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Applying Six Sigma in foodservice organizations

Abstract

This study investigated how a large foodservice organization successfully adopted the Six Sigma quality system from other industry applications in their foodservice environment. In addition, the study explored how different levels of the organization had contributed to the application and the perceived importance of such system within the organization. Review of the recent foodservice literature suggested that quality service research is important because it is directly linked to customer satisfaction and return patronage behaviors. However, the literature also revealed that there was little theoretical understanding of quality systems and applications in the foodservice industry that would be akin to Total Quality Management (TQM) and that such systems were mainly to be found in other service and manufacturing organizations e.g. banking, insurance and electronics industries. The study also revealed that here was a lack of systematic quality measures in existence in foodservice operations, although exceptions did exist such as in fast food like operations and more recently at a hotel group. Therefore, the aim of this study was to evaluate and assess how a Six-Sigma-hybrid quality system was adapted and introduced in a typical foodservice operation. In this study, the Hong Kong Jockey Club's introduction of the Six Sigma-type quality initiatives called the 'Journey Toward Excellence' or JTE, were assessed and analyzed.

Keywords:
Six Sigma, foodservice organizations; Hong Kong

Introduction

A review of the foodservice and quality service literature, notably by Parasurman, Zeithaml, & Berry (1988), Zeithaml, Berry, & Parasuraman (1993), Johns, & Tyas (1996), Oh, & Jeong (1996), Qu (1997), Kivela, Reece, & Inbakaran (1999a), Kivela, Inbakaran, & Reece (1999b), Kivela, Inbakaran, & Reece (2000), and Kivela, & Chu (2001) suggests that quality service is important because it is directly linked to customer satisfaction and return behavior. If we are to accept the postulation in the service quality and satisfaction literature that the return or repurchase is a consequence of satisfaction, and that satisfaction is a consequence of a high quality organization, then, one can argue that the organization's management and staff are the central players in the way those quality systems are applied. The importance for the foodservice operator here is that such symbiotic relationship between organization's quality systems and its staff may also confirm whether or not the organization's quality systems and/or quality strate-

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gies are living-up to their customer expectations. Presently however, the reporting about foodservice organization's quality systems and how these are applied is lacking, and this study aimed in redressing that gap.

Definitions and concepts

What is Six Sigma? According to Pande, Neumann, and Cavanagh (2000) Six Sigma can be defined as: a) a statistical measure of the performance of a process or a product; b) a goal that reaches near perfection for performance improvement; and c) a system of management to achieve lasting business leadership and top performance.

The term "sigma" has not been used much in ordinary conversation. As most people are aware, the lower case Greek letter sigma "σ" is used to signify standard deviation. Standard deviation is a statistical way to describe how much variation exists in a set of data, a group of items, or a process (Pande & Holpp, 2002). For example, suppose that one runs a pizza delivery business that delivers to nearby homes and offices. Acording to the "contract" with the business's customers, pizzas will be delivered fresh and hot between 11:45am and 12:15pm. This allows customers to get their orders in time for lunch (the customer's "requirements"). The pizza shop has also agreed that if a pizza is delivered before or after the above times (a "defect"), the shop will discount their next order by 50%. Because the pizza shop manager and staff get a bonus for on-time delivery, all are very motivated to deliver the pizza during the customer's "requirements".

Six Sigma, as a measuring tool can play an important role in this simple process. If 68% of deliveries arrived on time, the process is at "2 sigma" level. If 93% were delivered on time, then a "3 sigma" level of performance would be achieved. If 99.4% of them were on time, it would be operating at "4 sigma" (see Table 1 below). To achieve six-sigma, pizza deliveries would have to be on time 99.9997% of the time; almost zero defects. In fact, to achieve Six Sigma, only 3-4 deliveries would be late out of 1 million deliveries. Therefore, the sigma measure was designed to help:

- focus on the organization's exacting customer needs as many other measures, such as labor hours, costs, and sales volume, companies have been traditionally used to evaluate issues that are not related to what the customer really requires; and
- to provide a consistent way to measure and to compare different quality processes and initiatives.

For example, using the sigma scale, one could access and compare performance of pizza baking process with the pizza delivery process; two very different but critical processes.

Table 1
SIX SIGMA - A MEASURE OF DEFECTS

Sigma level	Defects per million opportunities
6	3.4
5	233.0
4	6,210.0
3	66,807.0
2	308,537.0
1	690,000.0

Source: Pande and Holpp (2002)

When business violates significant or important customer requirements, it is generating product and/or service defects, customer complaints, rising costs, and probably, falling revenue. The greater the number of defects that occur, the greater the loss in rectifying them, as well as potentially losing the customers, in particular, repeat customers. Ideally, most organizations aim to avoid defects and the resulting cost in monetary terms and customer dissatisfaction. One can argue that that within a large foodservice organization with a diverse customer base and volume, certain defects are bound to happen. The problem, however, are that those even seemingly low percentages of defects can result in irate customers. For example, if a hotel processed 250,000 reservations per year and operated at 99.38% accuracy (4 sigma), the hotel would have had around 1550 unhappy customers . One can imagine the cost to correct the mistakes in terms of staff-hours, cost, dissatisfied customers, and loss of loyal customers.

While accuracy is just one requirement, the goal of Six Sigma is to assist people and processes to aim high in aspiring to deliver defect-free services and products. The notion of zero defects is not at work here, because Six Sigma also recognizes that there is always potential for defects, even in the best run processes or best devised products and services. However, at 99.9997% performance, Six Sigma sets a target where defects in many processes, products and services are almost nonexistent. The goal of Six Sigma is especially ambitious when one considers that, prior to the implementation of Six Sigma, most processes in most businesses operate at 1, 2 and 3 sigma levels. This is especially so in organizations that are dominated by intangible products such as the hospitality and foodservice industry.

Pande, et al. (2000) have identified a significant difference between Six Sigma and other but similar quality programs such as the TQM. The difference identified is the degree to which management plays a key role in regularly monitoring quality program results and accomplishments. A management system involves accountability for results and ongoing reviews to ensure results. By encompassing accountability and regular reviews, managers can then begin to use Six Sigma as a guide to leading their business. One of the few organizations in the hospitality industry that have applied Six Sigma quality principles is Starwood. Starwood Hotels, which owns and operates top hotel brands such as Westin, Sheraton and several other luxury and resort hotels, can show how Six Sigma is being inculcated into the management culture. At Starwood, managers at all levels are held accountable for a variety of measures, for example, customer satisfaction and retention; key process performance; scorecard metrics on how the business is running; profit and loss statements and employee attitude.

