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IMPLEMENTATION OF STATISTICAL PROCESS CONTROL BY MANAGEMENT IN COSMETIC PRODUCTION ORGANIZATION: CASE OF HALAL COSMETICS COMPANIES IN SELANGOR

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Abstract: *The demand for halal cosmetics products is rapidly increasing due to the high quality of the products. Hance, it is not surprising that halal cosmetics industry can be the next emerging sector for the Halal Industries in Malaysia . The halal cosmetic products in Malaysia are certified and control under JAKIM (Department of Islamic Development Malaysia) and follow the Malaysian Standard MS 2200:2008 requirement. According to the Standard MS2200: 2008, Halal Cosmetics products must be safe and not hazardous to be used by customers. It means the products should have high quality in the manufacturing process. Thus, the implementation of Quality Control method intended to improve the quality of the halal products has become a business strategy for organizations. Statistical Process Control (SPC) is known as a powerful technique which organizations can use in improving the quality of products or services and lead to the many benefit for companies. Therefore, the purpose of this study is to examine the influence of management commitment on SPC implementation and the impact of SPC implementation on company benefit. The study was conducted for 10 cosmetics companies in Selangor, and use self-administered questionnaires as data collection method. This study applies modelling methodology of Partial Least Squares (PLS) using SmartPLS software to study the relationships in the theoretical model. The results of the PLS analysis support the proposed model with all regression coefficients are significant at 0.05 (t-value > 1.97), i.e. the relationships among the constructs are statistically significant. As a result, the model is statistically valid and give a clear indicators of SPC implementation in Halal cosmetics companies.*

Keywords: *Halal Cosmetics, Statistical Process Control, Management Commitment*

INTRODUCTION

Nowadays, 'Halal' concept is becoming more spiritually conscious in the Middle East and some Asian countries. Muslim consumer awareness toward halal has widened from being concerned with meat-based products to a wide range of products. Muslim consumers are seeking Halal integrity and reliability of the products, and services. This also extend to a cosmetics and personal care products.

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In the scope of halal cosmetics, the halal concept covers all aspects of management system of halal quality. It is not only focusing on the aspect of production including sourcing of halal ingredients but all elements must be accounted, such as manufactured procedure, storing packaging and logistics (Tieman, 2011).

In Malaysia, Halal standard was established in 2003, and it was utilized by the appointed halal certification body, the Department of Islamic Development Malaysia (JAKIM) and their Halal Certification scheme (Department of Standard Malaysia, 2008). Under JAKIM, there are three types of Malaysian Halal Standards; 1- MS 1900:2005, Quality Management System-Islamic Perspectives; 2- MS 2200-1:2008, Islamic Consumer Goods-Part1:Cosmetics and Personal Care –General Guidelines; 3- MS 1500:2004, Halal Food-Production, Preparation, Handling and Storage-General Guidelines. JAKIM is also responsible for issuing the certification halal products for export and import, while the Islamic state government (JAIN) only issues halal certifications for local consumptions. Halal certification refers to the examination of the processes in its preparation, slaughtering, cleaning processing, handling, disinfecting, storing,and transportation and management practices. To comply with all conditions set by halal standard requirements, manufacturers must act responsibly to maintain the halal status of their products that they produce. For halal cosmetics and personal care products, the products must comply with the standard MS Malaysia 2200: 2008 requirements. According to MS 2200:2008, cosmetic products must be safe and non-hazardous to users and consumers. In brief, the halal cosmetics are products that must not have humans part of ingredient derived from thereof; not contain any animal parts forbidden to Muslims or, any animal not slaughtered according to syariah law; no genetic modified organism (GMO) which are decreed as najs; no alcohol from alcoholic drinks (khamar); no contamination from najs during preparation, processing, manufacturing and storage; and safe for consumers . The certification also requires that the products should have certain quality and meet the requirements of consumers in terms of usage and efficacy .

Hence, for the halal cosmetic products, the formulation and quality of the products must totally comply with the Islamic requirement and follows the requirements of National Pharmaceutical Control Bureau, Ministry of Health Malaysia. Moreover, the growth on demand of halal cosmetics product is rapidly increasing, and acquiring quality certifications and implementing quality management techniques has become a norm for purchasers.

Therefore, to maintain an optimal level of quality of halal cosmetics products, quality management system must be efficient and systematic. The existing concept of effective management in producing halal cosmetics products demands the successful execution of three activities: 1 quality planning; 2 quality assurance, and quality control and improvement (Montgomery, 2009). Similar concepts will be used to design and build quality management systems for halal cosmetics products.

