



Competence Development and Management in Malaysian Railway Traffic Management System

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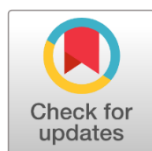
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Abstract: The purpose of this paper is to introduce a systematic approach to develop and manage competence of employee in the field of Traffic Management System (TMS) of Malaysian railway industry. The outcome of this research shall conclude a framework for competence management and define a benchmark for practice in this industry. Previous studies in competence management in the field of TMS mainly limited to non-Malaysian railway and from different type of railway network. The framework for this research study uses component of competence as core element mediate by suitable element to develop and enhance competence. This descriptive quantitative research study uses suitable competency model to explore the competence of the TMS employee. Following this, a suitable technique and method for learning and training method propose for Malaysian railway TMS operation employee. This whole process is summarized into a competence management framework.

Keywords: Competence development, Competence management system, Competency model, Malaysian railway, Traffic management system

Introduction

This article presents the summary of doctoral research's work-in-progress of main author. It presents an overall concepts and idea for undertaking the doctoral research study.

A. Background Study

Rail transport introduced in Malaysia since the late 19th century aim to speed up the transportation between tin mining areas and ports along the coast area (Abd Aziz et al., 2018). Since then, rail transport industry in Malaysian existed for more than 100 years and currently employing more than 12,500 workers (Humar et al., 2019). Presently, Malaysian railway consists of heavy rail, light rail transit (LRT), monorail and another funicular railway line (Masirin et al., 2017).

The modern railway system consist of many elements and multiple complex components such as rolling stock, signaling, communication, power supply, traffic management & operation, platform screen door, automatic fare collection and other mechanical equipment (Baek & Lee, 2017). Among these, the traffic management system being the core system, act as an interface between the traffic controller and other railway components (Morant et al., 2014). Presently, the management of rail traffic system is largely automated, with computers perform daily tasks and control the trains with sets of rules with pre-plan movement and operate by a team of skill personnel (Kalsapura et al., 2018).

In recent times, Malaysia recognize the importance of an advance, integrated rail system

and the benefit to develop its railway knowledge anticipate the future railway growth (Mohamed et al., 2015). Apart from this, the level of technology improvement take place in railway systems technology create huge demand for highly competence resources in this field (Rajaonah et al., 2018). In parallel, Prosser (2016), suggests competence plays an important role to control and manage risks on operational railway

B. Problem Statement

The current demand in railway industry require the railway operation become faster, more frequent, more comfortable, safer and more economical (Dillmann & Orellano, 2016). However, in Malaysian context, according to Ahmad Nazrul Hakimi Ibrahim et al., (2019), commuter rail passenger is not satisfy with the punctuality of departure and arrival of commuter rail and subsequently recommend for improvement action. In parallel to this, Abd Aziz et al. (2018) point out that Malaysian railways face challenges to improve reliability to offer competitive service. Supported by Humar et al. (2019), whereby, Malaysian rail industry face human capital competence issues such as insufficient multi skill workforce especially in specialize technical areas.

In addition to above, the current railway system integrates more functionality in a complex environment with more stringent comprehensive requirements (Abdelatif et al., 2015). Therefore, the railway industry become complex with multiple discipline and critical subsystems that changes regularly (Kaewunruen, 2017). In order to compensate this, the railway industry, especially the traffic management system require highly capable and competence resources to handle the growing complex environments. However, in Malaysian context, there is gaps with regards to local capabilities and capacity to support rail operations (Humar et al., 2019). In addition, there is lack of studies on the infrastructure and operations despite the advancement take place in the industry presently (Binti Sa'adin et al., 2016). On top of this, there is no specific rail courses available in Malaysia for competence development and only depend on foreign original equipment manufacturer which obviously lacks with knowledge and skill development process (Humar et al., 2019).

C. Research Aim

This research study focus to introduce a framework to develop and manage competence of TMS operation staff. as an attempt to solve the operational problem faced by Malaysian railway industry. The intention of this to attempt resolve the service reliability issue face by Malaysian railway industry.

