

The Role of Cultural Change in the Relationship between Critical Factors with the Success of Statistical Process Control (SPC) Projects

Phyanthamilkumaran, Suhaiza Zailani ¹, and Yudi Fernando
School of Management,
Universiti Sains Malaysia, 11800
Penang, Malaysia
Tel no: 04 6533888 ext 3952
Fax no: 04 6577448
Email: shmz@usm.my

Abstract

In today's manufacturing and service world, customer is highly demanding and consistently increasing their demand for high quality products and services with low costs. To meet the customer's demand and request compile with increase in competitive advantage, a company should focus on their process/products consistently with high level of quality and this could be done by implementing Statistical Process Control (SPC). This study examines the key factors influencing success of SPC projects in Electrical and Electronics firms in Malaysia. The relationship between the moderating variable, culture change is also being studied. Total of 160 questionnaires were distributed by using the purposive sampling method. Hierarchical Regression analysis was performed to determine the most significant factor influencing the success of SPC projects base on 103 responses received. The results revealed that Role of Quality Department and Communication are directly influencing the Success of SPC Projects in the Electrical and Electronics firms. Quality department is required to guide the process with SPC and being like a consultant in the process. However, communication is required to discuss among the members and also to share SPC knowledge among them. Besides this, the interaction between the moderating variable indicates that Teamwork have a significant relationship with the Success of SPC Projects in Electrical and Electronics firms.

Key words: *Cultural Change, Statistical Process Control, Success Factors, Malaysia*

1.0 INTRODUCTION

Statistical Process Control is an application of statistical process control and its own techniques in any environment to manufacture a product with most economical way or concept. According to Herrman (2002), by practicing SPC, it increases customer satisfaction for long term deal, less investment on finish product inspection as well as reduction in rework cost which eventually increase the production rate. A successful application of SPC requires a unification of planning skills, engineering skills, management skills, statistical skills and communication skills (Antony, 2000).

The past decade have shown or highlight us many firms focusing on Statistical Process Control (SPC) mainly to reduce defect rates, operator errors and variability cause found in the process. Even though SPC is a proven problem-solving tool in manufacturing and service industry, there are organizations, which fail to establish SPC in their respective organization due to lack of top management commitment, ignorance by the employees for continuous improvement and due to customer's request (Antony, 2000). Similarly, Nasirin et al (2001) have studied on the failure factors in the Malaysian context; however, their study was looking on IS (information system) projects. They have identified factors such as corporate leadership, goals/deliverables, skills, deviation from timetables and management practices influence the failure of IS projects.

This paper is therefore, attempts to explain the most significant factors that influence the successful SPC implementations in an organization. The paper point out, though most organizations start to

¹ Corresponding author

practice SPC to achieve success, but they are frequently exposed to the factors which may cause their project to delay or fail at the end. SPC able to capitulate a poor performing performance but when it did not succumb the expected results, it will be classified as a failure. Nevertheless, understanding the key elements of the success of SPC would be beneficial to the organization. Instead focusing on the failure of the SPC in an organization the organization or the management should focus on the factor influencing the success of SPC such as Top management commitment, SPC knowledge, proper and easy communication between members and teamwork in the organization (Gupta, 2002), so that they could align themselves and work towards to it. One of the main successes of implementing success of SPC in the organization is to gain customer satisfaction, to reduce the defect rates and to increase process capability and stability. Further more, properly used SPC tools and technique will motivate the companies to apply six sigma and enhance their quality level towards zero defect.

Despite of technology and system introduction in Malaysia from Multi National Cooperation, there is another factor which is lacking for any new systems and technologies to fully utilized here (Gates, 1998), which is the culture implanted by the locals in the Multi National Cooperation. Organization culture is a crucial factor in influencing SPC project to be implemented and practiced in an organization (Stepanov and Laansoo, 2004). Culture mainly referred to the attitude of the employees in the organization. Attitude of the employee usually leads to the culture change for them to adapt the new phenomenon or practice enforced by the top management in the organization. The employees should be highly motivated and willing to accept the challenges to successfully implement SPC project which requires very tedious implementation.

