A Review of Resistance Factors to Quality Management in the IT Sector in Malaysia

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***Abstract*-Quality Management, with its widespread global acknowledgement is becoming a necessity in the IT sector today. With the availability of a multitude of initiatives that can yield continuous improvement in organizational performance, an increasing number of companies are seeking to increase competitive advantage via improved management of quality. Despite its prevalent practice, most quality initiatives end at a standstill or take too long in implementation and thus fail. This paper serves to establish the possible resistance factors to the successful implementation of such initiatives as the International Organization for Standardization (ISO 9000) standard, Capability Maturity Model (CMM), Integrated Capability Maturity Model (CMM-I), Information Technology Infrastructure Library (ITIL) and Six Sigma in the IT sector in Malaysia and how to overcome these barriers.**

Keywords- Information Technology; Malaysia; Quality Management; Resistance Factors

I. INTRODUCTION

As a relatively new concept in management practices, Quality Management aims to achieve quality assurance by means of assessing and fulfilling current and anticipated needs as well as overseeing and organizing all the tasks and processes involved in achieving and maintaining a high level of quality. With growing global competition, Quality Management is becoming increasingly important to the organizations that accept its principles in the context of leadership, competitive advantage and management [1, 2].

The IT sector in Malaysia is a booming industry, and there are several Quality Management initiatives defined in its IT sector today. In an effort to strengthen an organization's performance in terms of its management, its customers and its stake holders, most organizations attempt to implement these standards; however, only a small percentage of these organizations manage to succeed completely, and therefore eventually abandon the initiative [3, 4].Having narrowed the scope of the initiatives under consideration to ISO 9000, CMM, CMM-I, ITIL and Six Sigma, this paper serves to define, identify and address the critical issues faced in their implementation, and highlight the seriousness of the influence of each factor identified.

The problem statement therefore is to identify and analyse the resistance factors, and if possible, provide preventive actions to remove or reduce the effect of these factors in the implementation of ISO 9000, CMM, CMM-I, ITIL and Six Sigma Quality Management initiatives in the IT sector in Malaysia.

This paper will consist of a brief explanation of Quality Management and each Quality Management initiative under consideration, and specific resistance factors based on a review of existing literature. A study will be conducted based on identifying the influence of each resistance factor and identifying those not already documented. These results will then be analysed and any possible solutions will be identified.

II. QUALITY MANAGEMENT AND ITS APPLICATIONS

Quality Management is defined as 'an integrated approach to achieve and sustain high quality output, focusing on the maintenance and continuous improvement of processes and defect prevention at all levels and in all functions of the organization, in order to meet customers' expectations [1]. Another largely accepted definition of Quality Management entails the following ISO 9000:2008 standard: 'Quality Management includes all the activities that organizations use to direct, control, and coordinate quality. These activities include formulating a quality policy and setting quality objectives. They also include quality planning, quality control, quality assurance and quality improvement.'

It is important to note that Quality Management not only aims to achieve a good quality end product in terms of goods or services but also the process and organization involved. In order to optimize such a view, Quality Management is defined by a number of principles aimed towards improved performance, according to the ISO9001:2008 standards. A high level of importance is placed on identifying, understanding and fulfilling the customer's requirements to the best of the organization's ability. Establishing roles of leadership as a guide and maintenance of a quality environment is also required.

People at all levels in the organization are encouraged to completely involve themselves in the system. All processes are considered a system and the efficient management of this system as a whole is considered essential. Continual improvement is a very important factor, as well as factual approach to decision making, where data analysis and information are the basis of any decision; considering an organization and its suppliers in a 'symbiotic' relationship results in addition of value to both

parties (ISO 9000, 2008).

III. OVERVIEW: MALAYSIA AND ITS INFORMATION TECHNOLOGY SECTOR

Malaysia may be ranked a Middle Level Developing Nation in terms of Quality Management [5]. It is also stated to have a competitively mature National Quality Award system, the Premier National Quality Award being the Prime Minister's quality award [6, 7].

It has been observed that developing countries do not give as much attention to Quality Management compared to more developed nations [8]. However, it can also be seen that with globalization and increased economic interdependence, Quality Management in developing countries is increasingly being viewed as a means of improving productivity and competitiveness in international markets [9]. The introduction of the ISO 9000 standards to Malaysia in the 1980s is known to have kick-started a more quality oriented Malaysia, due to a significant increase in third party registration activity [10].

Malaysia is forecasted to spend up to USD 5.2 Million in 2012 on IT, a significant increase from an estimated USD 4.9 Billion in 2011. Business Monitor International (BMI) shows a 9% increase in IT spending in 2011. IT demand is expected to stay fairly strong in the forthcoming year [11].The hardware market shows a USD 2.7 Billion value forecast for 2012, whereas the software market is expected to grow to approximately USD 871 Million. The IT services spending is set to hit US 1.6 Billion in 2012 according to BMI forecasts [11].

The government, which accounts for about 15% of Malaysian IT spending over recent years, intends to make Malaysia a net exporter of ICT products by 2020, which further proves the importance of identifying the resistance factors to improve its quality. The government has invested in several initiatives to improve competitiveness in the IT market, including certification programs in their budget. It also intends to close the barrier in 'digital divide' between the more rural and urban areas of Malaysia. The national IT industry association therefore plans to incorporate an increased number of PC centres throughout the country [11]. Malaysia currently holds fifth position in BMI Q112 IT Business Environment regional ratings and holds 28th place in the Information and Communications Technology Competitiveness ratings [12].

