Interaction design for countries with a traditional culture: A comparative study of income levels and cultural values

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It is often necessary to take differences in cultural values and ways of thinking into account when doing interaction design for use in other countries. This paper presents an empirical study of cultural differences between a low-income traditional country and a high-income developed country, and how these differences are reflected in design decisions made in the two countries. The study identifies differences in design decisions and possible consequences of them. The results indicate that the attitudes to reliability are the same in the two countries. The study identifies differences between the two countries as regards attitudes to privacy and honesty and describes how they can be taken into account when doing interaction design for use in other low-income countries.

1 Introduction

Computers and software are not only used in the developed part of the world, they are essential for companies and public authorities in less developed countries, information processing is increasingly out-sourced to such countries, and they represent some of the fastest growing markets for mobile phones and telecommunication services.

Users of the Latin alphabet and users of the Chinese alphabet have different visual preferences [Prabhu & Harel 1999], and symbols that are acceptable in one culture may be offensive in another [Mullett & Sano 1995]. It is today generally agreed that such differences shall be taken into account in order to ensure that interfaces are usable and acceptable for local users. However, it may also be necessary to take into account that the cultural background of users affects how they operate and interact with an interface. Their goals and how they try to accomplish them are influenced both by their personal values and by the social context in which they live and work.

In this study I will investigate whether there are differences in personal values and ways of thinking that should be taken into account when doing interaction design for use in a less developed or low-income country, even in the case where the alphabet and other visible cultural characteristics are the same as in Europe or the United States.

A number of different methods have been used to determine cultural differences. Foucoult et al [2004] determine cultural differences through mediated immersion, where they surround themselves with artefacts describing another culture, and they do so-called concept explorations where members of the target culture comment on possible interface designs. However, such methods tend to focus on the appearance of an interface, not on how users interact with them.

Hofstede [2001] has investigated cultural variations on five different parameters, and Marcus et al [2003] have deducted a number of cultural preferences of relevance for interface design from his parameters. Ford and Gelderblom [2003] have also used Hofstede as a basis when investigating how users with different cultures interact with an interface. However, Hofstede's parameters describe how people interact with each other, not how they interact with interfaces or physical objects, making it difficult to use his categories to predict how users will interact with an interface.

Singh and Kotze [2003] measure cultural values of interest for interaction design directly by asking to what extent their participants agree with a number of statements. However, Nisbett [2003] notes that this method may underestimate cultural differences when the statements are interpreted differently by participants with different backgrounds. It is possible to overcome some of these cultural differences in the interpretations of questions by focusing on people's behaviour as Hall [1959] does in his classic anthropological study of how time and space are used in different cultures.

In this study I will use similar methods to determine differences in cultural values between Denmark and in Philippines. The majority in Philippines are Christian, the Latin alphabet is used, the grammar and part of the vocabulary of the national language, tagalog, are derived from Spanish, a European language, and the school system and the culture in general are strongly influenced by European and American values and cultural symbols. This means that many visible cultural characteristics are the same in Denmark and Philippines. However, the differences in cultural values span a large part of the possible global variation, as it is described by Hoftstede [2001] and World Values Survey [Inglehart 1997 & World

Values Survey 2005], another major study of differences in cultural values. See table 1.

Philippines	Denmark
Low income (1,080 USD GNI/capita)	High income (33,750 USD GNI/capita)
Traditional	Secular-rational (post-modern)
Masculine – survival values	Feminine – well-being values
Large power distance – inequality and privileges are considered normal.	Small power distance – equality is seen as ideal.
Collectivistic	Individualistic
Medium uncertainty avoidance	Low uncertainty avoidance – people accept ambiguity and new challenges

Table 1: Comparison between incomes and cultural values in Philippines and Denmark. The GNI/capita is now replacing the GNP/capita (The difference between the two figures is minimal). [Hofstede 2001, Inglehart 1997, World Bank Group 2005, World Values Survey 2005]

2 Method

This study was done in three stages:
1. Identification of possible cultural differences through participant-observation.
2. Verification of the observed differences through a questionnaire.
3. Investigation through a questionnaire of how cultural differences were reflected in software design.