Given this situation as above, the benefits gain by the organization by implementing SPC and the critical success factors of SPC projects, coupled with culture influence in the SPC project is an interesting study to be focused on in today's highly socially developing manufacturing and service industry in Malaysia.

2.0 LITERATURE REVIEW

Antony and Mason (2000) discuss SPC has statistical technique used to control processes and to reduce the variation in the processes, which is the key aspect to quality improvement. Antony and Mason (2000) support this concept by referring to Dale (1999). SPC is generally accepted to control and manage (the management) a process (manufacturing or service) through the usage of statistical methods. Antony and Mason (2000) further define the process variations as special causes and common causes. Special causes are the variation not inherent in the process and can be rectified easily. Examples for special causes are machine tool wear, errors in measurement and operator error. The failure magnitude is rather high for this cause. Common causes are the variations inherent in the process and affect the products or the services of the process. Examples of the common causes are humidity fluctuations, temperature fluctuations and raw material variations. SPC is a tool which distinguishes between the common and special causes of the variation and it used to alert the management about the abnormality of the process. SPC should be practiced willingly by the organization and requires high motivation and not for customer satisfaction (Dogdu et al, 1997).

2.1 Key success factors of implementing SPC

In the recent study by Antony and Taner (2003), they have classified success factors of SPC into four main characters. They are management skills, engineering skills, statistical skills and teamwork. Initially Antony et al (2000) and Antony and Mason (2000) focused main ten ingredients of success of implementing SPC in an organization. They are management commitment and support, training and education for SPC, teamwork, process prioritization and definition, selection of appropriate quality characteristics (or process variables), defining the measurement system, selection of control charts, culture change, use of pilot study and use of computers and software packages. Figure 2.1 illustrates, the normal practice of implementing SPC in the organization as justified by Antony et, al (2000).

Antony and Taner (2003), which was the latest study done on factors influencing in SPC implementation in an organization was less focusing on role of quality department, communication, characteristics of SPC projects and culture in the organization. So in this study, these variables are given importance and the factors are regrouped in-line with the Malaysian, electric and electronic manufacturing environment. From the literature review it is found several factors are significantly influencing the success

of implementing SPC in an organization such as Commitment of Top Management, Employees Participation and Education, Statistical and Engineering Skills, Role of Quality Department, Communication, Characteristics of SPC Projects, and Teamwork, The details of the variables are explained below:

(i) Commitment of Top Management

In this independent variable, support of the management is being gauged by their involvement in SPC projects and ability to spread the goal or objective of the project throughout the organization. The management is also being judged by the employee's for training allocation and approval, monitoring and follow-up of the project by the management. According to Antony et al (2000), one of the successes of SPC depends on management where, they should highlight the importance of SPC in the organization as well as allocate sufficient spend more time monitoring the project and budget allocation for the projects to complete. Kaye and Anderson (1998) illustrate that continued support and commitment from management will effectively increase the quality level in an organization.

H1: The success of SPC project is influenced by the commitment of top Management

(ii) Statistical and Engineering Skills

In this independent variable, the engineering ability and statistical knowledge to understand and analyze the SPC chart and rectify the cause is being gauged in their respective organization. An accurate understanding in SPC will enable the engineers or related responsible person to rectify the appropriate process variable that causes deviation in the process, which is being monitored. Engineers with SPC knowledge able to solve the process related problem effectively Streumer (1996). The SPC knowledge covers the ability of the engineers to interpret un-control process situation and control charts (Antony et al, 2000). Statistical skills is being judged base on the ability to select the appropriate charts for measurement as mentioned in Figure 2.3 and able to perform data collection properly. Selection of the control charts is very important to illustrate the actual stability of the process (Lipke, 2002). Softwares are being introduced to store the data and perform the tedious calculations. Employees are also gauged on the ability to use softwares, which has been recommended by the management.

