



# Cultural Patterns in Software Process Mishaps: Incidents in Global Projects

Eve MacGregor

+1 604 742 1505  
evem@ece.ubc.ca

Yvonne Hsieh  
University of British Columbia  
2356 Main Mall  
Vancouver, BC, Canada  
+1 604 827 5654  
yvonneh@ece.ubc.ca

Philippe Kruchten

+1 604 827 5654  
pbk@ece.ubc.ca

## ABSTRACT

This paper describes a current and ongoing research project being conducted at the University of British Columbia, Canada. The paper begins by briefly describing past anthropological and sociological culture research. This research will inform our current exploration into the issues surrounding culture and its role in Global Software Development efforts. It then clarifies why this research is particularly important. The paper continues with a description of the current phase of this research, which is an exploratory qualitative approach rooted in Grounded Theory, and of the next phase, which will be a more quantitative approach looking at specific “problem areas” that were identified during the first phase.

## Categories and Subject Descriptors

D.2.9 [Software Engineering]: Management – *human factors, process models, programming teams.*

## General Terms

Management, Design, Human Factors

## Keywords

Culture, Global Software Development, Cultural Patterns, Software Engineering

## 1. INTRODUCTION

The aim of this on-going research project conducted at the University of British Columbia is to create an analyzable repository of cultural mishaps that occur within the context of Global Software Development (GSD). Global development efforts, whether through sub-contracting, outsourcing or off-shoring, have become an industry norm rather than an exception. In this context, human cultural factors are recognized as continuing and critical issues that influence the ability of teams to work together effectively and successfully. More specifically, as

outlined in [1], we will look at how these intercultural factors are affecting software development practices.

## 2. CULTURE RESEARCH

Depending on the field of exploration there are differing definitions of culture. All these definitions have certain aspects in common: culture is learned, culture is associated with values and behaviours that are shared by a group, and these values are passed from generation to generation.

There are a number of prominent culture researchers including Kluckhohn & Strodtbeck, Hofstede, Hall, and Trompenaars & Hampden-Turner. A brief summary of some of their relevant work and pointers to further reading are presented in the following sections.

### 2.1 Kluckhohn & Strodtbeck

Kluckhohn & Strodtbeck [2] study culture from the perspective of “value orientations.” They identify five areas in which all cultural groups have fundamental, though differing, beliefs. These value orientations represent how a culture views human nature, the relationship of its people with nature, time, individual or collective focus, and whether space is public or private. For each of the orientations, Kluckhohn & Strodtbeck identify 3 relative positions where a culture may stand.

**Human Nature** People are born good, evil, or a mixture of both.

**Person vs. Nature** People value their subjugation to nature, mastery over nature, or harmony with nature.

**Time Sense** Priority is given to traditional customs, future plans, or present events.

**Social Relations** Society is organized around a lineal hierarchy of authority, collateral interests, or individual goals.

**Space** Business and life is conducted publicly or privately, or a mix of the two.

### 2.2 Hofstede

One of the most widely cited cultural researchers is Geert Hofstede. Based on a large scale study of IBM employees located in over 40 countries, Hofstede develops a set of cultural indices. The indices are relativistic scales (continuums) for a culture’s approach to power distance, individualism/collectivism, masculinity/femininity, uncertainty avoidance and long-term/short-term orientation [3, 4].

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage, and that copies bear this notice and the full citation on the first page. To copy otherwise, to republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

Human and Social Factors of Software Engineering (HSSE) May 16, 2005, St. Louis, Missouri, USA

Copyright 2005 ACM ISBN # 1-59593-120-1/05/05

**Power Distance** The power distance index measures the extent to which a culture embraces social inequality. In a culture with high power distance, there exists an established hierarchy of power, based on status, wealth, intellectual capacity, or some other factors. A culture with low power distance, on the other hand, considers every individual as equal, despite difference in power, status or wealth.

