DEVELOPMENT AND APPLICATION OF COMPETENCY MODEL IN MANUFACTURING OPERATIONS: AN OVERVIEW

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Abstract

A knowledgeable and technically competent workforce is one of the main operations components that influence the positioning of an organisation in global market competition. Competencies can offer workers an opportunity to define excellence in job performance. However, since job task do not remain fixed and to be aligned with rapid advancement in global market competition, it needs to be re-visited from time to time. Organizations need to build its strategies to continuously establish and enhance different competencies of different purposes in order to stay competitive. In manufacturing operations management, workforce is said to be the resources besides machines where skills are managed through a very simple model which is far from expressing the requirements of competence over the process management. Nevertheless, no generic framework is suggested and there is a huge gap between a very simple off-the-shelf description of basic skills or competencies and the possibility to define its own framework. Therefore, it requires an important development effort to develop and establish one. This paper aims to review the past studies on competencies and competency model while exploring the development and application process of establishing one in manufacturing operations environment. The review highlights the importance of competencies development which not only benefited to the individual worker and the organization but also can gives great impact to country as part of the initiative to scale up workforce productivity to achieve next stage of economic competitiveness

Keywords: ***Competence, Competency, Competency Model, Production Competence***

1. INTRODUCTION

With the rapid advancement in technology and operations management, the need of knowledgeable and technically competency workforce in the global market competition is inevitable (Lahidji, Ph, and Albayyari, 2002). Knowledge workers need to be constantly developed to maintain and improve its innovativeness. Aside from operations components which are the technology and product, it is said that human resource has a strong link to the performance through the development of their skills and abilities which in this context categorise as individual competence, collective competence and global competence(Boucher, Bonjour, Grabot, and Etienne, 2007).These three (3) components are used in several disciplines which integrating the concept of competence. Individual competence referring to the underlying personal competencies which integrated knowledge, skills and attitude of a worker. Organisation needs to define and establish workers' individual competencies which able to support business operations strategy. Individual competence will assess functional and behaviour competence. Whereas, Boucher et al., (2007) emphasized that collective competence is used to deal with the competence emerging from a group of person or employees. A top down approach will be used for a consistent deployment of strategic orientations through collective and then individual competencies. Thus, Global competence is described as the organisational ability of an enterprise. The development of these three (3) competencies components is essential for future-oriented production aligns with the aims to improve production workers' skill which is a key success factor for the operative excellence of production processes (Cachay and Abele, 2012).

The main objective of this paper is to review the past studies on competencies and competency model while exploring the development and application process of establishing one in manufacturing operations environment. The review highlights the importance of competencies development which not only benefited to the individual worker and the organization but also can gives great impact to country as part of the initiative to scale up workforce productivity to achieve next stage of economic competitiveness. Many countries have started to recognize the needs in matching and developing competence-based qualification profiles based on occupational core competences and work processes. For instance, the Workforce Skill Qualification (WSQ) system was introduced by Singapore government as one of the initiatives and supports toward developing high-skilled workers. Despite of the challenges in rolling out the WSQ system at all levels of personnel, Singapore government has shown remarkable progress in its national budget for workforce skills upgrading for the past 7 years (Kodiappan, 2011). In Malaysia, National Vocational Training Council (NVTC) is entrusted with a major role in formulating, promoting and coordinating industrial and vocational training strategy and programmes among Malaysian Workers to support the Tenth Malaysia National Plan. Malaysia has allocated 3.7 billion ringgit Malaysia in its 2013 national budget aims to train students in technical and vocational fields.

2. PAST STUDIES ON COMPETENCY DEVELOPMENT

It is utmost important to ensure having the right employee at the right place with the right skills, behaviours and mind set. Today, there is general consensus on the importance of competencies. Although, it is essential for performance, it is not by itself adequate for effective performance in a job. Performance is more than a function of motivation and ability. It is influenced by the organisational environment that includes processes and systems. In order to stay competitive globally, manufacturing strategy effectiveness will need to be maintained. Organisation is required to be able to position itself and build competence exponentially.