H2: The success of SPC project is influenced by the statistical and engineering skills

(iii) Teamwork

In this independent variable, the teamwork among the employees to success the SPC project in an organization as well the commitment given by the employees to a project is being gauged. The team is responsible to change their process into statistically controlled process which able to eliminate all the assignable causes and variations in the process (Antony et al, 2000). Experience, skills, talents of an employee differs in a team, which is an added advantage in problem solving activity (Philips, 2003). Krumwiede and Sheu (1996) states the team leader should motivate and continuously guide the team members in problem solving by providing relevant materials and examples. Dogdur et al (1997) mentions that Quality department should guide the members in the process when there is any abnormality in the process or suggest the activity when the process when out-of control.

H3: The success of SPC project is influenced by the teamwork

(iv) Employee Participation and Education

In this independent variable, the amount of participation and education process undergone by the SPC project members as well as the other members in the organization is being gauged. Adequate training and education enables the responsible member to conduct their assigned tasks well and accurately. This is very important in the data collection process and measurement process as any variation in these processes will lead to wrong judgment and deviate from the actual cause. The training should consist of rectifying and developing control chart, interpretation of control chart and successful case studies of SPC (Antony et al, 2000), which

allows the participants to have a better understanding on SPC benefits. Krumwiede and Sheu (1996) argue that all the employees should understand the benefits of SPC and its function in quality improvement and in their respective job. Frequent meeting with the team members and the participating operators will increase the awareness of SPC projects by sharing the SPC projects among them and the achievement and action should be taken at certain condition will accelerates the training and education (Strevmer, 1996).

H4: The success of SPC project is influenced by the employees participation and education

(v) Communication

In this independent variable, the communication among the team members, communication among the higher management and shop floor is being gauged. Communication is one of the important factors which drive a project to success or failure, it is because, inputs from all relevant members are required for detail analyzing on the implementation procedures in complex process or systems (Antony et al, 2000). Poor communication between the team, customers, trainers and even vendors will lead a project due to no clear information (Oz and Sosik (2000). On top of that, open discussion should be emphasized it the team, to encourage ideas, knowledge and insights to be flow to all the members (Philip, 2003).

H5 : The success of SPC project is influenced by the communication

(vi) Role of Quality Department

In this independent variable, the role of quality department in implementation SPC is being gauged. Mitra (2004) collaborate quality as control aspects, which occur during pre-production and production phases. Their main objective of Quality department is to determine the out-going-quality by monitoring process quality, involve in improvement activities and inspect and detect any abnormalities in the process. Khoo and Tan (2002) explain that quality department should prepare for new changes, should focus customer driven goals or more to customer satisfaction, should lead and to involve every member in the firm to participate in quality related activities. Dogdur et al (1997) explains quality department should act as a consultant and guide the process members when there is any abnormality or critical situation taken place in the process.

H6: The success of SPC project is influenced by the role of quality department

(vii) Characteristics of the SPC Projects

In this independent variable, the characteristic of the SPC projects being implemented in a firm or organization is being gauged. Adequate selection of process variables strengthens continuous improvement in a process (Anthony and Kaye, 1999). The selected variable ought to be precise, accurate and stable whenever it is being measured. Minimizing the measurement error and the measurement equipment error will eliminate the major variation during the data compilation and data analysis. Further more defining the measurement system is a major factor to be concerned. In most cases measurement processes itself is a variation in SPC. It may due to the operator's skill and experience and the instrument itself not measuring accurately. Measuring instruments and operators variation should be minimized the errors and ensures accuracy of any measurement conducted (McQuator, 1996). On top of that, importance is given to a project in the organization by the top management and the performance of the project plays and important role in the implementation stage. (Antony et al, 2000). The relationship of the quality characteristics is very important and it's and advantage for confirms the process or product quality (Yan Xu, 2001).