The quality management technique is an effective management tool with the system organized properly within an organizations (Montgomery, 2009). However, to be more effective, statistical technique must be implemented within and be part of a management system that is focused on quality improvement. The statistical technique, including statistical process control (SPC) and design of experiments, along with other problem solving tools are the technical basics for quality control and improvement. According to Smith (1991) statistical process control involves the use of statistical signals to identify sources of variation, to improve performance, and to maintain control of processes at higher quality levels. Thus, the study on implementation of statistical process control (SPC) in cosmetics industry would be appropriate to access the quality of cosmetic products and the company's commitment toward quality control and improvement system. Hence, the success of SPC implementation, management must coordinate using team-effort approach in which everyone involves can contribute meaningfully to the quality effort.

Recently, Muslim customers and organizations which produce halal cosmetics products have endorsed the requirement of their suppliers to have halal certification. However, much of the focus of Malaysia halal standard is on formal documentations of the halal system; that is, on halal quality assurance activities (Mukhtar, Muhammad Butt, 2012), (Bonne at el, 2001), and (Rajagopal, Ramanan, Visvanathan, Satapathy, 2011). Too much effort is focused on the preparation of documentation, paperwork, and bookkeeping, it is not enough to reduced variability and improved process of halal cosmetics products. In order to improve and maintain the quality of the halal cosmetics, the quality certifications and the implementation of quality management technique should be considered as well

The disclosure of mistakes made by the manufacturing company today is that some of them simply find defective items after they are produce and remove them before shipment to the customer. These are examples of trying to achieve quality through the detection of defective on products made. Therefore, the quality of the production system has not improved, and the detection process on the products will continue. Thus, the statistical process control technique leads to a system of prevention, which will replace the existing system of detection. As a consequence, the statistical process control is becoming the core for both quality improvement and quality maintenance.

The purpose of this study was aims to (1) examine the influence of management commitment on SPC (statistical process control) implementation on halal cosmetics organizations (2) examine the impact of SPC implementation on company benefit

(3) assess the relationship between management commitment and company benefit.

LITERATURE REVIEW

Benefits of Statistical Process Control in Manufacturing Process

Statistical process control is a primary part of monitoring, managing, maintaining and improving the performance of the production process in manufacturing or services throughout the successful use of statistical method (Montgtomery, 2009). The statistical method that been discuss by Montgomory (2009) is considered into three scope; 1) statistical process control; 2) design of experiments; 3) acceptance sampling procedure. The statistical process control involves systematic statistical procedures that will help manufacturer to attain a better performance in the manufacturing process by reducing the variability of the process (Roland Caulcutt, 1996). There are seven tolls or techniques that have been used in the statistical process control; 1-check sheet; 2-histogram; 3-control chart; 4-scatter diagram; 5-stratification; 6- pareto chart; 7- cause and effect diagram (Smith, 2000).Generally, there are three benefits of implementing statistical process control in organization, which can improve the production process. Then it also can reduce cost and achieve the process output and reduced the variability in the process (Smith, 2000). Several studies have been conducted on statistical process control, and had shown that statistical process control (SPC) had more potential benefits to the company. The benefits that can be gained by the company is, that it can improve the production process by minimizing or reducing waste, by reducing the variation of the process. The variation of the process can be determined by SPC (statistical process control) chart and diagram, which help the operation workers and engineers to distinguish special form of common causes of variation in the process output. Consequently, statistical process control (SPC) is used to identify whether there is a significant change in both process and outcome. Therefore, it can also be used to distinguish common cause of variation. It becomes a key factor to improve the processes and outcomes by identifying the stability of the process and results; and also important in determining the factors that can improve these processes or outcomes (Kottner, 2014). In addition, SPC can improve operator information at the correct time and step. In such a case, a predictable process can be achieved by the company. Hence, the company can control the consistency of process output. As a result the company can produce a greater amount of output, with the high quality of products, consequently it may reduce customers complains.

Thus, management can use statistical process control methods (SPC) as an effective technique to improve product quality and reduce operating costs. Then, statistical process control (SPC) techniques can also be used by the company to maintain the quality of halal products.