Traditionally, academic aptitude and knowledge were said to be the main predictors of the outstanding job performance. Started with a finding by David C. McClelland in 1973, the definition of competencies evolved. Through his research paper: Testing for Competence Rather than Intelligence, he managed to influence all researchers on the existence of competencies characteristics which were known as underlying, enduring personal characteristics or self-concepts, traits and motives. With the existence of these competencies, he argued that the success of job performance can be predicted. McClelland has described his findings in an Iceberg Model as shown in Figure 1. The Iceberg Model is referred as the famous competency model used to describe the competency characteristics.

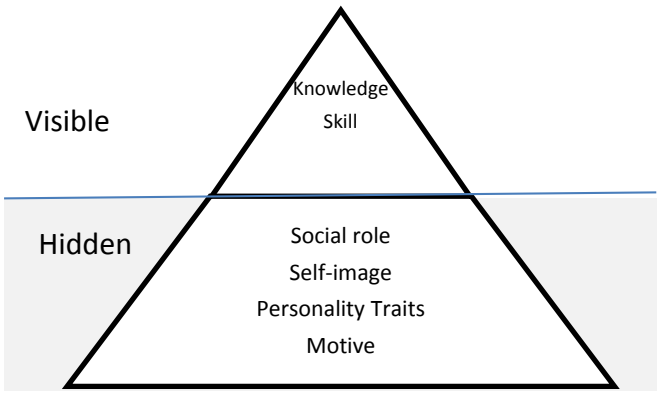

Figure 1: The Iceberg Model of the Competence (McClelland D C, 1998)

Despite of the generally accepted competencies characteristics by Dr McClelland, the arguments between the term competencies, competence and competent are still continues. The common notion of most competence definitions is that it consists of integrated pieces of knowledge, skills and attitudes that can be used to carry out a professional task successfully. Whereas many researchers define

competence as the integrated whole of knowledge, skills and attitudes (Baartman and Bruijn, 2011). All these part and pieces of competencies are the main factors and crucial in determining the organisational performance. This appears to be aligned with the findings by Spencer and Spencer since 1993 that said competence is not only what the worker would be desirable to have but how the competencies relate to their performance at the workplace (Spencer and Spencer, 1993). Indeed, Dr McClelland highlighted through his iceberg model that personal characteristics are the hidden behaviour competencies which represent part of the overall competencies and constitute the larger portion of the iceberg. Nevertheless, knowledge and skills are the visible competencies that require further development.

From Dr McClelland Ice berg model, the expansion of competencies definitions continues. Many research studies are presented to explore the relational connection between competencies and industrial performance. Boucher, Bonjour, Grabot, and Etienne (2007) claimed that there was a significant positive relationship between core competencies and organisational performance. In their research, challenges and constraints are identified and studied to ensure all levels of employees will get benefited through the integrated competence orientation which are functional and behaviour competence. Figure 2 shows the difference in viewpoints which were raised by Boucher et al.(2007) between competence and performance.

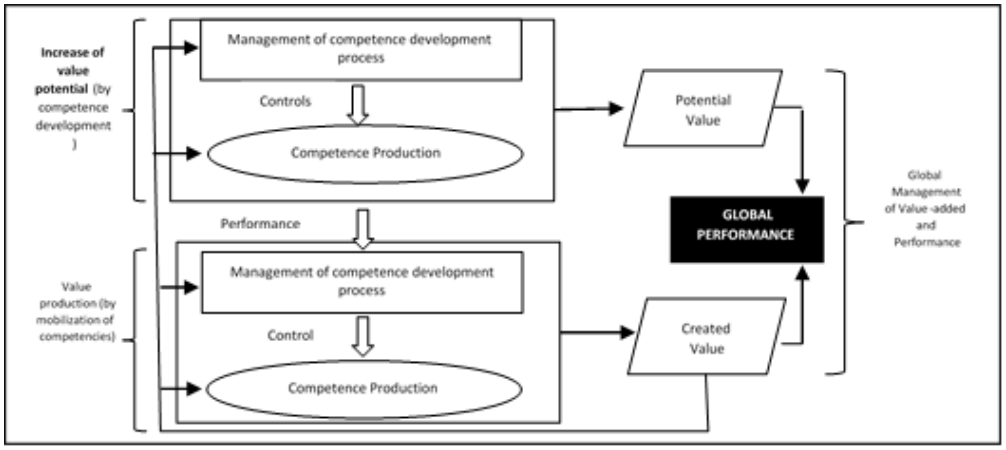

Figure 2: Two complementary points of view between competence and performance (Boucher et al., 2007)