H7: The success of SPC project in an organization is influenced by the characteristics of SPC projects

2.2 Culture Change

SPC implementation involves culture change in the organization. Culture change is there in the organization but they should understand the benefits of SPC and continuous improvement. Operators, who understand the process well, should take the responsibility to make corrective action within their authority and highlight to the middle management when it is beyond problem exceeds their authority. The steering team is highly needed in this situation to drive the organization and other members by proving the positive output and able to solve any crucial problem occur during the implementation period (Antony et al, 2000). On top of that, employee's commitment in the project and their participation level together with their efficiency and capability to complete the project and the usage of the special software for gauging SPC will make the project a successful one. Diago et al (2001), highlight the individual's perception plays an important role in the creation of the culture change in the organization. It has a continues effect where the employees tend to lose their control in organization, their normal routines in the organization and their tradition as well as communication. It is also expected that there would be a clash between the management and employee, when the employees are forced to perform the assigned tasks (Jeffery et al, 2001). They further their argument, when the situation is tensed in the organization, an implicit agreement could be fore seen, where the employees not willing to share their knowledge or expertise with others in the organization.

Gravenhorst (2003) has a stand that culture change among the employees confronts not all changes. In fact, most of the employees have positive expectation on the outcome of the changes. He also pointed out that different level of employees reacted differently in willingness to change but these differences are relatively small. Dent and Goldberg (1999) together with Gravenhorst (2003) outlines that; culture change occurs because of the approaches and conducts of change managers rather than the change itself. He also further explains that when the shop floor is not creatively involved in the change process and only is to follow orders, resistance is usually a natural response. Dent and Goldberg (1999) clearly concludes that management does not have to overcome the culture change among the employees, but rather design the change processes in such a way that all groups of employees can work together and realize a shared goal and this will result in organizational and work improvement. Anderson (2002) takes a very optimistic approach towards culture change. The author believes that Change Managers should look at culture change a positive manner or negative manner to the organization. Hence, the goal is not to eliminate negative culture change, but rather working with the energy to achieve greater results. The author also concludes that creative employee involvement is a crucial factor in changes that effect the entire organization. Burton (1999) sticks by Lewin's 3 phase change management process which is unfreeze, change and refreeze. He further emphasizes that a low-tension environment is suitable for the 'new economy' business as it promotes low resistance to change.

In this moderating variable, the culture change to the SPC project among the employees in the organization is being gauged. It is poor commitment by the employees by not supporting the management by welcoming the SPC project introduced by the management. According to Hofstede, (1980) employees have higher tendencies to avoid any uncertain situations. Antony et al, (2000), mentions that resistance to change is being there in the organization but the employees should understand the benefits of SPC and continuous improvement which will ease their working procedures in later part. Where the employees should take charge or responsibility for the change required in their respective process coupled with employees' commitment in the project and their participation level together with their efficiency and capability to complete the project and the usage of the special software for gauging SPC will make the project a successful ones. Diago et al (2001), highlight the individual's perception plays an important role in the creation of the culture change in the organization.

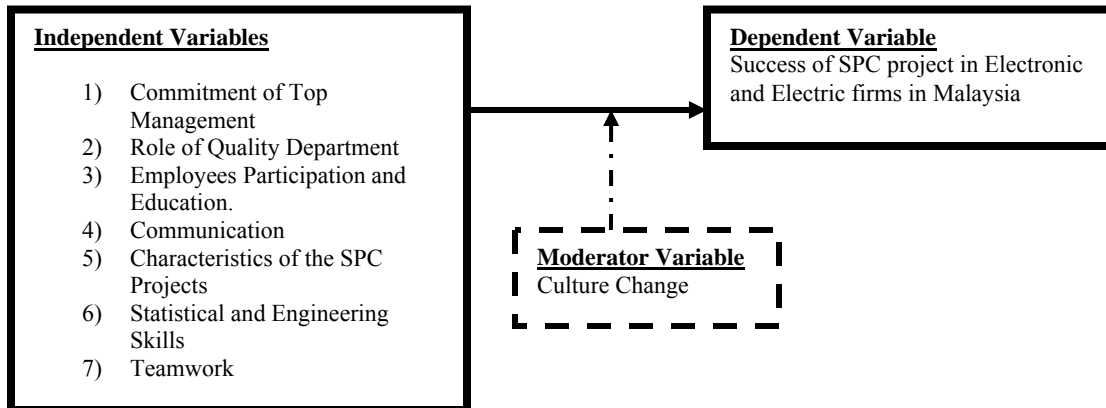
H8: The relationships between the success of SPC project and critical factors is moderated by the culture change

