

An organization typically contains processes: structured (probably standardized) flows of information exchanges and actions. These processes need to be supported by information systems. These systems range from the phonebook to remember numbers, to an advanced system for legal case administration and monitoring. In the context of this research, an information system is: an electronic system with an interface towards user, through which they enter and retrieve information to support their activities (derived from Iivari, 2007).

Data collection in this context is the users entering the information to support their own, or their organization's processes. Relevant for parts to distinguish are; the user interface, the information structure, the information accessibility.

2.3 Culture sensitivity

As has been discussed in the section on 'Structured culture', collective learning can influence an individual's worldview and habits. Therefore, culture influences both the way in which information is structured and how it is presented. In the process of data collection by people (e.g. processing a client's story into descriptive fields in an online form), people's usage of all mentioned elements (user interface, information structure, information accessibility) can be influenced by their culture.

To achieve a process of data collection that is independent of cultural influence, a culture sensitive information system should be designed. By 'culture sensitive' is understood that the interface, structure and accessibility of the system are either not influenced by culture or accommodate for this influence. The next chapter presents a methodology that aims at designing such system.

3. METHODOLOGY

As discussed in the first chapter, the goal of this study is to provide guidelines for designing information systems for culture sensitive data collection, supported by the following research question: *How can a structural approach to cultural background be translated into guidelines for designing information systems that facilitate culture sensitive data collection?*

This chapter discusses two methods that are used for deriving and applying the guidelines, which will be displayed in the next chapter. The methods discussed are Value Sensitive Design, which is a method for incorporating end-users' values while designing and Grounded Theory, a method for performing an in-depth case study.

3.1 Value Sensitive Design

Technology and how it is designed influences the world around it. This calls for an explicit approach to integrating ethical considerations in technology design. Value Sensitive Design (VSD) offers a methodology for this. The name self explains as creating technology which is sensitive to the values of its users (B. Friedman et al., 2009). The methodology embeds considering human values systematically into a design process.

A 'value', in this context, is something a person or multiple people consider important in life and is therefore less narrow than e.g. the economic value an object might have. Friedman et al. (2009) further distinguish values from facts, something *is* not always what it *should be*. Embedding these values in technology design can be done by what is called 'the tripartite methodology'. It consists of three investigations, which are applied iteratively.

The three investigations are 'Conceptual', drawing up a framework which shows involved stakeholders, potentially influenced values and potential tradeoffs; 'Empirical', observations on how people prioritize values in theory and in practice; and 'Technical', either descriptive or prescriptive insight on whether technological properties support values.

3.2 Grounded Theory

The grounded theory methodology aims at understanding the chaotic and messy daily practice by either constructing or distilling theory of visible patterns (Glaser & Strauss, 1967). Interviews can help researchers to create insights in a subject. Answers and stories told by respondents however are messy, they consist of feelings, emotions and experiences with the subject. Together these constitute a viewpoint, rather than giving direct objective insight. By coding the concepts behind these stories specifically, a structured theory can be generated (Corbin & Strauss, 2015). Corbin emphasizes the interaction between the data and the researcher's interpretation (Hallberg et al., 2010; Morse et al., 2009). This constructivist approach is used in this research.

Grounded Theory is used in (especially the case illustration part of) this research to obtain a detailed overview of the users of the current information systems. By constructing theories in in-depth interviews, the people, their situations and work processes are better understood.

4. CULTURE SENSITIVE DESIGN

This chapter displays the results of the conducted research. The culture sensitive design approach is discussed in the first paragraph, followed by a specification based on Hofstede et al. (2010) and a case study at an anti-human-trafficking NGO, International Justice Mission, where an in-depth qualitative case study has been conducted.¹

The Value Sensitive Design (VSD) methodology provides a systematic approach to designing technical systems while incorporating (competing) values and multiple stakeholders. These properties make VSD a suitable tool for translating cultural frameworks and environments into information systems.