IV. THE QUALITY IMPROVEMENT METHODOLOGIES

A. ISO

According to Poksinska [13], the ISO 9000 family of standards is a set of standards which are designed to optimize an organization's ability to meet customer needs in relation to quality management systems. The ISO certifies over one million third party organizations, making ISO one of the most used management tools in the world according to the ISO survey of certifications 2009[14]. The ISO standards aim to achieve continuous improvement in an organization. This set of standards is now widely accepted as a minimum quality management technique for an organization [15]. In simpler terms, the ISO standards act as a guide to optimized quality performance without specifying how this should be achieved [16].

B. CMM / CMM-I

The Capability Maturity Model, or Software CMM, was created by the Software Engineering Institute at Carnegie Mellon University as a means of disciplining and structuring the software process. It organizes the practices involved in the planning, engineering, management and maintenance aspects of software processes, providing a set of guidelines for improvement in a dependable and duplicable manner [17, 18]. CMM was created with the purpose of presenting to the world of software processes a disciplined code which preached gradual increments with regards to improvement. It is based on different levels and aspects, via tried and tested methods assembled in one set of guidelines, to maximize the software improvement process [19].

CMM-I, the evolution of CMM, provides guidelines for effective process improvement. According to the Software Engineering Institute, CMM-I helps to bring together the independent organizational functions, prioritize aspects of process improvement, acts as a guideline for quality in processes and acts as a benchmark for on-going processes. CMM-I was initially introduced to optimize the concept of using multiple CMMs for quality improvement.

Over time, the CMM has been superseded by CMM-I, though the CMM continues to be a general theoretical process capability model used in the public domain. CMM-I is used to measure the maturity levels of the Application Development process of the company. It is capable of measuring the maturity level of the whole lifecycle of application development including addressing practices that covers the products' lifecycle from inception to deliver and maintenance [20].

C. ITIL

The Information Technology Infrastructure Library is a set of guidelines established by the United Kingdom's Office of Government Commerce (OGC) in 1987. It is essentially a set of processes which act as a standard to optimize a company's IT functions. Quite similar to the ISO set of standards, it consists of a set of statements that explain the 'best practices' of successful IT related processes [21].

Today, ITIL is considered the set of standards that will eventually change the outlook of IT organizations around the world.

Initially meant for the government, ITIL was composed of analysed and filtered information on how different organizations coped with service management to form a set of best practices. Eventually, however, other organizations caught on and realized that the guidance was applicable to them as well and it became a 'worldwide de facto standard'.

D. Six Sigma

Six Sigma is a major trending quality management initiative created in 1986 by Motorola, USA. Its main aim is to isolate and eliminate defects in processes and minimize process variations or redundant steps in processes [22]. This highly disciplined approach continuously seeks to investigate and identify how defects occur and implements an action plan to improve the process by elimination or reduction of defects; thereby boosting customer satisfaction [23].

Six Sigma is essentially a set of tried and tested customer oriented quality improvement initiatives that uses statistical methods to create an infrastructure of individuals within an organization. It creates a 'zero error' business environment, thereby increasing profits by improving customer focus and quality and minimizing waste. Companies operating at Six Sigma are stated to spend less than 5% of their profits troubleshooting, whereas a non-Six Sigma company spends approximately 25-40% of their profits for this cause [24].

V. THE RESISTANCE FACTORS

A. Initiative Specific

1) ISO:

The ISO family is a set of definitions that act as a guide to define the quality of an organization and what elements make up a value added organization, however it does not specify the means by which the quality assurance can be achieved [25]. It should be taken into account that ISO itself does not guarantee high quality or assure appeal to the customer; instead it only ensures consistency of the product. A common misconception lies in the fact that a higher level of quality is expected as an outcome of implementation. Some documentation even suggests that ISO certification itself gives no guarantee for the improved performance of an organization [26].

ISO 9000 is also considered too reliant on the assessor's opinion on quality; ISO 9000 cannot be implemented in the same way in every organization, rather, it is a general standard that is not specific to any industry, and is assessed by a number of certifying bodies [27]. The standard also creates a large amount of documentation [28], which is considered a waste of time, training and resources. The high cost of implementation of the establishment and conservation of a documented organizational system is an obvious downside.

It is also stated to be lacking in the aspect of continuous improvement [29]. The ISO certification is known to be more customer-oriented than quality-oriented in that most organizations seek the certification as a means of placating and encouraging customers into trusting in and investing in their goods, thereby failing to understand and invest sufficient effort into actually implementing Quality Management methods to their optimum [16]. It is also difficult to prove if an organization is implementing the Quality Management methods properly without daily monitoring [16, 30, 31].

Other resistance factors to achieve quality could include the lack of commitment by senior management in monitoring and controlling the implementation of ISO. Without the support from higher management it is difficult to expect a change in attitudes of the other staff or obtain the proper resources. Training is also an important aspect for the successful implementation of such a project. The increased amount of training required and new skills learnt also causes resistance in terms of employees not wanting change. Lack of recognition and a consistent reward system could be another barrier, as this reduces motivation [32]. Apparent threat to positions of authority in middle management is seen as a barrier as well, especially to the older employees [6].

Also, despite the fact that the ISO 9000-3 model was developed specifically for software processes, it is perceived to be lacking in its approach; limited to a few software quality development 'best practices' and companies need additional support to implement a more complete quality program [33].

It should be noted that such downsides, such as the lack of continuous improvement and magnitude of documentation have been reportedly dealt with in the ISO 9000: 2000 revision [27]; however, the common perceptions to this regard remain.

2) CMM/CMM-I:

CMM is once again not a set of rules that can be followed exactly as given. CMM is considered too vague in its approach to Quality Management; it is a set of guidelines, which possibly would be more successful if it specified how to improve a process instead of which areas need to be improved [34].