D. Research Objective

The research objective concentrates on competence development matters of TMS operation staff of Malaysian railway. Following this, the breakdown of research objective is indicated below: -

- 1) To assess the competence of TMS operation staff using a suitable competency model
- 2) To identify supporting factor to enhance competence development within the TMS operation department
- 3) To investigate systematic method to develop competence of TMS operation staff
- 4) To develop a competence management framework fits the TMS operation department

E. Research Questions

Following the research objective, this research study will address following research questions: -

- 1) What is the current competence level of Malaysian TMS operation staff?
- 2) What additional factor supports the competence development in TMS operational department of Malaysian railway?
- 3) How to systematically develop competence among the TMS operation staff of Malaysian railway?
- 4) How to manage competence in Malaysian rail TMS operation department?

Literature Review

This section explains the analysis on secondary data from past literature in particular to the research objective and problem of this research study.

A. Introduction to Competence

Competence indicate an ideal situation and quality of physical and intellectual qualifications of individual in carrying out specific task (Salleh et al., 2015).

B. Understanding Competence and Competency

In many literatures, the words competence and competency have been used inconsistently and sometimes confusing (Chuenjitwongsa et al., 2016). Competence refer to necessary ability to do something successfully and it's easily recognize (Potts, 2016). In contrast, competency does not exclusively focus on knowledge or technical skills, but include abilities like communication dan language skills for successful function (El Asame & Wakrim, 2018). According to European Unian Agency for Railway (2018), the differentiation between competence and competency is describe below;

- 1) Competence is the ability to undertake responsibilities and to perform activities to a recognize standard on a regular basis
- 2) Competency is combination of knowledge, skills, attitude, values, and behavior that point to successful performance in a job result from training and coaching

In summary, Ali Memon et al. (2015) conclude that increase one's competence will develop his or her competency. Therefore, to move forward, this research emphasis to explore the characteristics of competence that fits the Malaysian TMS operation area.

C. Component of Competence

In general, competence is more than an individual skill, it include knowledge and connects to performance that can be improve (Lumme & Tuomala, 2019). In specific manner, competence refers to a person's skill, knowledge and abilities (Ali Memon et al., 2015).

1) Knowledge Competence

The term knowledge is broadly refers to the expertise and know-how abilities to perform a particular task successfully (Jayawickrama et al., 2016). Similarly, knowledge is consider as the implication of understanding and shaping of actions (Kuncoro et al., 2017). In railway TMS operation area especially, knowledge such as train dynamics, train routes, rules and operational standards is important is vital for train operation (Naghiyev et al., 2017).

2) Skill Competence

The term skill define someone's ability to do something (Bryson, 2017). In parallel, skill can be consider as the execution part of an action and as well an observable act or behavior exhibit while undertake an activity (Sandom, 2016). In railway TMS operation facility, the process of train dispatch activities still mainly depend on skill along with other competence of the dispatchers (Schipper & Gerrits, 2018).

3) Ability Competence

Abilities can be seen as an element that represents the interpersonal characteristics and the capability to change for a development process (Lunev et al., 2013). The ability to mobilize, integrate, and transfer knowledge and skill is part of the competence (Takey & Carvalho, 2015). Considering both, ability is the capability to mobilize knowledge and skill towards a common subject matter such as competence.

D. Competence Assessment

Competence assessment is a process to determine the basis for skill standard that specify the level of knowledge, skills and abilities require in the workplace (Kuncoro et al., 2017). Competence assessment is similar to an exam and mean to explore the actual competence level (Bohlouli et al., 2017). In broader picture, Russo (2016), explain that competence assessment refers to the process of comparing an individual's competencies to those of a competency model

E. Competence Assessment Tool

Competency model is a descriptive tool to identifies competencies that require for a job requirement (Singhal & Kansal, 2018). Similar to this, competency model is the most appropriate tool for organization to gauge the current competency elements and the desire competencies (Arifin et al., 2017).

The Transportation, Distribution, and Logistics (TDL) competency model developed by Department of Labour and Department of Transport of United States particularly identifies the competencies and skills across the transportation sector (Mary et al., 2015). This TDL competency model depicted in six-tiered pyramidal shape represent competence areas

applied to skills, knowledge and abilities in increasing specialization (Leslie, 2016).

