An Organizational Development Study of the Impact Of Cultural Factors on the Implementation Of the Six Sigma Methodology in Southern China

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Abstract
Research and empirical study from organizational development (OD) perspective on the Six Sigma methodology as a means of quality management in China is limited. It offers an opportunity for a mixed methods study of this present research, which examines the impact of cultural factors on Six Sigma implementation, and analyzes the respective variables that may affect necessary Six Sigma outcomes. The theoretical underpin is the change process theory formulated by Porras and Robertson (1987). This study measures organizational culture factors by utilizing a revised (or shortened) Organizational Culture Profile model (Sarros et al., 2005; cf. O'Reilly III et al., 1991), and looks at Chinese national culture factors by employing the Chinese Value Survey (Bond et al., 1987).

Only in the last decade researchers have explored into studies in the relationship between the "soft" factors of culture and the concerned business management initiatives (Detert et al, 2000; Zu et al, 2006; Naor et al.,, 2008).

The result of this research will add knowledge to academic research of the role of organizational culture factors in quality management by Six Sigma. It also will give relevant and real world reference to practitioners and industrialists of the position of Six Sigma as they design or consider strategic and implementation plan for the Six Sigma methodology.

Key Words: *Organizational Development, Quality Management, Six Sigma, Culture, Implementation.*

1. Introduction

Implementing Six Sigma is a change process from management decision for a planned change in preparation for and application of Six Sigma aiming at the designed outcomes. This study measures "soft" factors of culture that affect the implementation process by utilizing two research models: The revised version of Organizational Culture Profile (Sarros et al., 2005) and the Chinese Value Survey (Bond et al., 1987) .

The Six Sigma methodology has a development history of over two decades in Greater China. The current Chinese experience is: It becomes prevalent that, explicitly or inexplicitly, Six Sigma is either resisted or modified by the workforce in Chinese culture of operation. This study looks at the problem in Southern China. The survey questionnaire is launched and completed in Hong Kong, where Six Sigma has some 30 years of experience, and is the strategic gateway for Western investment in China and for Sino-global business and trade. The location of survey is deemed appropriate

Delivered online by Qualtrics software system, the survey questionnaire gathers information and collects data from academics, consultants and professionals who are actively involved in research, and in practical use and application of Six Sigma in time of survey.

1.1 Research Problem

The research problem of this study proposes: The cultural factors can have a positive, significant impact on Six Sigma implementation, as a means of organizational development.

After three decades of practical application and industrial experience, Six Sigma is treated as one of the few popular management drivers in the business world, and has been mixed with other methodologies rather than treated as the selected, sole, company-wide, strategic initiative as instituted by Motorola. Apparently, the original Six Sigma designed in the mid-1980s looks not as useful or popular today.

When Six Sigma runs counter to existing culture, value system and mind set in the workplace, cultural incongruity may impede its application, and may eventually cause ultimate failure of Six Sigma projects.

If Six Sigma can be a successful management initiative simply by rolling out the structured, disciplined, engineering tools without consider other factors, is a question that comes under increasing attention. Investigating into the cultural factors that can influence Six Sigma implementation apart from its mechanical procedures and processing is the central theme of this study.

1.2 Challenge of this Research

A big challenge is that this study tries to look at the "soft" factors of cultural issues in reality of a business initiative which is essentially based on and work for project success in terms of "hard" factors. Dealing with the research topic from both exploratory and confirmatory perspective, this study attempts to provide a solution to the business decision makers and Six Sigma professionals.

This study investigates that how a successful methodology in the West can produce the designed results in the Chinese environment, and what Six Sigma can do to yield the planned and designed outcomes in Chinese territories, and probably in the Chinese way of operation. This study also explores into the strategic factors that are imperative to the success and failure of Six Sigma.

The present researcher is active in running Six Sigma projects in both the manufacturing and servicing industries. There is still growing demand for Six Sigma in the market. This study thus helps professional practitioners to gain conviction and confidence in the exercise and execution of Six Sigma. On the academic side, it can induce further study and can contribute to knowledge.

2. Literature Review

The research community has provided a rich source of information about Six Sigma which gives insight into application and implementation of the methodology. These studies are relevant for an appropriate understanding the casual chain of Six Sigma: objectives, methods, processes, and outcomes. They assess problems in different stages of OD intervention by Six Sigma

To further understand Six Sigma as an instrument or a type of organizational change (OC), it is also necessary to examine knowledge of OD and OC, particularly within the context of China. As this study takes cultural factors as essential study variables in the change process, sections in this chapter encompass a wider search and review on culture theories and studies, organizational and national cultures, and Chinese cultural characteristics and guanxi issues.

2.1 Six Sigma Overviews

Prior researches (e.g., Coronado & Antony, 2002) recognize the importance of cultural elements in the introduction of a new management strategy. However, it has been argued that most organizations ignore the importance of the cultural component as they consider new business initiatives like Six Sigma. Thomson (2003) pointed out that it is necessary for decision makers to handle the compatibility between Six Sigma assumptions and the current culture of an organization when considering a cross functional Six Sigma project. Chan (2006) studies the implementation of Six Sigma in companies in Hong Kong and the Pearl River Delta regions. He designs the readiness assessment model (RAM) to evaluate the organizational and cultural factors and measure the readiness of the case companies before implementing Six Sigma.