**Individualism/Collectivism** The individualism/collectivism index is based on how an individual is perceived in a culture: either as an independent entity, or as part of a tightly knit group. A highly individualistic culture is one where individual interests take precedence over collective ones and everyone is expected to look after himself/herself. A highly collectivist culture is one in which people are integrated into strong, cohesive groups. People are expected to give allegiance to the groups to which they belong.

**Masculinity/Femininity** A more masculine culture has more distinct social gender roles (i.e., men are supposed to be assertive, strong, and focused on material success while women are gentle, caring, and concerned with quality of life). Gender roles in a feminine culture are more fluid (i.e., both men and women can be concerned with relationship, modest, tender, and focused on improving quality of life). This index is reflective of culture on a national, rather than personal, level.

**Uncertainty Avoidance** The uncertainty avoidance index indicates the tolerance a culture exhibits towards unfamiliar or ambiguous situations. A culture with a high ranking in this area may rely upon strict, detailed rules and procedures in order to mitigate uncertainty. A culture with low uncertainty avoidance is more comfortable handling unknown events and thus relies less upon rules.

**Long-Term/Short-Term Orientation** This dimension did not come from Hofstede's early work. It was added after a similar study that was carried out by researchers from Asian and Pacific countries. A culture with long-term orientation prescribes to long-term commitments and perseverance toward slow results. A culture with short-term orientation is more pragmatic welcoming to changes, and looking for rapid compensations, possibly to the detriment of the final outcome and the survival of the organization.

## 2.3 Edward Hall

Hall's research [5] results in a dimensional model that examines culture from a more anthropological standpoint. The two dimensions we will discuss here are time (polychronic vs. monochronic) and communication patterns (high-context vs. low-context).

**Time** In a monochronic culture time is managed in a linear manner: one event takes place at a time; a task is completed before another can be started. Activities such as meetings have definite start and end points and scheduling mechanisms are used to ensure that interruptions are avoided. A polychronic culture, on the other hand, considers time to be much more flexible. Tasks can be handled simultaneously and interruptions are common.

**Communication Patterns** According to Hall, a culture's communication patterns fall somewhere in the continua between high context and low context. In a low-context culture the speaker assumes that he/she must be explicit in the message. The intention

of the speaker is directly and unambiguously stated. In a high-context culture the speaker assumes that every participant in the conversation understands the context and thus complexity may be expressed in fewer words.

## 2.4 Trompenaars and Hampden-Turner

Trompenaars and Hampden-Turner's [15] research builds upon that of Hofstede with a focus on the impact of intercultural variances on business and management processes. They conducted an empirical study with managers in multinational corporations and developed a set of 7 value dimensions, of which four are presented here.

**Universalism vs. Particularism** The universalism/particularism value orientation describes a culture's preference for rules or relationships. A universalist culture believes that established rules should be applied under all circumstances. A particular culture focuses on the nature of the present circumstance and is more inclined to give special consideration based on the uniqueness of the situation or relationship.

**Neutral vs. Emotional Expressions** The neutral/emotional dimension addresses the extent to which feelings can be openly expressed in a culture. Members of a neutral culture are reluctant to reveal their feelings and thoughts in public while people in a more emotional culture may more plainly display feelings and thoughts.

**Specificity vs. Diffuseness** This dimension measures the degree of involvement. In a specific-oriented culture, each (business) relationship is precisely defined around its limited context. Co-workers are less likely to establish a relationship outside of the work context. In a diffuse culture, however, more areas of life are interconnected, with arenas like work and family life intermingling.

**Achievement vs. Ascription** An achievement-oriented culture accords status by performance while an ascription-oriented culture judges status based on a variety of factors including birth, kinship, gender, age, and seniority.

## 2.5 Criticisms of Cultural Models

There have been some questions about the applicability of cultural models to Information Systems research [6] that could be extended to include a Global Software Development context. There have also been criticisms of, in particular, Hofstede's model.

Walsham [7] comments that Hofstede's work assumes "cultural homogeneity", does not analyze work patterns and does not pay enough attention to the dynamic nature of culture. There are other critics of Hofstede (see, for example, [8]). None-the-less, his work, as well as that of other culture researchers, provides a good framework for beginning to understand cross-cultural issues.