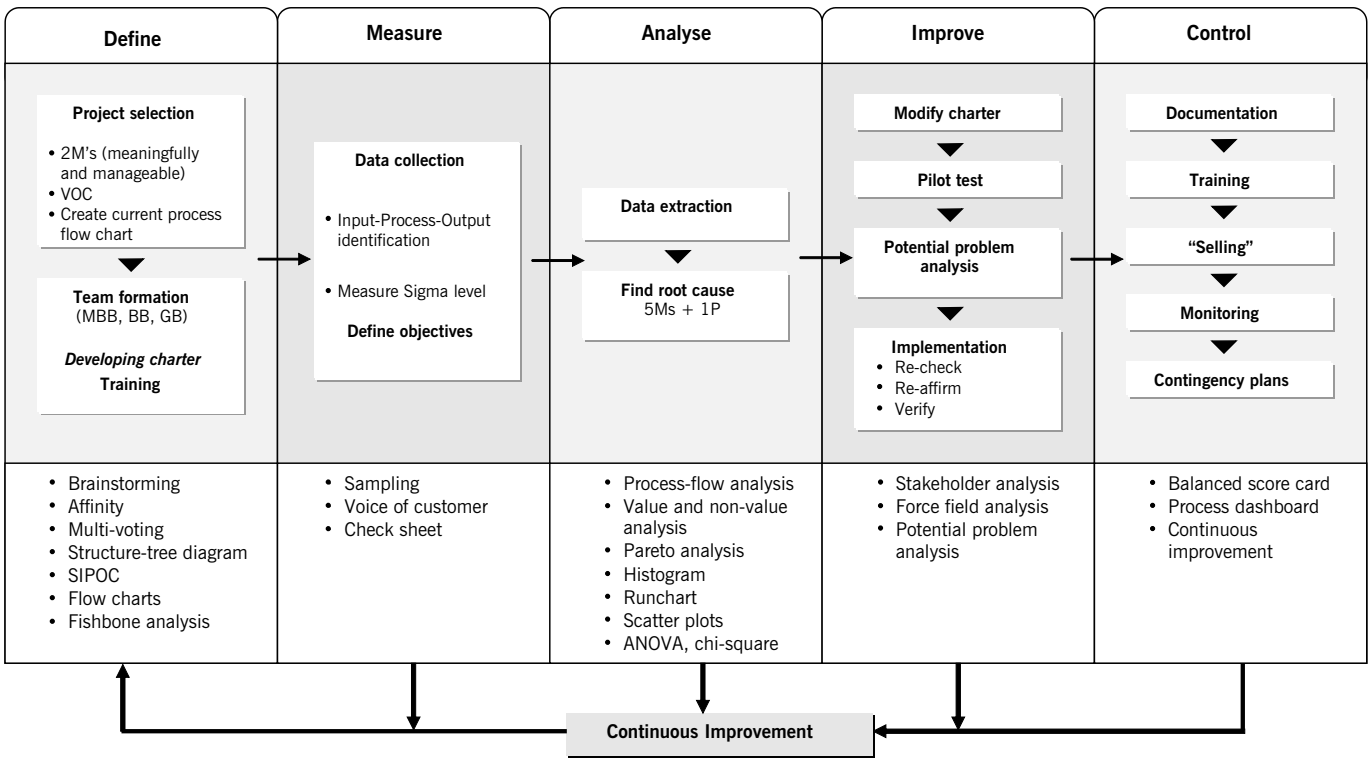
The net effect is to make Six Sigma a means of responding to critical business needs and ingraining proactive, customer-focused management into the daily organizational routine. As a management system, though, Six Sigma is not 'owned' by senior management leaders, although their role and participation is critical, or driven by middle management despite their participation being the key component. The ideas, solutions, process discoveries and improvements that arise from Six Sigma take place at the front lines of the organization. The first and most obvious path an organization can take into implementing Six Sigma into its organization is an entire cultural change. This complete business transformation requires a serious effort to work. Firstly, communication is important in that the message of change and the willingness to change must be hammered into all members of the organization. The first task of any Six Sigma implementation is dependant on all employees understanding Six Sigma as not a fad but a long-term goal, a new company culture, a way of life or the key to the future. For a complete transformation to succeed, management must select the right

people with the right attitude to form Six Sigma teams to devote themselves to analyzing and improving key processes. These teams should scrutinize: how the company distributes its products; the effectiveness of the sales process; new product development; critical customer complaints; product defects and habitual problems; information systems critical to business decision-making andlarge scale cost reductions.

The DMAIC - define, measure, analyze, improve (or implement) and control

DMAIC (Figure 1) is one of the most important abbreviations within the Six Sigma terminology and is one of the major contributions to the success of Six Sigma in general. This is because improvement of quality, problem solving and process design teams is the most visible and active component of the Six Sigma effort.

Figure 1
THE SIX SIGMA DMAIC MODEL - JTE ADAPTATION



The Six Sigma teams are created to solve organizational problems and to capitalize on opportunities. An interesting factor of forming Six Sigma teams is their diversity within the organization. The teams consist of employees of different departments, job levels, backgrounds, skills and seniority. However, although team members are diverse, within the Six Sigma team planning ideology all members are equal and the contributions of all members is the key to achieving the breakthroughs sought in the Six Sigma effort. While one could argue that DMAIC is just one of countless other problem-solving techniques developed in the past or present, the greatest differences or advantages of DMAIC include:

1. *Measuring the problem*: In DMAIC, problems must be validated by facts and hard evidence, not simply gut feeling or assumptions of problems.
2. *Focusing on the customer*: The external customer, in Six Sigma, is always the most important, even if the aim of the project is to cut costs in a process or processes.
3. *Verifying root cause*: Traditionally, it can be argued that if a group of people agreed on a cause for a problem that in itself was proof enough. In Six Sigma, however, the cause of a problem must be proven with facts and data.
4. *Breaking old habits*: Solutions derived from Six Sigma principles using the DMAIC technique are often not minor changes in old processes and methods. Real change and results take creative new solutions.
5. *Managing risks*: As mentioned earlier, Six Sigma principles allow for certain risk-taking in identifying solutions. Further to that, testing and perfecting solutions is an essential part of Six Sigma disciplines.
6. *Measuring results*: The follow-up action to any solution is to verify its real impact with facts and data.
7. *Sustaining change*: Solutions and improvements to process design developed by DMAIC teams can be outdated quickly if not nurtured and supported. Making change last is the final key to the DMAIC problem-solving approach.

Hence, the salience of Six Sigma for the foodservice operator is that the relationship between organization's quality systems and its various levels of staff may have an impact on whether or not the organization's quality systems and/or quality strategies are meeting and/or exceeding their customer expectations. As noted earlier, however, the reporting about foodservice organization's quality systems and how these are applied is lacking, and this study aimed in redressing that gap. In this context the following Hypothesis was put forth for confirmation:

Hypothesis $H_a 1_{1\text{-}4.}$, states that the 'application of Journey towards Excellence (JTE) quality initiatives at the Hong Kong Jockey Club lead to:

1. facilitation of meetings (dialogue) between foodservice management and staff to affect better quality practices;
2. evaluation of the organization's "best practices";
3. an improvement in the organizational culture to affect better quality practices; and
4. an improvement in the 'quality' mind-set of its managers and employees.'