There are rooms for further study about the relationship of organizational culture, corporate culture, professional culture, Chinese national culture, and work culture with operations and quality management. Research on the "soft" factor of culture is relevant.

2.2 Six Sigma Implementation

Literature illustrates a number of study directions and aspects of Six Sigma implementation. Huo (2006) raised the importance of TQM experience and other quality initiatives before implementing a Six Sigma planned change. The basic organizational and operational hurdles are in the start-up stages (Gijo & Rao, 2005), preparation of cultural and organizational aspects as well as adequate knowledge sharing capacity (Pettigrew, 1998)

There also exists a close relationship between Six Sigma implementation and organizational culture, and during the last decade, researchers began to link Six Sigma implementation with

organizational culture (Szeto & Tsang, 2005), and mapped Six Sigma practices with organizational culture (Zu et al., 2010).

It is also helpful to look at case studies for understanding implementation in practice. The multilevel case study by McAdam and Lafferty (2004) concentrated on measures and results of Six Sigma in statistical control and strategic change respectively. It embraced process and people, and highlighted the evaluation process for the current culture of organization. Another case study (Nonthaleerak & Hendry, 2006) emphasized on a couple of areas of weakness within Six Sigma implementation i.e., the mental fear of statistical and quality tools, and the crucial factor of the presence of Six Sigma professionals. These two case studies show situations and issues of implementation and provide more practical advice to practitioners.

2.3 Soft Factors of Culture

The study of soft factors of culture can be found in other research works. Nahm et al. (2004) tried to examine "soft issues" of organizational culture by employing Schein's framework (1986). The model was used to assess how organizational culture (focused on espoused values and beliefs) impacted time-based manufacturing practices and performance. The result showed positive relationships between the two sides, and organizational culture played a positive role in improving performance.

Gregory et al. (2009) made another attempt on the relationship of "soft" factors of culture and effectiveness by examining employee attitudes. It was observed that culture influenced employee attitudes, and in turn influenced outcomes. The survey in this present study will cover elements in these levels of organizational culture. Giving a great deal of consideration to "soft" skills for the Six Sigma process change, Pinedo-Cuenca et al. (2012: 294) identified "organizational culture which encourages communication and collaboration" as one of the five success factors for SMEs' introduction of Six Sigma.

Zu et al. (2010) performed a survey on fourteen factors, and nine of them are soft factors. Lewis et al. (2006) explore the "soft" and "hard" factors on TQM implementation. This exploratory study of two groups of 13 "soft" and 12 "hard" factors demonstrates that " the top ten critical factors are composed of seven soft factors and three hard factors", though "soft factors are generally difficult to be measured and assessed" (p.545). Fotopoulos and Psomas (2009) also studied "soft" and "hard" TQM elements. It findings show that the performance is mainly influenced by "soft" elements.

These previous studies prepare grounds for the present researcher to research on the cultural factors in Six Sigma implementation.

2.4 Change Process Theory

Organization Development (OD) is an area of social study. Many researchers have contributed on OD theories. Porras and Robertson (1987) identify two types of OD theories: change implementation theory and change process theory. The change process theory is constituted of four types of variables: 1. target variables; 2. manipulable variables; 3. mediator variables; and 4. moderator variables. Porras and Robertson explain, "The goal of change process theory is to explicate the causal mechanisms through which changes in various organization characteristics lead to desired changes in the targeted outcomes." (1987:50)

According to Porras and Robertson, the change process theory "explains the dynamics of the change process by specifying (a) the variables that are manipulable in the change effort, (b) the intended outcome of the change attempt, (c) the casual relationships between manipulable, mediator, and outcome or target variable, and (d) the effect of relevant moderator variables." (1987: 29-30)

The Six Sigma is a methodology that effects planned change which, in operation, emphasizes on core processes and targeted outcomes. The organizational effectiveness and efficiency will be enhanced and re-equipped by successful implementation of this methodology. In this connection, the change process theory is an appropriate underpinning to guide the research objective of this study.

2.4 Culture Theories

Culture in organizational context is the focus of this study, as it looks at organizational development and its cultural implications. In the last two decades, researchers suggest their own sets

of cultural dimensions and orientations. They include the more systematic studies of Hofstede et al., Trompensaars and Hamden-Turner, and the more recent GLOBE project by House et al.

The first large scale, transnational, organizational and people management study is the model survey by Geert Hofstede (1980 and revised in 1986). This model postulates five dimensions of culture (power distance, individualism vs. collectivism, masculinity vs. femininity, uncertainty avoidance, and long-term vs. short-term orientation) which provides relevant information for this study. Another model of theory is from Fons Trompenaar who identifies four types of organizational culture: family, Eiffel Tower, guided missile and incubator

As Chinese culture is the context, the present research employs the Chinese Culture Connection model (Bond, et al., 1987), which was developed in response to Hofstede's Chinese Value System model to measure culture. It helps understand, analyze and classify the data collected from multiple individual interviews and relevant literature. The research survey by questionnaire on Six Sigma academics, experts and practitioners will report results and will suggest future study directions.