CMM fails mostly because it is expected to deliver instant results, but in reality it takes a very long term commitment to reach its optimum [17, 19, 34, 35]. It also requires a complete turnover in practices, preaching a process centred quality improvement strategy, in repeated cycles of implementation and failure; this may seem too daunting a challenge to take on. Failed projects may cause cynics to forfeit instead of seeking improvement. It requires all members of an organization to

commit to its cause as well as mandating direct training, which once again, as previously described under ISO, can be quite a difficult hurdle to overcome. The required level of discipline in CMM can be considered a viable threat in implementation of CMM, and several organizations may adhere to the principle until a threat is perceived; at which point all discipline is abandoned [17].

For the proper implementation of CMM and in order to proceed from one stage to another, continuous evaluation is required. There is considerable difficulty moving from stage one to stage two in CMM implementation. Moreover, substantial costs are incurred [19]. Despite the fact that in the long run this will reduce costs and improve end products [17], this does act as a barrier to implementation. Once again, there is comprehensive documentation required for proper implementation, which as explained earlier, acts as a negative factor.

Adopting CMM is also said to encourage too much bureaucracy in its implementation. The level of dedication required for success is said to ultimately prove counterproductive and causes neglect in terms of important non-CMM related issues; customer focus is said to be lost while the process is underway. It is argued to cause risk aversion in an organization, in fear that maturity ratings might be affected. However counter arguments exist in this regard stating that with higher maturity level, risk is lowered on other regular projects, thereby providing leeway for high risk projects [19].

CMM-I is an evolution of CMM; as such, much of the resistance to both their implementation can be observed to be common. As with CMM, CMM-I adoption entails a large cost and requires expertise in deploying the different areas of CMM-I[36]. During CMM-I implementation, a common mistake made would be to ignore the fact that the different environments and technical requirements of an application need to dictate the CMM-I approach. 'By the book' application of the model therefore results in difficulties in achieving process improvement goals, and therefore selection of CMM-I process is critical [37]. The large amount of documentation required also proves a barrier, not only in that the documentation is time-consuming but also the fact that due to improper interpretation, it can cause redundant documenting [38]. It is important to note that for proper CMM-I functionality the entire organization needs to be performing at the optimum maturity level rather than a section of it.

A major hurdle for CMM-I implementation is the lack of understanding of the models. Proper training is essential for everyone involved before CMM-I implementation, which will also largely contribute to the cost incurred. It should also be taken into account that even when well-versed with the theories of the model, implementation requires the ability to modify the model to suit the organization's needs. Difficulty due to a lack of participation of people within the organization as a consequence of change resistance is also prevalent. It is considered important, according to Morgan, in his article 'Process improvement-is it a lottery?' [39], to give all participants a 'feeling of ownership' so they would not rebel against the imposition of new processes.

Obtaining the support of those in higher management is very important in CMM-I implementation. Lack of this support will not only result in resource constraints but also the inability to reassign staff or obtain full support from other members of the organization in order to ensure smooth running of the initiative [36, 39].Many organizations consider CMM-I adoption too time-consuming and infeasible, as with CMM [40]. Smaller organizations, as observed by Staples [40], considered the concepts of CMM-I not applicable to a smaller context. This is because most of CMM-I is considered to focus on a process quality improvement perspective whereas smaller organizations tend to focus on a more product quality improvement based approach.

3) ITIL:

ITIL is quite structured in its approach to Quality Management. This can be interpreted as an argument for and against ITIL. Whereas some see ITIL as a set of guidelines that will help put into order a chaotic organization while saving time, others claim that this very characteristic stifles creativity in process development [41]. Thus ITIL is also said to stifle continuous improvement. As with several of the other Quality Management initiatives, ITIL is said to divert attention from other more important issues like reliability and services, causing organizations to shy away from its usage. It should be noted once again that like the ISO set of standards, ITIL does not guarantee a higher level of quality performance. Therefore, ITIL applied to an already ad hoc organization will result only in worsening the situation of the organization, so it is very important that ITIL is not seen as a 'quick fix' [41]. Being a set of standards, ITIL tells you 'what' it should be, but not 'how' it should be done [41-43]. It also requires training and skill which requires investment of time and money.

As Marquis [42] explains, ITIL successes are owed mainly not to software, workflow, consultants or training (although these are paramount) but to the staff involved. Hence failure to involve staff in the entire ITIL journey is extremely damaging. Sound management and leadership skills are therefore very important factors. A study by Evergreen Systems in February 2006 [42], proved that 72 percent of responses claimed that organizational resistance was the biggest barrier to proper implementation of ITIL.

ITIL, being initially developed by government officials [41], is however, said to encourage bureaucracy and discourage interdepartmental liaison by drawing lines and differentiating between functional groups. While ITIL is quite detailed in some aspects, it is said to be lacking in detail in others. One of the most confusing aspects about ITIL however, is considered to be how and where to use it as ITIL does not demand any restrictions in terms of organizational structure. The initiative is also said to be quite costly, as it is more value centred than cost saving focused. Essentially, this means that ITIL implementation

focuses on providing value even if it means spending more money on the IT service, process or product prior to its implementation. Hence business requirements are finally met but possibly at a higher price [42].

4) Six Sigma:

Several key factors are critical in Six Sigma implementation. As with most other Quality Management initiatives, top management blessing is crucial in terms of support, participation, and provision of resources and training [44]. Lack of good leadership skills, support from all levels of the organization and resistance to change are some other rather common resistance factors.

For proper implementation of Six Sigma, training is required. This, as in the other aspects can cause resistance in terms of time and change. Six Sigma is not easy to understand or implement in its fullest form, therefore, a clear organizational strategy needs to be identified [45]. There is also difficulty in measuring and gathering data which requires training, time and skill [44, 46].