The Hong Kong Jockey Club – a brief introduction

Horse racing in Hong Kong commenced in 1841 with the arrival of the British. The Hong Kong Jockey Club (HKJC) was founded in 1884 and changed from an amateur to a professional organization in 1971. The Club has a long tradition of donating to charitable causes, but it was in the 1950s, as Hong Kong struggled to cope with post-war reconstruction and a massive influx of immigrants, that this role became integral to its operation. In 1955 the Club formally decided to devote its surplus each year to charity and community projects.

Today, the Hong Kong Jockey Club is one of the largest racing organizations in the world, horse racing being the most popular spectator sport in Hong Kong. The Club also operates the Mark Six lottery and, under Government authority, offers betting on football matches held outside Hong Kong. The Club is the largest single taxpayer in

Hong Kong -HK$13,115 million in 2007/08, or about 6.5% of all taxes collected by the Hong Kong SAR Government. A unique feature of the Club is its not-for-profit business model whereby its surplus goes to charity. Over the past decade, the Club has donated an average of one billion Hong Kong dollars every year to hundreds of charities and community projects (HK$3,321 million in 2008). Today, the Club ranks alongside organizations such as the Rockefeller Foundation as one of the biggest charity donors in the world. The Club is also one of the largest employers in Hong Kong, with 4,800 full-time and 20,200 part-time staff, of which more than one third is employed in the Club's foodservice outlets (Hong Kong Jockey Club webpage, 2008).

Methodology

A questionnaire-based survey was developed and administered to the target population to evaluate "importance" and "applicability" perceptions of the Six Sigma quality system foodservice environment. The perspectives of senior managers, middle managers and rank and file staff as well as service, food production and administrative staff of a large local foodservice and catering organization were surveyed. The data-collection instrument was based and designed in accordance to the Six Sigma's DMAIC quality dimensions and protocols, and it comprised of three main sections. After an exhaustive search of the relevant foodservice literature, no 'Six Sigma'-type research instruments were to be found that could be applied in foodservice and/or catering environment. The research instrument used was therefore, designed and developed for this study.

The questionnaire was designed to elicit the respondents' perceptions about how JTE was actually operationalized at the HKJC vis-à-vis the Verbal Frequency Scale (Alreck & Settle, 1995) the respondents were required to respond to each statement indicating their perceptions of how the JTE precepts were actually applied at the HKJC by anchoring their answers from (1) "never", (2) "rarely", (3) "sometimes", (4) "often" and (5) "always". A pilot test was conducted representing HKJC's senior managers, (n=5), middle managers (n=5), and rank and file staff (n=10). Cronbach's alpha was performed to test the reliability and internal consistency of each of the instrument's items. The results of reliability testing were Alpha 0.9217 and 0.9148 for each set of questions respectively, which was above the minimum value of 0.5, which is usually acceptable as an indication of reliability (Hair, Anderson & Black, 1995; Nunnally, 1970).

SAMPLING PLAN

The target population for this study comprised of six groups: senior managers, middle managers, and rank and file staff who worked in foodservice and service, food production and administrative positions at the Hong Kong Jockey Club – Sha Tin Club House, Happy Valley Club House and Bees River Country Club. A research design was adopted which utilized quantitative techniques for data collection and analysis. Based on judgmental or purposive sampling, quantitative data was obtained from foodservice managers, middle managers and rank and file staff to gather the appropriate data. A convenience sample of the Hong Kong Jockey Club foodservice staff (total sample size: 112) comprised of senior foodservice managers (n=15), supervisors and executive chefs/executive sous chefs, cost controllers, restaurant/banquet managers, captains (n=65), foodservice back-of-the-house and front-of-the-house employees (n=32) who are working in the various HKJC operations.

The t-tests were used for the purpose of measuring differences in "importance" and "application". Factor analysis was used in this study to: (1) create correlated variable composites from the original attributes ratings and obtain a relatively small number of

variables that explain most of the variances among the attributes; and (2) to apply the derived factor scores in subsequent regression analysis. The data for the factor analysis were the "Importance" and "Application" attribute items. The Principal Components and Orthogonal (Equamax with Kaiser Normalization) rotation method was used for the analysis. The Equamax is a hybrid between Varimax and Quartimax that tries simultaneously to simplify the factors and the variables. The Equamax rotation is often selected when the original variables are complex and when simplicity is needed for both variables and factors (Tabachnick & Fidell, 1996). Multiple regression analysis was used in this study to learn more about the relationship between several independent or predictor variables and a dependent or criterion variable. That is, it was used to test the hypothesis $H_a 1_{1\text{-}4}$., outlined earlier.

Findings and discussion

Table 2 represents the demographic profile of the respondents showing that 50% of the respondents who participated in the questionnaire were aged between 31- 40 and 28.6% were aged between 41- 50. This suggested that the majority of respondents were mature experienced foodservice workers with 75% of them having 10 years or above related work experience. The total number of respondents was 112 with 32 employed at rank and file positions, 65 were middle management and 15 were senior management. Of those 112 respondents, 71.4% were male and 28.6% were female in which nearly 50% of them have been working in HKJC for at least 5 years. Results also showed a high level (87%) of employee participation in service quality training, while 64.3% were working in the service areas and 28.6% and 7.1% respectively were working in food production and administration.

Table 2
DEMOGRAPHIC PROFILE OF RESPONDENTS

	Frequency	Percent	Valid percent	Cumulative percent
Age				
22-25	4	3.6	3.6	3.6
26-30	16	14.3	14.3	17.9
31-40	56	50.0	50.0	67.9
41-50	32	28.6	28.6	96.4
51 - above	4	3.6	3.6	100.0
Gender				
Male	80	71.4	71.4	71.4
Female	32	28.6	28.6	100.0
Food service experience				
1 to less than 3 years	4	3.6	3.6	3.6
3 to less than 5 years	4	3.6	3.6	7.1
5 to less than 10 years	20	17.9	17.9	25.0
10 years above	84	75.0	75.0	100.0
Work experience in HKJC				
Less than 1 year	12	10.7	11.0	11.0
1 to less than 3 years	36	32.1	33.0	44.0
3 to less than 5 years	8	7.1	7.3	51.4
5 to less than 10 years	22	19.6	20.2	71.6
10 years or above	31	27.7	28.4	100.0

Table 2 **CONTINUED**

	Frequency	Percent	Valid percent	Cumulative percent
Service quality training				
Yes	96	85.7	85.7	85.7
No	16	14.3	14.3	100.0
Rank				
Rank and File	32	28.6	28.6	28.6
Middle Management	65	58.0	58.0	86.6
Senior Management	15	13.4	13.4	100.0
Position				
Service	72	64.3	64.3	64.3
Food Production	32	28.6	28.6	92.9
Administrative	8	7.1	7.1	100.0

Source: Adapted from Pande et al 2000

Results of T-test Analysis (Paired t-test for gap analysis between "Importance" and "Application")

Table 3 provides a summary of the paired t-test findings undertaken to measure the gaps between "importance" and "application" of the three respondents groups (rank and file staff, middle management and senior management). From the analysis about the differences in the mean scores between the three respondent groups, it can be argued that there was a statistically significant difference between the senior management, middle management and rank and file staff's overall mean "importance and "application mean scores, that is, that the difference between "Importance" and "Application" perceptions (of quality initiatives) mean scores was statistically significant. As indicated in Table 3, the mean gaps (I-A) have been categorized into three categories. Firstly the bold Italics denote a gap of 1.00 or greater, the asterisk***** denotes a negative gap and those with normal text denote gaps from 0.00 to 0.99.