2.5 Organizational Culture

It can be noted from literature that, generally, organization researchers did not distinguish between organizational culture and corporate culture (e.g., Denison, 1990; Schein, 1985). However, Rollins and Roberts (1998) distinguished work culture from national, regional, and ethnic cultures, but defined work culture in a similar way to organizational culture. Martinsons et al. (2009) set culture in four demarcations: societal (national), industrial, professional, and organizational. This is relevant and useful in formulating ground work for this present study, and offers basic ideas for designing and choosing a suitable model in the survey research of this study.

First and basic is to measure culture. As part of his long-term research on organization, Pettigrew (2001) explored the study of organizational cultures anthropologically by elaborating the key concepts of culture. Hofstede et al. (1990) conducted a dual approach (qualitative and quantitative) study in measuring organizational cultures. In that study Hofstede et al. approached their research by first drawing six characteristics of organizational culture from previous studies: "(1) holistic, (2) historically determined, (3) related to anthropological concepts, (4) socially constructed, (5) soft, and (6) difficult to change." (1990: 286) Their research confirmed two basic features about organizational culture as "shared perceptions of daily practices" is the "core" thing; and measurement is varied according to "the demographic criteria of nationality, age, and education" (1990: 311). Hofstede (1994) investigated cultural factors and stated that international business management was to handle coexisting differences within national and organizational cultures. He commented, "Organizational cultures are somewhat manageable while national cultures are given facts for management" (1994: 1). The studies of Pettigrew and Hofstede paved way for attempts to measure organizational culture.

Detert et al (2000) proposed a culture of collaboration for organizational learning, adoption of specific innovations, and pluralistic reality of subcultures. These are important components to improvement and change initiatives.Using the GLOBE framework, Naor et al. (2010) found that organizational culture had a significant impact on manufacturing performance, but national culture had a corresponding weak influence. MNCs establish local organizational cultures in transnational manufacturing processes and operations.

The survey design of this present research will investigate if organizational culture, Chinese national culture, or a combination of both will affect Six Sigma implementation.

2.6 Organizational Culture Profile (OCP)

O'Reilly III et al. (1991: 488) proposed the organizational culture profile (OCP) firstly for examining "person-culture fit and its implications for work attitudes and behavior". Secondly, drawn on previous studies of researchers, the OCP set 54 items to examine "individual and organizational values". Thirdly, the OCP "was developed and used to measure person-organization fit" (O'Reilly, 1991: 494). This present study utilized the third way of OCP for measuring and interpreting organizational culture in the course of implementing Six Sigma as an organizational change program.

Sarros et al (2005) developed distinctly the revised version of the OCP for use in "a more user-friendly" way, and for overcoming the originally complex-designed data collection procedures.. This version of OCP is a seven-factor structure of 4 value-items each (28 items): (1) competiveness, (2) social responsibility, (3) supportiveness, (4) innovation, (5) emphasis on rewards, (6) performance

orientation, and (7) stability. This framework is relevant to the present study as the revised OCP is robust, and "may facilitate the monitoring of organizational cultural change in conjunction with changes in values, leadership styles, and approaches to problem solving" (2005: 176).

The study adopts five factors of the OCP by Sarros et al., which match processes and procedures of the Six Sigma implementation, and the casual mechanism that produces the outcomes. This present study applies them to test against Six Sigma implementation and outcome factors.

2.7 National Culture

Researchers generally employ Hofstede's five dimensions, and few utilize Trompannars' five orientations. Developed partly from Hofstede's cultural components to nine core dimensions, the more recent Project GLOBE by House et al. (2001) is reviewed and applied by researchers more regularly in recent years (e.g., Leung et al., 2005; Minkov, 2013).

Another point of study is the existence of subcultures in a populace, heterogeneous country. Dibella (1996) found that culture could be a detrimentally negative factor to planned organizational change. This is particularly true "in multiple cultural systems concurrently at the sub-cultural, organizational, and societal levels" (1996: 368). Regarding sub-cultural elements, from another angle, Huo and Randall (1991: 160) took a decompositional approach for "investigating subcultures within national boundaries", assuming that China is culturally heterogeneous (cf. Huo and Glinow, 1995), instead of a compositional approach which assumes an overall national culture.

Whether Six Sigma as an organizational change is culture bound, and what aspects of culture affect implementation of this methodology have been long-asked questions. Pisani et al. (2009: 1135) advised, "There is a clear need for research to assess the impact of national culture on the stages of the Six Sigma methodology. National culture has the potential to affect the way in which Six Sigma is implemented in internal consulting efforts and its overall effectiveness." This present study will examine the impact of both organizational and Chinese national cultures on Six Sigma implementation. Survey results will report findings in both Hong Kong and Southern China.

2.8 Chinese Culture of Guanxi

The concepts of guanxi take roots from Chinese feudalistic family traditions (Dunning & Kim, 2007; Rarick, 2009), and Confucianism which "emphasizes authority, order, harmony, loyalty and personal relationships. It assumes that people exist in a web of harmonious and orderly relationships" (Zhang & Zhang, 2006: 378). The secondary meaning of guanxi is that of an interpersonal relationship. Organizational network relies on the individual guanxi established (Tsang, 1998). A Chinese "turns to his or her guanxiwang, or 'relationship network', for help" (Hutchings & Murray, 2002: 185) when encountering personal or organizational problems. This relationship can tap deep to form network which brings out the issues of "face", trust, reciprocal obligation, and exchange of favors. The guanxi network can build up for family members and relatives, for friends, neighbors, colleagues and classmates, and even among strangers.