Six Sigma also requires some other forms of change management. Technical details may be difficult to grasp hence creating cynicism and resistance to change in terms of individual and organizational resistance. One of the main obstacles in implementing Six Sigma is the necessity for resources and financial commitment in Six Sigma certification. The start-up costs could potentially be significant when implementing Six Sigma and may cause resistance, particularly among smaller organizations. Also it needs to be taken into account that Six Sigma is a long term commitment and patience is a necessity; therefore it is important to keep people focused on celebrations of small successes to keep morale up. Failure to do so may result in further cynicism or loss of drive [44]. Another reason for failure in implementation of Six Sigma is failing to apply Six Sigma principles to all aspects of an organization [45]. Most Six Sigma projects fail due to the usual reasons: poor management skills and involvement and failure to achieve targets within a set time [44, 47].

Six Sigma certification standardization has been named a major issue, meaning a black belt in one company may not have the same capabilities and skills as a black belt in another [48]. Thereby, in some cases, it gives a false sense of security and causes the initiative to suffer.

Judging the Six Sigma level on the number of trained black belts or greenbelts or successful projects could result in a bureaucratic approach, with less attention paid to actual quality achieved [48].The proper selection of projects and project prioritization are key factors to Six Sigma implementation. Improper selection or definition of projects can result in frustration and loss of motivation as well as improper results. The project needs to be selected based on the business goals and objectives of the organization [49].

Some believe Six Sigma is nothing but a marketing tool used by consultants with vague knowledge of quality, and that most take on Six Sigma without a proper grasp of its optimal implementation and benefits [45]. As a framework, it is also considered to inhibit creativity and innovation in terms of organizational excellence and it is important that it is identified as a framework rather than a step-by-step methodology [23].Six Sigma is not a 'stand-alone' methodology. It represents a philosophy rather than a technique and the link between Six Sigma and business strategy as well as the link between Six Sigma and the customer needs to be established clearly. This can be done by linking every project to its objectives and business strategy, identifying main processes and outputs and the customers targeted, while ascertaining customer wants and needs.

B. "Common to All" Resistance Factors

According to research by Brietzke and Rabelo [4] and Nasir, Ahmad and Hassan [3], resistance factors in software process improvement can be categorized into two sections: (1) Organizational factors and (2) Project factors. By comparison between all Quality Management initiatives listed previously, a common list of resistance factors can be obtained.

Organizational factors include such human factors as lack of commitment, lack of teamwork and participation, cynicism and resistance to cultural change, lack of support from senior management and lack of proper training and knowledge. Other organizational factors include lack of established policies and goals. Also a factor is the improper translation of quality improvement processes to suit the organization's needs. Another major barrier to proper implementation is the setting of unrealistic expectations and that the methods would provide a 'quick fix'. Obtaining support from ALL levels of an organization has proved difficult as well.

Under project factors, budgets prove a potent resistance factor, in terms of lack of visible returns in a short period of time or high start-up cost, and costs incurred to keep a Quality Management principle. This is also affected directly by support from senior management. Excess documentation and therefore more responsibilities cause lack of support among the people in the organization. Also the training required for proper implementation and the skills that need to be acquired cause resistance because of the cost that needs to be incurred and time that needs to be spent, as well as overcoming the cultural resistance to change. Some believe that quality improvement projects are counterproductive in that they distract the employees from 'actual work' that needs to be done. A more detailed list of identified common-to-all factors can be seen in the range of questions included in the survey, seen in Table II. It can also be noted that it is critical that all the initiatives considered in this study be viewed as a framework rather than a set of step-by-step guidelines, and that the process needs to be catered to each individual organization's needs.

VI. THE RESISTANCE FACTORS

The research was conducted in several stages. It began with an extensive literature review of Quality Management initiatives and how they work as a means of understanding the background of this project. That was followed by reviewing literature based on resistance factors *specific* to each initiative. Using this framework, a set of '*Common-to-all'* factors was defined. This was used as the framework to devise the survey questionnaire, along with reference to similar studies performed by Brietzke and Rabelo [4] and Nasir, Ahmad and Hassan [3].

A. Demography Information

These questions define the respondents participating in the survey. It involves identifying the expertise level and position in the organization in order to judge the different views among different types of respondents. It also identifies type of Quality Management initiative used in the respective organization. This was included in order to identify the most successful initiative being implemented.

B. Main Scope: Quantitative Methodology

The main body of the questionnaire under the scope of interest comprised of 30 specific 'common-to-all' resistance factors identified according to the literature review. The questions were classified under the following subsections, as shown in Fig. 1 below. The respondent was instructed to choose a choice of four predetermined answers, ranging from '*Not a Factor'* to '*Very Significant Factor'*. Each of these answers had a defined influence level weightage, and using *(1)*, an 'Influence Level score' was attributed to each defined factor.

$$S_f = \sum_{x=0}^{x=3}([I(x) \text{ x } N(x)]^2) \quad (1)$$

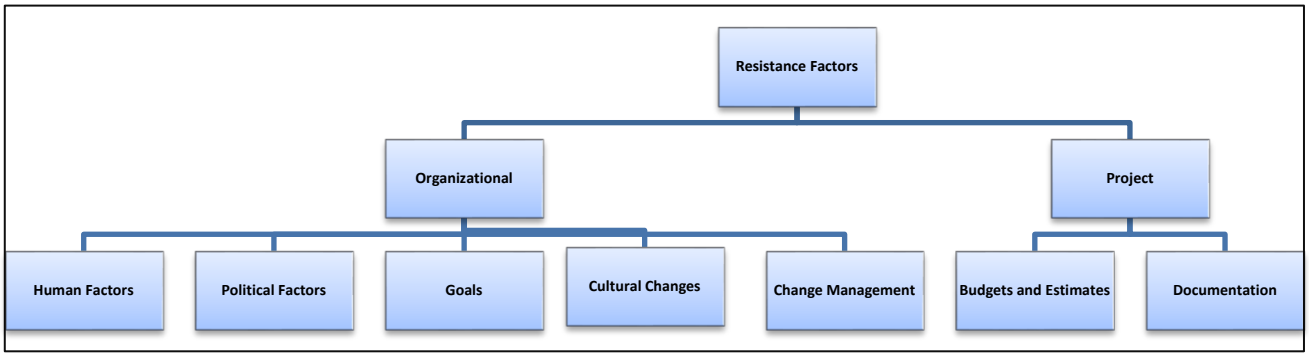

Fig. 1 Resistance factors classification

Where, S_f represented the total influence level score for the factor (f) under consideration, which is calculated using l(x), which represents the influence level weightage represented as follows and N(x), which represents number of respondents for the influence level under consideration.