## 3. WHY ALL THIS MATTERS

Collaboration in teams that are not collocated and not culturally homogeneous creates new dynamics: "In the new paradigm there is no obviously dominant culture and there may be little or no incentive to create a negotiated culture [9]." Intercultural factors are catching projects "off guard" [10] and are the source of "countless misunderstandings" [11].

There are a number of researchers who have recognized that culture in global teams is a phenomenon to be taken seriously (see

[12], [13], [14], [15], [11], [16]). In global software development several areas in which fault lines may appear have been identified, including; the need for cross-cultural sensitivity [13], challenges in mediated communication [17], planning and management of global innovation [19], differences in work-style (as described in [16]), power, hierarchy and agency [14]. These fault lines, as described in Walsham's paper on working across cultures in ICT's [16], are part of the structure across which conflict may develop.

#### 4. CULTURE AND AGILE METHODS

The authors of this paper have some concern that agile methods are inherently western in orientation and do not translate well to other cultures. We postulate that high power distance cultures will not gain the same benefit from some agile practices.

For example, in a culture where an employee rarely, if ever, contradicts and/or speaks freely in front of a manager, the benefit of a daily scrum would be minimized if not completely lost. The issue of 'face' in conjunction with the "customer on site" practice may interfere with a team's ability to engage in out-in-the-open risk assessment activities.

This question about agile methods and culture will remain an open one during the course of the research described below. We intend to keep this in mind while we are doing our analysis of process and practice.

#### 5. OUR RESEARCH

Our research is based on the notion that there are, and will continue to be, intercultural factors that affect both collocated and distributed software development efforts. It should not be assumed that these factors are all negative. In fact, at least two project managers have reported that a good mix of cultural approaches was beneficial to their projects [1, 10].

General recommendations about the necessity of a well-defined development process and the importance of planning are not enough. This type of recommendation is already in the literature. Culture is identified as potentially affecting GSD project success rates [1], but this industry needs more concrete solutions.

For this reason we have begun an effort to create a repository of well-defined critical incidents that can be systematically analyzed. In the analysis we propose to extract patterns by utilizing discourse analysis and the critical incident technique. The analysis will be informed by the work of culture researchers such as Hall and Hofstede, while also keeping in mind the dynamic nature of culture and the potential need for new paradigms.

The results of this analysis will assist project personnel in both palliating and mitigating existing and potential issues, leading to higher quality up-front risk assessment and on-going risk management. Though this research may result in a pattern language, the development of such a language is not driving this effort.

The critical incident technique (CIT) was described by Flanagan [20] in 1954. In the intervening half-century social science has moved from positivism through post-modernism and beyond [see [21] and chapter 2 of [22], among others]. For our purposes this

shift entails a modification of Flanagan's method but remains rooted in those original ideas.

The CIT is a methodology for observing human behaviour. Its strength lies in defining a boundary around an interaction thereby creating a specified unit of analysis. CIT consists of an *incident* which is specifiable and complete, in that observation of such an incident would permit inferences and predictions. The incident is considered *critical* if the purpose, or intent, of the act is clear and the consequences are definite (i.e., there is "little doubt" concerning effects) [20]. Flanagan's original description of the CIT assumes that reality is objective [23], whereas current social research considers reality to be more subjective.

We must strike some balance between objective and subjective reality. Semi-structured interviews, rather than passive observation, will ensure commonality across a globally dispersed ethnographic field [24]. This commonality will allow for the identification of recurring themes, leading to results that can be generalized.

Our research consists of two phases: the current phase is a qualitative exploration followed by a more quantitative exploration and analysis.

##### 5.1 Phase one

The phase we are engaged in currently is informed by Grounded Theory. We are meeting with project managers and personnel and exploring the space of global outsourcing and sub-contracting. Our aim is to see what emerges in terms of what is being said about cultural mishaps and successes in projects.