Senior management

The senior management's gaps between "importance" and "application" that were greater than 1.00 are identified now. These gave an indication of areas where the HKJC JTE could have been improved and more importantly, about which areas the JTE has not performed to the requirements of the Six Sigma's DMAIC model:

- The use of focus groups and teams for the quality improvement process.
- The use of graphical tools in the evaluation of the JTE.
- The use of numerical measure in determining the extent of success of a quality program.
- JTE in attaining a high level of customer satisfaction.
- The organizational culture in promoting a high quality program.
- The supplier relations in maintaining a high quality program.

However, there were also the variables which senior management think the HKJC's JTE quality program, are exceeding their "importance" perceptions (negative gaps). In other words, the "application" of these was greater than their "importance" which suggested that the JTE have been most successful in areas such as the involvement of all levels of staff in the decision-making process.

Middle management

At the middle management level, the following areas of the HKJC's JTE quality program exceeded their "importance" perceptions (gaps of 1.00 or above). In other words, the "application" of this was greater than its "importance" which suggested that these areas of the JTE have been most successful; for example, the use of focus groups and teams for the quality improvement process.

From the Middle management level, the following areas of the HKJC's JTE quality where negative gaps occurred at middle management level, that is, the "application" had greater mean scores than that of its "importance" which suggested that these were areas of the JTE which have been successful: the use of benchmarking in the rating of JTE; and continuous improvement.

Rank and file staff

In terms of the "importance" exceeding the "application mean scores by 1.00 or above, the rank and file staff findings suggested these areas in which improvements could be made to the HKJC's JTE:

- The use of benchmarking in the rating of JTE;
- A systematic, fact-driven approach to solving quality problems;
- The use of numerical measures (a score) in determining the extent of success of HKJC's JTE; and
- The customer focus groups as a feedback mechanism.

There were areas of the rank and file staff gaps where the "application" exceeded its "importance" mean scores (negative gaps). These suggested that in terms of performance, the rank and file had exceeded their "importance" expectations. These areas in which the JTE rank and file staff had been successful include the involvement of all levels of staff in the decision-making process.

Table 3
SUMMARY OF PAIRED T-TEST FINDINGS

Senior management (N = 15)								
Variables	Importance (I)		Application (A)		Gap	T-value	SD Error	Sig.
	Mean	SD	Mean	SD	(I – A)			
The use of focus groups and teams for the quality imp process	4.2667	0.59362	2.3333	0.97590	**1.9334**	9.374	0.20625	0.025
The involvement of all levels of staff in the decision-making process	2.6000	0.91026	4.1333	0.83381	-1.5333*	-7.122	0.21529	0.035
The use of graphical tools (e.g. fishbone analysis) in the evaluation of your quality program	3.7333	0.45774	2.7333	0.59362	**1.0000**	10.247	0.09759	0.001
The need for "contingency plans"	3.2677	0.96115	2.8667	1.12546	0.4010	2.449	0.16330	0.000
The use of numerical measure (i.e. a score) in determining the extent of success of a quality program in your organisation	4.7333	0.45744	3.0667	1.09978	**1.6653**	7.174	0.23231	0.017
The quality program such as yours (Journey to Excellence) in attaining a high-level of customer satisfaction	4.6000	0.50709	3.4000	0.63246	**1.2000**	4.294	0.27946	0.000
The organisational culture in promoting a high quality program	4.2000	0.67612	2.8000	0.56061	**1.4000**	10.693	0.13093	0.005
The supplier relations in maintaining a high quality program	3.9333	0.45774	2.8000	0.56061	**1.1333**	12.475	0.09085	0.001
The customer focus groups as a feedback mechanism of your quality outcomes	3.7333	0.59362	3.2667	0.79881	0.4666	2.824	0.16523	0.015
Is creating a multi-skilled workforce in your organisation	4.0000	0.84515	3.7333	0.96115	0.2667	2.256	0.11819	0.000

Table 3 **CONTINUED**

Middle management (N = 65)								
Variables	Importance (I)		Application (A)		Gap	T-value	SD Error	Sig.
	Mean	SD	Mean	SD	(I – A)			
The use of focus groups and teams for the quality imp process	4.0615	0.72623	2.9077	1.38883	**1.1538**	7.913	0.14582	0.000
The role of the "leader" in the success of a quality program	4.2769	0.45096	4.1077	0.92065	0.1692	1.557	0.10868	0.005
The use of MI S in determining the effectiveness of your quality program	3.9538	0.64785	3.2615	1.21549	0.6923	4.997	0.13854	0.001
The use of benchmarking in the rating your quality standards	4.0000	0.79057	4.0615	0.88171	-0.0615*	-0.489	0.12572	0.030
Is training, in relation to developing a service quality-oriented organisational culture in your organisation	4.3385	0.59364	4.0308	0.95147	0.3077	3.226	0.09538	0.000
The need for "contingency plans"	4.0462	0.73805	3.4000	0.89791	0.6462	6.222	0.10385	0.000
A systematic, fact-driven approach to solving quality problems	4.3692	0.60128	3.5692	0.95147	0.8000	6.639	0.12050	0.023
Continuous improvement in quality in your organisation	4.2154	0.73935	4.2923	0.74421	-0.0769*	-0.727	0.10586	0.006
The suggestions of staff for determining the causes of quality problems	4.6308	0.48635	4.2308	0.65596	0.4000	4.589	0.08716	0.029
The customer focus groups as a feedback mechanism of your quality outcomes	4.1231	0.76050	3.1846	1.43497	0.9385	5.886	0.15944	0.000