Research identifies that individual guanxi has influence on organizational performance and affects organizational dynamics (e.g., Luo & Chen, 1997; Zhang & Zhang, 2006). However, Tsang (1998) found that guanxi for competitive advantage had little theoretical basis. Zhang and Zhang (2006) investigated work group emotion and Chinese guanxi culture, and found that "group emotion is deeply affected by national culture" (2005: 81). Huang et al. (2008) concluded that the cultural factors of face and guanxi affected knowledge sharing in organization.

This review of guanxi has two main significances. First, the social exchange aspects of guanxi that build into a work culture the element of mutual trust in the workplace can help understand the effectiveness of organizational development by Six Sigma as a means of intervention. Second, the issue of guanxi can help explain the employees' mind set, attitudes and behavior towards work processes and new business systems. For this reason, the questionnaire survey will explore the variablesChinese Value Survey and its influence to Six Sigma implementation, and is useful for understanding the influence of Chinese culture to this foreign imported methodology.

2.9 Chinese Value Survey (CVS)

The CVS is divided into four factors of altogether 40 value-items as integration, Confucian work dynamism, human-heartedness and moral discipline. Except uncertainty avoidance, the Hofstede

model and CVS were largely similar and common. These cultural dimensions are universal human traits. CVS can be acted as a "cultural synergy" to complement national culture dimensions in management studies.

The CVS can also be employed in surveys for different purposes and levels of survey population (e.g., Matthews, 2000). This present study will employ 3 dimensions of 18 selected and suitable CVS item-variable to examine the influence of Chinese values to Six Sigma implementation.

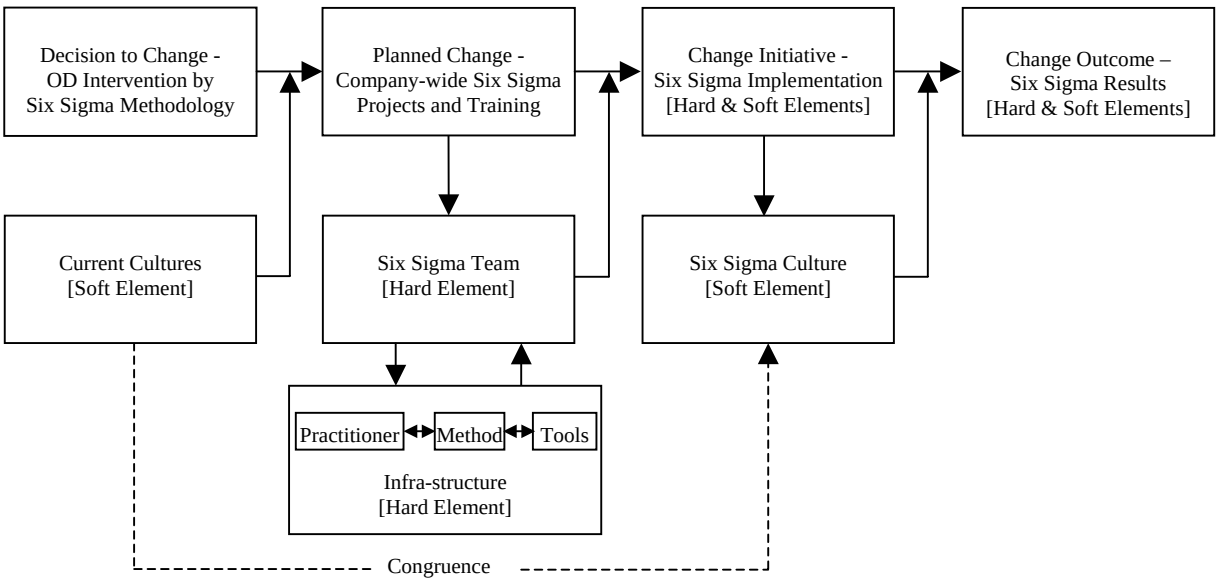
2.10 Summary

Given that this study is focused on Six Sigma implementation, the larger part of this study is engaged in the literature of three subject matters: Six Sigma, organizational development and change process theory, and culture. The literature of these subjects encompasses the scope of the three research questions, and is helpful in identifying OD intervention by Six Sigma and OC outcomes, the infra-structure of Six Sigma implementation in terms of input, process, and output, and the more abstractive relationship of congruence between Six Sigma and the culture factors.

3. Research Framework and Methodology

The map below provides the layout of research, which examines the impact of cultural factor on Six Sigma implementation, and analyzes the respective variables of the process by applying the change process theory (Porras and Robertson, 1987, 1990).

FIGURE 1: CONCEPT MAP – ORGANIZATIONAL DEVELOPMENT BY SIX SIGMA



Following the change process theory model, this map emphasizes on the top two rows. The third row illustrates a value-item box which extends from the moderator variable of the Six Sigma team. It is an infrastructure of three elements established and used for Six Sigma implementation.

The elements of Six Sigma implementation are framed into the change process model. The corresponding variables are as follows: planned change through the application of Six Sigma, change activities of Six Sigma, change actions of Six Sigma, and finally the change outcome of Six Sigma. The upper row of this table shows the aggregated, causal relationship of four change variables in the process chain in terms of Six Sigma.

