Influence of Culture on Risks in Offshore Outsourcing of Software Projects: A Quantitative Study on Mum Effect

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Abstract – The growth of offshore outsourcing of software projects is phenomenal. Offshore outsourcing generally occurs from developed nations to developing nations. It is undeniable that several major issues, such as culture, could subtly influence the success of such projects. Mum effect is an important risk in offshore outsourcing of software projects. The degree of intensity and probability of this particular risk is likely to be different in different cultural environments. This study investigates the relationships between mum effect and Hofstede’s cultural dimensions by collecting data from hundreds of Thai IT professionals. Several mitigation strategies are also discussed.

I. INTRODUCTION

Offshore outsourcing of software projects play an important role in the present software industry. Arguably almost all existing IT related tasks can be offshored to developing nations. This irrefutably introduces a number of both foreseen and unforeseen opportunities as well as threats.

A software project has several unique characteristics such as its conceptual nature and its heavy involvement of stakeholders [1]. Although these unique characteristics obviously lead to several benefits, they also cause software projects to be vulnerable to certain risks, especially human-related risks. Certainly, in an offshore outsourcing environment which involves different people from a variety of different cultural backgrounds, the intensity of these risks could increase.

Different cultural backgrounds lead to different risk perspectives and behaviours. For instance, Schmidt et al reports that the risk perceptions of project management from various countries significantly differ [2]. Culture is often suggested as an important risk in offshore outsourcing of software projects. However, most of the time, culture is vaguely referred as a conceptual body. Without a clear definition, it is not possible to investigate the relationships between culture and its consequences. This accordingly limits possible mitigation strategies.

Mum effect, or so-called “code of silence”, is an important risk in software projects [3]. This phenomenon surfaces when one or more project stakeholders decide to remain silent despite being aware of significant problems in their project. The CONFIRM project is often quoted as a case of mum effect leading to a multimillion dollar failure [4]. A previous pilot survey of ours on a group of IT students has suggested that the degrees of intensity and probability of this risk are both influenced by culture [5]. This paper expands the scope of the investigation by including a large number of participants with professional experience. Results of the statistical analyses of the data and subsequent discussions are presented in the following sections.

II. A MULTIDIMENSIONAL MODEL FOR MUM EFFECT

The original factors causing mum effect are defined as fear of consequences, information asymmetry and organizational culture [6]. These factors are further refined in order to cope with additional issues in offshore outsourcing scenarios, resulting in three broader factors, i.e. fear of consequences, communication gap and team solidarity [7]. Hypothetically, each of these factors has relationships with certain cultural dimensions.

In order to define culture, we use the well known Hofstede’s cultural dimensions model [8]. Hofstede’s cultural model consists of five dimensions. Firstly, power distance index (PDI) indicates the degree of societal inequity. Secondly, individualism (IDV) denotes the importance of interpersonal relationships. Thirdly, masculinity (MAS) designates the communal role of different genders. Fourthly, uncertainty avoidance (UAI) specifies the perception towards risks. Finally, long-term orientation (LTO) indicates the preference towards times. Hofstede measured these five dimensions on a scale of 0 to 100 with a few exceptions which exceed the 100 maximum. Table 1 summarizes the cultural dimension scores of major offshore outsourcing stakeholders.

TABLE 1. CULTURAL DIMENSIONS OF MAJOR OFFSHORE OUTSOURCING STAKEHOLDERS [9]