3.0 METHODOLOGY

The main sets of variables are categorized into independent, dependent and moderating variable. These variables are engaged to summarize the success factors of SPC project in an organization. The dependent variable of this study is the success of SPC project in an organization. Which is being measured from the experience and knowledge of the users itself. To study this dependent variable, Commitment of Top

Management, Role of Quality Department, Employees Participation and Education, Communication, Characteristics of the SPC Projects, Statistical and Engineering Skills, and Teamwork are being selected as independent variables. Culture change in the organization to the SPC implementations and concepts has been integrated as a moderating variable in this study. Figure 1 further illustrates the theoretical framework for this study.

Figure 1: Theoretical Framework.



The unit of analysis of this project will be the completed SPC projects which was conducted or involved by the individual employees by themselves. The sampling size is followed according to [19] which states it is sufficient to have a sample size from 30 to 500. The sampling method used to collect the data is purposive sampling. Two main Multi National Cooperations were selected from each of the ownerships, totaling to eight MNCs. Average of twenty questionnaires were equally distributed to each of these companies, totaling 160 sets. The Questionnaires are passed to Human Resources Department or to Quality Assurance Department Managers to distribute the questionnaires to their respective employees who have knowledge and experience in implementing and practicing successful SPC projects in the organization or in the firm.

The questionnaire is designed base on the unit of analysis studied in the research. For this study the unit of analysis is successful SPC projects in an organization. All the questions in the questionnaire are based on the hypotheses generated which aligns to the unit of analysis. Erroneous results may occur if the questions are not answering the unit of analysis which leads off beam conclusions [20]. The questions designed in a way that the respondents able to understand and answer the questions faster. The model of questionnaire was adapted from [8] as it was referring to the ten critical variables influencing successful implementation if SPC project, which were having very much option to select relevant questions for this study. The questionnaire consists of five sections. The first section covers the demography details (gender, age, education qualification, position hold in the organization and working experience in their respective organization). Second section covers the experience of the respondents in SPC projects. Continued by, Section C compress of the benefits of implementing successful SPC projects in the organization. Five point Likert scale was used in Section C and D, which gauged the respondents degree or observation and experience from 1 (Strongly Disagree) to 5 (Strongly Agree).

4.0 ANALYSIS

The overall respondent stood at 103 out of 120 of the total sample size; represent the response rate of 85.8%. It reveals that, all the respondents are well worth or know SPC in their organization. It is because, the respondents should have practiced SPC in their previous companies or practicing SPC in their current organization, which why the purposive sampling was chosen for this study to able to minimize the noise in the data. The respondents came mainly from Japanese companies contributed 29.1% (30) of those who responded, followed by 26.2% (27) from the European companies, 2.3% (23) from American companies and lastly 22.3% (23) of those who responded came from Malaysian companies. From this study, 58 respondents were working with firm of total employees of 500-100 employees (56.3%), followed by 45

respondents working with firm of total of more than 1000 employees (43.7%). None for respondent work with less than 500 employees in firm. The firms established in Electric and Electronic industry for more than 15 years would be 55.3% (55), continued by 11 to 15 years of experience 26.2% (27) and 6 to 10 years of experience 18.4% (19). There are no companies less than 5 year old maturity.

All the eight hypothesizes were tested using regression analysis. From the summary Table 1, independent effects of Commitment of Top Management, Role of Quality Department, Employees Participation and Education, Communication, Characteristics of SPC Projects, Statistical and Engineering Skills and Teamwork explains 37% ($R^2 = 0.37$) of variance in success of SPC project in electronic and electric firm. The 63% due to error or explain by other factor does not including in this study. The model is significant ($F=8.164$, $p<0.01$).