We are also collaborating with a UBC based research project called EMERGENCE (Estimation and Mapping of Employment Relocation in a Global Economy in the New Communications Environment). They are conducting case studies where the companies at both ends of an outsourcing or off-shoring relationship are being interviewed to "investigate the quality and describe the characteristics of telemediated jobs that are relocating between Canada, Asia and Europe [25]." It is hoped that our combined effort will result in more data points.

In our initial meetings with project managers a couple of areas for exploration have arisen. One of these areas is in scheduling: Does the schedule provided to a contractor reflect an actual commitment to that schedule or is it just one that "meets the requirements?" Another area for investigation is in documentation: Is the documentation a true reflection of the system or is it just an artifact with little or no relationship to the reality of the system?

Neither of these issues should be seen to promote a particular value system. Though it may be tempting to say "well of course a schedule is a commitment," one should recognize that this could be a particularly western, monochronic viewpoint.

##### 5.2 Phase two

Once some areas for more specific exploration have emerged we will move into phase two. This phase will be characterized by a more quantitative approach.

In order to elicit a broad range of feedback we will design a questionnaire that can be used to create a larger data set of incidents which will ensure external validity. The questionnaire will be designed to "drill down" at various key points in the

software development lifecycle in order to ascertain what is actually occurring in these projects.

Phase two will also continue the discourse which we have already begun in the form of semi-structured interviews.

## 6. PRELIMINARY RESULTS

Though it is early in our exploration we have loosely identified a few patterns through the personal experience of one of the authors and evidence in the literature. Though we are calling these descriptions “patterns,” some might be called “anti-patterns” depending on the definition of “pattern” – a debate which would not further the reader’s understanding of our research.

These patterns will be structured similarly to Coplien & Harrison’s organizational patterns [26]. First the *context* within which the pattern occurs is described, next the *forces* behind the pattern are discussed and where appropriate we will describe a *solution*. Here are a few examples of such patterns.

### 6.1 Yes (but no) Pattern

During the course of any project it is normal behaviour for project managers and team members, collocated or otherwise, to request of another that an action be performed (e.g., “we need your code in the CM system by Friday at noon”). Person B, of whom the request is made, responds by saying “Yes.” Person A, who made the request, goes off to continue his/her work satisfied that Person B will do as requested. Friday noon rolls around and Person B has not pushed their code into the CM system. Assuming no other intervening factors, Person A is left wondering why the ‘promise’ was not kept. In this instance Person A has assumed that Person B meant “Yes, I will do as you request,” when in fact B meant “Yes, I heard what you said.”

Incidents of this sort are characteristic of intercultural miscommunication wherein a number of factors may be at play. One issue could be *power distance*; perhaps Person B is from a high power distance culture and perceived Person A to be higher in the hierarchy. In this instance, Person B may not speak his/her mind nor modify the deadline by citing information that could affect his/her ability to satisfy the request.

Any solution to this issue is a variation of asking for clarification. Rephrasing the request, or appending a definitive request for a promise.

### 6.2 Proxy Pattern

In the context of global software development companies may not always be willing or able to invest in extensive intercultural training. They run into frequent issues that they finally attribute to cultural differences.

Some individuals, due to their life history, have spent enough time in two cultures to make them able to operate equally at ease in both cultures. These individuals are “bi-coded” and are able to assume the role of a proxy. For example someone born and raised in Asia comes to North America to study, staying some 6-10 years. This person may stay in North America to work for a while, thereby internalizing the values and associated behaviours of North American culture (and specifically ‘high tech’ culture).

The solution to the issue raised above is for the company to place the bi-coded individuals in a position where they can, in a sense, translate between cultures [1].

### 6.3 We’ll-take-you-literally (Anti) Pattern

Different cultures may have different perceptions for a development practice, process, or artifact. A practice may be considered as unimportant and superficial in Culture A, but perceived to have great importance in Culture B. In order to please or appease their counterpart from Culture B, developers from Culture A, properly educated in the expectations of B, may overplay this practice, even though they do not believe in the benefits of the practice. But as the developers from Culture A do not have a good understanding of the execution and benefits of the practice, their attempt to overplay the practice will often lengthen the development process, resulting in inefficiency, frustration, and distrust from Culture B.