Implementation of Statistical Process Control (SPC)

As discuss by Montgomery (2009), basically the concept of statistical process control (SPC) is based on the assumption that every process is full of variability, where it would produce the output with higher variability. Recently, with competitive environment, it is not enough for products to just meet the specification. Instead, manufacturers have to be able to show a capability to minimize the variability as well as maintain the quality of products. Hence, all finished products should have no variation between one product and another as far as good quality is concerned. In order to achieve as near perfection as possible, process variability has to be brought under control and this is the purpose of introducing statistical process control (SPC). Statistical process control methods provide many benefits to companies that successfully implement it.

The failure of statistical process control (SPC) implementation in organizations has been discussed by Anthony and Taner (2003), the failure was reported to be due to lack of commitment and involvement of top management, lack of training in statistical process control (SPC), lack of knowledge of product characteristics or process parameters to measure and monitor within process, failure to interpret control charts and take any necessary actions, invalid and incapable measurement system at workplace. Support and commitment from Top management is the most important factor for successful statistical process control (SPC) implementation in organizations. It is because statistical process control (SPC) is a part of quality management system (Asif, Bruijn, Douglas.and Fisscher, 2009).

The successful implementation of statistical process control (SPC) depends on the cooperation and serious commitment from both management and production people (Oakland, 2008). The Implementation of SPC required the cooperation and support from top management, which determine the effectiveness of an inclusive approach to statistical process control (SPC) training (Gordon, Philpot, Bounds, and Long,1994). Successful implementation of statistical process control (SPC) also requires operational definitions and precise measurement (Does & Schippers, 1997). According to Oakland (2008) successful implementation of SPC depends on the structuring approach taken by the management itself. This includes all organizations, of any size, technology, and product or service range. Unsuccessful SPC implementation programs are usually caused by weakness in the restructuring of the company and the commitment shown. Oakland (2008) also add that the obstacles which usually need to be addressed by an organization in the implementation of SPC is to give good training to employees about this method. The lack of basic knowledge about the SPC can have a bad impact on the implementation.

Reviews of relevant literature have shown a number of management problems that influence the implementation of statistical process control (SPC) in organization. In summary it can be classified into; (1) Management Involvement and Teamwork (2) Training and education for SPC (3) Culture Change in work environment (4) Measurement Framework and data (5) SPC knowledge

The Importance of Management Commitment

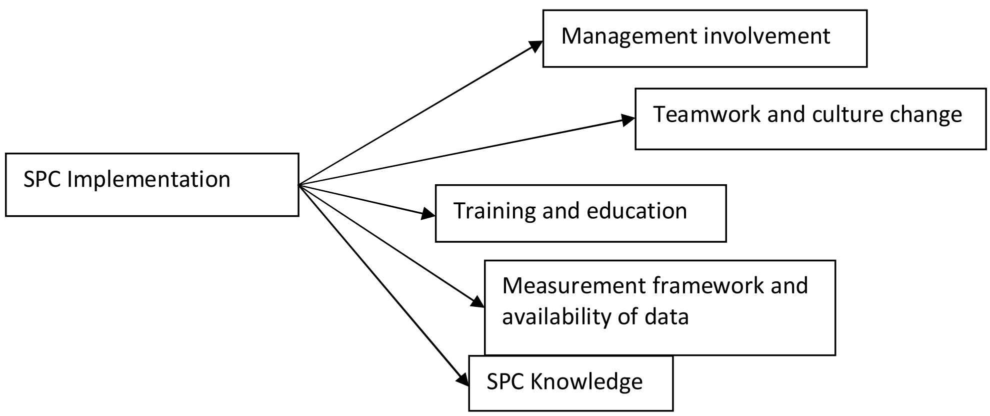
The successful implementation of quality improvement process, it start with the management commitment, which is required the support and full devotion from all levels of management in organizations (Owen, Dale & Shaw,1998). The management commitment is a main factors for successful implementation of quality management system in organization is also been stress by Krunniede and Sheu (2000). First, management should show their commitment on capital expenditure for SPC implementation and improvement process. Whereas, providing enough recourse for SPC training, SPC software and other related facilities (Watson,1998). According to Krunniede and Sheu (2000), management should show their commitment on SPC implementation to co-workers by giving a great support on implementing the quality improvement process in the organization. Anthony (2000) point out that it is importance for managers to understand that concept of SPC and how it works as a detection tools to indentify the signal of variation in the process, and used that for reduction of the variation .Thus, the underlying principles of SPC must be taught to senior managers within the organisation by providing intensive training on SPC. The training is just not focus on the concept, but also on the knowledge of SPC. The successful implementation of statistical process control is start from the awareness of statistical process control among the employees. Thus in creating the awareness of statistical process control, the management should show their commitment by managing the communities steering meeting and make a plan for implementation (Antony & Taner,2003). Elg, Olsson and Dahlgaard (2008) discuss that top management support is the most importance aspect for successful SPC implementation. The top management support was including infrastructural assistance, mentor, critics and finance. Clearly, the successful implementation of statistical process control is based on the management commitment (Rungasamy, Antony, & Ghosh, 2002).

