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THE INFLUENCE OF TRAINING IN SUPPLY CHAIN MANAGEMENT ON COMPETITIVENESS

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ABSTRACT

This paper examines the relationship between training in supply chain management (SCM) and competitive advantage of manufacturing companies in Malaysia. The study measures senior SCM managers' or production managers' perception of training in SCM practices and level of competitiveness in the industry. Associations between training in supply chain management and competitive advantage are analyzed through methods such as Pearson's correlations, cluster analysis and structural equation modelling (SEM) utilizing 115 respondents' data. The findings suggest that training in SCM has significant correlations with competitive advantage (comprises of determinants such as product differentiation, employee differentiation, service differentiation and price differentiation). Specifically, competitive advantage (CA) has high correlations with training variables such as 'adequacy of production training among employees', 'management training in supply chain effectiveness' and 'employee training in supply chain technologies'. The SEM result also reveals that training in SCM exhibit direct impact on competitiveness. Findings of the study provide a demonstration of the importance of training in enhancing competitiveness in Malaysian manufacturing companies.

Keywords: Supply chain management, training, competitive advantage, manufacturing companies, Pearson's correlation, cluster analysis and structural equation modeling.

Introduction

Over the past two decades, the theory and practice of supply chain management (SCM) has received considerable attention from academics and practitioners alike. One of an important aspect of SCM is training. Globalization and the diffusion of industry supply chains to developing countries have provoked a fierce debate over how best to improve labor standards in these emerging centers of production (Locke & Romis, 2007). Supply chain management is the integration of key business processes from suppliers through to the end user that provides products, services and information that add value (Tracey & Smith-Doerflein, 2001). The supply chain management way of thinking has an important human dimension due to its emphasis on communication and cooperation across all parties comprising the chain. Currently supply chain managers are a quite varied group and to an extent reflect the disparate origins of the subject in terms of their functional background Examination of the basics of supply chain management in parallel with some major trends occurring throughout the training discipline indicate that trainers have the means to assist in the development of individuals capable of functioning well in this environment. There fore, in recent years, there has been a growing awareness of the critical role played by people, knowledge and talent in the context of supply chain success. The demand for experienced and qualified supply chain managers have recognized. There is a need for a more

pro-active approach to logistics and supply chain management development through the creation and provision of in-house learning capabilities. Knowledge flow creates value by making the supply chain more transparent and by giving everyone a better look at customer needs and value propositions (Myers & Cheung, 2008). Thus, in order to benefit from their partners' knowledge, companies need to participate in the sharing process such as socialization and giving more training. Agility, adaptability and alignment are possible only when all members of the supply chain network promote knowledge flow between supply chain nodes. In other words, the flow of knowledge is what enables a supply chain to come together in a way that creates a true value chain for all stakeholders. Normally, many numbers of stakeholders involved in supply chain in organizations. Each stakeholder is responsible for maintaining his own supply chain. Thus, training needs to take into account many factors to facilitate effective training.

The purpose of this paper, then, is to discuss training in SCM and its application to the Malaysian manufacturing industry. Although SCM practices are becoming integral part of manufacturing industry, their impact on competitive advantage remains largely unknown. This paper explores the possibility of adopting training in SCM as the basis for enhancing competitive advantage in manufacturing companies. First, this paper proceeds with an introduction, the objectives of the study and the test conducted to obtain the reliable measures of the variables; Secondly, it continue with a brief explanation on training in SCM principles and literature review; Thirdly, it describes the conceptual framework consisting of the conceptual model and hypotheses; Fourthly, it discusses the methodology adopted; Fifth, it highlights the results of Pearson correlations, cluster analysis and structural equation modeling. Finally, the results are then discussed and implications highlighted. The purpose of this paper is to enhance managerial understandings of training in SCM and performance. The main objectives of this paper are:

a) To empirically investigate correlates between training in SCM and competitive advantage.
b) To empirically assess the importance of each training in SCM indicator on competitive advantage.
c) To empirically determine whether training in SCM has significant impact on competitive advantage.

Training in Supply Chain Management (SCM) in Malaysian Manufacturing Industry

In today's world of global outsourcing, supply chain management plays an ever important, strategic and expanding role in delivering results. Supplier quality management now must transform itself from simply measuring supplier compliance to gathering knowledge, managing risk and executing project management. Total quality management (TQM) ensures processes are followed and customers are satisfied. Supply chain management involves "the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities" (Council of Supply Chain Management Professionals, 2007). Interactions across multiple transacting firms (namely suppliers, manufacturers, distributors, and retailers) pose complex management challenges. Therefore, efficiently and synergistically managing the supply chain can be a considerable, untapped source of competitive advantage (Ketchen & Hult, 2007). Supply chain management (SCM) has been a major component of competitive strategy to enhance organizational productivity and profitability (Gunasekaran, Patel, & McGaughey, 2004). Supply chain is also an important element in logistics development for all industries. It can improve efficiency and effectiveness of not only product transfer, but also information sharing between the complex hierarchies of all the tiers. Eventually this will lead to sales and business performance. The core of supply chain is training in SCM. Training has both current and future implications for the success of organizations. Effective training is an investment in the human resources of an organization, with both immediate and long-range returns. Training is a learning process whereby people acquire skills or knowledge to aid in the achievement of goals. It is a human resource practice that can give competitive advantage to organizations, if appropriately