The middle row notes both soft and hard factors of Six Sigma which moderate between these variables of the change process. The first and third moderator variables are soft factors of culture. In the change process, the current cultures are to cause either positive or negative change, and converge or diverge with the new Six Sigma culture for Six Sigma implementation. This is a central point of

research. The survey result will reveal how and what cultural factors show consistency and confirm hypothesis.

The middle moderator in the lower row represents the Six Sigma infrastructure, which is extended from hard elements of the Six Sigma team. The three components are core, hard, building elements of Six Sigma in organization.

3.1 Research Questions and Hypotheses

The following research questions are to be considered:

1. What strategic factor must the management emphasize for organizational development by Six Sigma implementation?
2. How do cultural characteristics impact Six Sigma implementation?
3. What factors influence the ultimate outcomes of Six Sigma?

These three questions cover the research subjects, and are designed to deal with the research problem, and to produce the research results. Three hypotheses on Six Sigma implementation and ten hypotheses on Six Sigma outcomes are proposed in this study. (See Table 1)

3.2 Research Method

This research takes a positivist approach, and employs a mixed methods study. Comprising multiple individual interviews and a two-stage survey, this method of study is considered suitable for it can collect a wider range of respondent information and data for analysis of the validity and reliability of the research variables.

Two series of multiple individual interviews, one before the survey and another one after the survey, are conducted for Six Sigma academics, consultants and professionals for sharing knowledge and experience of Six Sigma implementation in Hong Kong and in Shanghai.

The survey which is the mainstay of study follows the variables in the concept map and the three research questions. The survey questions are designed to explore into factors and confirm study models. The number of participants counted is about 1750. Each question is measured on 7-point Likert scale. The Cronbach's alpha is used to assess reliability.

4. Research Results

The survey data was from a two-stage questionnaire which was sent to the participants in a time frame of some two weeks. They were checked through. Missed data was confirmed from the respondents either by phone or email.

4.1 Pre-Survey Interviews

These 5 main points marked out, to a bigger or lesser degree, are shared subjects in the two series of interviews:

1. Objectives,
2. Workplace culture,
3. Continuous improvement culture,
4. Efficiency and effectiveness factors, and
5. Outcomes and results.

4.2 Survey by Questionnaire

The two-stage survey was run online. The population size of this 2-Stage survey was counted 1,713. Raw result showed that Part 1 had 328 responses, which was 19.1% of the population, and Part 2 had 162, which was 9.5%. The edited feedback of Part 1 was 144 responses, and Part 2 was 116

responses. Thus, there were 116 sets of completed Part 1 and Part 2 responses of the survey (N=116). This was 6.8% of the population.

The survey shows that, 50% (58) of respondent finished Part 1 within 10 minutes, 23% (27) finished it between 10 to 20 minutes, and 27% (31) took more than 20 minutes to finish it. For Part 2, 61% (71) finished it within 10 minutes, 23% (26) finished it between 10 to 20 minutes, and 16% (19) took more than 20 minutes to finish it. 50% of the respondents finished Part 1 in 10 minutes, and 61% completed Part 2 in the same time frame.

The questionnaire fulfilled the time factor, and the other suggestions made by the academic and professional reviewers of the pilot survey

4.3 Survey Analysis

In this survey, the results were examined by two sets of factor analysis for testing the two lines of hypotheses.

First exploratory factor analysis (EFA) is employed. In the EFA, the alphas were above .8. It is therefore claimed that internal consistency in these three construct models was well reliable. The three models: objectives, activities and actions, are good and valid for further analysis of hypotheses.

The EFA for the two constructs: quality culture (4 items) and efficiency (3 items) were valid (cost reduction at .82, bottom line result at .73, and cycle time improvement at .69), and 3 items of quality culture were also well acceptable (People's knowledge of quality services/ products at .86, corporal team spirit at .78 and corporal continuous improvement culture at .75), but the external factor, "open recognition as a quality management body" scaled at .58.

Cronbach's α for the two constructs were above .8. It is claimed that internal consistency of the item-variables in these two models was also well reliable. Two constructs of Six Sigma outcomes: quality culture (QC) factor and efficiency (E) factors, were found valid.

The CFA for the 5 constructs of OCP model. It shows a reasonable and acceptable model fit (Brown, 2006). The CFA for the three CVC constructs have reliable alpha scores.

In the CVC variables, integration (M = 5.20, SD = .98) and personal (M = 5.18, SD = .90) factors were moderately well applied, but Confucian (M = 4.95, SD = .88) looked slightly well applied only.

In the OCP variables, performance (M = 5.35, SD = .99) and competitiveness (M = 5.26, SD = .99) were well applied values in these companies, supportiveness (M = 5.19, SD = .97) showed itself an emphasized value, but rewards (M = 5.05, SD = 1.07) and innovation (M = 4.90, SD = .97) are moderately emphasized only.

The third thing, which is noteworthy, is that the quality culture factor does not correlate significantly with the three CVC factors: integration (r = .17, ns), Confucian (r = .10, ns), and personal (r = .16, ns). This shows primarily that the all Chinese culture characteristics do not contribute to the building of Six Sigma quality culture. On the other hand, as these two sides were not correlated, Chinese culture may not cause negative influence to Six Sigma implementation and its intended or desired outcomes.