Variable	Standardized Coefficients Beta
Commitment of Top Management	0.100
Statistical and Engineering Skills	-0.168
Teamwork	0.062
Participation and Education	0.042
Communication	0.426***
Role of Quality Department	0.348***
Characteristics of SPC Project	0.011
F	8.164***
R ²	0.376
Adjusted R ²	0.330
F ² Change	8.164***
R ² Change	0.376

Note: *** $p<0.001$

Table 1: Result of Regression Analysis

In this study, Commitment of Top Management is found to be not significant correlated with success SPC project ($\beta = 0.100$, $p>0.05$). As a result, hypothesis H1 is rejected. Employee's Participation and Education ($\beta = 0.042$, $p>0.05$), Characteristics of SPC Project ($\beta = 0.011$, $p>0.05$), Statistical and Engineering Skills ($\beta = -0.168$, $p>0.05$), and Teamwork ($\beta = .062$, $p>0.05$) were found not statistically significant as a success factor influencing SPC project in Electronic and Electric firms. As a result hypotheses H1, H2, H3, H4 and H7 were not supported and rejected.

However, role of quality department is critical factor influencing success of SPC project. It is found to be positively and significant correlated to success of SPC project in Electronic and Electric firm ($\beta = 0.348$, $p<0.001$). The beta value of 0.35 (35%) indicates that role of quality department is the influential variable in explaining the variance with SPC project in Electric and Electronic firms. Based on this finding the hypothesis six was supported and accepted. Lastly, communication is found to be positively and significantly correlated at 1% level for SPC project success ($\beta = 0.426$). As a result, hypothesis H5 is supported also being accepted. Below are the summary of the results of Hypothesis acceptance and rejection.

- H1: Commitment of Top Management is NOT significantly influenced the success of SPC project.
- H2: Statistical and Engineering Skills are NOT significantly influenced to the success of SPC project.
- H3: Teamwork is NOT significantly influenced the success of SPC project.
- H4: Employees Participation and is NOT significantly influenced the success of SPC project.
- H5: Communication is significantly influenced the success of SPC project.
- H6: Role of Quality Department is significantly influenced the success of SPC project.
- H7: Characteristics of SPC Projects is NOT significantly influenced the success of SPC project.

The regression analysis is further performed by involving the moderating variable. Table 2 illustrates the detail of the analysis. Step 1 analysis revealed that 37.6% ($R^2= 38\%$) independent variables has the relation with the dependent variable. Role of Quality Department ($\beta = 0.348$, $p< 0.001$) and Communication ($\beta = 0.426$, $p< 0.001$) are the two independent variables which directly influencing the Success of SPC Project in Electric and Electronic Firms with significant of F value = 0.000. The other independent variables cannot be explained due to the error term and it is because there are other variables

influencing them. Proceeding with Step 2 analysis, it exhibits the similar results as in Step 1. Where 38% ($R^2 = 38.3\%$) of the independent variables has relation with the dependent variable. Role of Quality Department ($\beta = 0.373$, $p < 0.001$) and Communication ($\beta = 0.448$, $p < 0.001$) proved they are directly influencing the dependent variable with the significant of F value = 0.279. Moderating variable, culture change is influencing the dependent variable Success of SPC projects in Step 3 with 47% ($R^2 = 46.5\%$) of the independent variable and moderating variable. Teamwork ($\beta = 1.215$, $p < 0.05$) is the only factor significant after interacted with moderating variable, culture change. The independent and moderating variables significant with the dependent variable stood at F value = 0.081. The other independent variables cannot be explained due to the error term and it is because there are other variables influencing them as well.