planned and implemented. It is accepted that it is the national interest to promote the acquisition of individual and organizational knowledge and skill (Sloman & Philpott, 2006). However, what will be required to encourage learning will be different from what will be required to encourage training. Indeed there may be dangers in promoting training as this may be counter productive. The study emphasize that managers who are desirous of enhancing organizational commitment among their staffs, should pay more attention to training. In order to enhance transfer of training, organizations should design training that gives trainees the ability to transfer learning, reinforces the trainee's beliefs in their ability to transfer, ensures the training content is retained over time and provides appropriate feedback regarding employee job performance following training activities (Velada, Caetano, Michel, Lyons, & Kavanagh, 2007). The need to provide training throughout the organization supply chain is important and being given equal priority for every organization either local or foreign corporations. A study in Sri Lanka shows in its result analysis of variance do not confirm the hypotheses that foreign-owned companies exhibit more training practices of setting objectives, transfer, validation and evaluation than local and joint-venture companies (Wickramasinghe, 2006).

Training

There is broad agreement that human capital, defined to include both education and post school training, contributes to economic growth through raising the productivity of workers and facilitating the adoption and use of new technologies. Support for this view is found in three lines of research -- on human capital and productivity, on technology and innovation, and on models of endogenous growth. Within the strategic human resource management (SHRM) perspective, psychology-based practices, especially empowerment, extensive training, and teamwork, are seen as vital to sustained competitive advantage. Other approaches, such as those of integrated manufacturing and lean production, place greater emphasis on operational initiatives such as total quality management, just-in-time, advanced manufacturing technology, and supply-chain partnering as determinants of organizational performance. Birdi et al. (2008) studied the impact of human resources and operational management practices on company productivity by investigating the relative merit of these practices through a study of the productivity of 308 companies over 22 years. Consistent with SHRM theory they found performance benefits from empowerment and extensive training, with the adoption of teamwork serving to enhance both. In contrast, none of the operational practices were directly related to productivity nor did they interact with other practices. The clearest and most parsimonious theoretical implication of this study, however, is the support it provides for the resource-based view of the firm (Barney, 1991) that underlies the SHRM approach (Becker & Huselid, 2006). The implication of this approach is that empowerment, extensive training, and teamwork should have stronger positive effects on company performance than their operational (e.g., total quality management, just-in-time, advanced manufacturing technology, and supply-chain partnering) counterparts.

Collins and Smith (2006) studied the relationship between high-commitment HRM practices (assessed by a mix of selection, training, and compensation items), social climate, knowledge sharing, and firm revenue from new products and sales growth over the subsequent year for technology companies. A positive relationship was demonstrated between the HRM practices and financial performance, mediated by climate and knowledge exchange/combination. With major changes taking place in the SCM domain and global business competitiveness, it is essential that more focused training is conducted in the areas of supply chain management technologies. This training is essential as not only will it familiarize managers with the technological changes taking place in the supply chain landscape but develop skills in a variety of functional areas like procurement, production, operations, finance and accounts. Research conducted by Naim *et al*. (2000) argues that the skills required by logistics professionals can be classified into four broad domains: (i) *finance* (and policy) including economics, accounting, law and environment; (ii) *organization* including management skills; (iii) *technology* including

control, transportation and information systems; and (iv) *people* including HR, supplier relationships, marketing and sales. For Mathews *et al.* (2001a, b), the training that underpins quality management determines the likely effectiveness of the quality initiatives undertaken. Zhang *et al.* (2000) consider investment in education and training vitally important for TQM success (also Cebeci and Beskese, 2002). Several recent empirical studies revealed that training and education are critical to successful TQM implementation (Thiagarajan and Zairi, 1998; Quazi and Padibjo, 1998; Rao *et al.*, 1999; Zhang *et al.*, 2000; Yusof and Aspinwall, 2000; Black and Porter, 1996; Tamimi, 1998; Pun, 2001; Calisir *et al.*, 2001; Dayton, 2001).

Studies have focused on the human resource management practices of empowerment, training, and teamwork for at least three reasons. First, these practices are expected to enhance employee knowledge specific to the company and allow employees to exploit it (Appelbaum *et al*., 2000; Lawler, Mohrman, & Ledford, 1992, 1995; Pfeffer, 1994; Way, 2002). Second, these three practices are also theoretically linked to the extended concept of lean production (e.g., MacDuffie, 1995). Third, these practices are among the most popular in both the research literature and organizational practice (Waterson *et al*., 1999; Wood *et al*., 2004). On the basis of such arguments, we would expect that each of the human resource practices will contribute to company performance. Measures of SHRM typically have empowerment, extensive training, and teamwork as key components, and several studies have shown positive relationships with company performance (e.g., Combs *et al*., 2006; Guthrie, 2001; Huselid, 1995). Wright *et al*.'s (2005) study of business units in a food service organization found that aggregated HRM practices (selection, training, rewards, and participation) were related to past, current, and future firm performance. Other recent studies also suggest a link between HRM practices and subsequent organizational performance (e.g., Peterson & Luthans, 2006; Zatick & Iverson, 2006). In addition, several studies find that the practices are synergistically related, so that empowerment, extensive training, and teamwork are predicted to interact to promote performance (Appelbaum *et al*., 2000; Combs *et al.*, 2006; Pfeffer, 1994; Wood & Wall, 2007). Bhattacharya, Gibson, and Doty (2005) investigated the relationship of flexibility of employee skills and human resource practices with accounting measures of firm performance (see also Kato & Morishima, 2002).