While Dr McClelland iceberg model emphasized on underlying, enduring personal characteristics or self-concepts, traits and motives to support employees job performance, Boucher et al.(2007) through his viewpoints added the existence of functional competence to improve industrial performance which they indicated some improvements in quality, time and cost. Although the findings did highlighted on a few positive impacts, the usage of competence in operational management is still said to be in an emerging phase which require further in-depth study. Functional competence refers to the technical skills that the employee should possess in which form the basis for their unique ability to fulfil job tasks, duties or responsibilities and shall be used to establish performance from a perspective that others cannot (Palaniappan, R, 2005). Moreover, in operational management, functional competencies are very different from role to role and process to process which often technical and operational in nature. The skills set will need to commensurate with employees' strong abilities to perform on specific tasks.

Various competence areas were analysed in the past studies which include production competence, marketing competence, R&D competence, HR competence and manufacturing competence. Its impact on firm's overall performance was closely monitored and explored. One of the studies conducted had analysed production competence as the variables and has resulted in seeing the positive relational connection emerge between production competence and business performance (Avella and Vázquez-Bustelo, 2010). However, the studies failed to observe its impact to the workers or people. With those evidence, there is a gap which requires to re-visit the study as to ensure that the findings are still valid to current practice. Not only business performance, studies are also conducted to investigate the

impact of competencies on various areas on market competitiveness. In addition to this, it is said that cultural intelligence competence among workers are able to enhance industrial performance as well since it requires more than just knowledge, skills and attitude. It requires a global mind set thinking so that the workers are able to see the overall job performance in wider scope (Goodman, 2012). Moreover, as observed by Mai and Nguyen (2008) in their studies in Vietnam, there are other four competencies that can expect to earn profitability and improve market performance namely manufacturing competencies, marketing competencies, R&D competencies and HR competencies. However, the findings revealed that manufacturing competencies are found to have no significant relations to market competitiveness and require more in-depth study to analyse the influence of different manufacturing practices on organization performance. A similar findings are suggested by Cachay and Abele (2012) which emphasized on the needs for organization to be able to quickly adapt their industrial operations method to change following market conditions, or the industrial performance will be affected. Thus, the studies claimed that an industrial setting with different approach for different production group in a longer durations will also provide different results findings.

3. DEVELOPMENT OF COMPETENCY MODEL

Several research studies have explored the development of competency model. Nevertheless, there are very minimal studies on the competency model applications to the actual industry operations. Despites the findings, it was observed that competency frameworks in the manufacturing operations environment are managed through a very simple model indeed. No generic framework has been introduced in the past studies and there is a huge gap identified on the needs to define them based on the organisation own framework. By having a customise competency framework and competency model in the organization, workable performance behaviour standards can be defined, training needs analysis standard can be prepared and goals or performance target can be easily communicated (Yuan, Yun and Zhou, 2011). Moreover, their findings particularly stated that competency model would be able to assist organisation in developing training programs which can fulfil the actual needs of a job or required task. One of the example of competency modelling for job qualifications in China is shown in (Figure 3) (Dai and Liang, 2012).