Rank & file (N = 32)								
Variables	Importance (I)		Application (A)		Gap	T-value	SD Error	Sig.
	Mean	SD	Mean	SD	(I – A)			
The involvement of all levels of staff in the decision-making process	3.5000	0.87988	4.0000	1.24434	-0.5000*	-3.215	0.15554	0.000
The use of graphical tools (e.g. fishbone analysis) in the evaluation of your quality program	3.2857	0.71270	2.5714	1.31736	0.7143	2.121	0.33672	0.007
The use of MI S in determining the effectiveness of your quality program	3.8750	0.60907	4.0000	0.87988	-0.1250*	-0.510	0.24491	0.000
The use of benchmarking in the rating your quality standards	3.8750	0.60907	2.8750	1.18458	**1.0000**	5.568	0.17961	0.003
A systematic, fact-driven approach to solving quality problems	4.1250	0.60907	3.0000	1.43684	**1.1250**	3.188	0.35284	0.000
The use of numerical measure (i.e. a score) in determining the extent of success of a quality program in your organisation	4.5000	0.71842	3.3750	1.23784	**1.1250**	3.704	0.30371	0.003
The suggestions of staff for determining the causes of quality problems	4.3750	0.70711	4.0000	1.34404	0.3750	3.000	0.12500	0.000
The quality program such as yours (Journey to Excellence) in attaining a high-level of customer satisfaction	4.0000	0.71842	3.3750	1.00803	0.6250	4.061	0.15391	0.002
The supplier relations in maintaining a high quality program	3.5000	1.00600	3.0000	1.01600	0.5000	1.679	0.29784	0.034
The customer focus groups as a feedback mechanism of your quality outcomes	4.2500	0.43944	3.1250	1.07012	**1.1250**	6.757	0.16650	0.005

a. The correlation and t cannot be computed because the standard error of the difference is 0

b. bold denotes a significant gap of greater than 1

* This denotes a negative gap where the "application" exceeds the "importance" mean

Factor analysis for "Importance" attributes

From the Orthogonal (Equamax) rotated factor matrix, eight "Importance" factors with 26 variables were defined by the original variables that loaded most heavily (loading ł 0.5) on them. Table 4 highlight that the factor analysis produced a clean factor structure with relatively higher loadings on the appropriate factors. The eight-factor solution explained 81.198 per cent of the variance. Most variables loaded evenly on factors. The factor structure verified that there was a minimal overlap among these factors and that all factors were independently structured. The higher loadings signaled the correlation of the variables with the factors on which they loaded. The communality of each variable was relatively high, ranging from 0.5812 to 0.8691, which also indicated that the variance of the original values was captured well by the eight factors. The eight-factor structure resulted in a relatively more workable and meaningful number of composite (DMAIC) dimensions that were interpreted and used for further analysis.

Table 4.
FACTOR ANALYSIS OF IMPORTANCE ATTRIBUTES - FACTOR LOADINGS, COMMUNALITIES, % OF VARIANCE AND RELIABILITY WITH ORTHOGONAL ROTATION

Factor	F1	F2	F3	F4	F5	F6	F7	F8
Processes								
(10) **How important is …** Providing effective and efficient "documentation" in maintaining your quality objectives	0.770							
(13) **How important is …** A systematic, fact-driven approach to solving quality problems	0.653							
(20) **How important is …** The organisational culture in maintaining a high quality program	0.650							
(21) **How important is …** The organisational culture in promoting a high quality program	0.536							
(22) **How important is …**The supplier relations in promoting a high quality program	0.664							
(23) **How important is …** The supplier relations in maintaining a high quality program	0.590							
Internal control								
(11) **How important is …** Is training, in relation to developing a service quality-oriented organisational culture in your organisation		0.710						
(12) **How important is …** The need for "contingency plans"		0.637						
(17) **How important is …** The suggestions of staff for determining the causes of quality problems		0.733						
Continuous improvement								
(8) **How important is …** The involvement of customers and their feedback in determining quality objective outcomes			0.671					
(14) **How important is …** Providing training in the successful resolution of a quality problem			0.675					
(16) **How important is …** Continuous improvement in quality in your organisation			0.600					
(26) **How important is …** Is creating a multi-skilled workforce in your organisation			0.912					
Pro-active management								
(1) **How important is …** The use of focus groups and teams for a quality improvement process				0.788				
(5) **How important is …** The role of the "leader" in the success of a quality program				0.729				

Table 4. **CONTINUED**

Factor	F1	F2	F3	F4	F5	F6	F7	F8
Fact-driven management								
(3) **How important is …** The development of "best practices" or "charter" in maintaining a quality program					0.922			
(4) **How important is …** The use of graphical tools (e.g. fishbone analysis) in the evaluation of your quality program					0.518			
Quality control								
(7) **How important is …** The use of benchmarking in the rating your quality standards						0.590		
(9) **How important is …** The employment/cooperation of 3rd party consultants in the assessment of the quality program						0.857		
External control								
(18) **How important is …** The quality program such as yours (Journey to Excellence) in attaining a high-level of customer satisfaction							0.852	
(19) **How important is …** Employing staff with a strong service-mindset in applying the quality program in your organisation							0.618	
(25) **How important is …**Developing precise "standard recipes" for your food quality standards							0.565	
Focus on customer								
(2) **How important is …** The involvement of all levels of staff in the decision-making process								0.886
(24) **How important is …** The customer focus groups as a feedback mechanism of your quality outcomes								0.607
Per cent of variance	13.424	10.951	10.887	10.162	9.713	9.441	9.003	7.617
Cummulative percentage	13.424	24.375	35.262	45.424	55.137	64.578	73.581	81.198
Communalities	0.809	0.891	0.870	0.744	0.676	0.902	0.796	0.853
Composite reliability	0.8691	0.6743	0.7951	0.6508	0.5812	0.5957	0.6379	0.6018

Factor analysis for "Application" attributes

From the Orthogonal (Equamax) rotated factor matrix, seven "Application" factors with 24 variables were defined by the original variables that loaded most heavily (loading ł 0.5) on them (Tables 5). The factor analysis produced a clean factor structure with relatively higher loadings on the appropriate factors. Most variables loaded evenly on factors. The seven-factor solution explained 80.407 per cent of the variance. The factor structure verified that there was a minimal overlap among these factors and that all factors were independently structured. The higher loadings indicated the correlation of the variables with the factors on which they loaded. The communality of each variable was relatively high, ranging from 0.748 to 0.902, which also indicated that the variance of the original values was captured well by the seven factors. The seven-factor structure resulted in a relatively more workable and meaningful number of composite (DMAIC) dimensions, which could be more easily interpreted and used for the subsequent ANOVA (not reported here) and regression analysis.

Table 5.

FACTOR ANALYSIS OF APPLICATION ATTRIBUTES - FACTOR LOADINGS, COMMUNALITIES, % OF VARIANCE AND RELIABILITY WITH ORTHOGONAL ROTATION