The study by Patterson *et al*. (2004) was longitudinal and used independent measures of company performance. They focused on five of our seven practices and examined how the use of each related to change in productivity and profit. They found advanced manufacturing technology, empowerment (job enrichment), and extensive training (skill enhancement) all predicted subsequent productivity, though only the latter two also predicted profit. Other recent studies also suggest a link between HRM practices and subsequent organizational performance (e.g., Peterson & Luthans, 2006; Zatick & Iverson, 2006). Investment in the training and education of employees would also enhance organizationally specific knowledge by helping employees to learn a wide range of skills, rather than equipping them simply to complete a restricted job. Pfeffer (1998) uses the term "extensive training" to represent this approach. The rationale for an effect of extensive training on organizational performance is further strengthened by work on learning organizations (Harvey & Denton, 1999; Power & Waddell, 2004; Senge, 1990). The argument is that by upgrading employees' skills and knowledge, they are in a better position to produce high-quality products and services in the most cost-effective way, adapt to change, and contribute to company competitiveness through product or process innovation.

Training in Malaysia

Work-related training is very important for providing the workforce with the necessary skills for improving productivity and enhancing the competitiveness of firms and the economy. The Government of Malaysia has placed great emphases on training, as reflected by a substantial increment in the budget allocation from RM2, 237.3 million in the Seventh Malaysia Plan (1996-2000) to RM45.1 billion in the Ninth Malaysia Plan (2006-2010) for a comprehensive

improvement of the education and training programs and lifelong learning delivery systems to sustain economic resilience and growth and drive a knowledge-based economy. Other forms of incentives include pioneer status and tax exemption for firms conducting trainings. The establishment of Human Resource Development Council (HRDC) in 1992, which was later renamed to Human Resource Development Limited (HRDL) in 2001 was aimed at enhancing workers trainings. The establishment of Human Resource Development Fund (HRDF) in 2005 through 1 percent levy/grant from employees salaries was one of the steps undertaken by the government to enhance workers trainings especially workers from private firms. The HRDL is responsible for organizing the HRDF and providing the training needed by workers.

Study by Tan and Batra (1995) found that, overall, the incidence of training provision in Malaysia was relatively high compared to Colombia, Indonesia, Mexico, Taiwan and China. Malaysia was ranked first in terms of the provision of informal training, and second for the provision of formal training. Study by Tan and Batra (1995) also found that only firms with higher investments in R&D had a significantly higher likelihood of enterprise training. The study also found that trainings were more likely to be conducted by foreign owned firms and firms with a more highly educated or highly skilled workforce. Firms with a higher percentage of automation and practicing quality control measures were also likely to train. Wan Abdul (1995) gathered qualitative data on training provision for 60 randomly selected manufacturing firms in 1993 and found that transnational corporations (TNCs) have a greater incidence of training and re-training their work force. Study by Tsung-Ping (2000) found the positive economically significant returns to education and training in Malaysia.

Nevertheless, workers training in Malaysia have not yet achieved satisfactory level. Many firms are reluctant to train their workers especially the small and medium scale industries because of several reasons. The majority of them do not foresee training as important (Rahmah, 2000). In another study, Rahmah *et al*. (2002) found that only 3-13 percent workers for the Malay manufacturing enterprises had attended training and only 23.5 percent of the firms registered with HRDL. Study by Rahmah and Zulridah (2006) found that almost 35 percent workers received training in the present job. This figure conformed with findings by Tan and Batra (1995) regarding percentage of workers receiving formal training from any sources. Study by Zulridah & Rahmah (2008) also found that more educated skilled and semi-skilled male workers who received training in their previous jobs were more likely to be trained in the reference jobs as compared to their female counterparts. Age and tenure in the current job also played very important role as determinants of work-related training indicating the ongoing process of employer supported work-related training in the manufacturing sub sectors in Malaysia.

In the Third Industrial Master Plan for Human Resource Development (IMP3-HRD) there are several short-term recommendations to enhance human resource management including encouraging employers to train their workers during employment, reviewing training course contents to focus on building human capital capabilities, knowledge skills and keeping pace with changes in technology, business practices and policies, as well as statutory and compliance guidelines. The IMP3-HRD also recommends HR consultants and training providers to organise dialogues, training programmes, seminars, conferences and workshops on new HR practices in the globalized environment. The Plan also recommends several actions to be taken by the Government and the private sectors during employment and retraining such as establishing collaboration between public and private sector on skill training, making it mandatory for SMEs to provide in-house trainings for its workers and encouraging lifelong learning to enhance employability and productivity of the labour force. The Plan also recommends improving accessibility to training for individuals by promoting the Skill Development Loan Fund (SDF) and inculcating training culture among employers by means of promoting levy/grant system.

Training in SCM

A successful change in quality culture has to start with an educational programme which begins with senior management, followed by all employees. People in the organisation should be continually trained and be given adequate training and education on prescriptions, methods and the concept of quality which usually includes SCM principles, team skills, and problem-solving. In the decision-making process, all levels of workers must be trained to work together in an atmosphere that nurtures individual initiative (Cherkasky 1992).