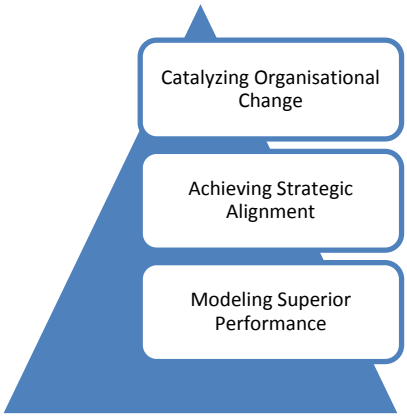

Figure 3: Three Types of competency modelling ((Dai and Liang, 2012)

The model above has similar findings with the earlier studies addressed that human resource skills are identified as a critical component for strategic application. If the competency model ever-being used in an organization to measure performance, human related issues and concerns can be easily monitored and controlled. This has positive effect which allow more effective decisions making support by managers. So, what is Competency Model? Competency model is a descriptive tool that identifies the competencies needed to operate in a specific role within job, occupation, industry and organization (Vazirani, 2010). It consists of a list of competencies which provide competencies details as guideline for employee to improve performance in the current job and prepare for other jobs.

Besides job performance, Competency Modelling can also be used for (1) Training and development (2) Selection Criteria (3) Performance management compensation (4) Succession Planning and (5) Management Information Systems (Homer, 2001). In order to analyse the usage of the competency modelling in the operational management, the competencies development process should be initiated. Competency development need to be conceptualised accordingly following the organisation's need.

There are many ways and methods to establish competency model. In the studies conducted by Ljungquist (2008) on competency modelling development, his research specified that ability and competence are in sequence linked. This appears to be aligned with McClelland's findings on the Iceberg competency model. The process of developing a good competency model can be in the range of simple to complex process, depending on the needs of the organization. The core components of competency-based systems are shown in Figure 4. At the end of the phases, a learning needs analysis roadmap and design will define the learning path for a worker to close their job performance gap and later will be used as the basis to measure overall performance.

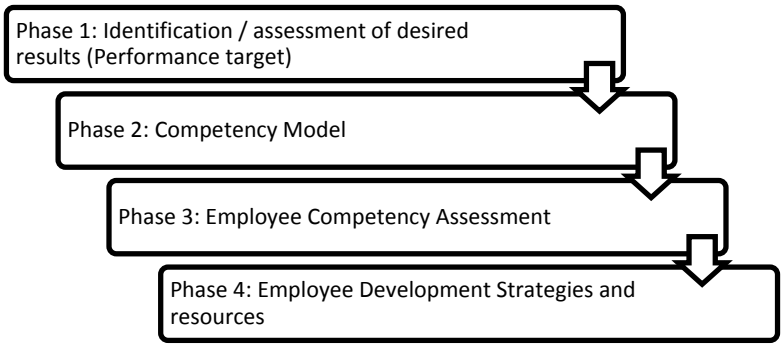

Figure 4: Core components of a competency based system (Adopted from Draganidis and Mentzas, 2006)

3.1 Phase 1: Identification / assessment of desired results

During the development of phase 1, workforce performance such as individual job performance will be identified and observed. Generally, core and functional competencies can be observed from individual worker's job descriptions. The details listed in the job descriptions will be able to guide the worker on job performance target and able to encourage job incumbents to work more effectively (Vathanophas, 2007). Thus, in order to get a comprehensive competency profile for a position, it requires a lot of analysis on the current job descriptions which need to be aligned with the organisational structure as well. Job descriptions require to be updated from time to time to reflect the actual job performance target which differs from one to another depending on the project, tasks or department objectives. In manufacturing operations, the widely used sources of data for developing competency model are senior management interviews, behavioural event interviews and generic competencies dictionaries. In fact, systematic observation of people and jobs are also identified as an effective research method.

Furthermore, Vathanophas (2007) in her study enlisted the needs to design specific curriculums based on the required competencies. Moving forward, organisation needs to link these identified competencies into its future competency based human resource plan. The linkage between identified competencies and job performance can be further explain through "Model of Effective Job Performance" in Figure 5 (Boyatzis, 2009).