<table>
<thead>
<tr>
<th>Country</th>
<th>PDI</th>
<th>IDV</th>
<th>MAS</th>
<th>UAI</th>
<th>LTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>80</td>
<td>20</td>
<td>66</td>
<td>30</td>
<td>118</td>
</tr>
<tr>
<td>India</td>
<td>77</td>
<td>48</td>
<td>56</td>
<td>40</td>
<td>61</td>
</tr>
<tr>
<td>Malaysia</td>
<td>104</td>
<td>26</td>
<td>50</td>
<td>36</td>
<td>-</td>
</tr>
<tr>
<td>Thailand</td>
<td>60</td>
<td>20</td>
<td>34</td>
<td>64</td>
<td>56</td>
</tr>
<tr>
<td>Australia</td>
<td>36</td>
<td>90</td>
<td>61</td>
<td>51</td>
<td>31</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>35</td>
<td>89</td>
<td>66</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>United States</td>
<td>40</td>
<td>91</td>
<td>62</td>
<td>46</td>
<td>29</td>
</tr>
</tbody>
</table>

PDI = Power Distance Index, IDV = Individualism, MAS = Masculinity, UAI = Uncertainty Avoidance, LTO = Long-Term Orientation

An interesting pattern can be easily observed from Table 1. The supplier countries have similar values to several cultural dimensions while the client nations have very different values. Specifically, the client nations share very similar
scores of high PDI, low IDV and high LTO while the supplier nations share low PDI, high IDV and low LTO values. In contrast, the other two dimensions, MAS and UAI, of the stakeholders are not significantly different. Therefore, they are not included in further investigation. Hypothesized relationships between the three focused cultural dimensions and expanded perceived mum effect factors are shown in Table 2 (where an up-arrow indicates a positive relationship, a down arrow indicates a reverse relationship, and a hyphen indicates no relationship).

<table>
<thead>
<tr>
<th>Group</th>
<th>PDI</th>
<th>IDV</th>
<th>LTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear of consequences</td>
<td>↑</td>
<td>-</td>
<td>↑</td>
</tr>
<tr>
<td>Communication gap</td>
<td>↑</td>
<td>↓</td>
<td>↑</td>
</tr>
<tr>
<td>Team solidarity</td>
<td>↓</td>
<td>↓</td>
<td>↑</td>
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</tbody>
</table>

Three significant relationships between cultural dimensions and mum effect factors were found. The increase in communication gap positively correlated to the increase in PDI and LTO. Team solidarity tended to decrease in high IDV participants. However, no relationships between fear of consequences and the three cultural dimensions were found significant. Nevertheless, the pilot study confirmed that cultural dimensions could influence mum effect factors.

In order to further investigate the phenomenon in a real industrial setting as well as minimize possible inconsistency of the variables, we refined the survey items and performed an exploratory survey to collect data from a large group of experienced IT professionals. We employed Hofstede’s original questionnaire (VSM’08) as well as its original formula to calculate the relative cultural dimensions of the participants [10]. This allowed us to cover all five cultural dimensions. Additionally, we also attempted to measure the relationships between mum effect and perceived mum effect factors. As a result, twenty refined and expanded questions on mum effect and perceived mum effect factors were included in this exploratory study. These questions were measured in the five-point Likert scale with an extra option of ‘Undecided’. The following are examples of these survey items:

- You hesitate to express an opinion different to your supervisors
- You will keep information a secret if it could be interpreted as your poor performance or poor decision making
- You have experienced occasions when your comments fell on deaf ears
- You feel that your project need more monitoring effort
- You would not commit to an action if it might lead to a bad consequence for you
- You feel that revealing negative information would harm your career
- You never act against team consensus even though you disagree
- You try to maintain relationships within the group at all costs

The questionnaire was translated into Thai and was made available online as well as disseminated to Thai IT professionals and software organizations. After inspecting and cleaning the data, e.g. removing data from undergraduate students who have no work experience, we found that of 412 responses, 392 cases were suitable for further analysis.

### IV. Statistical Analyses

We first looked at the reliability of the survey instrument using the Cronbach’s alpha measure. Although the reliabilities of certain survey items were lower than ideal, they were determined as suitable for exploratory research.
Table 4 sums up the Cronbach’s Alpha of each dependent variable. 