Factor	F1	F2	F3	F4	F5	F6	F7
Continuous improvement							
(35) **How often….** Do you hold/participate in meetings with all your staff to discuss quality related issues	0.835						
(36) **How often….** Do you evaluate your "best practices" for maintaining your quality program	0.802						
(41) **How often….** Do you involve customers and their feedback in determining quality objective outcomes	0.592						
(44) **How often….** Do you organise/participate in training activities to promote a quality-oriented organisational culture	0.703						
(49) **How often….** Do you revise your quality program (Continuous Improvement)	0.561						
(50) **How often….** Do you listen to the opinions of staff/co-workers for determining the causes of quality problems in your organisation	0.531						
Fact-driven management							
(37) **How often….** Do you use graphical tools to evaluate your quality problems		0.664					
(39) **How often….** Do you use Management Information systems in determining the effectiveness of your quality program		0.734					
(45) **How often….** Do you deploy contingency plans in dealing with quality problems		0.752					
(51) **How often….** Does your quality program "Journey to Excellence" attain a high level of customer satisfaction		0.774					
Focus on customer							
(33) **How often….** Have you organised/ focus groups with customers to gain customer feedback			0.798				
(34) **How often….** Have you participated in focus groups with customers to gain customer feedback			0.54				
(36) **How often….** Do you evaluate your "best practices" for maintaining your quality program			0.826				
Internal and external control							
(40) **How often….** Do you benchmark with others to measure your quality standards				0.508			
(42) **How often….** Do you employ/cooperate with 3rd party consultants in the development of your quality				0.507			
(56) **How often….** Do you scrutinize the product specifications of your foodservice purchases				0.859			
(57) **How often….** Do you scrutinize your standard recipes				0.799			
Pro-active management							
(52) **How often….** Do you evaluate the mind-set of your employees/co-workers in identifying whether they are in line with the service quality objectives of the organisation					0.737		
(53) **How often….** Do you initiate/participate in exercises to improve the organisational culture to affect better quality practices					0.845		
(58) **How often….** Do you offer opportunities for multi-skilling in your organisation					0.523		

Table 5. **CONTINUED**

Factor	F1	F2	F3	F4	F5	F6	F7
Processes							
(43) **How often….** Do you provide effective and efficient "documentation" to your staff about your quality objectives						0.634	
(48) **How often….** Do you use numerical measures (i.e. score) for determining the success of your quality program						0.84	
Boundaryless collaboration							
(54) **How often….** Do you involve your suppliers in promoting and maintaining a high quality program in your organisation							0.924
(55) **How often….** Do you involve your customer focus groups as a feedback mechanism of your quality outcomes							0.615
Per cent of variance	15.847	12.683	11.614	11.439	11.035	9.688	8.101
Cummulative percentage	15.847	28.530	40.144	51.583	62.618	72.306	80.407
Communalities	0.891	0.884	0.884	0.797	0.834	0.810	0.793
Composite reliability	0.8418	0.8304	0.7603	0.7045	0.7022	0.5325	0.5120

Regression analysis

Thus far the results of the analyzed data from the HKJC suggests that HKJC's Journey To Excellence (JTE) – a Six Sigma hybrid quality system, has been embraced and accepted, although not equally, by the HKJC's foodservice staff. Furthermore, the application of the JTE, vis-à-vis its DAMIC methodology has had homogeneous results throughout the HKJC foodservice operations, as indicated in the comparison of the 'importance' and 'applicability' results. To test what impact did the introduction of JTE have on HKJC's organizational culture, staff-management relations, organization's "best practice", and the organization's 'quality mind-set', a number of multiple regression analysis were used to test Hypothesis $H_a1_{1\text{-}4.}$ Note that only the results of H_a1_3 and $_4$ will be reported in full in this article, while acknowledging that the $H_a1_{1 \text{ and } 2}$ were accepted.

HYPOTHESIS H_a1_3

This hypothesis states that the application of Journey to Excellence quality initiatives (vis-à-vis X) at the Hong Kong Jockey Club lead to: "an improvement in the organizational culture that affected better quality practices". To test this proposition a multiple regression analysis was performed. The results of the stepwise method showed that a significant model emerged ($F_{1, 110} = 274.632$, $p=0.000$), with four predictor variables (F#5) "Pro-active Management"; F#2 "Fact-driven Management"; (F#3) "Focus on Customer"; (F#1) "Continuous Improvement", and (F#4) "Internal and External Control" were added and none were removed. The model summary included predictor variable (F#5) "Pro-active Management", which accounted for 71.1 per cent of the variance (Adjusted $R^2 = 0.711$). The inclusion of (F#2) "Fact-driven Management" into model 2 resulted in an additional 7.1 per cent of the variance being explained (R^2 change = 0.071). The inclusion of (F#3) "Focus on Customer" into model 3 resulted in an additional 3.9 per cent of the variance explained (R^2 change = 0.039), and the inclusion of (F#1) "Continuous Improvement" in the second-last model resulted in an additional 3.3 per cent of the variance explained (R^2 change = 0.033). The final model – model #5, also included predictor variable (F#4) "Internal and External Control", and this model accounted for 87. 1 per cent of the variance explained (Adjusted $R^2 = 0.871$) by the final model.

The analysis of the strength and the direction of the relationships between the predictor variables and the criterion variable showed that in the first model (predictor) variable (F#5) "Pro-active Management" had the largest Beta coefficient, 0.845. In the second model (predictor) variable (F#5) "Pro-active Management" was retained and variable (F#2) "Fact-driven Management" with Beta coefficient, 0. 266 was included, meaning that variable (F#2) "Fact-driven Management" lead to a 0.266 standard deviation increase in prediction that customer focus at the HKJC did have a contributory positive impact that lead to an improvement in the organization's quality culture at the HKJC.

In the third model, predictor variables F#5; and F#2 were retained and the predictor variable (F#3) "Focus on Customer" with a Beta coefficient, 0.206 was included. In the fourth model predictor variables F#5; F#2; and F#3 were retained and (F#1) "Continuous Improvement" (Beta –0.188 variable was added, which meant that a one standard deviation increase in "Continuous Improvement" would lead to a 0.188 standard deviation decrease in the change in the organizational quality culture at the HKJC, with the other predictor variables held constant.

In the final model predictor variable (F#4) "Internal and External Control" with a Beta value of 0.149 was included. The results of the preceding regression analysis suggested that the research Hypothesis H_a1_3. was accepted for that the "application of Journey To Excellence quality initiatives (vis-à-vis a pro-active management, a fact-driven management, focus on customers, and having internal and external quality control at the Hong Kong Jockey Club), lead to an improvement in the organizational quality culture at the HKJC. However, the analysis also suggested that "Continuous Improvement" philosophy might not have had the critical impact as anticipated, in improving the organizational culture at the HKJC.

HYPOTHESIS H_a1_4

This hypothesis states that the application of Journey to Excellence quality initiatives (vis-à-vis X) at the Hong Kong Jockey Club lead to. an improvement in the 'quality' mind-set of its managers and employees. The results of the Stepwise method showed that a significant model emerged ($F_{1, 110} = 130.571$, $p=0.000$), with four predictor variables (F#5) "Pro-active Management"; F#2 "Fact-driven Management"; (F#1) "Continuous Improvement", (F#7) "Boundary-less Collaboration", (F#3) "Focus on Customer", and (F#4) "Internal and External Control" were added and none were removed.