Next point to note is that most independent variables show positive correlation between each other; only Six Sigma activities and OCP – performance (r = .20, ns) are not significantly correlated. As to the dependent variables, the correlation between efficiency factors of outcome with the independent variable OCP – innovation (r = .17, ns) is not significant, and so does its correlation with the quality culture factors of outcome (r = .04, ns). This shows that innovation culture may not affect Six Sigma implementation and generation of the necessary outcomes

4.4 Factor Analyses

Based on the first EFA study and the correlation analysis above, the logistic regression analysis was done for the three Six Sigma constructs: objectives, activities, and actions.

4.4.1. Logistic Regression

In the survey, three status of Six Sigma implementation were reported: The A status is completion of Six Sigma, the B status is continuation with Six Sigma, and the C status is abandonment of Six Sigma. The logistic regression was furnished to assess the companies implementing the Six Sigma methodology.

The A and B status were merged as group 1 for companies completed/continuing Six Sigma, and the C status was considered as group 2 for companies abandoned Six Sigma. Of the 116 completed sets of survey return, group 1 has 92 companies and group 2 has 24 companies.

The analysis confirms hypothesis 1a about objectives (sig. = .02): Six Sigma implementation is positively related to Six Sigma objectives. But hypothesis 1b: Six Sigma planned activities (sig = .28) and hypothesis 1c: Six Sigma actions (sig. = .88) are not supported.

4.4.2 Regression Analysis

A regression analysis was done to assess the independent variables that might have impact on quality culture and efficiency, the two factors of outcomes.

Of the five OCP variables under test for efficiency, only supportiveness ($b = .42$; $p < .05$) was positively related. The other four variables: performance ($b = -.32$; ns), reward ($b = .06$; ns), competiveness ($b = .31$; ns), and innovation ($b = -.19$; ns) were not significant.

OCP supportiveness is positively significant to both quality culture and efficiency; innovation is however negatively significant to quality culture and is not significant to efficiency.

Thus, according to the above analysis of the two propositions, about hypothesis testing on the OCP models, hypotheses 2a: “Six Sigma implementation is positively affected by the application of organizational culture of supportiveness” and 2f: “2f. “The outcome of Six Sigma efficiency is positively affected by the application of organizational culture of supportiveness” are confirmed. It is worth notice that hypothesis 2e. “The outcome of Six Sigma quality culture is positively affected by the application of organizational culture of innovation” is negative, and is not supported.

However, the other seven hypotheses: 2b, 2c, 2d, 2e, 2h, 2i and 2j were not supported.

5. Research Findings

A number of propositions were tested, and significant supports were found for the five of them. Following is a discussion of the five significant findings:

5.1 The Importance of Change Objectives

What stands out most clearly in the study is the importance of setting clear objectives for the Six Sigma implementation. Logistic regression analysis shows that failing to create a set of clear objectives for the Six Sigma initiative is associated with a significantly increased likelihood of abandoning the Six Sigma initiative. The noteworthy point here is that the content of the objective, whether to pursue

quality improvements or as a means of seeking legitimacy and enhancing reputation, does not appear to matter.

Unlike business process re-engineering (BPR) for OD and OC which drives change objectives without conforming to a formal, explicit or universal recognition, Six Sigma projects are to set objectives for definite planned activities and actions of implementation. BPR contains "specific OC manipulations" (Hempel & Martinsons, 2009: 470), and TQM emphasizes baseline outcomes (Detert et al., 2000) for auditing. Nonetheless, these two and other initiatives do not have a certification body and system to rectify project results like Six Sigma. Six Sigma has developed standards to certify projects and professionals. Six Sigma is able to check real or fake projects or personnel whether the program is introduced for quality improvements, or as a means for legitimacy or reputation. However, BPR and TQM have procedures to audit results, but do not have the mechanism to perform certification.

The Six Sigma experts agreed that setting clear objectives was critical for creating a sense of purpose, although there was some disagreement over how precise and specific the objectives needed to be.

5.2 Organizational Culture Influences Quality Culture and Efficiency

Secondly, the quality culture and efficiency factors in the results show that both soft and hard factors are core to Six Sigma success. The effect of both factors gives hints to the inter-dependency of these two factors in the process change of Six Sigma. Company management is to set goals like bottom line results, cost reduction programs and cycle time efficiency. However, it is also imperative for them to consider quality elements like corporate continuous improvement culture, corporate team spirit, and employee knowledge of quality services and products. This is too a definite reference to decision makers for quality management by Six Sigma.

Both academics interviewed confirmed knowledge and experience. Consultants interviewed acknowledged the importance of these two factors. The practitioners also agreed to the result.

5.3 The Role of Chinese Value Characteristics

It was predicted that Six Sigma implementations would be influenced by aspects of Chinese culture (cf. Hempel & Martinsons, 2009). However, the analysis failed to find any significant effects. While one must be cautious in discussing non-results, it is interesting that it appears that Chinese culture should not be taken as a convincing element for arguing against implementing the Six Sigma in Chinese organizations or MNCs in China.

The Six Sigma experts expressed interest with this point, with one commenting that this was a "new and interesting" finding. This respondent elaborated that people could not simply argue that cultural issues can obstruct Six Sigma from yielding successful results in China. As the survey was carried out in Hong Kong, this interpretation of the results should be supported by further quantitative and qualitative studies.