Similar studies, for example Nasir, Ahmad and Hassan [3] and Brietzke and Rabelo [4], use influence level weightage as a means of providing a comparative basis across the pre-identified resistance factors. A higher score (S) therefore would imply that the resistance factor had a more significant effect on the implementation of Quality Management in the IT sector. In order to isolate the method that displays the most significant difficulty in implementation among the five, the following formula (2) was used:

$$S_{T,qm} = (\sum_{f=1}^{f=30} S_{f,qm})/N_{qm} \quad (2)$$

$S_{T,qm}$ calculates the total influence level score for the particular quality methodology per respondent, *qm*, where $S_{f,qm}$ represents the individual score for each resistance factor from 0-30 for the particular methodology, and N_{qm} is the number of respondents who have *previously used* or *are currently using* the methodology. Here once again, the assumption states that the higher the $S_{T,qm}$, the higher the barriers experienced during implementation.

TABLE I INFLUENCE LEVEL WEIGHTAGE

Questionnaire Answer Choice	Influence Level Weightage (x)
Not a Factor	0
May be a factor	1
Significant Factor	2
Very Significant Factor	3

TABLE II RESULT SCORES FOR PRE-IDENTIFIED RESISTANCE FACTORS (S_f)

ORGANIZATIONAL FACTORS					
1.1	**HUMAN FACTORS**	**SCORE**	**1.3**	**GOALS**	**SCORE**
R01	Insufficient training and awareness for individuals in ALL levels of the organization	710	R17	Implementation is counterproductive; causes distraction from more urgent needs	533
R02	Lack of complete understanding of concepts involved	481	R18	Unrealistic expectations towards result on a time or quality based scale	326
R03	Lack of teamwork and participation among members of ALL levels in the organization	493	R19	Neglecting to include adaptation period in plan	268
R04	Lack of leadership, skill and professional knowledge in implementation	812	**1.4**	**CULTURAL CHANGES**	
R05	Lack of support from senior management	774	R20	Fear of change and job insecurity	445
R06	Too Much bureaucracy	356	R21	Lack of a tactical approach to implementing cultural changes	441
R07	Lack of satisfaction with regard to quality level within the duration of implementation	388	**1.5**	**CHANGE MANAGEMENT**	
R08	Reduction of morale due to long time lapse before visible results	276	R22	Insufficient analysis of current situation of software process	610
R09	Reduction of morale due to lack of updates on effort and lack of celebration of small successes	305	R23	Simultaneous focus on improvement in several areas	346
R10	Lack of Motivation via lectures and workshops	221	**2**	**PROJECT FACTORS**	
R11	Forfeit when hurdles encountered during implementation	190	**2.1**	**BUDGETS AND ESTIMATES**	
1.2	**POLITICAL FACTORS**		R24	Costs higher than budgeted	662
R12	Lack of clear organizational and/or quality policies making intentions clear regarding the quality improvement initiative	641	R25	Lack of short term returns	261
1.3	**GOALS**		R26	Lack of understanding that focus is placed on long term returns instead of short term ones	269
R13	Lack of clear goals and objectives	774	R27	Expecting instant results; unrealistic expectations	269
R14	Failure to conduct an initial analysis checking if organization required the implementation of this particular initiative	565	**2.2**	**DOCUMENTATION**	
R15	Implementation of an initiative not suited to organization's best interests	341	R28	Excessive documentation and formality	217
R16	Failure to alter chosen initiative to cater to organization's needs, instead following initiative 'by-the-book'	434	R29	Lack of proper documentation management system	261
			R30	Increased workload and required discipline	341

TABLE III TOP 10 RESISTANCE FACTORS

F01	Lack of leadership, skill and professional knowledge in implementation	812	F06	Lack of clear organizational and/or quality policies making intentions clear regarding quality improvement initiative	641
F02	Lack of support from senior management	774	F07	Insufficient analysis of current situation of software process	610
F03	Lack of clear goals and objectives	774	F08	Failure to conduct an initial analysis checking if organization required the implementation of this particular initiative	565
F04	Insufficient training and awareness for individuals in ALL levels in the organization	710	F09	Implementation is counterproductive; causes distraction from more urgent needs	533
F05	Costs higher than budgeted	662	F10	Lack of teamwork and participation among members of ALL levels in the organization	493

TABLE IV INDIVIDUAL METHODOLOGY INFLUENCE LEVEL SCORES ($S_{T,qm}$)