The model summary showed that the model only included predictor variable (F#5) "Pro-active Management", which accounted for 53.9 per cent of the variance (Adjusted $R^2 = 0.539$) and with Beta value of 0.737. The inclusion of (F#2) "Fact-driven Management" into model 2 resulted in an additional 16.4 per cent of the variance being explained (R^2 change = 0.164). The inclusion of (F#1) "Continuous Improvement" into model 3 resulted in an additional 6.4 per cent of the variance explained (R^2 change = 0.064). The inclusion of (F#7) "Boundaryless Collaboration" in model four resulted in an additional 5.3 per cent of the variance explained (R^2 change = 0.053). Whilst the inclusion of predictor variable (F#3) "Focus on Customer" resulted in an additional 4.1 per cent of the variance explained. The final sixth model also included predictor variable (F#4) "Internal and External Control", and this model accounted for 86.1 per cent of the variance explained (Adjusted $R^2 = 0.861$) by the final model.

The analysis of the strength and the direction of the relationships between the predictor variables and the criterion variable showed that in the first model (predictor) variable (F#5) "Pro-active Management" had the largest Beta coefficient, 0.666. In the second model (predictor) variable (F#5) "Pro-active Management" was retained and variable (F#2) "Fact-driven Management" with Beta coefficient, 0. 366 was included, meaning that variable (F#2) "Fact-driven Management" lead to a 0.366 standard deviation increase in prediction that customer focus at the HKJC did have a contributory positive impact that lead to an improvement in the organization's quality mind set at the HKJC. In the third model the predictor variable (F#1) "Continuous Improvement" with a Beta coefficient, 0.228 was included, whilst in the fourth model the predictor variable (F#7) Boundary-less Collaboration with a Beta coefficient of 0.207 was also included.

In the fifth model, predictor variable (F#3) "Focus on Customer" with a Beta coefficient of 0.182 was included. In the final model predictor variable (F#4) "Internal and External Control" with a Beta value of –0.073 was included. The results of the sixth and final model suggested that a one standard deviation increase in "Internal and External Control" would lead to a 0.073 standard deviation decrease in the change in the organization's quality mind set at the HKJC, with the other predictor variables held constant.

The results of the final regression analysis suggested that the research Hypothesis $H_a 1_4$. was accepted for that the "application of Journey To Excellence quality initiatives (vis-à-vis a pro-active management, a fact-driven management, continuous quality improvement, boundary-less collaboration, and focus on customers), lead to an improvement in the 'quality' mind set of managers and staff who worked in foodservices at the HKJC. However, the analysis also suggested that "Internal and External Control" did not have the influential impact on improving the peoples' quality mind-set at the HKJC

Conclusion

The results from the analysis suggested that statistically significant differences were found on how the HKJC's JTE collaborators believed what they thought they should be doing (importance), and what they were actually doing (application). In this context, the best way to present the findings was a simple graphical manner. The two models below, (Figures 2 and 3) about these differences are presented. Firstly, model 2. is based on the findings for the "Importance" perceptions of the ranks and positions of the staff at the HKJC, and the second model (Figure 3) presents the findings based on the "application" perceptions of the ranks and positions. The bold font in both models represents that these attributes were statistically significant for the ranks (senior, middle management and rank and file staff) at the HKJC, and where an asterisk is used, this represents a statistical significance of the staff positions (administrative, service and food production staff) of the HKJC. It can be summarized that the HKJC were successful in implementing most of the designed JTE into the fabric of the HKJC organization, but not all. It must be noted however, that other Sigma leaders such as Motorola and General Electric have struggled to implement the Six Sigma fully, which seemed to be equally the case at the HKJC. For example, major differences were found between the management of the HKJC and rank and file staff in terms of how important JTE was and how JTE was actually applied. Also, evidence from the findings suggested that the HKJC were unable to be equally successful with all the steps of the DMAIC model. Most notably, research findings suggested that the HKJC could be more effective (with the Six Sigma methodology) in "Measuring" quality

problems during the "Improvement" or "Implementation" stage. However, it should be acknowledged that although differences were detected in the statistical findings, the JTE has been tremendously successful in training and educating HKJC's staff about the principles of the JTE. For instance, "importance" perceptions outweighed actual "application", implying what is important to understand, and that is, that the acceptance of these major organizational changes that the JTE brought about, was already a significant achievement for the HKJC.

As noted in the literature, a major theme for the critical success factors of Six Sigma implementation is the participation and collaboration of all employees and management; in the Six Sigma terminology, this is known as boundaryless collaboration. The statistical findings and the qualitative feedback from HKJC employees strongly pointed to the transformation of the HKJC managerial style. It is suggested here that this transformation was the bedrock for the JTE's success e.g., active participation and leadership of key HKJC personnel. Although JTE can be said to have been successful, there were still many areas for the JTE to improve. In terms of leadership and staff involvement, the findings suggested that the success of JTE could be attributed to the leadership style and staff involvement, in terms of accurate and realistic measurement of JTE's quality processes and its performance, there was room for improvement. One of the reasons why measurement was not as prominent as it should be could be attributed to the fact that little historical data existed in which to compare performance with. Furthermore, it was also noted that the defining of measurements had not been fully completed at the HKJC at the time of the study.

Figure 2
THE HKJC JTE QUALITY PROGRAM (Importance - What they thought they should be doing)