Using the TDL competency model as the target competence standard, the competence assessment of TMS operation staff is now achievable.

F. Factors Support Competence Development

Competence and knowledge appears to be hierarchically related, this suggest that mastering knowledge is essential to competence development (Charland et al., 2016). The significance of mastering appropriate knowledge is essential in competence development, therefore knowledge is consider be an important organizational resource (Bosancic, 2016).

G. Concept of Knowledge Acquisition

Concept of knowledge acquisition existed ever since the earliest time in history, as such the empowerment of humankind has stem from the fact that the acquisitions of knowledge is the key to achieve the goals and objective (Mohd. Rodzi et al., 2015). The term knowledge acquisition refer to all activities which require in order to create the knowledge base in an expert system (Hadj Mabrouk, 2016). Knowledge acquisition is a mechanism by which firm incorporates new technologies ideas and know-how to its existing knowledge base (Gómez-Ortiz et al., 2017).

H. Knowledge Acquisition Method in Railway TMS

E-learning system approach useful to enhance the knowledge of the railway practitioner and rely on the development of theoretical value rather than their application (Khamparia et al., 2010). The learning management system (LMS) uses a way of encourage learners to develop their own competence (Railway Safety and Standards Board Limited, 2013). This method introduced and implemented in London Underground Rapid Transit System (Tube) and it's open and visible to all staff. Most courses on the system are available to all staff using online facility. Similar to Tube, the Sigma Rail is a structural project whose objective is to create e-learning training material on the topic of railway engineering (Rajaonah et al., 2018).

Similar LMS e-learning method for knowledge acquisition fits the needs to support competence development in Malaysian TMS operation segment.

I. Competence Development Method

Competence can be gain through formal training and development activities (Hernández-López et al., 2016). In particular, learning is the fundamental action to obtain competences (Gronau et al., 2017). Learning in general describe the process by which human beings increase own capabilities (Hadj-mabrouk, 2016).

In railway particularly, establishment of specialized services for the selection and improvement of staff occurred in the second half of the 19th century in Europe (Asaff et al., 2015).

J. Concept of Learning Factory

Learning process that make transition from an experience gain in a situation to knowledge and re-utilize this in similar situation is an effective learning process (Hadj-mabrouk, 2016). In parallel, the concept of learning factory is a promising approach to ensure the requirement and capabilities of the employees is achieve (Schallock et al., 2018). Learning factory is basically an infrastructure facility that mimics the real working environment for the purpose of education and training (Tisch et al., 2016).

Learning factory method (LFM) for competence development in railway industry is already practiced by few railway operators. The railway operation research center in Darmstadt - Germany consist of simulation center for railway operation and dispatching facility in railway operation (Streitzig & Oetting, 2016). Another prominent learning factory model is the United Kingdom (UK) rail network. Here, effective fault-finding methodology is facilitate through immersion into a real lineside environment and simulate in a practical layout within the training center (Railway Safety and Standards Board Limited, 2013).

In Malaysian railway, a similar facility but in much smaller scale known as Malaysian Railway Academy (MyRA) initiated in year 2016 and located in Batu Gajah Perak. This facility responsible to transfer knowledge specific to railway operation, signalling and communication to Malaysian railway employee (Humar et al., 2019).

The main idea of LFM do not aim at a mere demonstration of state-of-art technology and systems but the participants self-organize ability to act in complex environment (Enke et al., 2016).

Therefore, a dedicated facility for learning and training purpose mimics the actual TMS operation environment will serve the purpose of competence development in Malaysian railway.

K. Competence Management Framework

In times of globalization and dynamics technological changes, the strategic management of competences becomes highly relevant task as the job requirement is rising especially with in the current digitalization and Industry 4.0 revolution (Decius & Schaper, 2017).

A competence management is a system that responsible to ensure staff are competent to perform their tasks and that staff skills and knowledge is maintain in all circumstances (European Union Agency for Railway, 2018). A formal competence management inclusive of an intrusive, independent means to check a practitioner’s activities (Baker, 2018).