Independent Variable	Std Beta Step1	Std Beta Step2	Std Beta Step3
Model Variables			
Commitment of Top Management	.100	.110	.556
Role of Quality Department	.348***	.373***	-.472
Participation and Education	.042	.028	.490
Communication	.426***	.448***	1.251
Characteristics of SPC Project	.011	.019	-.021
Statistical and Engineering Skills	-.168	-.140	-.379
Teamwork	.062	.074	-1.215*
Moderating Variable			
Culture Change		.108	-.471
Interaction Terms			
Culture Change*Commitment			-.786
Culture Change*Role of Quality Department			.932
Culture Change*Participation and Education			-.362
Culture Change*Communication of SPC Project			-1.098
Culture Change*Characteristics of SPC			.249
Culture Change*Statistical and Engineering Skills			.169
Culture Change*Teamwork			1.565*
R ²	.376	.383	.465
Adjusted R ²	.330	.331	.373
R ² Change	.376	.008	.081
Sig F Change	.000	.279	.081

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 2: Hierarchical Regression Results Using Culture Change as a Moderator in factor influencing the Success of Statistical Process Control (SPC)

Thus, H8: Culture Change is significantly moderated the relationships between the success of SPC project and critical factors. To better interpret the findings, it's conducted a simple slope test, as suggested by Aiken and West (1991). Figure 4.1 shows the moderating role of culture change and teamwork were recoded into specific numbers. One was low, two was moderate and three was categories as high level. Recoding is important to express interaction slope on the factors influencing the Success of Statistical Process Control (SPC) projects in Electric and Electronic firm. The interaction between culture change and teamwork is significant and effected of success SPC project ($t=2.191$, $p < 0.05$).

A simple slope analysis revealed that, at high level of culture change has significant and positive to success of SPC project, whereas at moderate level of culture change has significant interaction with SPC project success. Otherwise, low levels of culture change are not significant interaction, the factors influencing (teamwork) towards SPC project success is not effect. Figure 2 does not shows the low level interaction between teamwork and success of SPC project as well as the moderating effect of culture change.

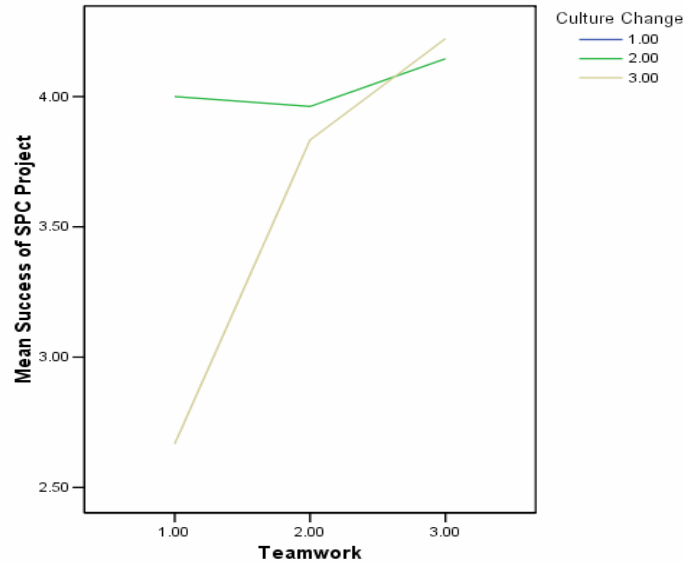


Figure 2: Moderating effect of culture change on factors influencing the success of Statistical Process Control (SPC)

Based on the data analysis, it being revealed that Role of Quality Department and Communication directly influence Success of SPC projects in Electric and Electronic Firms in Penang and Kulim Industrial Area. With the Culture Change as the moderating variable, it does influence the Success of SPC projects by Teamwork in the organization or in the firms. Commitment from Top Management, Employees Participation and Education, Characteristics of the SPC projects and Statistical and Engineering skills are only required in the initial implantation of SPC projects as mentioned by Antony et al (2000) and Krumwiede and Sheu (1996). Role of Quality Department and Communication are required to sustain and practice in the organization as mentioned by Khoo and Tan (2002), and Dogdur et al (1997). The significant of the study was the moderating variable (culture change) implicating to the success of SPC projects. As stressed by Stepanov and Laansoo, (2004) organization culture is influencing success of SPC projects and Teamwork is required to overcome the culture change to successfully practice SPC projects (Antony and Mason, 2000).