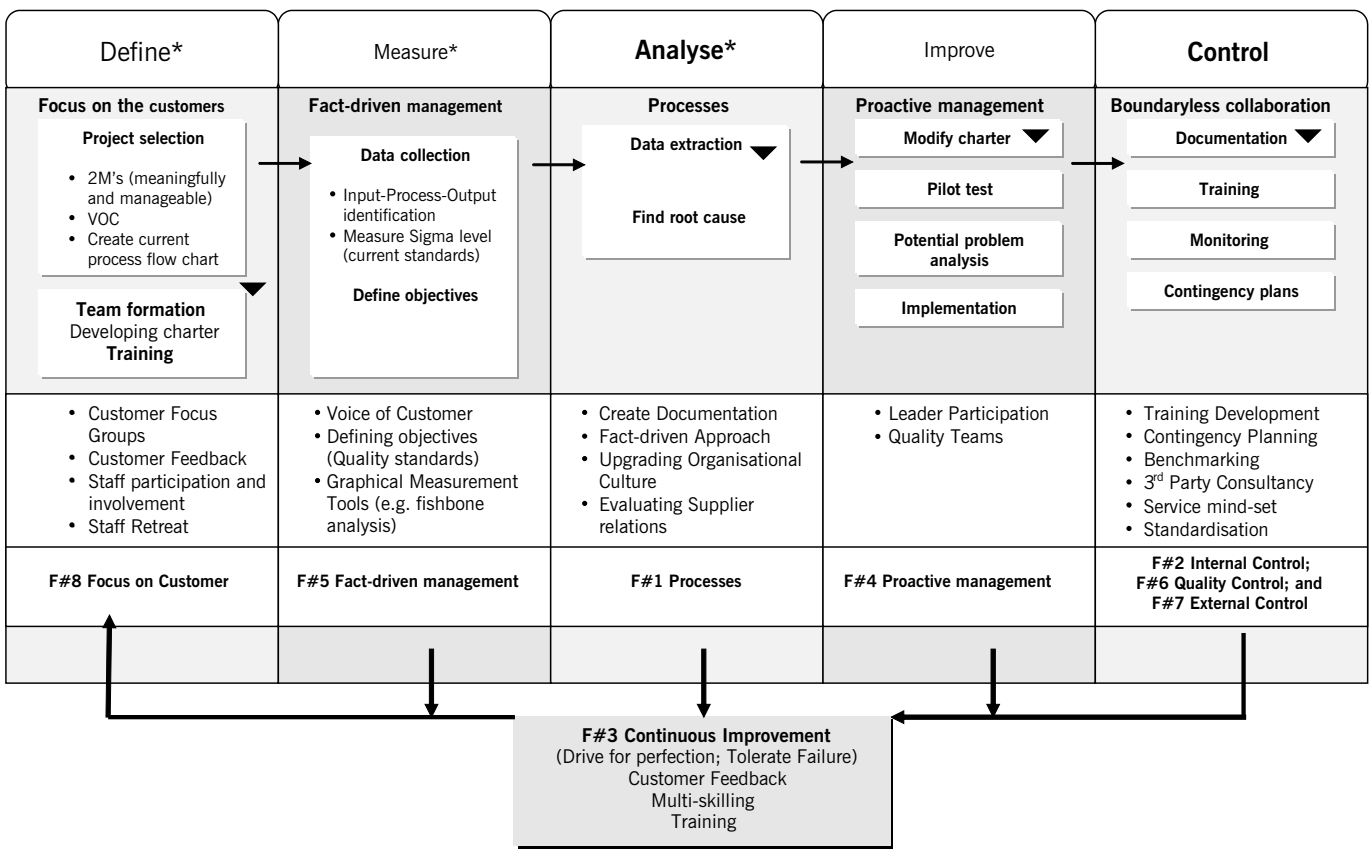
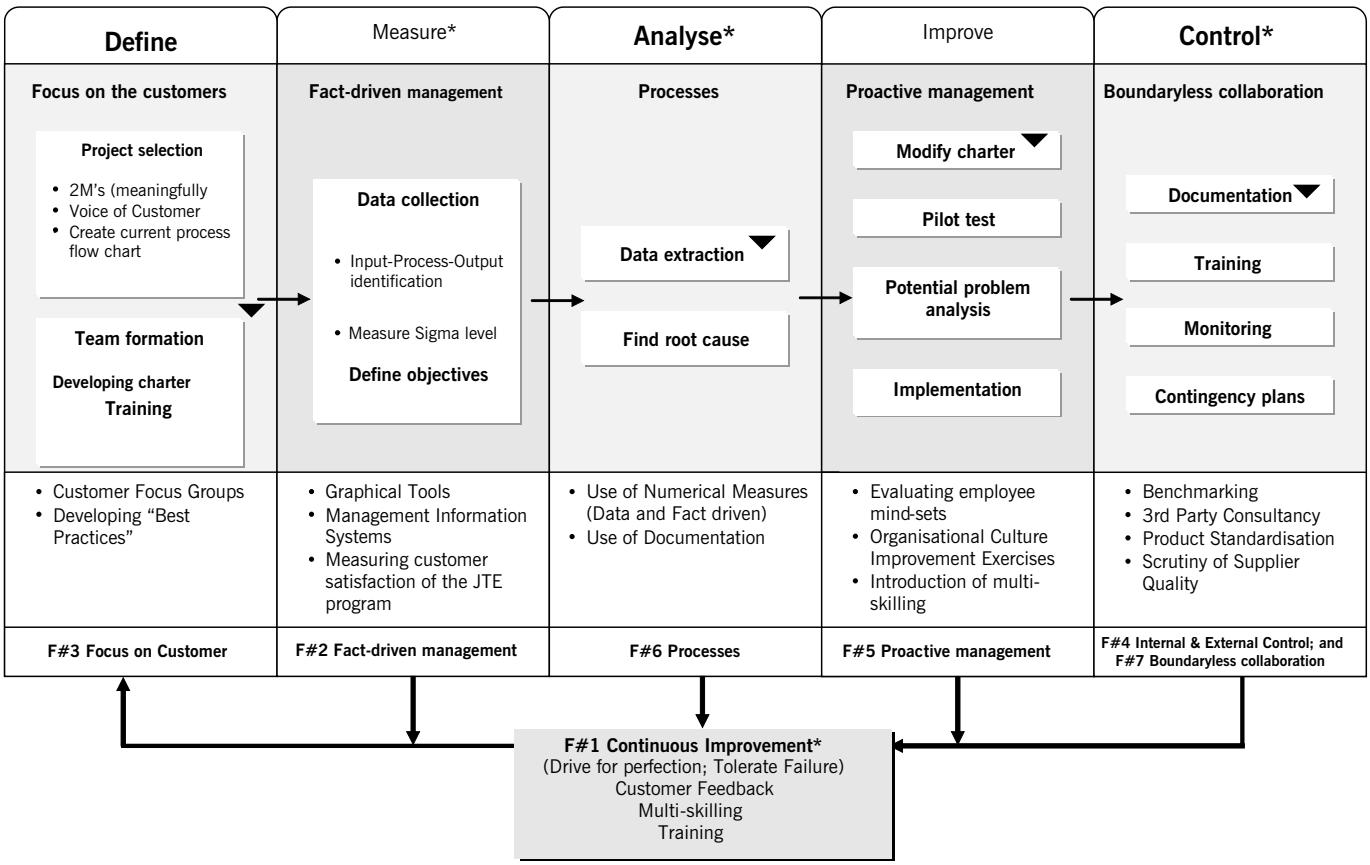


Figure 3
THE HKJC JTE QUALITY PROGRAM (Application – What they were actually doing)



The implications of the findings are several-fold. Firstly, the mean scores of "importance" perceptions can be used by the HKJC to determine whether or not employees from various ranks (senior management, middle management, rank and file) and roles (service, food production, administrative) differed. That is, the findings indicated that, the HKJC's senior management were able to determine how well the JTE quality improvement process and philosophy was instilled into their organizational culture and systems as well as the employees. Importantly, by analyzing the gaps between "importance" and "application", the HKJC management was able to identify where problem areas lie within the JTE methodology and create solutions to minimize perception and application gaps.

Limitations of the study

The nature of the study involved dealt with issues that most would considers as sensi tive and confidential, coupled with the fact that only few foodservice organizations have formal TQM or Six Sigma-like quality assurance systems in place. Access to these was not always easy and most organizations have shown their unwillingness to participate in this study for fear in disclosing their company's internal matters. However, the HKJC, a very large foodservice organization, consented to accommodate the needs of this study. Therefore, it can be said that this study was based on a convenience sampling approach. Hence, despite of the advantages of convenience, this study and its results have limited generalizability. The sample size for Senior Managers (N=15), Middle Managers (N=65) and Rank and File Staff (N=32) (Total: 112), and Service Staff (N=72), Food Production Staff (N=32), and Administrative Staff (N=8) (Total: 112) was relatively small hence; the results might exhibit a larger sampling error, which may also limit the generalizability of the study.

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