Throughout all three phases of the VSD methodology, values play an important role. This research aims at working towards a *culture* sensitive information system, which is a more specific form of value sensitivity. First the general translation between values and culture will be discussed. Secondly, the specification of values into culture will be performed for the three types of investigations.

The role of values in CSD is slightly different from VSD in each part of investigations. Example questions are formulated for each part to constitute a specific approach for usage in the case study. These questions are based on the examples by Friedman et al. (2009).

Conceptual

To be able to draw a conceptual framework on cultural values impacted by the system that will be designed, at first the stakeholders need to be listed. Direct and indirect stakeholders can be distinguished, the first directly interact with the system, the latter do not but are affected by the system. This is followed by a theoretical exercise of listing all implicated cultural values. Potential value tradeoffs should be identified, followed by an approach to weigh these tradeoffs.

- 1) Who are the direct stakeholders of the information system?
- 2) Who are the indirect stakeholders of the information system?
- 3) What cultural values of these stakeholders are implicated?
- 4) Do competing cultural values exist in the design of the information system?
- 5) How should weighing these tradeoffs be approached?

Empirical

The empirical investigations explore how conflicting cultural values are weighed. For certain values, this weight can be directly culturally determined. E.g. people have a national cultural tendency towards the value 'individualism' or towards 'collectivism'. Another example in an organization is the importance of values related to information culture

¹ More elaborated results are discussed in the master's thesis 'Culture Sensitive Information Systems', which can be retrieved at the TU Delft repository.

(Curry & Moore, 2003). Questions to answer in these investigations are:

- 6) What is the influence of cultural values on information systems usage?
- 7) How do individual stakeholders prioritize competing values and usability?
- 8) How does the organization prioritize competing values of multiple people?

Technical

This part of investigations considers a technology-oriented viewpoint. The first step in this phase is to list technical properties that could be part of the final design. After this, cultural value implications are listed. Finally design solutions to weigh or solve conflicting values are explored.

- 9) What are potential technical properties of the information system?
- 10) How do these properties impact cultural values?
- 11) How can properties be designed to solve or weigh competing cultural values?

The three parts of investigations with in total eleven questions to assess the influence of a design on cultural values and vice versa are applied in a case, which will be discussed in the next section.

5. CASE: INTERNATIONAL JUSTICE MISSION

This chapter illustrates the proposed design methodology as discussed in the previous chapter with an application in a case. A detailed description of the approach, validation and results is discussed in the related master thesis.²

International Justice Mission (IJM) is an NGO fighting slavery, human trafficking, sexual abuse and similar acts of violence. To achieve sustainable systemic change in justice systems, operations are conducted by field offices. These field offices are highly localized organization parts aiming at reducing a particular form of slavery. A headquarters office supports the field offices and evaluates whether systematic change is achieved.

All phases are supported by information systems, which contain information for daily local operations and also supply information on an aggregate level to the US-based headquarters. The field offices are primarily spread across Latin America, Africa, India and Southeast Asia (International Justice Mission, 2016). The cultural diversity resulting from this spread imposes a challenge for data collection and data aggregation.

Culture at International Justice Mission

While performing research in the case, culture is qualitatively measured by a questionnaire based on two interpretations of culture (Curry & Moore, 2003; Hofstede et al., 2010). The results of these will be discussed, followed by the in-depth interview findings.

² Methodology and results are discussed more elaborate in the master's thesis 'Culture Sensitive Information Systems', which can be retrieved at TU Delft repository.

Measuring culture

The Hofstede (2010) dimensions are based on national cultural values. Each dimension measures the balance between two values (e.g. Indulgence vs. Restraint; high vs. low Power Distance). These values are abstract but can nevertheless be supported or demoted by properties of technology.

The information culture model by Curry and Moore (2003) aims at performing an objective assessment of an organization's information culture. It assesses the current state of the information culture. Though this assessment does not directly display values, underlying values of what a good information culture is are still visible. Examples of values derived from this questionnaire are: decisions should be based on data, data quality is important, achieving objectives is important, collaboration between teams is important, et cetera. Individuals and organizations might share these values but might have other values too.