The purpose of a competence management system is to control in a logical and integrated manner all activities within the company or organization that will assure and further develop competent performance in work (Prosser, 2016). An efficient competence management process require accurate assessment and representation of available competences as well mapping of require competences for a specific job (Bohlouli et al., 2017).

Competence management system involve the process to identify and define the competence for a job function and systematically drive the development measure as well the implementation and evaluation measure (Decius & Schaper, 2017). In line with this, the competence management system cycle is described in Figure 1 below.

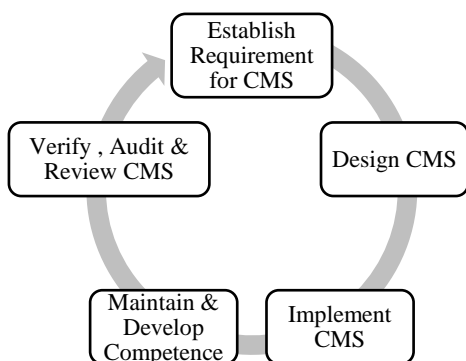


Fig: 1: Competence Management System Cycle (Source : European Union Agency for Railway, 2018)

The understanding of a competence management system discussed in the previous section. However, the classification of this competence management system needs to reflect and most importantly integrate the objective of this research study. This particular process is vital as such the new competence management framework reflect and suit the need of Malaysian railway TMS environment. The integration process is highlight in the upcoming Table 1.

Table 1. Development of a competence management framework for the TMS of Malaysian railway

Competence Management System Cycle	Research Objective
1. Establish the requirement for the CMS	<ul style="list-style-type: none"> The competency model acts as competence requirement for TMS
2. Design the CMS	<ul style="list-style-type: none"> Use the outcome from competence assessment process to determine the content of LMS & LFM
3. Implement the CMS	<ul style="list-style-type: none"> Implement the competence assessment process Roll – out LMS & LFM
4. Maintain and develop CMS	<ul style="list-style-type: none"> Re-assess competence from time to time according to Malaysian TMS needs
5. Verify, audit, and review the CMS	<ul style="list-style-type: none"> Re-assess the description in the competence model in line with present need

Research Design and Methodology

A research is scientific and systematic search on a specific topic (Kothari, 2004). Therefore, a research requires a systematic plan to implement the research and to use the resources efficiently as to guide the research in a scientific method.

A. Research Design

This research follows the postpositive method or better known as scientific method suitable for a quantitative approach compare to qualitative approach (Rahi, 2017 ; Cresswell, 2014). Accordingly, this research follows the descriptive applied quantitative analysis method.

Summarizing the literature review, the research frameworks is defined in Figure 2 below.

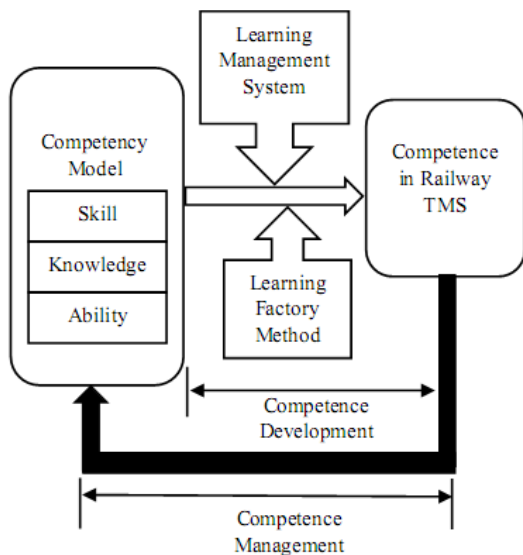


Figure 2 Research Framework

The framework of this research study composes of component of competence as independent variable made up of knowledge, skill, and ability. The competence development supporting factor and method such as learning management system and learning factory method acts as the mediating variable. Finally, the competence in Railway TMS acts as the dependent variable in this research study. This whole process is summarized as a competence management framework.