2.1 Identification of possible cultural differences

In 2003 I stayed 9 weeks in Polanco, near Dipolog, in the Southern Philippines. My stay made it possible to use participant-observation, i. e.: "...spending a great deal of time with and participating in the everyday life of the natives" [Nardi 1997]. My wife is Filipino, we stayed in the municipality where she had grown up, and I knew the area from earlier visits. We had rented an apartment, and my everyday activities were similar to those of a local citizen who had returned home after having worked abroad. I went into Dipolog to buy things for the household; I visited family, had dealings with the municipality, went to the local college to arrange for one of my wife's cousins whose studies we supported, and I talked with our neighbour who was a teacher and with other people in the city. People were in general eager to talk, which meant that it was easy to get information, and that I talked with a large number of people.

I did not plan to do particular activities in order to investigate specific cultural differences (that would have biased the investigation towards differences I in advance had expected to find). However, because of my professional background

my observations inevitably tended to focus on the use of computers, the Internet, mobile phones and other electronic appliances.

I collected a number of incidents where people in the area appeared to act in ways that were definitely different from how they acted in Denmark. Based on the incidents I identified three cultural characteristics that I believed were relevant for interaction design and with apparent substantial differences between Philippines and Denmark. While doing that I kept a diary to support my memory.

2.2 Verification of the observed differences

Based on the participant-observation I designed a questionnaire. As recommended by Dray and Mrazek [1996], I worked with a local assistant (a young computer science graduate in my wife's family) who reviewed the questionnaire. It described eighteen specific situations and five possible emotional reactions, and each participant was asked to select the reaction that best fitted how he or she felt about each situation. The possible reactions were:

- It is okay, it is the way it should be.
- It makes no difference for me.
- I don't like it, but it isn't important.
- It irritates me.
- It makes me angry.

The following are three examples of situations that respondents were asked about their reactions to:

1st situation: You have sent a text message with a personal joke to a friend. The joke is about a person you both know. You later find out that your friend has forwarded the message to at least six of your mutual friends.

3rd situation: You use an Internet café, and you know the people who runs it. One day you find out that they can see what sites you visit and that they sometimes read e-mails send from the cafe.

5th situation: The phone company has published on the Internet, phone numbers of all of their subscribers with full names, age and job information.

All situations described use of mobile phones, the Internet or computers in settings that could be understood by both Danish and Philippine students. (In particular the use of mobile phones had grown rapidly in the area since 2000 when I made a study of the introduction of them [Strøm 2002].)

My local assistant helped me to recruit the Filipino participants in the study (among students she knew in the city). The questionnaire was filled out during interviews with fourteen Filipino participants, thirteen students and one recent graduate, and after my return to Denmark by nineteen Danish students. All participants had a good understanding of English so it was possible to use the same English language questionnaire in both countries. There were about 40 % male students in each group. The median age of the Danish students were 22 and of the Philippine students 19. (This partly reflects that it is possible to enrol in college after ten years of school in Philippines, whereas twelve years are required in Denmark).

2.3 Investigation of how differences were reflected in software design

I designed a questionnaire with eight questions about specific decisions that could be made when designing or setting up a computer system and with five possible outcomes for each decision. The decisions described in the questionnaire were of the type where an optimal technical solution cannot be found, so the answers only could be based on the opinions of the respondents, and the decisions were designed to be understandable by computer science students in Denmark and Philippines.

   The following is an example of a design decision and possible choices (for reference the decisions are numbered in this paper from 21 to 28):

   21th decision: You are setting up a computer to be used by a group of students in college. In addition to reports and course assignments, you can expect that the computer will be used for writing job applications and personal letters.

   How much will you do to prevent that other users of the computer, students or teachers, can read personal information belonging to one student?

1. It shall only be possible for students to store their materials in one open area on the computer. Anything stored in the open area is visible for and accessible to all users of the computer.
2. Each student can store his or her material in a personal folder. However, there is no protection of the contents of the folders. Other users may open a personal folder and read what is stored in it.
3. It shall be possible for students either to store their material in a personal folder without any protection, or to log on using a password and then store their personal materials in a special area. It may be possible for other users to download tools from the Internet and use them to break into such an area.
4. It shall only be possible for students to store their material on the computer in a special area, which require that they log on using a password. It may be possible for other users to download tools from the Internet and use them to break into such an area.
5. It shall not be possible for students to store any materials on the computer. They can only store material on a personal diskette that they take with them after having used the computer.