5.4 The Positive Role of Supportive Culture

Supportive culture is the only one of the five OCP dimensions that indicates a positive impact on Six Sigma in the analysis. Despite the finding that Chinese culture does not appear inconsistent with Six Sigma, the implementation of Six Sigma can still represent a substantial change for a Chinese organization.

This result makes it clear that having a supportive culture is very helpful in overcoming resistance to this change. Supportiveness has a positive relationship with both Six Sigma outcomes studied, with a supportive culture being associated with the creation of a Six Sigma quality culture, as well as being associated with the achievement of the Six Sigma efficiency goals.

The Six Sigma experts agreed, stating that their experiences have indicated that supportiveness is needed to overcome both passive and active resistance to the implementation of Six Sigma.

5.5 The Negative Role of Innovative Culture

The study found that an innovative culture of OCP is not positively related to efficiency and quality culture outcomes. In fact, the most controversial finding is that an innovation culture appears to impede the ability to create the Six Sigma quality culture. This unexpected finding requires careful thought, because if replicated in other studies has interesting implications for the type of organizations suited for Six Sigma initiatives.

Innovative culture in employee is the creative characters and thinking that inspire and drive change. It is the work of an innovator. This study deal with Six Sigma process designed for a Six Sigma executor to implement and perform it to perfection. This is the work of an executor. Six Sigma is a structured and rational approach to the design of quality initiatives, and requires an acceptance of discipline and consistency of action to successfully implement.

Innovative culture appears to represent a mindset embracing a much more flexible and risk-taking approach. It looks this innovative mindset is inconsistent with the mindset underlying Six Sigma, making it difficult to accept the structured work and improvement process mindset used by Six Sigma to generate the intended outcomes and gaining successes.

The Six Sigma experts had mixed reactions to these findings, but agreed that they were important to examine in detail. One expert pointed out that Six Sigma was in itself an innovation, which appeared contradictory. Another expert agreed that this result was true for big and well-established companies for their drives are to optimize existing business performance, but thought that this would not be true of smaller or younger companies. Unfortunately, the sample size in this study was not large enough to permit testing of this. Overall, this particular finding was surprising enough to the experts that it will need to be examined in greater detail in the future.

In addition, this study also tests the effects of Chinese value characteristics upon Six Sigma implementation. The three CVS dimensions were chosen for the test: Integration, Confucian work dynamics and personal. The result is that Chinese values do not aid or obstruct Six Sigma implementation. Moreover, the three guanxi variables (reciprocation of greetings, favors, and gifts; protecting your “face”; and, respect of tradition) in the Confucian dimension of CVS do not have significant influence in the organizations’ running of Six Sigma. This can represent a regional characteristic for the survey was performed in Hong Kong which is a special administration regional of China, and is a much westernized metropolitan city in the Chinese soil. Three points of interest can be drawn from this survey result. First, the family-bound and socially-based nature of guanxi is not reflected in conventional practice in the Six Sigma workplace in Hong Kong. Second, unlike the prediction of previous study reviews (See sub-section 2.3.3.1), guanxi does not have a strong impact on organizational behavior of companies implementing Six Sigma in Hong Kong or Southern China. Third, the influence of guanxi on firm operation in China is not observed in Six Sigma companies in Hong Kong or Southern China.

6. Discussions

This study handles the research problem in terms of the variables of the change process theory. It can be concluded that the successful accomplishment of Six Sigma is due to setting clear objectives, with the presence of supportive characteristics in the employed establishment of an organization which breeds a Six Sigma quality culture, and, having built a Six Sigma infrastructure, practices the methodology for Six Sigma efficiency.

6.1 Study Limitations

This study assumed that cultural factors can affect the process of implementation of Six Sigma and its ultimate success. It focused on “soft” factors, and limited the scope of the survey to factors on the soft side. The scientific and engineering variables underpinning Six Sigma were not included, and so the structured DMAIC method of Six Sigma is not examined in the survey. Excluding those measurements and data on quality improvement tools and techniques thus reduces the overall explanatory power of these results.

The study utilized selected dimensions from the Chinese Culture Survey and Organizational Culture Profile. Dimensions were selected which suit the Six Sigma nature and characteristics, and

which focused on the implementation process only. Thus, while the study focused on soft factors, the study only examined a limited number of potential soft factors.

The study was performed using respondents from Hong Kong and Southern China. Strictly speaking, given the substantial regional differences throughout Chinese in market development, the significance of the survey is applicable to these areas of China, with the results only giving a partial or regional picture of Six Sigma implementation in China. The Six Sigma methodology has been widely used in the last decade in Eastern China, Central China and Northern China. However, given the broad nature of the Organizational Culture Profile and Chinese Culture Survey, these results are likely to generalize throughout China, but data from other regions of China will be needed to confirm this.

One significant drawback of this research is that data was often retrospective in nature, and thus subject to recall biases. Longitudinal comparative and case studies may provide a more complete, and thorough understanding of the research topic.