Theoretical Model

The following discussion will describe the propose model for SPC implementation. The summary from the previous studies on SPC implementation shown that successful SPC implementation is combination from a few factors, which is

1) Management involvement 2) teamwork and culture change 3) training and education 4) measurement framework and availability of data and 5) SPC knowledge. Then, the hierarchical component model is formed to connect all those factors. Thus the hierarchical component model is as follow:

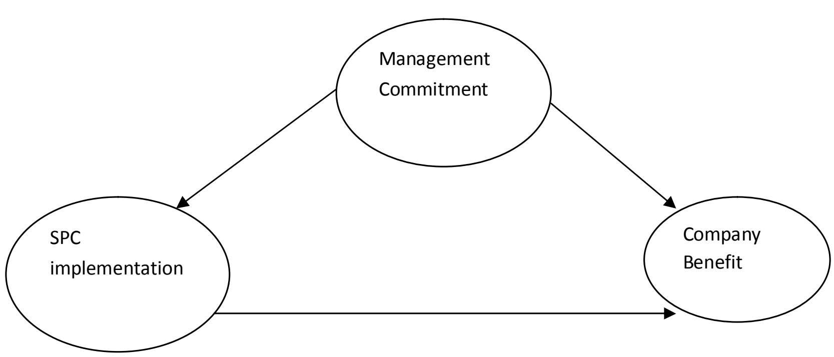
Figure 1: Hierarchical component model



The next step is developing the structural equation, which is exploring the factors that influence the SPC implementation and the impact of SPC implementation in halal cosmetics organization. Thus the model will shows the relationship of management commitment on SPC implementation, SPC implementation on benefit and management commitment on benefit.

Thus the framework for this study is as follow:

Figure 2: Theoretical framework



The figure 2 above shows the theoretical framework proposes for this study. The dependent variable is the company benefit, whereas influencing by the two independence variables 1) management commitment and 2) SPC implementation. The framework shows that management commitment has a direct and indirect impact on company benefit.

METHOD

Sample and Data

The population of the study is the management department of halal cosmetics companies in Selangor. The sampling frame for this study was gathered from JAKIM (Department of Islamic Development Malaysia). According to the JAKIM directory, there are nearly 10 cosmetic companies with estimated number of 144 cosmetics products in Selangor. This study used a self-administrated questionnaire. The questionnaire was distributed using probability sampling. The stratified sampling technique is used for this study. In stratified sampling, the target population is first separated into mutually exclusive, homogeneous segments or strata, and then a simple random sample is selected from each segment or stratum (Richard L. Scheaffer, William Mendenhall III & R.Lyman Ott, 2006).

Measurements

The measure on SPC (statistical process control) implementation, are adapted from Rupa Mahanti & James R. Evans,(2012), which is consist five 5-point Likert items aimed on the five major factors, which is management involvement and teamwork, training and education for SPC, culture change in work environment, measurement framework and data and SPC knowledge. This five factors also used as a critical success factor for SPC implementation (Jiju Antony & Tolga Taner, 2003). Measures on management commitment was adapted from five difference studies(Owen, Dale & Shaw, 1998; Krunniede and Sheu, 2000; Watson,1998; Elg,Olsson and Dahlgaard, 2008; Rungasamy, Antony, & Ghosh, 2002), also comprised five 5-point Likert scale items, asking respondents about their commitment on SPC implementation. Measures on companies benefits by implementing SPC, ware adapted from previously published questionnaires addressing the issues. These constructs were also measured on five 5-pointLikert scales. As shown in table 1,all the measures were reliable, as the Cronbach's alphas exceed 0.7 (Nunnally, 1978)