   The questionnaire was answered by twenty Philippine computer science students and by sixteen Danish Computer Science students (It was sent to Philippines and distributed and collected by my local assistant). The median study experience for the Philippine participants were four years, whereas it was three years for the Danish participants. Seven out of eight Danish participants were male, in contrast to only about one out of three of the Philippine participants (this reflects the gender distributions of computer science students in the two countries).

3 Results

Based on my participant-observation I selected three topics for further study:
1. Privacy: Because the required level shall be taken into account when deciding how and to what extent privacy shall be protected in a computer system.
2. Reliability: Because the reliability of a system always is a compromise between costs and the level that is required by users and different stakeholders.
3. Honesty: Because it shall be taken into account when deciding how and to what extent protection against misuse and fraud shall be built into a system.

I selected these topics because they might influence the use of computer systems, and because I observed a number of incidents where peoples' reactions indicated substantial differences in values between Denmark and Philippines. However, it is likely that there are other important differences that I did not notice during my participant-observations.

3.1 Privacy

The participant-observation indicated that privacy was taken much less seriously in Philippines than in Denmark. Some examples:
- At a Danish university student grades are not even displayed on a bulletin board. In contrast, Philippine newspapers published lists of students with their grades, even for those who barely had passed the exam.
- In Philippines, social and health information for each family is posted on a board in the middle of the barangay (village), whereas such information in Denmark only is available for public employees who need it.
- In Denmark, people normally do not tell the PIN-code to their ATM-cards, even to family members or close friends. In Philippines, a woman who did not know me asked for asked for my assistance when using an ATM-machine and told me her PIN-code, in such a manner that people who stood around us could hear it.

The replies to three of the six questions in the questionnaire indicate that privacy was taken significantly more seriously in Denmark than in Philippines. See table 2. It is in particular interesting that none of the female Philippine students who replied objected to having their name (showing their gender) and age published together with their phone number if they owned a mobile phone. (The replies that did not indicate any differences in the attitude to privacy are probably influenced by other cultural differences: Question 1 and 2 by honesty being taken more seriously in Philippines than in Denmark, question 4 by a larger power distance, which leads to more distrust of authorities in Philippines compared to Denmark [Hofstede 2001].)

However, the investigation of design decisions shows only a significant difference on one of the three privacy questions, question 21, and in that case the Philippine protection of privacy is on a higher level and more cumbersome than indicated in the Danish replies. See table 3.

Situation ↓	Phil.	DK	Exp. from observations
1. Friend passes on personal joke about someone you both know.	2.6	3.3	Phil < DK
2. Friend borrows your phone and copies stored number w/o permission.	4.5	4.3	Phil < DK
3. People running internet cafe you use read customers' e-mails.	**3.1**	**4.5**	Phil < DK
4. Your boss can get copies of e-mails you send or receive.	4.0	3.5	Phil < DK
5. Publication of phone numbers, with full name, age and occupation.	**1.5**	**3.5**	Phil < DK
6. Phone company store text messages and police has access to them.	**2.6**	**3.5**	Phil < DK

Table 2: Privacy results from questionnaire. One is the most positive emotional reaction; five is the most negative. Statistically significant differences (p<0.05 tested in normal dist.) are highlighted. The column at the right show the results that were expected based on the participant observation.

Situation ↓	Phil.	DK	Exp. from ident. cultural char.
21. Protection of private files in school computer (privacy)	**4.6**	**3.7**	Phil < DK
22. Protection of e-mails privacy in company (privacy)	3.5	3.1	No diff.
23. Protection of SMS messages (privacy)	3.2	3.4	Phil < DK
24. Protection against computer crashes (reliability)	3.7	3.8	No diff.
25. Indication of unreliable results (reliability)	3.7	3.6	No diff.
26. Requirements for back-up of computer files (reliability)	**3.4**	**4.1**	No diff.
27. Prevention of fraud in group running netcafe (honesty)	4.4	4.0	DK < Phil
28. Prevention of fraud with bookkeeping (honesty)	3.0	3.0	Phil < DK

Table 3: Results of investigation of design decisions. One is the reply where least precautions are taken; five is the one where most precautions are taken. Statistically significant differences (p<0.05 tested in normal dist.) are highlighted.