Example: An Italian team did not see much value in the process used by their Canadian counterparts, but were willing to produce whatever the Canadians requested, with no real impact on the process used by the Italians.

### 6.4 We’re-one-single-team (Anti) pattern

Many agile practices rely on the concept of a rather “flat” team, where hierarchy is minimized and informal, direct communication is encouraged. Agile methods suggest the practice of a daily scrum to assess status and progress. The assumption made by this practice is that in a team with a flat structure all team members can freely, openly communicate their progress, problems, and needs.

The pitfall here is that the definition of team is different between cultures, entailing different rules and norms as to how a team should function. Teams may be more hierarchical in some cultures than others, resulting in many inhibitions. As a result the flat team concept upheld by agile methods may not work when cultural groups with different notions of power distance work together.

For example, in a development team composed of American and French developers, the French team members have a greater sense of hierarchy, and will address other teammates formally or informally, depending on the perceived differences in terms of rank and seniority. On the other hand, the American members may be more likely to openly discuss their problems and requests, regardless of the ranks/seniority of the other members. These differences may lead to blunders and mishaps. The French developers may perceive the American developers (whom they consider to be lower in the hierarchy) as disrespectful, while the American developers may think of their French colleagues as condescending.

Another area where problems may arise is in the decision-making mechanism of a team. Developers from a less hierarchical culture may feel that decisions about a particular artifact belong to those working on that artifact. Developers from a more hierarchical culture may feel it is not their place to make any decisions; instead, they report the problems to the management and the management is responsible for making the decisions.

### 6.5 The-customer-is-king (Anti) Pattern

Throughout the course of any project development, the developers frequently need to communicate and negotiate with the clients on issues such as requirements feasibility and changes, and the need for schedule changes. Culture A, in which the sense of hierarchy is less dominant, may permit direct and open communications

between the developers and the clients (e.g., via the customer-on-site practice promoted by agile methods). A more hierarchical Culture B perceives developers to be subordinate to the clients and considers it disrespectful for the developers to directly negotiate with the clients. As such, developers from Culture B report all their problems to management (see [27] for example). The management weighs the severity of the problems against the organization's relationship with the clients and then decides whether to take the issues to the clients. Problems arise when developers from Culture B are unable to implement certain features but the clients are not informed; the management is perceived to be making empty promises. The clients may also perceive the layered communication structure as inefficient.

One factor at play here is the issue of power distance, which determines the position of the developers with regard to the management and client. Another factor addresses the nature of the social structure: work-oriented or relationship-oriented. A work-oriented culture takes a more "objective" stance and focuses on facts. The developers are able to express their concerns even though this may lead to certain dissatisfaction on the clients' part.

## 7. CONCLUSION

While culture and its affect on GSD projects is a large area of exploration, we hope that the result of our efforts will be not only a tangible and utilizable set of results but also a clear path for future research.

As we collect more data from global projects we should be able to identify and describe more such patterns and hopefully provide software project managers with tactics and tools to overcome their negative effects.

## 8. ACKNOWLEDGMENTS

Special thanks to Mackie Chase at the Center for Intercultural Communication at UBC and Stefan Storey.