According to Mann (1992), competitiveness is, in fact, the overriding management principle. So are meaningless slogans that exhort the workers to be more productive without supplying the methods for doing so. Everyone should be equipped with knowledge to avoid inflicting losses through wastage and defect due to inappropriate use of inferior and outdated tools. Everyone should be trained and when necessary, retrained. The key here is for employees to do whatever is required to help produce excellent product. The firm must continue to provide training and education on an on-going basis for application in the work place, vis-à-vis from a simple routine task to highly sophisticated statistical techniques so that problem-solving abilities of all employees at all levels are enhanced.

Competitive Advantage - Differentiation factors (Product, services, personnel and price differentiation).

(i) Product differentiation

Product differentiation on the basis of quality creates a defensible competitive position and insulates a firm against inroads of rival firms (Porter 1990). The uniqueness associated with quality forms a difficult barrier for new competing firms to surmount. Research suggests that product differentiation is important for gaining competitive advantage in many international and global markets (Porter 1990). Inevitably, competition has shifted to new product development because customers now expect high quality and low costs in global markets (Prahalad 1990; Erramilli et al. 1997).

(ii) Personnel differentiation

Another key to gaining a competitive advantage is the ability to tap into the productive energy of a firm's workforce (Marshall 1998). A company's workforce, represents the intellectual capital - the brainpower and the creative energy of the company - that is the company's competitive advantage. Without them, a firm's productive engine growth will become idle. Without their full commitment, we risk sub optimizing our competitive potential (Read & De Fillipi, 1990). Hofer and Schendel (1978) suggest a direct relationship between distinctive personnel differentiation and competitive advantage through the ability of the firm to use competencies of their personnel to create major competitive advantages.

(iii) Service differentiation

Some firms are able to service niche customers with a premium price product that enables them to secure a competitive advantage. The fundamental element in service differentiation is to know what customers want and what meets that expectation. It is not sufficient to ask them what they want. This must be assessed in conjunction with what they receive (Haskett, 1986). Firms need to identify possible service strategies by starting with their customers and suppliers. If consumers see the service as differentiated, they are willing to pay a premium for it (Brooks, 1996).

(iv) Price factor (Price differentiation / Cost advantage)

An offering can be positioned according to price compared with the prices of competing offerings (Mathur 1992). Price can only be derived after considering several factors and usually termed as the cost advantage of a certain industry. The ability to establish a cost advantage over a competitor rests upon the possession of elements such as scale-efficient plant, superior process technology and ownership of low-cost sources of raw materials (Grant 1991). Lower cost is the ability of a firm to design, produce, and market a comparable product more efficiently than its competitors. At prices almost similar to competitors, lower cost translates into superior returns (Porter 1990). Through lower cost we gain the flexibility to respond to pricing challenges in the market. Many must have realized that price factor can help companies to enhance and capitalize on competitive advantage and help them protect areas of vulnerability. Price too can bring about beneficial changes in the behavior of competitors. Compared to other strategic actions, price generally requires limited investment, is easily implemented, and generates rapid results. Effective customer-oriented pricing involves the understanding of how much value consumers place on the benefits they receive from a product and subsequently set a price that fits this value.
In conclusion, differentiation creates brand loyalty for consumers that, once established, can take on the characteristics of a durable asset. Therefore, because differentiation is based upon firm-specific skills and creates a durable asset, it is more difficult to imitate. Hence, differentiation can form the basis of a sustainable competitive advantage when all significant cost economies have been exhausted. Differentiation may become the way a firm maintains its scale economies and safeguards its market share. The simultaneous pursuit of both differentiation and low cost will be necessary for a firm to establish and then maintain a sustained competitive advantage (Hill 1988; Kotler 1994).

Table 1: Descriptive Statistics of Critical Variables

Constructs	Mean	Std Dev	Exploratory Factor Analysis – EFA(Varimax Rotation)	
			Factor Loadings1 (BUSPERF)	Factor Loadings3 (CA)
Training in SCM				
Adequacy of production training among employees (B9TRAIN2)	5.4174	1.09210	.314	**.863**
Management training in supply chain effectiveness (B9TRAIN3)	5.1826	1.22534	.344	**.891**
Employee training in supply chain technologies (B9TRAIN4)	5.0609	1.26551	.350	**.871**
Competitive Advantage				
Product differentiation	5.2522	1.16109	**.846**	.343
Employee differentiation	5.1217	1.24356	**.843**	.362
Service differentiation	5.2348	1.14195	**.872**	.319
Price differentiation	5.0261	1.30761	**.826**	.285

Exploratory factor analysis, confirmatory factor analysis and Cronbach's reliability analysis were used to select and assess the final items that would be used for hypothesis testing. The training in SCM determinants in this study were adopted from prominent studies or sources (Karlsson & Ahlstrom, 1996; Inman, 1999; Davis & Heineke, 2005; Womack and Jones, 1996). As the initial data analysis, the five determinants of training in SCM were subjected to validity and reliability tests. Exploratory factor analysis was conducted to investigate whether the constructs as described in the literature fits the factors derived from the factor analysis. The result from the factor analysis indicates that the KMO (Kaiser-Meyer-Olkin) measure is 0.886 with

significant chi-square value (Barlett's Test of Sphericity = 717.76). The value of KMO in this analysis surpasses the threshold value of 0.50 as recommended by Hair et. al (1998) and all the eigenvalues of the three constructs are above 1.00. All variables or determinants exhibit high factor loadings and almost fall into the designated factors as described by the literature. This result provides evidence to support the theoretical conceptualization of each construct. In addition, confirmatory factor analysis (CFA) or a measurement model using AMOS 5 was employed for examining construct validity of each scale by assessing how well the individual item measured the scale (Ahire et al., 1996). The goodness of fit indices (GFI) and comparative fit index (CFI) of the exogenous determinants exceeded the 0.90 criterion suggested by Hair et al. (1998), hence, establishing the construct validity (see Table 2).