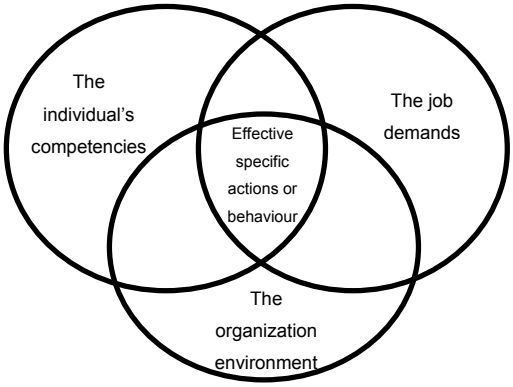

Figure 5: A Model of Effective Job Performance Source: Boyatzis (2009)

3.2 Phase 2: The development of Competency Model.

Prior embarking in developing the competency model, it is important to consider answering this four (4) questions.

1. The purpose of having a competency model
2. The strategies for model building
3. The available resources required, both financial and human
4. The key people involved in the process of developing and validating the model

The purpose of a competency model is dependent on the nature of organisational needs. Competency model can be developed at organisation, position and function levels. Among the important variables in the competency model are competency dictionaries, required competencies matrixes and the identification and verification methods such as surveys, interviews and focus group. Prior in having the job-specific Competencies Matrix, a competency-based training needs analysis process need to be performed (Figure 6) (Yuan et al., 2011).

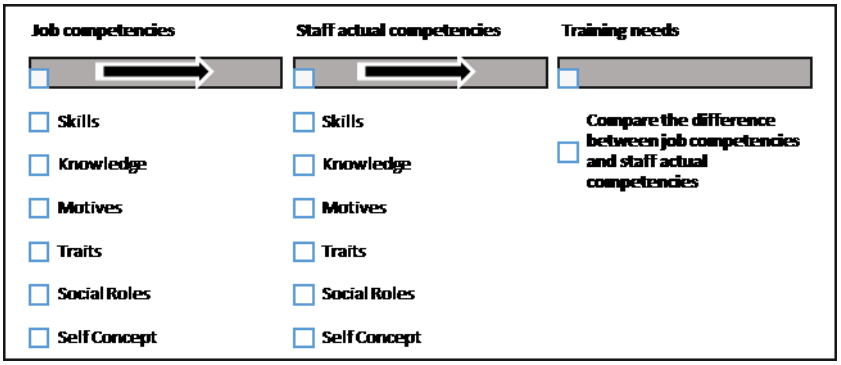

Figure 6: The backbone of the competency-based training needs analysis process (Yuan et al., 2011)

In order to ensure a comprehensive competency-based training needs analysis process to be conducted, components such as (1) legislation needs; (2) Organisational needs; (3) Job or Function needs; and (4) Team or Individual needs will need to be included as shown in Figure 7.

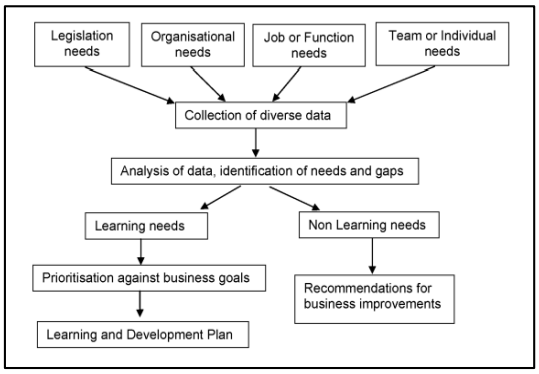

Figure 7: The proposed competency-based training needs analysis process

The compiled data from these four (4) components will determine and influence the required competencies matrix for each worker. In the absence of competency matrix, further development to upgrade and enhance skills will be very complicated to execute. Job competencies need to be monitored and the gaps need to be assessed. Knowing the facts that different people has different speed in performing tasks and solutions, the difference can be observed through competence level. At the end of this phase, it is expected to have a set of competency matrix and identify required competency level (RCL) for each identified matrix of every workers. The RCL marks the level of proficiency expected of an incumbent in a particular position.