<table>
<thead>
<tr>
<th>Item</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mum Effect</td>
<td>.695</td>
</tr>
<tr>
<td>Mum Effect Factors</td>
<td></td>
</tr>
<tr>
<td>Fear of consequences</td>
<td>.616</td>
</tr>
<tr>
<td>Communication gap</td>
<td>.516</td>
</tr>
<tr>
<td>Team solidarity</td>
<td>.496</td>
</tr>
</tbody>
</table>

Pearson’s product moment correlation analysis was conducted to examine the relationships between variables. The analysis showed several interesting results. The statistically significant relationships between cultural dimensions and perceived mum effect factors are illustrated in Table 5.

Table 5. Relationships between cultural dimensions and perceived mum effect factors from the exploratory study

<table>
<thead>
<tr>
<th>Group</th>
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<th>LTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear of consequences</td>
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<td>Communication gap</td>
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<td>Team solidarity</td>
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Surprisingly, unlike the results from the pilot study, we found that an increase in individualism lowered fear of consequences (r = -1.98, sig. = .000) as well as communication gap (r = -1.58, sig. = .002). We could not find a significant relationship between IDV and team solidarity. The analysis also showed that long term orientation and masculinity did not have any relationships with the three mum effect factors. An increase in uncertainty avoidance, on the other hand, seemed to correlate with higher fear (r = .136, sig. = .013) and gaps of communication (r = .134, sig. = .013). Finally and surprisingly, power distance index appeared to have a significant relationship to only one mum effect factor, team solidarity (r = .157, sig. = .003), and their relationship was completely different from our hypothesis. However, in all cases, the coefficient of determination (r2) is less than 0.05 which is considered a small effect [12]. This means that only less than 5% of the variance in mum effect factors is explained by the cultural dimensions.

We also employed Pearson’s correlation to investigate the relationships between mum effect and its perceived factors. Table 6 summarizes these relationships.

Table 6. Relationships between mum effect and mum effect factors from the exploratory study

<table>
<thead>
<tr>
<th>Mum Effect</th>
<th>Fear of consequence</th>
<th>Communication gap</th>
<th>Team solidarity</th>
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<tbody>
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<td></td>
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</tbody>
</table>

As hypothesized, an increase in each mum effect factor correlated to an increase in mum effect. The relationship between fear of consequence and mum effect showed the strongest connection (r = .517, sig. = .000), followed by communication gap (r = .340, sig. = .000) and team solidarity (r = .324, sig. = .000).

V. DISCUSSION

A. Cultural Dimensions and Mum Effect Factors

Our statistical analysis confirms that all perceived mum effect factors are affected by cultural dimensions. Based on the correlation coefficients, fear of consequences is significantly associated with two cultural dimensions, IDV and UAI. The individualists appear to have significantly less fear of consequences from various scenarios.

On the other hand, uncertainty avoidance is the main factor that leads to fear. Yet, it is the only cultural dimension which has a positive relationship with communication gap. It seems that the degree of uncertainty could increase the gap in communication.

Individualism acts as a negative factor for communication gap. The highly individualistic participants have significantly fewer communication gap problems. It is possible that the individualists, having focused on personnel objectives, are less likely to hesitate to pursue their own interests.

The final mum effect factor, team solidarity, only has significant relationships to PDI. This relationship was also seen in an earlier study of ours, albeit with a smaller sample [11]. This surprising relationship between team solidarity and PDI possibly suggests that employees at the same level tend to strengthen their solidarity with their colleagues when they experience increased power distance with their superiors. It is also worth keeping in mind the relatively lower reliability of this part of the survey instrument.

Despite being expected to be the strongest cultural value that influences team solidarity, IDV's negative correlation to this mum effect factor was not significant. It might be interesting to study this issue in a multi-nation context to find out if differences in national individualism can affect this perceived mum effect factor.

B. Mum Effect Factors and Mum Effect

All perceived mum effect factors have moderate positive relationships to all aspects of the mum effect risk at the 0.01 significance level. This confirms the validity of the multidimensional model for mum effect (Figure 1).