The reply to question 21 is similar to what I observed in a Philippine College. It was impossible for students to store any private files in the college's computer system. They had to keep them on personal floppy disks. In contrast, I observed how users of a Philippine net-cafe stored private files on the hard-disks of the computers, even though it was possible for anyone who used the same computer to read the files. In comparison, at a Danish university it is possible for students either to store files in a private password protected area or in another area where others can read them.

3.2 Reliability

The participant-observation indicates that repairs of electronic equipment were more frequent and acceptable in Philippines than in Denmark.

In Philippines electronic equipment fails fairly often. The available equipment is often of a lower quality than in Denmark, and it is used for longer periods of time in an environment that is more dusty and humid. There were a considerable number of repair shops and shops selling electronic spare parts. In Denmark electronic equipment is frequently discarded before it breaks down, and when something breaks down, it is often discarded, without trying to find out whether it can be repaired.

In Philippines, it appears that the main concern is to have a working piece of electronic equipment. If a piece of equipment can be repaired, it will be repaired, even if the repair degrades the look of it. In Denmark, electronic equipment that has been repaired is often regarded as being damaged, even if it can be used without problems, and repairs that in any manner degrade the look of a piece of electronic equipment are in general not accepted.

However, five out of six replies to the questionnaire show no significant differences in the attitude towards reliability. See table 4. This indicates that Filipinos want the same reliability as Danes. (I had expected that questions 8 and 11 showed that Filipinos were less patient than Danes waiting for repairs because of the large number of shops that did repairs while the customer waited. However, it appears that the more relaxed attitude to time in Philippines compared to in Denmark was decisive.)

The investigation of design decisions shows only a significant difference on one of the three reliability questions, question 26, where the reply indicates that a substantially less reliable back-up solution would be selected in Philippines compared to Denmark. See table 3.

Situation ↓	Phil.	DK	Exp. from observations
7. New mobile phone breaks down.	3.8	4.1	Phil < DK
8. Shop says a repair takes three days.	**1.9**	**3.1**	DK < Phil
9. Phone turns itself off regularly.	3.4	3.9	Phil < DK
10. Shop tells that problem can be solved by putting tape around the phone.	3.5	3.8	Phil < DK
11. Phone has to be sent to manufacturer's shop for repair.	3.1	2.9	DK < Phil
12. Low-cost phone company breaks off one out of three calls.	3.6	4.2	Phil < DK

Table 4: Reliability results from questionnaire. One is the most positive emotional reaction; five is the most negative. Statistically significant differences (p<0.05 tested in normal dist.) are highlighted. (The numbering is continued from table 2.)

3.3 Honesty

On a personal level and in daily transactions Filipinos appeared to take more care to be honest than people in Denmark. They frequently stressed the importance of honesty, something that is not done naturally in Denmark. I was visibly wealthy compared to the local level, and expected that some would try to take advantage of it. However, I experienced that shopkeepers took time to explain the actual prices and to ensure that I did not pay more.

I saw how persons working in shops took time to note down every sale with the amount in a small notebook, and had the impression that they took time to demonstrate they were honest. Net-cafés had systems that registered the time each user had used a computer, but that was only a convenience for the cashier. It was only large department stores that had an automatic registration of each payment as it is customary in Denmark.

Filipinos frequently complained about the dishonesty of public officials, and corruption of public officials and politicians appeared to be a serious problem [Chua 1999, Hofstede 2001], whereas Denmark is reported as one of the countries in the world with least corruption [Hofstede 2001]. It should be noted that I had a number of satisfactory dealings with public officials in the area where I stayed, and that none of them demanded or suggested any sort of payments.