In-depth interviews

To understand the people in the organization who are working with the information systems, in-depth interviews have been conducted about their work, systems usage and their worries.³ Cultural diversity appears to be distinguishable in three categories: national background, professional background and digital literacy.

Since field offices are highly localized (i.e. consist mostly of local employees), national background diversity does not cause much issues within field offices. Nevertheless, examples of communication barriers that do occur: One example of this is the translation of legal concepts in English between different Indian languages. Another example is the diversity in stance towards determining a case operation as 'successful', this seems related to cultural diversity in how failure is treated.

People with diverse professional backgrounds also use different language to describe the people and processes they work with. E.g. this might lead to confusion on the condition of the victim in trafficking cases, where victims are both part of an aftercare process (to get care) and a legal process (to testify). These flows of information should be aligned in terms of both process and language.

Digital literacy (i.e. ability to work with digital systems) is a differentiating factor between field offices. Staff in one office has been using devices since they grew up, staff in other offices never used digital systems or since their first job. This also influences data collection, because less digital literate people tend to only describe high-level information, omitting details.

Applying Culture Sensitive Design

The methodology as described in chapter ***Error! Reference source not found.*** is applied below. The conceptual, empirical and prescriptive technical investigation parts are discussed.

³ Methodology and results are discussed more elaborate in the master's thesis 'Culture Sensitive Information Systems', which can be retrieved at TU Delft repository.

Conceptual investigations

Who are the direct stakeholders of the information system?

Direct stakeholders are spread across several offices, a major difference exists between the USA based headquarters and the worldwide spread field offices. Direct stakeholders at headquarters mainly use the collected data for measurement and evaluation, while direct stakeholders in field offices collect data for managing their own work.

Who are the indirect stakeholders of the information system?

Clients, potential perpetrators, legal parties, partners and internal indirect users are examples of indirect stakeholders. The main group of indirect stakeholders are the clients (victims) in cases that IJM (or any of its partners) work on.

What cultural values of these stakeholders are implicated?

The models of culture discussed above are translated into value considerations: collecting data for local usage vs. aggregated insights on HQ level (Power distance), the way failure is treated (Masculinity), the role of privacy (Individualism) and how much time is spent on precisely describing details and avoiding ambiguity (Uncertainty avoidance & Long-/short term orientation).

Do competing cultural values exist in the design of the information system?

Combinations of implicated values lead to potential value conflicts. Three potential situations in which these occur are described.

Short term vs. long term gains

A potential situation could involve headquarters' staff who emphasize data quality for decision making. At the other end, field office staff rather spend time on performing practical work than collecting data. Headquarters thus receive data of less quality. This behavior can be related to a lower uncertainty avoidance and shorter-term orientation in field offices.

Efficient collaboration vs. individual privacy protection

Efficient collaboration might highly benefit from early and often exchange of information. On the other hand, clients with a more individualistic cultural background might have privacy protection considerations regarding sharing their personal details.

Open information sharing vs. preventing losing face

When decisions on continuing an operation, or improving processes are made, doing so data-driven means involving data around success and failures. In a masculine society, especially Eastern, face can be lost when public information about (personal taken) failures is shared.

How should weighing these tradeoffs be approached?

Weighing competing values can be done in numerous ways, of which one example is deriving a hierarchy of values ranging from abstract values on top to specific values at the bottom. Organizational values provide an anchor to derive specific operational values from. The application of this example method for weighing on the three issues described previously will be discussed below.

Short term vs. long term gains

An organizational value is to achieve systematic change through individual cases. When working for individual cases no longer supports the overarching system reform goals, the value of short term

achievements can no longer be derived from organizational goals. Data collection for enabling systematic improvements is preferred over individual care where less overall gains are achieved.

Efficient collaboration vs. individual privacy protection

This tradeoff is partially constrained by privacy protection legislation. Within these constraints, weighing by deriving specific values from the generic organizational values is still possible: protecting clients is a core component of the organization. Additionally, collaboration is no longer providing benefits when clients are not protected. Therefore, information systems should operate in a way that protects individual personal details.