Since data for this study was generated using scaled responses, it was deemed necessary to test for reliability. The reliability analysis was conducted by calculating the Cronbach's alpha for the main constructs. The result shows that the Cronbach's alpha measures for the main constructs exceeds the threshold point of 0.70 suggested by Nunnally (1978). Alpha coefficients for training in SCM scales and competitive scales ranged between 0.927 and 0.930 after the alpha maximization processes were carried out (Table 2).

Table 2-: Factor Analysis and Reliability Test

CONSTRUCT	Exploratory Factor Analysis –EFA (Varimax Rotation)			Confirmatory Factor Analysis - CFA		Reliability Test
	Eigenvalue	% of Variance Explained	Cummulative Variance Explained	GFI	CFI	Cronbach's Alpha
Training in SCM	3.209	45.845	45.845	0.999	0.999	0.930
Competitive advantage	2.728	38.977	84.823	0.998	0.999	0.927

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization (KMO= 0.886)

Conceptual framework

This paper explores the relationships between training in SCM in supply chain management, competitive advantage within the context of the Malaysian manufacturing industry. The proposed model, as depicted in Figure 1, is based on three main constructs namely: (i) training in SCM (TRAIN) and (ii) competitive advantage (CA).

In this study, training in SCM represents a manager's assessment of the overall level of training in SCM practices in supply chain management (Arawati Agus & Za'faran Hassan 2008; Myers and Cheung 2008, Sloman and Philpott 2006). In addition to improving levels of performance, training in SCM has also been shown to provide benefits in terms of outcomes (Za'faran Hassan 2008; Sloman and Philpott 2006; Velada, Caetano, Michel, Lyons, & Kavanagh, 2007). The model proposed here uses training in SCM dimensions derived from prominent studies and documented references which are considered to relate to distinctive features of training in SCM and are therefore incorporated in the present conceptual model. In summary, the training dimensions in SCM are:

(1) Adequacy of production training among employees (B9TRAIN2)
(2) Management training in supply chain effectiveness (B9TRAIN3)
(3) Employee training in supply chain technologies (B9TRAIN4)

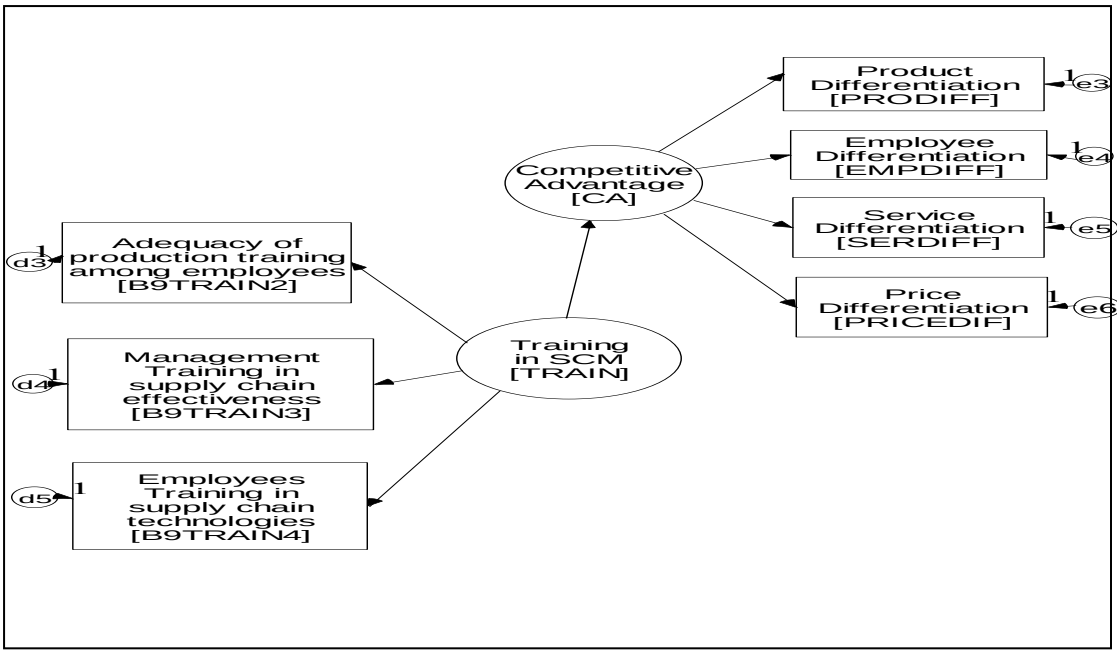

Figure 1: The conceptual model linking the structural relationship between training and competitive advantage.