3.3 Phase 3: Employee Competency Assessment

Gap analysis is to carry out by assessing the current competency level (CCL) and the required competency level (RCL). When measuring competence, we can assess the level of such knowledge, skills and attitudes as they are applied together to perform a professional task (Baartman and Bruijn, 2011). The gap analysis can be done through various data collection methods. Observations, interviews and distributions of questionnaires are part of the effective data collection methods which always been used by researchers (Bogdan and Biklen, 2006). The selection of research methods should aim to enhance the credibility, validity and reliability of the data outcomes. Collected data should not only rely on a single source but from various sources (Razak, Kamaruddin, and Azid, 2012). Data can be collected from survey results, experiments, observations, internal reports such as manufacturing key performance reports, manpower monthly report, training attendance records, job descriptions etc. McClelland (1973) has introduced Behavioural Event Interview (BEI) technique as reliable data collection method which allows researchers to differentiate competencies by comparing outstanding and average workforce performance. At the end of this phase, the findings on the competency gap analysis will be finalised and to propose the development plan to close the competency gap. During this phase, learning interventions will be used as a platform to monitor the progress of competency management development program towards industrial performance and to ensure the effectiveness of the execution of the development plan (Cachay and Abele, 2012). Hill's Strategy Development Framework in Figure 8 has used learning and innovation systems as one of the operations strategy elements towards achieving high manufacturing performance.

Operations Strategy	
Operations Design Choices	**Infrastructure**
• Type of processes and alternative designs • Supply chain integration and outsourcing • Technology • Capacity and facilities (size, timing, location) • Inventory • Trade-off analysis	• Workforce • Operating plans and control system(s) • Quality control • Organizational structure • Compensation system • Learning and innovation system • Support services

Figure 8: Hill's Strategy Development Framework (Hill, 1993)

As highlighted by Spencer and Spencer (1993), training intervention is needed to develop competencies of an individual. Prahalad and Hamel, (1990) specified that with the multiple stream of technologies available, a collective learning especially on how to co-ordinate diverse production skills is required. Supported by Draganidis and Mentzas(2006), the integration of the competencies management with web services technology can simplify the communication and application of information sharing.

3.4 Phase 4: Employee development strategies and resources

Phase 4 is also known as the relflection phase whereby the outcomes of the competency management system's execution will be examined. In this phase, the performance optimisation that will be analysed and observed are the industrial performance and job performance. The impact of these two variables (functional competencies and industrial performance) will be compared and assessed. For the organisation to be in better position, realistic objectives and achievable strategies will need to establish (Wei, Chen, and Lee, 2009). Inter-departmental objectives and strategies of diverse divisions will need to align with the organisation mission and vision. At the end of the phases, further analysis will need to conduct to reflect on the effectiveness of the competency model established towards ensuring the positive impact towards achieving the organisation expected performance. Once the model has been validated and applied, the development is considered complete.

4. CONCLUSION

Organisation's best source of competitive advantage lies with its employees. By having a structured competency management, it allows employees to up skill competencies for their own benefit and the benefit of others. The concept of competence is fundamental to organizational renewal and as a driving force behind strategic change. In manufacturing operations, with different levels of management and different types of modelling, competence is said to be performance driver and not performance indicator. Yet it is a challenging concept due to the difficulty in specifying competencies theoretically and identifying empirically as a phenomenon, subsequently its complexity to apply in practice. There is a real need to develop a framework or a model on competence management to assist the organisation in pursuing, cultivating and achieving manufacturing excellence. From all the previous studies, it can be concluded that competencies development explores insights about workers' talent and their potential development. Without the structured competence planning, workers' talent and development cannot be conducted. Integrated competence orientation which include functional and behavioural competencies is said to be the effective competencies combination towards

excellence performance, regardless of competence areas. In addition to the physical and technical aspects of works, worker motivation is vital in improving productivity. Employees who shared similar values and goals with those of organization would feel happier and more committed with their work, and this indirectly, results in high job performance (Johari, 2012). Aside from rewards, the psychological factor such as knowing the purpose or benefit of work will also lead to job satisfaction and high motivation level. There are a few findings confirmed on the needs of competence development in organisation as it can be used as a tool to justify business diversifications. In addition to that, studies have revealed that there was a significant positive relationship between competencies and organisational performance. Nevertheless, further studies are required to investigate the impact towards workers or people.

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