Table 1
Cronbach's alpha

Variables	*Number of items*	*Cronbach's Alpha*
Management Commitment	3	0.842
Benefit	5	0.900
Management involvement	3	0.905
SPC Knowledge	10	0.948
Availability of data and measurement of framework	6	0.895
Culture change and teamwork	7	0.891
Training and education	4	0.834

RESULTS

Data Analysis

Partial Least Square (version PLS-graph 03.00) was used to analyze the data. The measurement model in PLS is assessed in terms of item loadings and reliability coefficients (composite reliability), as well as the convergent and discriminant validity. Individual items loadings greater than 0.7 is considering adequate (Fornell and Larcker, 1981). Interpreted like a Cronbach's alpha for internal consistency reliability estimate, a composite reliability of .70 or greater is considered acceptable (Fornell and Larcker, 1981). The average variance extracted (AVE) measures the variance captured by the indicators relative to measurement error, and it should be greater than .50 to justify using a construct (Barclay, Thompson and Higgins, 1995). The discriminant validity of the measures (the degree to which items differentiate among constructs or measure distinct concepts) was assessed by examining the correlations between the measures of potentially overlapping constructs. Items should load more strongly on their own constructs in the model, and the average variance shared between each construct and its measures should be greater than the variance shared between the construct and other constructs (Compeau, Higgins and Huff, 1999).

The structural model in PLS is assessed by examining the path coefficients (standardized betas). T statistics are also calculated to assess the significance of these path coefficients. In addition, $R^2$is used as an indicator of the overall predictive strength of the model.

Measurement Model

The results in table 2 shows the results for outer loading and cross loading for reflective constructs company benefit (BENEFIT), management involvement (MI), management commitment (M.COMMITMENT), culture change and teamwork (CH&TM), measurement framework and availability of data (MF&AD), training and education (T&E) and SPC knowledge (SPC KNWD). This table provide information how the difference data set correlated to each item to its intended constructs (outer loading) and to all other constructs (Cross loading). Regarding to Chin (1998), at the particular constructs column, the item loadings value must be higher than the cross loadings. Then, the item must be strongly related to its construct column than any other construct column. Therefore, the results confirm that the measures of the constructs examined are robust in terms of item loadings. The items loadings were above the suggested 0.70 (Table 2).

Table 3 also demonstrates satisfactory convergent and discriminant validity of the measures. Average variance extracted (AVE) for all constructs exceeded 0.5. Thus all constructs were more strongly correlated with their own measures than with any of the other constructs. The discriminant validity value the square root of AVE of each constructs. From the table above, the discriminant validity for company benefit (BENEFIT) is 0.879 ($\sqrt{0.772}$) . Therefore, the company benefit (BENEFIT) construct has a highest value (0.879), compared with all the correlation value in the column of BENEFIT. It followed, by culture change and teamwork (CH & TM), with 0.886 and the discriminant validity is higher compare to other constructs. The result shows that all constructs have higher discriminate validity on its own construct compare to other. Thus, all constructs were more strongly correlated with their own measures than with any of the other constructs

Table 2
Outer model loading and cross loadings

Construct	*Benefit*	*CH&TM*	*M. Commitment*	*MF&AD*	*MI*	*SPC KNWD*	*T&E*
BA1	0.882	0.251	0.464	0.219	0.458	0.258	0.166
BA2	0.909	0.328	0.585	0.314	0.559	0.305	0.259
BA3	0.844	0.292	0.340	0.238	0.418	0.290	0.236
B2b	0.407	0.873	0.453	0.541	0.616	0.654	0.668
B3d	0.309	0.902	0.309	0.529	0.587	0.599	0.532
B3e	0.158	0.882	0.207	0.570	0.547	0.578	0.597
C1a	0.373	0.222	0.784	0.274	0.471	0.240	0.131
C1b	0.408	0.251	0.733	0.274	0.462	0.224	0.211
C1c	0.490	0.372	0.840	0.348	0.501	0.355	0.368

B5a	0.243	0.542	0.321	0.904	0.545	0.638	0.603
B5b	0.225	0.528	0.341	0.903	0.520	0.571	0.595
B6c	0.327	0.580	0.365	0.869	0.593	0.558	0.664
B1a	0.504	0.660	0.501	0.580	0.906	0.639	0.557
B1b	0.479	0.498	0.536	0.431	0.877	0.471	0.419
B1f	0.499	0.594	0.595	0.633	0.898	0.545	0.557
B8a	0.276	0.712	0.361	0.584	0.574	0.901	0.660
B8b	0.305	0.536	0.320	0.595	0.532	0.887	0.668
B8c	0.249	0.574	0.211	0.551	0.507	0.912	0.640
B9a	0.329	0.644	0.374	0.636	0.615	0.884	0.676
B4b	0.165	0.523	0.219	0.632	0.511	0.587	0.857
B4c	0.220	0.573	0.250	0.626	0.456	0.662	0.888
B4d	0.271	0.674	0.354	0.569	0.546	0.681	0.873