On the other hand, competitive advantage is manifested by:

(1) Product differentiation (PRODIFF)
(2) Employee differentiation (EMPDIFF)
(3) Service differentiation (SERDIFF)
(4) Price differentiation (PRICEDIF)

Hypotheses

In investigating the influence of training in SCM practices on competitive advantage, structural equation modeling is utilized to evaluate and analyze the magnitude and direction of the linkages between those constructs. The main hypothesis proposes that training in SCM has a positive structural effect on competitive advantage. Conceptually, it makes sense that with good implementation of training, this would enhance production efficiency, production effectiveness and productivity. A commonly cited benefit of training in SCM is that it can lead to higher competitive advantage. Hence, in short, this study tests the following main hypotheses:

H_1: Training in SCM has a positive structural effect on competitive advantage (CA).

In investigating the structural effect of training in SCM on overall results such as competitive advantage, it is also pertinent to determine the structural loadings of each training determinant. Therefore, this study also attempts to test the following additional hypotheses:

H_{1A}: 'Adequacy of production training among employees' has a positive structural loading on training in SCM.

H_{1B} 'Management training in supply chain effectiveness' has positive structural loading on training in SCM.

H_{1C}: 'Employee training in supply chain technologies' has a positive structural loading on training in SCM.

More importantly, this study aims to test the overall model fit based on the main null hypothesis:

H_0: The overall hypothesized model has a good fit.

For structural modeling, accepting this hypothesis indicates that the model presented adequately reproduce the observed covariance matrix (Bollen, 1989; Joreskog, 1989; Mueller, 1996) and suggesting that the data fit the proposed model.

RESEARCH METHODOLOGY

Sample companies were chosen from manufacturing in Malaysia (the sampling frame was derived from the Federation of Malaysian Manufacturers Directory-FMM). One hundred and fifteen responses were received from a total of 300 sample companies chosen. The primary purpose of the research is to measure senior production managers' and SCM managers' or perception of training in SCM and to gain insight into the benefits of implementing training in SCM in the manufacturing industry. This paper is part of a larger study. The instrument used in this study was a structured survey questionnaire, which was designed to assess the companies in term of the described dimensions. The instrument developed in this study consists of two major parts. The first part comprises several variables measuring SCM practices including training in SCM, and the second part comprises several performance measurements. To enable respondents to indicate their answers, seven–point interval scales were use for the questionnaire. Several items of training in SCM, which have been widely referred, were extracted. Similarly, the dependent variables namely competitive advantage also used a seven-point interval scale, representing a range of agreement on statement whether over the past three years these performances are high relative to competitors after implementing training in SCM practices.

The goal is to understand and determine measures of training in SCM that can enhance competitive advantage and bottom line result (return on sale and return on asset). Face to face interviews with production managers were carried out to ensure the information accuracy, validating the outcome of analysis and developing an understanding of practical aspects of training in SCM principles adoption.

FINDINGS

Correlation Analyses

As a preliminary analysis, Pearson's correlation analysis was conducted between training in SCM and competitive advantage. Most of the competitive advantage indicators have high correlations with training variables specifically 'Adequacy of production training among employees', 'Management training in supply chain effectiveness' and 'Employee training in supply chain technologies'. These findings are consistent with several previous studies that proclaimed better organizational transformations as a result of training initiatives (Womack et al., 1990; Womack and Jones, 1996, Lee, Peccei 2008, p4, Inman, 1999, Arnheiter, & Maleyeff, 2005).

TABLE 3: Pearson correlation between Training in SCM and Competitive advantage

	TRAINING IN SCM	Product differentiation	Employee differentiation	Service differentiation	Price differentiation
1	Adequacy of production training among employees (B9TRAIN2)	.560(**)	.569(**)	.533(**)	.539(**)
2	Management training in supply chain effectiveness (B9TRAIN3)	.590(**)	.595(**)	.596(**)	.550(**)
3	Employee training in supply chain technologies (B9TRAIN4)	.598(**)	.625(**)	.591(**)	.508(**)

Notes: *p ≤ 0.05; **p ≤ 0.01 (all *t*-tests are one-tailed)

Cluster Analysis and Friedman's Rank Test

A cluster analyses were carried out to further explore on the segmentation of manufacturing companies in this study. Since competitive advantage is a very importance bottom-line outcome, therefore the classification is based on average competitive advantage clustering. This cluster analysis categorized manufacturing companies into two groups:

(1) "High" competitive advantage achievers
(2) "Average" competitive advantage achievers

TABLE 4: Rankings of Training in SCM Practices based on competitive advantage using Friedman's Test

Training in SCM	"High" competitive advantage achievers (n=91, chi-square = 13.650, significant=0.001, overall cluster's mean = 5.520)				"Average" competitive advantage achievers (n=24, chi-square = 11.200, significant=0.004, overall cluster's mean = 4.083)			
	Friedman's Test	Rank	Mean	Std Dev	Friedman's Test	Rank	Mean	Std Dev
Adequacy of production training among employees (B9TRAIN2)	2.16	1	5.670	.869	2.38	1	4.4583	1.31807
Management training in supply chain effectiveness (B9TRAIN3)	1.98	2	5.495	1.015	1.88	2	4.0000	1.25109
Employee training in supply chain technologies (B9TRAIN4)	1.85	3	5.396	.998	1.75	3	3.7917	1.38247

Table 4 highlights further information about the cluster. From the result, we can also infer that the higher level of training in SCM implementations are more realized in "High" competitive advantage achievers than "Low" competitive advantage achievers. "High" competitive advantage achievers" put high priorities on 'continuous improvement programs', 'setup time reduction' and 'pull production system'.