## 9. REFERENCES

- [1] P. Kruchten, "Analyzing Intercultural Factors Affecting Global Software Development," presented at (GSD2004) 3rd International Workshop on Global Software Development, Collocated with ICSE, Edinburgh, Scotland, 2004.
- [2] F. Kluckhohn and F. Strodtbeck, *Variations in Value Orientations*. Evanston, IL: Row Peterson, 1961.
- [3] G. Hofstede, *Culture's consequences*. Beverly Hills, CA: Sage, 1980.
- [4] G. Hofstede, *Culture and organizations--Software of the mind*. McGraw-Hill, 1997.
- [5] E. T. Hall, *Beyond culture*. New York: Anchor Books/Doubleday, 1976.
- [6] M. D. Myers and F. B. Tan, "Beyond models of national culture in information systems research," in *Advanced topics in global information management*: Idea Group Publishing, 2003, pp. 14-29.
- [7] G. Walsham, "Cross-Cultural Issues in Global Software Outsourcing," Retrieved from [http://www.almaden.ibm.com/institute/pdf/2004/Geoff\\_Walsham\\_1.pdf](http://www.almaden.ibm.com/institute/pdf/2004/Geoff_Walsham_1.pdf), 2004.
- [8] B. McSweeney, "Hofstede's Model of National Cultural Differences and their Consequences: A Triumph of Faith - A Failure of Analysis," *Human Relations*, vol. 55, pp. 89-118, 2002.
- [9] E. MacGregor, Y. Hsieh, and P. Kruchten, "Intercultural Factors in Global Software Development," presented at Canadian Conference on Electrical and Computer Engineering, Saskatoon, Sask., 2005.
- [10] G. Borchers, "The Software Engineering Impacts of Cultural Factors on Multi-cultural Software Development Teams," presented at 25th International Conference on Software Engineering (ICSE.03), Portland, OR, 2003.
- [11] J. S. Olson and G. M. Olson, "Mitigating the Effects of Distance on Collaborative Intellectual Work," *Econ. Innov. New Tech.*, vol. 12, pp. 27-42, 2003.
- [12] S. Krishna, S. Sahay, and G. Walsham, "Managing cross-cultural issues in global software outsourcing," *Communications of the ACM*, vol. 47, pp. 62-66, 2004.
- [13] M. L. Maznevski and K. M. Chudoba, "Bridging Space Over Time: Global Virtual Team Dynamics and Effectiveness," *Organization Science*, vol. 11, pp. 473-492, 2000.
- [14] B. Nicholson and S. Sahay, "Some political and cultural issues in the globalisation of software development: case experience from Britain and India," *Information and Organization*, pp. 25-43, 2001.
- [15] J. S. Olson and G. M. Olson, "Culture Surprises in Remote Software Development Teams," *ACM Queue*, vol. 1, pp. 52-59, 2004.
- [16] G. Walsham, "Globalization and ICTs: Working across cultures." Cambridge, UK: University of Cambridge, 2001, pp. 37.
- [17] S. Whittaker, "Theories and Methods in Mediated Communication," in *Handbook of discourse processes*, A. C. Graesser, M. A. Gernsbacher, and S. R. Goldman, Eds. Mahwah, N.J.: Erlbaum, 2003.
- [18] P. Banerjee, "Narration, discourse and dialogue: issues in the management of inter-cultural innovation," *AI & Society*, vol. 17, pp. 207-224, 2003.
- [19] J. C. Flanagan, "The critical incident technique," *Psychological Bulletin*, vol. 51, pp. 327-58, 1954.
- [20] N. K. Denzin and Y. S. Lincoln, *Handbook of qualitative research*. Thousand Oaks, Calif.: Sage Publications, 1994.
- [21] J. D. Brewer, *Ethnography*. Buckingham, UK: Open University Press, 2000.
- [22] E. Chell, "Critical Incident Technique," in *Qualitative Methods and Analysis in Organizational Research*, G. Symon and C. Cassell, Eds. London: SAGE Publications Ltd., 1998, pp. 51-72.
- [23] L. Markowitz, "Finding the Field: Notes on the Ethnography of NGO's," *Human Organization*, vol. 60, pp. 40-46, 2001.
- [24] EMERGENCE, *EMERGENCE Canada*. Retrieved from <http://www.chs.ubc.ca/emergence/index.html>. Vancouver: UBC Center for Human Settlements, 2003.
- [25] J. O. Coplien and N. B. Harrison, *Organizational Patterns of Agile Software Development*. Upper Saddle River, NJ: Pearson Prentice Hall, 2005.
- [26] J. Hanisch, T. Thanassankit, and B. J. Corbitt, "Understanding the cultural and social impacts on requirements engineering processes: Identifying some problems challenging virtual team interaction with clients," presented at Global Co-Operation in the New Millennium: The 9th European Conference on Information Systems, Bled, Slovenia, 2001.