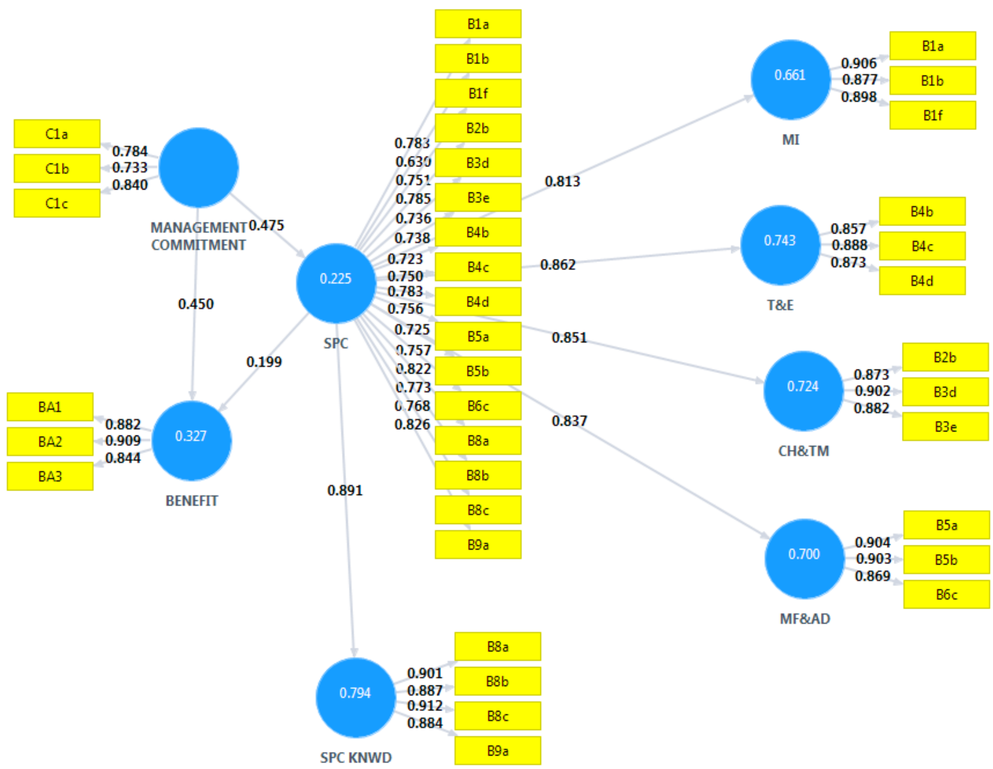
Table 3
Reliability, Convergent and Discriminant validity coefficient

Composite Reliability	*extracted*	*Average Variance*	*BENEFIT*	*CH&TM*	*M. COMMITMENT*	*MF&AD*	*MI*	*SPC KNWD*	*T&E*
0.910	0.772	BENEFIT	0.879						
0.916	0.785	CH&TM	0.332	0.886					
0.829	0.619	M. COMMITMENT	0.545	0.368	0.787				
0.921	0.795	MH&AD	0.298	0.617	0.384	0.892			
0.923	0.799	MI	0.554	0.660	0.608	0.620	0.894		
0.942	0.803	SPC KNWD	0.324	0.691	0.355	0.661	0.623	0.896	
0.906	0.762	T&E	0.252	0.678	0.317	0.697	0.578	0.738	0.873

Structural Model

Once the reflective measurement models are significant, and confirmed that the construct measures are reliable and valid, the next step is focus on the assessment of the structural model (inner model) results. This involves examine the model's predictive capabilities and the relationship between the constructs. The systematic approach to the assessment of structural model are 1) Coefficients of determination (R^2), 2) Predictive relevance Q^2 3) significance of the path coefficients. Thus the path coefficient is examined by estimated the path loading between constructs, in order to identify the significant value of t-statistics. To test the significant of t-statistics, all of the data were run using 500 bootstrapped samples.