Acceptance of Independent Variable without the Influence of Moderating variable	Acceptance of the Independent Variable with the influence of the Moderating Variable
Communication Role of Quality Department	Teamwork

5.0 DISCUSSIONS

The two independent variables which influence directly the Success of SPC project are Role of Quality Department and Communication. Role of Quality Department was not analyzed by Antony (2000), Antony, Balbontin, and Taner (2000), Antony and Mason (2000) and Antony and Taner (2003). Besides, Foster et. al. (2002) emphasizes that knowledge on Quality will certainly prove beneficial in process improvements. From the analysis, it showed that Quality Department should have the full autonomy to pursue SPC projects, should be continuous effective in improving quality and create awareness to all the employees on SPC. According to Dogdur et, al (1997) mentions that once the processes is stabilized and under control, the Quality Department should educate the responsible personals to take own the process and act as a consultant and support the process during any critical stages. Therefore, Role of Quality Department plays a major role to support the process, sustain and continuously practicing SPC. To make SPC successful in Electric and Electronic industry in Malaysia American, European, Japanese and Malaysian Multi National Firms should focus and prioritize role of Quality Department.

The second independent variable which was influencing the Success of SPC project is Communication. Communication is one of the factors mentioned by Antony (2000), Antony, et. al (2000), Antony and Mason (2000) and Antony and Taner (2003) in their studies. Generally communication is important to deliver the message among the cross-functional teams, from top management to lower level employees and also have the same understanding on the problem-solving method and skills. To make SPC projects successful in Electric and Electronic Firms in Malaysia it requires communication as another factor besides Role of Quality Department. As stated by Dogdur et, al (1997) Quality Department should be a consultant and lead the process, for this reason communication is needed to achieve the objective. Both these variable go in line very well for the success of SPC projects in Electric and Electronic firms in Malaysia.

Culture change is the moderating variable in this study. From the analysis performed, it shows does influence the Success of SPC projects. The culture change in this study reflects the positive environment. Referring to Table 3, the employees are not resisting the implementation and practice SPC projects. They are accepting it in their culture and practicing it. Where, the employees are not refusing to get involved in the development of the SPC projects, employees are not boycott to use any new system in the production line, employees do commit themselves till the end of SPC project compilation, employees do finish the task effectively assigned to them, employees do spend more time and energy to the success of SPC projects and they do share their SPC knowledge with other members for the benefit of the organization. Due to its influential, Teamwork as an independent variable plays an important role in the success of SPC projects (Antony and Taner (2003)). Atkinson, (1994) mentions that teamwork is needed to maintain continuous improvement. The employees have clear link and understanding with between the leaders and the corporate management, clear link with the team members, frequent meeting with the team members and they do accept ideas and concepts delivered by the professional and knowledgeable members on SPC. Indirectly teamwork is the driver to the success of SPC project when there is a culture change in the organization.

6.0 IMPLICATIONS

Based on the analysis done, it illustrates that, the Electric and Electronic firms are fully dependent on Quality Department to success SPC projects. It is because, Quality Department is the only department emphasizing on continues improvement and customer satisfaction. Thus, they are required to flow-up closely with the process variation as well as early detection. On top of that, proper Quality Policy and Quality objective coupled with ISO certification and TS16949 creates a Quality System by itself for Electric and Electronic firms. Thus, it doesn't require top management commitment to involve and spend more time and resources during any new projects. The Quality system and quality department take cares the success of the SPC projects by themselves.

When the awareness is created and system is taking place the continuous improvement activity in the organization, thus, communication plays an important factor to success SPC projects by, alerting the team members and responsible personals to take action on the sudden variation in the process or product variation immediately. Thus, the process stability is well taken care effectively and every member is aware of the variation taken place in the product and process, since it is being transparent. Even though the top management is not required for the success of SPC projects, but it is very important that top management should understand the benefits and objectives of the SPC. So that, they could support the quality department to actively implement SPC projects in the organization. Besides creating awareness, long-term education and training is required for the employees to develop the SPC projects in the organization. In addition to that, it is to equip the employees with proper statistical knowledge. This will help the employees to gauge the process with the appropriate statistical tools and measurement analysis as well as adequate SPC charts.

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