The replies to the questionnaire indicate honesty at a personal level was considered significantly more important in Philippines than in Denmark (questions 13 and 14 in table 5). The replies indicate that Filipinos more often than Danes expect that large companies are dishonest (questions 17 and 18 in table 5), and that Filipinos believe people shall be honest towards large companies, even though the companies may be dishonest (questions 15 and 16 in table 5). (This was not expected. However, it may be explained by taking into account that Philippines is a country with a large power distance where it to some extent is accepted that power

is abused [Hofstede 2001], and that Filipinos therefore accept that they are supposed to be honest even though large companies are not.)

The investigation of design decisions shows no significant differences on any of the honesty questions. Computer science students in Philippines choose the same level of protection against misuse and fraud as computer science students in Denmark.

Situation ↓	Phil.	DK	Exp. from observations
13. Friend uses phone without permission for prolonged period.	**3.9**	**2.8**	DK < Phil
14. Friend uses phone for international call without permission.	**4.6**	**3.8**	DK < Phil
15. Friend makes calls from faulty payphone that does not charge.	2.9	2.3	Phil < DK
16. Friend makes long international calls from faulty non-charging payphone.	3.1	2.4	Phil < DK
17. One-hour phone card runs out after forty five minutes.	**2.8**	**4.5**	Phil < DK
18. Phone company charges for call customer believe she did not make.	**3.2**	**4.1**	Phil < DK

Table 5: Honesty results from questionnaire. One is the most positive emotional reaction; five is the most negative. Statistically significant differences ($p<0.05$ tested in normal dist.) are highlighted. (The numbering is continued from table 4.)

3.4 Costs and economy are crucial for design

The replies and observations about reliability and levels of privacy required in systems are contradictory. Even though privacy is considered less important in Philippines compared to Denmark, Filipino students in general selected a design solution that was more restrictive and cumbersome than the one selected by Danish students, and even though it appears that people in Philippines want the same level of reliability as people in Denmark, computer science students in one case selected a substantially less reliable solution. However, the results can be explained when costs are taken into account. In the cases where one solution appeared to be less costly than another, Philippine students tended to choose the simplest or least costly solution.

4 Discussion

It is necessary to take into account that Philippines has large regional and income differences. The study was done within a middle class population in a provincial area, and the results may for instance not be valid for an upper-class population in the capital (Manila).

Participant-observation can capture more new aspects of a culture than structured interviews or questionnaires, but it is more difficult to determine how reliable the results are. The observer can only capture a small amount of his or her experiences, and in most circumstances it is impossible to determine what has been left out, whether the observations are biased by what the observer expected to see, or because he or she misinterprets some events.

I have therefore verified the results of the participant-observation through questionnaires. Both in Philippines and in Denmark these were answered by students. My observations indicate that their values in both countries probably are the same as for other people with the same age and social background, whereas older people might give different answers. Singh and Kotze's [2003] results indicate that the detected differences between Denmark and Philippines might have been larger if the respondents had been older. It is also likely that computer scientists with some years of work experience would make different design decisions than the participating computer science students, and it is not possible to determine how their work experience might influence their replies.

In the present study both questionnaires were answered by homogeneous groups of students with similar experience in Denmark and Philippines, such that valid comparisons are possible.

The first questionnaire asked how the respondents would feel about different situations. The interpretation of such questions are less culturally dependent than questions about values in general, but they may give false indications of differences in cultural values if the respondents from one culture in general react stronger than those from another. However, an analysis of the results shows that the ranges of reactions are similar in Denmark and in Philippines, confirming that the detected differences are valid.

Eight out of eighteen questions about reactions in different situations showed significant differences ($p<0.05$). With such a number of results there is a substantial risk that one or more of them are generated by chance, even if they separately are statistically significant. However, a test shows a > 90 % probability that none of the significant differences ($p<0.05$) are generated by chance.

Seven of the eight significant results confirm the results of the participant observation.

Replies to seven of the questions that do not confirm the results of the participant-observation were influenced by other cultural differences than those the questions were supposed to measure, and the remaining four cases where the replies does not confirm the results of the participant-observation can be attributed to the observations not taking sufficiently into account that the actions might have been determined by external circumstances more than by cultural values. This means that all differences between the participant-observation and the first

questionnaire can be accounted for, and it demonstrates the need of combining participant-observations and questionnaires or interviews.