Structural Equation Modeling

Given the confirmatory nature of this study, the statistical analysis technique called structural equation modelling (SEM) was utilized. A SEM model was employed to investigate simultaneous linkages that allow a researcher to determine the relative strength of relationships between variables. A two-step approach was employed. First, confirmatory factor analysis was performed

to ensure that all the indicator variables used to measure the constructs were reliable and valid. Second, causal relationships between constructs were postulated and tested. The link between training in SCM practices, competitive advantage is depicted in the model shown in Figure 2. The SEM model was evaluated to check if the specified items provided adequate fit. Since we would like the model developed to fit the data, the acceptance of the null hypothesis of the overall model is expected. Hence, in this test of goodness of fit for the structural equation modeling, the probability we are looking for should be higher than 0.05.

The findings of SEM model indicate that the resulting Chi-square value is 9.224 with 13 degrees of freedom and p-value of 0.756 (Figure 2). This supports the null hypothesis that the revised model has a good fit (H_0). The p-value is considerably substantial (p-value > 0.05), in supporting the proposition that the overall model fits the data. Furthermore, other statistical structural indices such as Bentler comparative fit model CFI (0.999), Bollen Incremental Fit Index IFI (0.999) and Tucker and Lewis Index TLI (0.999) further suggest that the model has a satisfactory fit (Table 5). Since the probability value and structural modeling indices are well above the recommended level, the model is considered to be a reasonable representation of the data (Hair et al., 1995).

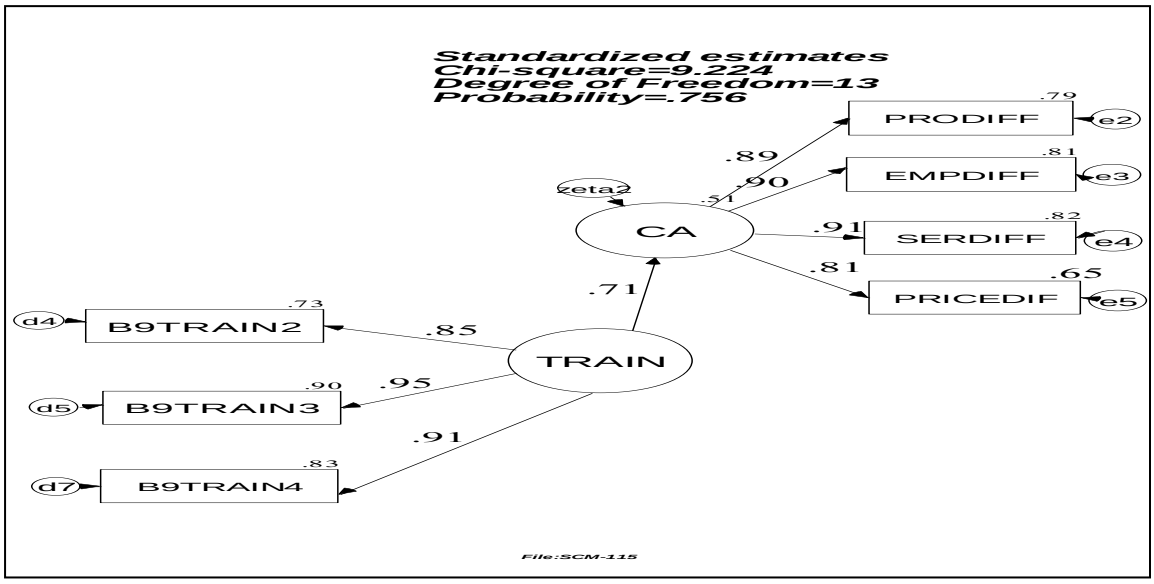

Figure 3: Model SEM Model linking the structural relationship between training and competitive advantage.

The direct structural effects of training in SCM on competitive advantage (0.71) is considered high given the complex causal linkages, suggesting the importance of training in SCM especially as shorter lead time, reduced setup time, continuous improvement programs and pull production system in improving competitive advantage in Malaysian manufacturing industry. Therefore, we have enough evidence to accept the proposition that training in SCM has a positive and significant structural effect on competitive advantage (H_1). Looking at the loadings of the training in SCM practices (Table 6) on the main construct, we can see that 'management training in supply chain effectiveness' (structural loading = 0.951) has the highest contribution towards training in SCM and it is followed by 'employee training in supply chain technologies' (loading loading = 0.913), and 'adequacy in production training among employees' (structural loading = 0.853). All of these indicators have significant probability values (critical values ≥ 2.00), giving statistical evidence that their contributions towards training in SCM construct are significant and

positive. The examination of residuals also reveals that variances among variables of the construct are perfectly explained by the respective constructs.