Finally, the survey utilized online surveys sent to members of the Six Sigma organizations in Hong Kong, and were restricted by a low response rate. It is unknown whether there was any sort of response bias in the participants who returned the survey. The data collected from the survey is from single respondent, and there was no independent data to verify these self-reports. While confirmatory factor analysis did confirm the dimensionality and distinctness of the measured variables, there is still the potential for common method variance.

6.2 Future Research

Exemplified by the study of Hempel and Martinsons (2009), this study "examines organizational change initiative in China", with a goal to "determine how OC initiatives are influenced by non-Western contextual elements" (2009: 460). Where the former attempt used a case study approach, the present study uses a mixed methods research approach, with a quantitative survey of companies which have introduced Six Sigma, supplemented with qualitative interviews of Six Sigma experts. This line of study can be instrumental for further research. A number of streams of future research are recommended.

Quality associations with or without Western affiliations have been established in China, and assistance from these associations can enable both quantitative methods and mixed methods data collection from field sources. Qualitative methods can also be used. However, its role will be more for confirmatory purpose. To overcome the potential for retrospective bias in the current study, it is suggested that these quality associations be used to identify potential data sources in very early stages of Six Sigma consideration.

In addition, future explorations of the usefulness of the two employed culture models (OCP and CVS) for the study of organizational change in China are recommended. Most of the predicted relationships were not supported, and it is unknown whether this is due to the relatively small sample size, or if there truly was no relationship. There are two particular areas where future research should focus. One potential area is to examine the way in which clear change objectives aid in Six Sigma implementation. The expectation is that clear objectives prevent the Six Sigma program from getting sidetracked or discarded as not useful. The other potential area for research is to examine in greater detail the surprising finding that an innovation culture appears incompatible with the Six Sigma culture. If so, there are profound implications, with Six Sigma being less appropriate for companies with a strategy focusing on innovation.

Finally, the literature chapter identified other relevant organizational studies models which were not used in this study: (1) Competing Value Framework (CVF), (2) Organizational Culture Index (OCI), and (3) Organizational Citizenship Behavior (OCB). These all have potential application in studying Six Sigma, and can be used to study Chinese organizational change. In addition, while Chinese cultural values appear to not be either inhibiting, or aiding Six Sigma, and only select dimensions from OCP were found to be significantly linked to Six Sigma implementation, other conceptualizations of culture such as the GLOBE project can also be used to study the link between values and Sig Sigma implementation.

6.3 Lessons from the Study

This work is built on the shoulders of giants. It is largely an empirical study which investigates cultural influences upon the Six Sigma quality initiative. Its main aim is to confirm knowledge of prior research and experience of practitioner. This adds knowledge to research and gives implications for business.

For quality management, setting objectives for implementation for success is indisputable. The prior literature has already touched on this (Mann & Kehoe, 1995; Pettigrew, 1998; Harry & Schroeder, 2000). This research explored three aspects of Six Sigma: objectives, activities and actions.

This OD and OC study on Six Sigma implementation is an attempt to fill research gap. The quantitative survey was sent to 70% of the Six Sigma population in Hong Kong. The 116 completed survey responses, though being a low rate, are representative and valid for drawing proper and convincing conclusion for the study.

7. Conclusion

This work ventures to investigate the workability of quality management by Six Sigma in China after it has been implemented in its territories for some two decades. Though geographical restricted to Hong Kong and Southern China, this study explores into a new stream which academics, seeing its relevancy, may consider related topics of future research in light of its result.

Given that the present researcher is a manager and has been engaging in quality management and education, he will have more opportunities to contribute to research and industrial consultant jobs. This study experience has motivated him to place equal attention to research rigor and practicality. This is what he had been taught in the methodology classes, and what he practiced this in the course of the present study journey. In the role of a quality management consultant, the present researcher must stay alert of the practical needs in the market, and, on the other hand, must also respond properly to the decent call for research scholarship.

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Table 1: Hypothesis Results

Hypothesis Title	Status
1a. Six Sigma implementation is positively related to Six Sigma objectives set for organizational development.	Confirmed
1b. Six Sigma implementation is positively related to Six Sigma planned activities set for organizational development.	Not confirmed
1c. Six Sigma implementation is positively related to Six Sigma actions set for organizational development	Not confirmed
2a. The Six Sigma outcome of quality culture is positively affected by the application of organizational culture of supportiveness.	Confirmed
2b. The Six Sigma outcome of quality culture is positively affected by the application of organizational culture of performance orientation.	Not confirmed
2c. The Six Sigma outcome of quality culture is positively affected by the application of organizational culture of emphasis on rewards.	Not confirmed
2d. The Six Sigma outcome of quality culture e is positively affected by the application of organizational culture of competitiveness.	Not confirmed
2e. The Six Sigma outcome of quality culture is positively affected by the application of organizational culture of innovation.	Contradicted
2f. The Six Sigma outcome of efficiency is positively affected by the application of organizational culture of supportiveness.	Confirmed
2g. The Six Sigma outcome of efficiency is positively affected by the application of organizational culture of performance orientation.	Not confirmed
2h. The Six Sigma outcome of efficiency is positively affected by the application of organizational culture of emphasis on rewards.	Not confirmed
2i. The Six Sigma outcome of efficiency is positively affected by the application of organizational culture of competitiveness.	Not confirmed
2j. The Six Sigma outcome of efficiency is positively affected by the application of organizational culture of innovation.	Not confirmed