Danish computer science students have comparatively more access to computers and computer magazines. This might have made them more aware of possible problems and their consequences and led to generally higher values in their answers. However, averages of the responses from computer science students are almost identical in Denmark and in Philippines (Total averages of all replies to design questions: Phil. = 3.4, DK = 3.3), indicating that these differences did not affect the results.

5 Relations between income levels and cultural characteristics

It is possible that the income level of a particular culture is sufficient to determine a number of cultural characteristics that shall be taken into account when a system or an interface is adapted for use in another culture.

Inglehart [1997] describes how there is a high level of constraint between the different cultural attributes; he describes how high income societies are rational-secular and well-being oriented, whereas low-income societies are traditional or survival oriented. Hofstede [2001] describes how a low income-level is correlated with a large power distance and collectivistic and masculine values. See table 6. (Which fits the cultural differences between Denmark and Philippines. See table 1.)

The cultural differences identified in this study appear to be closely related to income levels. In a low-income society where several people live together in the same room, children learn to live with almost no privacy. It is also likely that privacy only is expected in an affluent society with individualism and well-being values. When computer students in the Philippines consistently choose cheaper solutions than Danish students, even though the same level of reliability was required, it is likely because the equipment compared to local income levels was about five times more expensive. In a low-income society where many people live together personal honesty is important, whereas corruption and a large power distance both are correlated with low income levels [Hoftstede 2001], and lead to the distrust of large organisations that is indicated by the study.

Parameters	Correlation with GNP/Capita
Large power distance - inequality and privileges are considered normal.	-.64
Individualism vs. collectivism	.84
Masculinity vs. femininity values (survival versus well-being values)	.51
Uncertainty avoidance - people avoid ambiguity and new challenges	-.28

Table 6: Correlations between Hoftstede's [2001] parameters and GNP/Capita.

Hofstede's parameters and the results of World Values Survey suggest a number of additional relations between income levels and how people interact with an interface or a system. Denmark is a rational secular society. In such a society it is considered important to have imagination, to feel responsible and to be tolerant. [Inglehart 1997]. In contrast, Philippines is a traditional society [World Values Survey 2005]. In such a society it is considered important to work hard and to respect authorities [Inglehart 1997]. However, I have not made any observations that conclusively indicate how these differences affect how users interact with computers or other equipment.

There is a correlation between low incomes and Hofstede's [2001] masculine values (similar to what is called survival values in World Values Survey [Hofstede 2001]), and people with such values tend to trust science and technology [Inglehart 1997]. This may make it less likely that they will anticipate and prevent problems. Hofstede [2001] also finds a strong correlation between low incomes and a large power distance, and anecdotal evidence suggests that users in a community with a large power distance will tend to wait for instructions and keep problems hidden from their superiors. Hofstede [2001] discuss a number of studies that find correlations between higher airline accident rates, a large power distance and masculine values. However, he finds that the higher accident rates can be explained as consequences of fewer resources in low-income countries for maintaining planes, training crews and managing airports. It appears that masculine values and a large power distance do not affect the accident rate. The results of my own observations in Denmark and Philippines are inconclusive.

Hofstede [2001] shows that there is a weak correlation between uncertainty avoidance and low incomes. This is the only parameter where Denmark and Philippines are similar: None of the countries have a high level of uncertainty avoidance. See table 1. Hofstede [2001] describes that a culture with high uncertainty avoidance is less innovative and more resistant to change. It is possible that a high level of uncertainty avoidance makes it less likely that people will adopt new technology and learn to use it by trying to do something and seeing what happens. However, I have not found any conclusive information that supports such a relationship. All these possible relations between income levels and interactions with interfaces may be subjects of further studies.

6 Conclusion

In an affluent society the protection of private information is considered valuable in itself. Systems that take the customary level of privacy in an affluent society into account will therefore to some extent also protect against misuse of the information for instance for identity theft or fraud. The results indicate that is not the case in a traditional or a low-income society. In addition, when the protection of private information is considered less important, it is less natural for users to comply with rules to protect it.

When discussing specifications for systems for use in low income countries, it is therefore in particular necessary to explore how stored private information can be misused, and how misuse shall be prevented. (Given that the risk of phone harassment has been discussed in Philippine medias, it is interesting that all female

Philippine students who answered the questionnaire accepted that age and full names of subscribers were published.).