TABLE 5: Measurement Results of SEM Model

Statistics	Model Values	Recommended * values for good fit
Chi square	9.224	-
Probability Level	0.756	≥ 0.05
Degree of Freedom	13	-
χ^2 /df	0.567	≤ 3.00
Bollen (1989) Incremental Fit Index (IFI)	0.999	≥ 0.90
Tucker & Lewis (1973) TLI	0.999	≥ 0.90
Bentler (1988) comparative fit model (CFI)	0.999	≥ 0.90
Normed fit index (NFI)	0.988	≥ 0.90
Goodness of fit index (GFI)	0.978	≥ 0.90

*Chau (1997)

TABLE 6: Measurement Results of the SEM model

(i)Constructs and indicators	Std. Loadings	Std. errors	Critical Ratio	Probability
a. Training in SCM				
Adequacy of production training among employees (B9TRAIN2)	.853	.056	14.297	0.000
Management training in supply chain effectiveness (B9TRAIN3)	.951	.088	14.295	0.000
Employee training in supply chain technologies (B9TRAIN4)	.913	.058	17.121	0.000
b. Competitive Advantage				
Product differentiation	.886	.065	14.081	0.000
Employee differentiation	.900	.073	14.863	0.000
Service differentiation	.908	.062	14.861	0.000
Price Differentiation	.808	.081	11.619	0.000
(ii) Exogenous/endogenous Path				
a. TRAIN$\rightarrow$ CA [H_1 is supported]	.712	.079	8.684	0.000

Thus, a manufacturing company can enhance its competitive advantage by integrating and implementing training in SCM strategies and practices. The result highlights the unique contribution of training in SCM practices on competitive advantage and supports the notion that the structural model has a satisfactory fit. We can obviously suggest that training in SCM practices can help manufacturing companies improve their competitive advantage and in the long run, it is safe to state that training in SCM can ultimately enhance competitive advantage of manufacturing industry in Malaysia.

The Malaysian Training in SCM Index (MTSCM)

In this paper, an attempt is made to calculate the Malaysian Training in SCM Index (MTSCM) in the context of competitive advantage for the Malaysian manufacturing industry using structural equation modeling. The purpose of calculating this index is to determine the level of training in SCM implementation in the manufacturing companies in Malaysia. Since findings from several statistical analyses above, strongly indicate that training in SCM is very crucial in enhancing performance, this study tries to explore the level of training in SCM implementations or practices in Malaysia manufacturing industry by calculating Malaysian Training in SCM Index (MTSCM).

The calculation of the MTSCM is based on ACSI as suggested by Fornell et al (1996). This paper proposes the following formula for the index:

$$MTSCM = \frac{\sum_{i=1}^{3} w_i \bar{x}_j - \sum_{i=1}^{3} w_i}{6 \sum_{i=1}^{3} w_i} x\ 100$$

MTSCM = 70.00

Where,

MTSCM = The Malaysian training in SCM index
w_i's = the weights
x_j = the measurements variables

TABLE 7: Statistics of training in SCM determinants for calculating Malaysian Training in SCM Index (MTSCM)

	TRAINING IN SCM DETERMINANTS	Mean	Unstandardized weight from SEM
1	Adequacy of production training among employees (B9TRAIN2)	5.4174	.799
2	Management training in supply chain effectiveness (B9TRAIN3)	5.1826	1.000
3	Employee training in supply chain technologies (B9TRAIN4)	5.0609	.992

*MTSCM is based on ACSI calculation (Fornell et al, 1996)

Having calculated the index, Malaysian Training in SCM Index (MTSCM) is equal to 70.00. A score of 70.00 for the Malaysian Training in SCM Index (MTSCM) for the manufacturing industry is still considered moderate but above average. Therefore, more effort should be carried out by manufacturing companies in Malaysia to implement effective training in SCM in order to improve competitive advantage.

Conclusion and Implications

Training in SCM practices provide a vision that focuses everyone in an organization on quality improvement. The pursuit of quality improvement is not only requested by the market but also driven by the need to survive. This paper tries to investigate the structural relationship between training in SCM, competitive advantage in the Malaysian manufacturing industry. The associations and effects of the five training in SCM practices were evaluated using Pearson's correlation, cluster analysis and SEM. The results of the study assist in understandings how training in SCM practices influence competitive advantage. This study leads to several main conclusions. First, evidences suggested that:

(1) 'Management training in supply chain effectiveness', 'employee training in supply chain technologies' and 'adequacy of production training among employees' have **positive** and **direct** effects on competitive advantage.
(2) Training in SCM has **positive** but **significant direct** effect on competitive advantage through competitive advantage (mediating effect).

(3) The Malaysian training in SCM index (MTSCM) of 70.00 suggests that more effort should be carried out by manufacturing companies in Malaysia to adopt training in SCM in supply chain in order to improve competitive advantage

The conclusion emerging from this study is that training in SCM will ultimately results in positive changes. The results validate some of the key linkages and support beliefs and evidence by researchers of the relationship between training in SCM, competitive advantage. It is also important to note that this study attempts to enrich the literature review and make a contribution in SCM-related studies. This paper is relevant to practitioners because the findings may reveal important aspects in the implementation of training in SCM practices, which may provide significant information managers can use to solve implementation challenges and perhaps to improve performance. The paper would be of particular interest to practicing production managers or top level managers as it suggest what factors should be emphasized to stimulate the adoption of training in SCM concepts in the Malaysian manufacturing industry. Moreover, the findings may provide support for continued implementation of training practices. The result indicates that manufacturing companies should emphasize greater attention to employee and management training in SCM process and a greater degree of management support for training in SCM implementations.

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