Figure 2: PLS-SEM structural model relationship



***p<..005**p<.01*p<.05

The figure 2 shows the graphical presentation of the model with path coefficients and the R^2 values of the endogenous and extrogenous construct (shown in the circles). Thus, nearly 79.4% of the variance in the constructs SPC knowledge and 74.3% of the variance in training and education were accounted for predicting SPC implementation in halal cosmetics organizations. The value for path coefficient for culture change and teamwork is 0.851 (R^2 0.724), measurement framework and availability of data is 0.837 (R^2 0.700) and management involvement is 0.813 (R^2 0.661). Therefore, all path coefficient for SPC implementation reflective construct are above 0.8, which is significance. These results also indicated that for successful SPC implementation in halal cosmetics organization, the SPC knowledge, training and education is importance factors to highlight by management. Besides, management involvement is necessary for successful SPC implementation.

Figure 2 also shows the PLS path coefficient for structural model (inner model). The results shows that management commitment has a 0.475 path coefficient to SPC implementation, with R^2 0.225, whereas 22.5% of the variance in SPC implementation use to predict management commitment. The management commitment has 0.450 path coefficients to benefit, and SPC implementation has 0.199 path coefficients to benefit. Thus management commitment has highest total effect on SPC implementation. The SPC implementation has 19.9% total effect on company benefit. In addition, the result also indicates that management commitment also give indirect effect on company benefit. Thus, the examination of total effects used to evaluate how strong the reflective construct management commitment influence the target variable benefit via the mediating construct SPC implementation.

The analysis of structural model relationship showed that path coefficient between management commitments to SPC implementation has highest values, compare path coefficient between SPC implementation to benefit. Table. 4, below is the results from PLS-SEM bootstrapping path coefficients analysis.

Table 4
Significance Testing Results of the Structural Model Path Coefficients

	Path Coefficient	*T Statistics*	*Significance*	*P Values*	*C. Interval*	
			Level		Lower	Upper
MANAGEMENT COMMITMENT -> BENEFIT	0.450	4.792	***	0.000	0.238	0.624
MANAGEMENT COMMITMENT -> SPC	0.475	5.703	***	0.000	0.310	0.635
SPC -> BENEFIT	0.199	2.305	**	0.022	0.029	0.368
SPC -> CH&TM	0.851	22.707	***	0.000	0.764	0.911
SPC -> MF&AD	0.837	26.914	***	0.000	0.773	0.889
SPC -> MI	0.813	24.980	***	0.000	0.742	0.869
SPC -> SPC KNWD	0.891	37.604	***	0.000	0.837	0.925
SPC -> T&E	0.862	25.296	***	0.000	0.778	0.915

Note: *p<.10,**p<.05,***p<.01

The results from the table above display the path coefficient, t-statistics, p-value and the confidence interval. For the relationship management commitment to benefit with path coefficient 0.450 (C.I:0.238,0.642) is significant with *t-statistics* 4.792 (p*-value: 0.000)*. Management commitment to SPC implementation with path coefficient 0.475 (C.I:0.310,0.635) is significant with *t-statistics* 5.703*(p-value:0.00)*. While, the relationship SPC implementation to benefit with path coefficient 0.199 (C.I: 0.029, 0.368) is significant with *t-statistics* 2.305*(p-value: 0.022)*. It shows that all relationship in the structural model is significant. This result suggests that management commitment give an influence on the successful SPC implementation within the organization. The management commitment also influences on company benefit, but SPC implementation give a small influence on company benefit.

Results in table 5 shows the corresponding results for the total effects of the exogenous constructs, management commitment and SPC implementation on the target constructs benefit.

Table 5
Significance testing results of the total effects

Construct	*Total Effect*	*T Statistics*	*Significance Level*	*P-Values*	*Confidence Interval Lower*	*Upper*
MANAGEMENT COMMITMENT -> BENEFIT	0.545	7.050	***	0.000	0.378	0.683
MANAGEMENT COMMITMENT -> CH&TM	0.404	5.563	***	0.000	0.261	0.542
MANAGEMENT COMMITMENT -> MF&AD	0.397	5.417	***	0.000	0.260	0.534
MANAGEMENT COMMITMENT -> MI	0.386	5.345	***	0.000	0.247	0.537
MANAGEMENT COMMITMENT -> SPC	0.475	5.703	***	0.000	0.310	0.635
MANAGEMENT COMMITMENT -> SPC KNWD	0.423	5.728	***	0.000	0.276	0.563
MANAGEMENT COMMITMENT -> T&E	0.409	5.652	***	0.000	0.261	0.549
SPC -> BENEFIT	0.199	2.305	**	0.022	0.029	0.368