ISO 9000	4491
CMM/CMM-I	4743
ITIL	10225
SIX SIGMA	8295

VII. ANALYSIS OF RESULTS

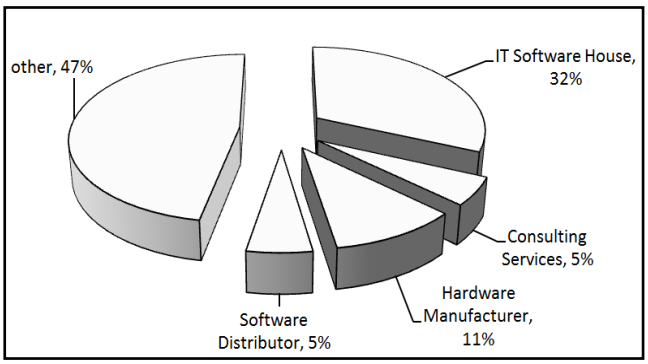

Fig. 2 Resistance factors classification

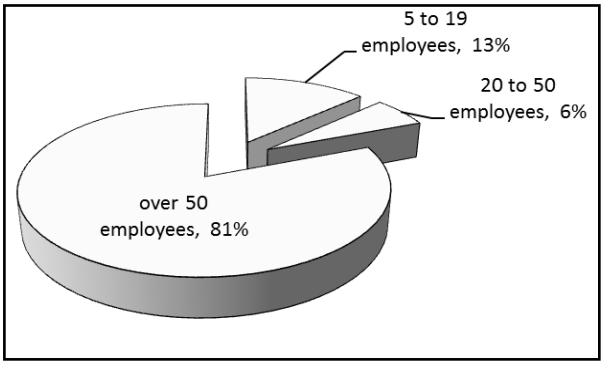

Fig. 3 Size of respondent organization

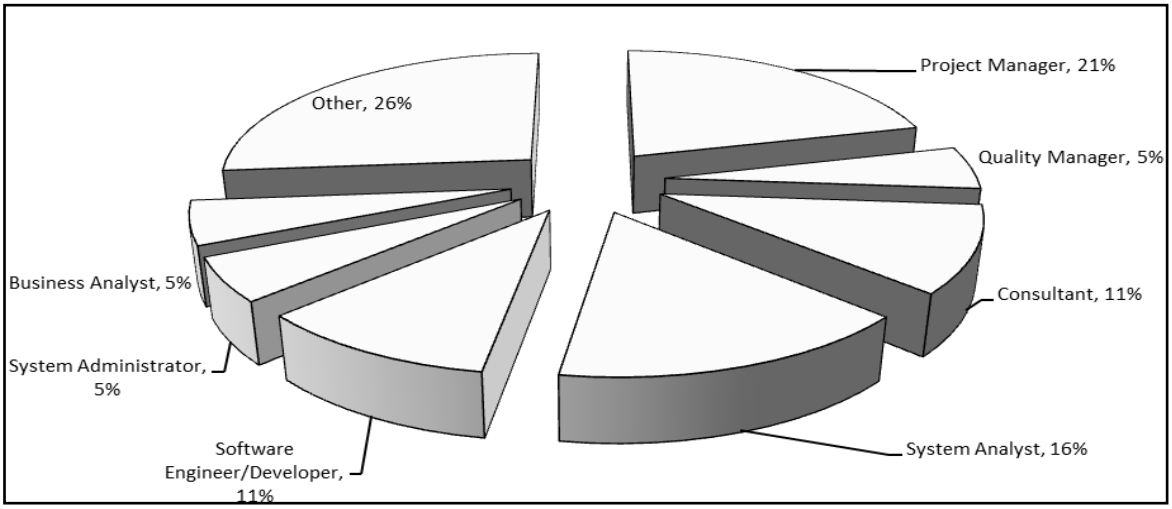

Fig. 4 Respondent designation

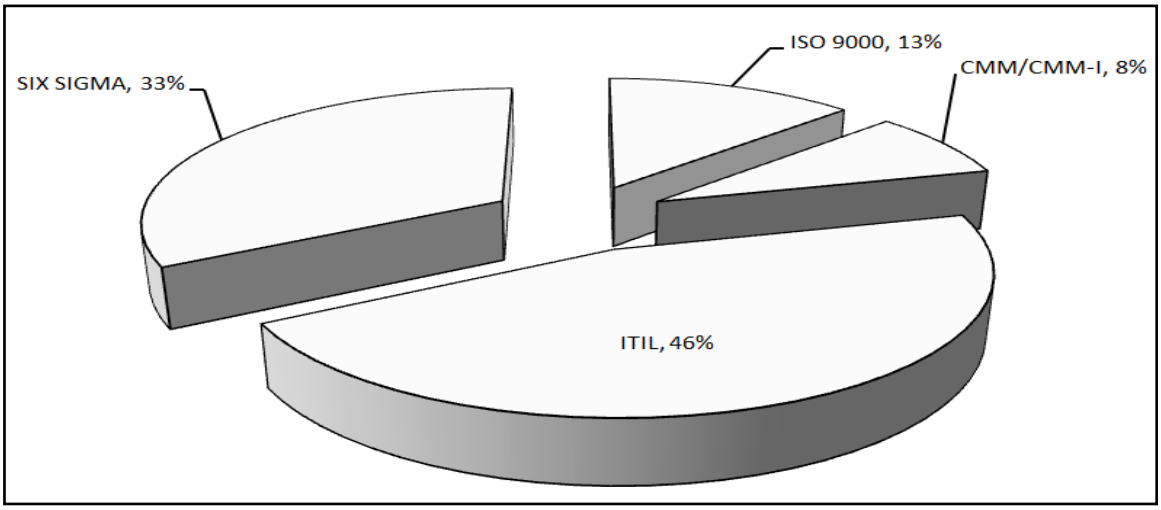

Fig. 5 Respondent designation

VIII. RESEARCH FINDINGS: CONSOLIDATION OF RESULTS

A. Demography Information

This study was conducted based on nineteen (19) IT-based organizations or IT sectors of organizations in Malaysia. Majority of the organizations had over 50 employees, some of whom catered to an employee base of up to 3000. The respondents ranged from IT software houses, consulting services, hardware manufacturers or software distributors, among several others. Respondents ranged from managers to consultants and engineers. (Refer to Fig. 2, Fig. 3, Fig. 4 and Fig. 5).

B. Resistance Factors

The results identified that, in the IT sector in Malaysia, the 3 key issues to be addressed are:

- Lack of leadership, skill and professional knowledge in implementation;
- Lack of support from senior management;
- Lack of clear goals and objectives.