Open information sharing vs. preventing losing face

Though the organization has American roots, adaptability to its global staff can be derived from the core value 'being bridge-builders', therefore protecting staff members or partners from losing face is important for the organization too. A way of discussing failed operations, without someone losing face, is preferred.

Empirical investigations

What is the influence of cultural values on information systems usage?

Data-driven operations, information quality and information exchanges are valued high by most respondents in the case study research. Field office and headquarters staff show diversity in value tradeoffs. National background influences provide a partial explanation. Another explanation is diversity in focus on individual client's cases versus a focus on overall system performance.

How do individual stakeholders prioritize competing values and usability?

Interviews indicate an influence of visible results on tradeoffs. Short term visible gains often get priority over long term invisible gains. A pragmatic 'whatever works' stance to usage of interfaces is displayed too: staff quickly returns to pen and paper when digital systems fail expectations. These system and interface expectations vary much across the respondents.

How does the organization prioritize competing values of multiple people?

Cost considerations force the organization to make choices. Technical solutions to meet all ends simultaneously cost a lot. Currently, these choices are basically made towards improving the quantity and quality of decision making information. However, global end-users are involved in this process and raised concerns are considered seriously.

Prescriptive technical investigations

What are potential technical properties of the information system?

The investigated system contains interfaces to enter and display structured information. These information flows are aggregated into and used by other people within the organization to analyze and improve work processes and outcomes. The data in the information system is collected by people working on cases. It is primarily structured around the process of providing care to clients and legal work in court trials.

How do these properties impact cultural values?

The way information flows are structured and stored influences how people perceive details as described in the conceptual considerations. Another important part is the interface; questions/fields formulation,

digital literacy considerations, and the amount of automation. This impacts cultural values like the importance of good quality information vs. preventing exclusion of less digital literate people.

How can properties be designed to solve or weigh competing cultural values? Reduction of the amount of time needed by people in field offices to collect data and reduction of complexity for less digital literate people solves some cultural value competition. A bridge between paper notes and digital information storage can be designed to achieve this. E.g. basic text editing like underlining and highlighting can be included.

The diversity between headquarters and field offices is illustrated by the conflict between spending time with clients vs. collecting high quality data for decision making. Insight in local level benefits of detailed data can bridge these gaps.

6. CONCLUSION & RECOMMENDATIONS

Information systems need to accommodate culture sensitive data collection to decrease bias in globally collected data. The existing Value Sensitive Design methodology has been transformed into a new approach, Culture Sensitive Design. This methodology assesses the cultural background of relevant stakeholders to identify cultural value conflicts. These conflicts can be resolved by making tradeoffs or by designing solutions for the issues. This paper discussed the derivation of the Culture Sensitive Design methodology and a case application.

Conclusion

How can a structural approach to cultural background be translated into guidelines for designing information systems that facilitate culture sensitive data collection?

The research question as formulated in the first chapter is displayed above. The structured approach to culture as provided by e.g. Hofstede (2010) and Curry & Moore (2003) can be used in the conceptual investigations in the Culture Sensitive Design methodology. An iterative process of empirical investigations (actual users and usage) and technical investigations (features and implications) provides insight in how cultural values are implicated and how these compete. Design guidelines for weighing or solving these competing cultural values can finally be derived.

Current limitations

Limitations to this research are that actual behavior in current systems is not considered. People do not always behave like they tend to respond in surveys. For design guidelines validation this means actual design should be made to enable actual usage observation and reflection.

Additionally, all interviews have been conducted in English, from a Western perspective. This cultural diversity research in itself might be culturally biased towards the author.

Further implementation might include more elaborate testing of the influence of different design choices on system's usage. The Culture Sensitive Design methodology's questions should be tested in a broad and large scale multi-cultural audience to refine the questions towards developing a further improved culture sensitive design research approach.

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