SPC -> CH&TM	0.851	22.707	***	0.000	0.764	0.911
SPC -> MF&AD	0.837	26.914	***	0.000	0.773	0.889
SPC -> MI	0.813	24.980	***	0.000	0.742	0.869
SPC -> SPC KNWD	0.891	37.604	***	0.000	0.837	0.925
SPC -> T&E	0.862	25.296	***	0.000	0.778	0.915

Note: NS=not significance, Note: *p<.10,**p<.05,***p<.01

The results from table above shows that all total effect for all construct are significant. Construct management commitment has a strongest total effect on benefit (0.545) and SPC (0.475). While, constructs SPC implementation has lowest total effect on benefits (0.199).

The PLS-SEM blindfolding procedure analysis is used to assess the predictive relevance (Q^2) of the path model. Table 4 below provides the Q^2 values (along with R^2 values) of endogenous constructs. The results shows that predictive relevance Q^2 are quite small, but considering above zero. According to Hair,. *at el* (2011) predictive relevant Q^2 more than zero, provide support for the model predictive relevant regarding the endogenous latent variable.

Table 6
Results of R^2 and Q^2 values

Endogenous latent variable	*R -Square Value (R^2)*	*Predictive relevance (Q2)*
BENEFIT	0.327	0.232

In path model, the predictive relevant Q^2 (table 6) of benefit has a value of 0.232 (Q^2>0) which is implies that the model has predictive relevance for benefit. Therefore, management commitment on SPC implementations give a significance effect on company benefit.

Table 7
Results of f^2 effect size

	BENEFIT(endogenous)
MANAGEMENT COMMITMENT (exogenous)	0.233
SPC (exogenous)	0.046

Table 7, shows the value for f^2 effect size, according to Cohen (1998), if the value for effect size f^2 is in a range of 0.02,0.15 and 0.35, it can be estimate for whether a predictor latent variable has a small, medium, or large effect at the structural level. Therefore, management commitment has a medium effect on benefit (0.233<0.35), SPC has a small effect on benefit (0.046<0.15).

DISCUSSION AND CONCLUSION

The measurement models showed that all indicators for the seven reflective constructs are above the minimum acceptable level 0.708. Thus, the item loads highly on their-own construct than on other constructs. Besides that, all seven reflective constructs also have high levels of internal consistency reliability. Thus, the indicators are reliable and can be used for the reflective constructs. The average variance extracted (AVE) for constructs is above the cut point 0.5, so the reflective constructs have high level of convergent validity. The discriminant validity of each construct is also higher because the results clearly showed that an indicator's outer loading on each construct is higher compare to its cross loading with other constructs. Based on the measurement criteria stated, it can be concluded that the reflective constructs are reliable and valid. Therefore, it can be concluded that reflective constructs are appropriate for PLS-SEM analyses.

Besides, the path coefficients in the structural model are also assessed. There are two important factors to be considered when assessing the PLS-SEM results for the structural model: the significance and the relevance of coefficients. Testing of significance requires the application of the boots trapping routine and examination of *t-values*, *p-values*, or boots trapping confidence intervals. Next, the relative sizes of path coefficients are compared, as well as the total effects, f^2 effect size. The coefficients of determination (R^2 values) used for primarily prediction purposes is also evaluated. The R^2 values can be use to evaluate the strength of the proposed model. The results in figure 9 show 0.327 for the benefit, therefore the management commitment and SPC moderately explain 32.7% of the variance in benefit. The management commitment explains 22.5% of the variance in SPC. The bootstrapping result is used to assess the relationship between constructs. The result shows that management commitment has a significant positive impact on SPC implementation; SPC implementation has a significant positive impact on company benefit, and management commitment has a significant impact on company benefit. Therefore, the bootstrapping path coefficient shows that management commitment influences the SPC implementation in the organizations.

This finding shows that management commitment is the important element in the execution of any program in organizations. Therefore, the management should provide adequate facilities for successful SPC implementation to take place.

Besides, the management personnel must also understand the benefit of SPC to their companies and always give an approval for SPC project. Last but not least, it is important that the management personnel should provide financial support for SPC projects and resources.

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