The results are concordant to previous studies in that the top three factors in the studies by Nasir, Ahmad and Hassan [3] and Brietzke and Rabelo [4] have also been identified as organizational factors. It is also interesting to note that Nasir, Ahmad and Hassan [3] who conducted their study on Software Process Improvement in Malaysia also identified 'Lack of support from senior management' as one of the top three factors.

Upon examining the top ten factors obtained in the results (See table III), it is important to note that nine of the ten barriers are categorized as organizational factors with only one factor (F05) categorized as a project factor. Furthermore it can be seen that 80% of the barriers can be directly linked to managerial responsibility. This could be translated to mean that the Malaysian IT sector needs to focus on improving organizational management approaches and planning in order to achieve optimum results.

When each initiative was isolated and compared, it can be seen (Table IV) that per individual respondent currently utilizing the methodology, ITIL was rated to have the MOST SIGNIFICANT resistance factors. However, ITIL remains the most popular initiative in use in the IT sector today (Fig.5); it is used by 46% of the respondents in this study. This is supported by the fact that ITIL is becoming the most popular framework for IT processes all around the world [50]. In a global study by Axios in 2008, it was seen that 64% of IT professionals were of the opinion that ITIL was the path to an improved IT reputation. What sets ITIL apart from other methodologies is its 'IT operations' focus. It provides a straightforward framework specifically designed for a better IT organization.

However, ITIL implementation itself is not easy. It is a set of best practices that has no direct step-by-step solution but relies heavily on strategic management [51]. This may be the reason for it being rated the most difficult to implement in Malaysia despite its widespread use; as discussed earlier, according to the results, the greatest barriers faced in the implementation of Quality Management initiatives in Malaysia are directly related to managerial aspects. It was also seen, according to the results obtained in this study, that 55% of ITIL implementation was complimented by another methodology such as Six Sigma.

It should be noted that in organizations that adopt more than one Quality Management initiative, the burden placed on the people in the organization is even more substantial, as it requires extensive training and a significantly increased workload. This causes high stress levels and low morale, hence reduced productivity. The increased amount of bureaucracy will also increase resistance towards these initiatives [52]. It could be a factor to take into account that the respondents who rated the resistance factors would not have taken the added difficulty of managing multiple quality management methods into account.

ISO 9000 has been rated the easiest methodology to implement. Besides ISO 9000's other strong points, as mentioned earlier in this report, this could be due to the fact that ISO 9000 has existed in the Malaysian industry since 1987 and has been strongly supported by the Malaysian government since then. Quality Improvement Practices Scheme (QIP) was launched in 1988 promoting ISO 9000 awareness, and the 'Umbrella Project' was launched in 1990 through the Standards and Industrial Research Institute of Malaysia (SIRIM), aiming to promote ISO 9000 throughout the country, among others [53].

The three least influential resistance factors identified were:

- Forfeit when hurdles encountered during implementation;
- Excessive documentation and formality;
- Lack of motivation via lectures and workshops.

The results obtained seem to display no discernible pattern and show no similarities with previous studies. This may be an area for future research, as a means of determining whether they are least effective because they are issues that are addressed, or because they are issues that are 'swept under the rug'. If addressed, the means by which they are addressed may also prove interesting prospective research scope.

IX. THE QUALITY SOLUTIONS

A. Recommendations

Having investigated and identified the major resistance factors to Quality Management Initiatives in the IT sector in Malaysia in the previous section, this section serves to provide a discussion of the solutions that can be implemented in order to improve or obliterate the said resistance factors. While identifying the fact that due to the interconnected nature of the barriers (particularly in organizational factors), it would not be effective to provide one basic solution and to tackle the

problem at its root. It is important to conduct a comprehensive analysis and implement a holistic solution that can address all the issues, this section will focus on the most potent factors identified specific to the IT sector in Malaysia (Table III).

1) FO1:

A responsible and importantly, proactive leader is required to initiate any change. A quality team leader could be an experienced project manager, a skilled software engineer, or the head of the HR team. The leaders need to be reliable advisors with sound problem solving skills and firm determination, especially in stressful situations [54]. Leaders should implement a quality focused strategy that clearly defines strategies and policies, assign roles and assemble teams, initiating and conducting measures to ensure a higher standard of quality [1].Tactical execution of methods is extremely important, and in order to achieve this, efficient leadership is crucial.

2) FO2:

Managers need to be more approachable and take on a more encouraging role. Research shows that senior management often accepts improvement initiatives with no knowledge of required effort, assuming it can be executed without too many alterations in the general running of the organization. This puts considerable pressure on middle level management, who are expected to turn the organization around with no cost, planning or functional support [54]. Many problems may remain unaddressed if the employees are afraid of approaching higher management. Research shows the tendency of lower level employees to hide difficult news from higher management [55]. Senior management playing a more active role might also act as a source of encouragement and add a level of importance to the initiative [54, 56, 57]; in Malaysia, according to the results obtained and studies by Nasir, Ahmad and Hassan [3], failure to do so is seen as a very significant barrier to the successful implementation of Quality Management in the IT sector. A supportive manager exists when subordinates are able to report their failures without fear of the consequences. This entails giving the employees a greater control over their work, while providing guidance and considering their involvement valuable. It is important that the managers stay involved. Managerial support has been linked commonly in previous research to greater job satisfaction and commitment [58].

3) FO3 and FO6:

It can be observed in the results obtained that in the Malaysian IT sector, it is important that clear organizational, political and individual goals and objectives are set, and that every member of the organization realizes what is expected of them and why it is expected. Setting realistic goals on a time, quality and cost based perspective is crucial. Quality Management initiatives need to be nurtured over time. When setting these goals, it is important that all employees understand that Quality Management is a long term endeavour, and realize the benefits in the long run. Important improvement areas need to be prioritized and focused on, and clear objectives defined. This will ensure there is no disappointment or loss of morale in that arena [54].