An access control based on the use of personal passwords may be inadequate in a traditional society. When privacy is not normal, it may even be considered a little odd to insist that a password cannot be shared. It may therefore be necessary to use ID cards or biometrics instead of passwords for access control.

The results indicate that breaches of trust in a traditional society are considered more serious than breaches of privacy. In many cases it is therefore likely that users will not object to private information being spread as long as they are clearly informed about how it is spread and to whom.

In an individualistic society where privacy is considered important it makes sense to adapt the information to each individual user. In contrast, in a traditional and more collectivistic society it may be advantageous to use systems where the same information is shared within a group. For instance such that some social information about each household is available for all families in a community, or such that persons working on a project in a company not only can see their own tasks and work-hours, but also the work-hours and tasks of all other persons working on the project.

The results indicate that system designers in low-income countries tend to choose the cheapest or most easily available solutions, even though the operating conditions because of dust, humidity and less reliable power supplies often are more demanding than in a high-income country, and even though the same level of reliability is required.

This must be taken into account when specifying a system for use in a low-income country. It is necessary to quantify the level of reliability that is required, and to discuss how it shall be accomplished. At the same time it is necessary to reduce the costs of both hardware and all materials used when operating a computer system (CD's may for instance be so expensive compared to the local price level that it is unrealistic to expect that they are used for back-ups.)

In a high-income country a closer integration is normally worthwhile because it provides a more efficient workflow. In a low-income country it may be worthwhile to compartmentalise a system such that a fault only affects part of it.

It is possible to increase the reliability by ensuring that the computers only are used in rooms with a stable temperature and with reduced levels of dust and humidity. When the equipment costs are high compared to salaries it is also worthwhile to introduce preventive maintenance that increases the reliability of the equipment, and it is possible to reduce the problems caused by less reliable equipment by improving the procedures and interfaces used for maintaining a system such that it can be repaired faster. In essence, it is worthwhile to introduce interactions with the equipment that are similar to those that were common in the developed countries fifty years ago when computers were more costly and less reliable.

The results indicate that people in a traditional low-income country expect that large companies and probably also public authorities are dishonest. It may therefore be both beneficial and necessary for them to make their systems

transparent to demonstrate that they act honestly towards the users (that may for instance be necessary for a web-based service to calculate personal taxes).

The present study shows that people in a traditional country express that they want a high level of honesty, and that they are aware of the amount of fraud and corruption in their society. This means that it is possible openly to discuss the risk of misuse of computer systems and how to design interactions that makes it more difficult.

In contrast, when people in a traditional society tend to expect a higher level of honesty on a personal level, they may be less suspicious and less likely to object when someone deviate from procedures that are set up to prevent misuse and fraud. At the same time, it appears that honesty on a non-personal or organisational level is smaller than in a high-income country, such that there is a considerable risk of fraud or other dishonest behaviour.

It is common that cashiers in Philippine department stores work in pairs, such that a single cashier cannot let a friend leave the shop with goods that only are partly paid. A similar system may be used for some software systems, such that some operations only are possible when two users work in unison.

According to the available information, corruption is a widespread problem in Philippines as in other low-income countries. It may therefore be worthwhile to design systems and interactions that restrict information and enforce decision processes that make corruption more difficult

It is also necessary to ensure that misuse and fraud is not possible because the designers of a system in a low-income country have chosen the cheapest and easiest available solution. Otherwise, it is for instance conceivable that out-sourced customer information including complete credit card details are kept on a standard PC that are used by a number of people without any access control.

It appears that it often is advantageous to take differences in attitudes towards privacy, reliability and honesty into account when designing systems for use in low-income countries. In contrast, my observations indicate that people often are tolerant and culturally flexible. They tend to accept software and electronic equipment almost no matter what cultural values they embody if they feel that the interaction with it gives them a more satisfying experience of their daily life. Two well-known examples are mobile phones and the Internet: Both are designed so they fit and encourage a small power distance, individualism and self-expression. However, because of the advantages they offer, they are without modifications accepted in cultures with large power distances, collectivism and survival-oriented values.

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