Among the three factors, fear of consequences, has the strongest impact on the risk. Fear of consequences has been identified by earlier researchers also as a cause of mum effect [12] and our study confirms their observation in this regard. Communication gap and team solidarity have approximately the same level of influence on mum effect. A detailed examination of the individual items in the questionnaire showed that, amongst all mum effect issues, a hesitation to express a different opinion to the supervisor and a reluctance to speak unless being invited were the scenarios most influenced by mum effect factors.

While it may be easier to understand the influences of fear of consequences and communication gap on mum effect, the role of team solidarity is perhaps paradoxical. Generally, high solidarity among team members is an encouraging factor to any software project. However, when the level of solidarity becomes too high, the team might become overprotective [3]. This situation is likely to encourage the chances of a group mum effect. This research confirms this proposition.
C. Mitigation Strategies for Mum Effect

There are several possible mitigation strategies which are likely to ease or minimize both probability and impact of mum effect. Concerning the mum effect factors, decreasing fear, decreasing communication gap and maintaining an appropriate level of team solidarity are probably the most straightforward strategies to tackle this subtle risk. Firstly, fear of consequences can be lowered by encouraging or rewarding the staff who professionally exposes certain problems. Fear can also be reduced by establishing an affable and rational organizational environment. Secondly, communication gap can be reduced by widening the communication channels, especially by providing an anonymous channel. Other communication difficulties such as language and culturally influenced behaviors could be dampened by increasing awareness and understanding. Finally, the team solidarity should be kept at an appropriate level. Too strong a team solidarity encourages the members to be too protective of each other. On the other hand, a weak team solidarity might result in teamwork problems.

From the cultural perspective, reducing power inequity and uncertainty as well as promoting individualism seem to be effective strategies to challenge mum effect. The supervisors should encourage their subordinates to report problems. All opinions, albeit a negative one, must be acknowledged and acted accordingly with justification and fairness. Autocratic management should be minimized. Likewise, organizational uncertainties should be minimized by establishing a set of rules, regulations or guidelines for certain actions. Individual rewarding could also help boost the competitiveness of the employees.

VI. LIMITATION AND FUTURE RESEARCH

The major limitation of this research is that the participants are all from a single country. Therefore, they are likely to share a very similar cultural background. Also, Hofstede’s value survey model is intended to be used at the national level. The established cultural dimension scores are often argued on its applicability to an individual level. However, in this research, we attempted to apply Hofstede’s survey to an individual level in order to determine their relative cultural dimensions. This method, although not supported by Hofstede, seems to be a reasonable approach to tackle the aforementioned issues. A future replication of this study on a wider scale, e.g. using international participants, could further improve the generalisability of the findings.

VII. CONCLUSION

Mum effect is an important risk in offshore outsourcing of software projects. This study confirms that this risk is influenced by certain cultural dimensions. Based on the statistical result, an increase in power inequity, collectivism, and uncertainty avoidance can lead to mum effect. This unfortunately matches cultural patterns of the leading offshoring suppliers. Thus, our finding suggests that the likelihood, and also possibly the impact, of mum effect are likely to be higher in offshoring supplier nations, however, it is worth noting that while the risks are statistically significant, their practical effect is indeed small as shown by the coefficient of determination.

Amongst the three mum effect factors, fear of consequences is the most influencing drive of mum effect. Nevertheless, all of the three factors are significantly related to the risk. Therefore, in order to efficiently mitigate mum effect, all three factors need to be appropriately approached.

Successful risk mitigation is an important step for increasing competitiveness. This paper suggests several straightforward but effective strategies such as introducing additional anonymous communication channels, encouraging feedback from subordinates, and increasing awareness on certain aspects.

Culture could influence risks in many possible ways. However, it is not impossible to manipulate and eventually control these risks. A better understanding as well as a thorough awareness is a first but essential step for managing these undesirable outcomes.

REFERENCES