4) FO1, FO2 and FO4:

Training is very important when facilitating change and implementing a Quality Improvement methodology and it can be specifically attributed as the management's responsibility [6, 56, 57]. Training results in a more educated, capable, assured workforce [58]. The IT sector in *Malaysia* needs to focus on providing quality training programs for employees. The manager needs to identify training requirements and provide 'needs-based' training; essentially, employees need to be able to relate their training experiences to the immediate needs of their job. Training is imperative to improve capability and skill and should be focused on results. Coupled with effective change management, training is said to ensure progress [54]. It is important that training be customized to fit the organizations needs and not be used as a 'one size fits all' philosophy [57].

5) FO5:

Cost is a major factor. It is incurred in several improvement areas: establishment, implementation, training, documentation, certification etc. Creating a realistic budget that includes all expected costs is important [54]. The employees need to be informed of the fact that the large amount of cost incurred and the lack of short term results would only result in long term benefits. Higher management needs to be convinced that the funding is necessary; obtaining their blessings is a major hurdle to cross as well. Therefore a long term plan with a clear, realistic budget, inclusion of adaptation period and a convincing argument involving greater quality end products are key factors [17].

6) FO7 and FO8:

It is imperative that before execution, an in-depth initial analysis is conducted on the organization, assessing the organization's needs and problem areas, which will be the basis of the Quality Management initiative selection. Once the chosen initiative has been justified and established, the company needs to ensure the selected initiative is catered to suit the needs of the organization, adapting the improvements to compliment strengths and address weaknesses in different parts of the organization. "Quality is a process, NOT a program", so it is important that methodologies are not followed 'off the shelf' [54, 57].

7) FO9:

It is a common opinion that quality improvement methods distract from more important work to be done. In order to eradicate such mentality, it is important that awareness is created among the employees as to why it is important and how it can benefit the organization and in turn the employees themselves [54]. If the organizational change required is not understood properly by the individuals in the organization, they will never accept the change, and it will not succeed [59].

8) F10:

It is also important that the employees feel involved in decision making; in this way they are more likely to take on the responsibility of presenting and implementing solutions. This entails involving people in idea ownership, creating awareness and the *need* to participate and move out of their comfort zones; this will help overcome the resistance to change. Many managers believe they have a team when they simply bring a group of people together. However, it is important to remember that 'it is easy to have a group, but more difficult to build a team'. Teams need to be trained on how to work together, how to function and how they fit into the big scheme of things. They need to be kept informed and be able to communicate with their superiors.

B. A Case Study

Electron, a sector of a large Japanese multidivisional company, illustrates skilfully managed integration of improvement processes in terms of managerial involvement, teamwork, clearly set objectives and importantly, the benefits of effective awareness programs and teamwork from all levels of the organization. Integration of these simple yet thorough practices could help improve the organizational barriers highlighted in the Malaysian IT sector.

The managing director addressed the quality improvement barriers by initially interviewing all staff on a one-to-one basis (F02). Once he identified the fact that the core of their quality issues was related to the people in the organization, their HR director was appointed as the leading figure in the quality movement (FO1) [60].

A Quality Improvement Team was built and an 'Error Identification Form' (EIF) was introduced, where employees were able to file complaints that 'prevented them from performing error-free work', its eradication acting as a goal to be reached (F03). Once the report was dealt with, the employee who filed the complaint was able to sign off on the document. Any outstanding EIFs were displayed on a noticeboard. This encouraged teamwork and participation among employees (F10). All staff was to attend a two day quality seminar to increase awareness and understanding (FO4, FO9), where the main focus was on continuous organizational improvement, personal improvement, participation and responsibility. Employees were kept informed via team briefings, a quality newsletter and noticeboards that were updated every two weeks. Performance appraisals were utilized to facilitate continuous improvement. An award system was set up by a 'recognition team' where efforts were rewarded via prizes, badges or certificates [60].

These efforts were rewarded by the increased idea input from across the organization, increased productivity, percentage decrease in returned products during warranty period, better warranty program, quicker invoice payments and maintenance of market share during unfortunate economic times [60].

X. CONCLUSION

This paper analyses and identifies the significant resistance factors affecting the successful implementation of Quality Management Principles in the IT sector in Malaysia, based on literature as well as quantitative research. It identifies the most significant resistance factors as: (1) Lack of leadership, skill and professional knowledge in implementation; (2) Lack of Support from senior management; (3) Lack of clear goals and objectives.

It also concludes that organizational factors specifically pertaining to managerial responsibilities play a key role in effective execution of the said initiatives in Malaysia. Additionally, it recognizes ITIL as the most popular framework of choice in the IT sector despite the fact that it displays the most significant resistance in implementation.

The paper also attempts to provide solutions to overcome or reduce the effect of these resistance factors in implementation. While recognizing the fact that a specific problem area cannot be targeted due to the interconnected nature of the barriers, it stresses on the importance of improved managerial level practices. The solution presented is of an all-encompassing holistic nature that will ensure lasting results. One of the major limitations of this study is that it is a quantitative survey methodology in the form of a questionnaire and is subject to a diminished degree of veracity. A larger number of respondents would have been preferable, though the collated opinions of respondents still provide a good insight into the issues addressed.

The findings in this paper indicate a correlation between the significance of resistance factors and ease of implementation linked to popularity of a specific initiative. This topic has not been discussed in previous works and therefore may prove a worthy topic for future research with respect to identifying the most suitable initiative for implementation. Further topics of interest may entail a comparison of Malaysia's Quality Management implementation barriers with those of other countries, for the purpose of highlighting specific cultural barriers and their influence native to Malaysia.

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