A. Survey Design

The survey design refers to the purpose of survey, type of survey and the form of data collection (Cresswell, 2014). The field survey in this research study focus to explore the competence level of TMS operation staff and thereafter to validate the competence development supporting factor and the effectively methodology before attend to competence in Railway TMS field.

B. Population and Sample

Population is the TMS operation staff of Malaysian railway. The sampling follow random

probability sampling technique, as such every TMS operation staff have equal and similar chance to be part of this research study (Naderifar et al., 2017).

The sampling design follow the table for determining sample size from a given population by (Krejcie & Morgan, 1970). Whereby, for a population (N) of 60 TMS staff, a sample size(n) of 52 is sufficient for this research study. The demographic representation of the population (N) of TMS operation staff is shown in Table 2 below.

Table 2. Demographic representation of TMS operation staff

Characteristics	Survey (N = 60)	
	N	(%)
<i>Gender</i>		
Female	1	1.6
Male	59	98.4
<i>Work Function</i>		
TMS	40	66.67
Rail Operation	20	33.33

C. Instrumentation Validity and Reliability

The content validity refers to the assessment of the items in research instrument whether the statement or questions is actually represents the issues they supposed to measure (Kumar, 2014). Following this, a committee consist of 2 panel members consist of a university lecture having rank of Associate Professor and a PhD Doctorate holder specialize in railway operation area is establish.

Reliability is the ability of a research instrument to provide similar results when used repeatedly and the higher is the reliability, the higher the accuracy (Kumar, 2014). The most commonly used internal consistency measure is the Cronbach Alpha coefficient (Taherdoost, 2018). As a rule of thumb, Cronbach alpha (α) value of 0.7 or greater is widely considered as acceptable (Taber, 2018).

D. Pilot Study

Main reason to carry out pilot study is to access the appropriateness of the data collection methods and to make necessary changes if necessary (Ary et al., 2010). Similarly, pilot test consists of N of 10 respondent is organize.

Competency Model and Research Instrument Design

A. Competency Model

The TDL competency model discussed in the previous literature review section represent generic competence standard of the railway industry. The description in the model need to rework in order to suit the TMS operation of Malaysian railway. As to achieve this, the Focus Group method comprise of 8-member panel is establish. Similar with Kumar (2014), whereby, the author explore the perception, experience and understanding of a group of people with common knowledge and experience using focus group method.

Table 3. Questionnaire Design and Length

Variable	Questionnaire design concepts	Number of Questions
Abilities	Follow description in competency model	24
Knowledge		24
Skill		24
Learning Management	Explore the effect on independent variable	14
Learning Factory		14
Competence	Explore the integration between independent and mediating variable	12
Total questionnaire length		112

B. Questionnaire Length

The questionnaire design in this research is segregate into few areas. The first section consists of questionnaire for competence assessment. The second section comprise of questionnaire for suitability of learning management system. The third section represent the questionnaire for effective learning factory method while final section comprise questionnaire to gauge the newly develop competence. The tabulation of questionnaire length for this research study is shown in the following Table 3.

Results

Pilot study to test the reliability of the questionnaire was conducted using 10 respondents. These respondents chosen based on their experience serving the operation department of Malaysian railway and those having vast experience in TMS of Malaysian railway. The outcome of pilot test is described in Table 4 below.

Table 4. Reliability test of the questionnaire

Item	Variable		Cronbach's Alpha (α)
1.	Abilities	Tier 1	0.917
		Tier 2	0.906
2.	Knowledge	Tier 3	0.927
		Tier 4	0.943
3.	Skill	Tier 5	0.910
		Tier 6	0.912
4.	LMS		0.932
5.	LFM		0.916
6.	Competence		0.932

Conclusion

This article summarizes the write up of chapter 1, 2, 3, 4 and 5 of the research study of main author. Following this, this research study focuses to use the component of competence and using appropriate concept to finalize a competence management framework. Using the secondary data analysis, the integration and development of skill, knowledge and ability is known vital for competence development. Moreover, LMS and LFM is consider effective for competence development in railway TMS field. The pilot test concluded the questionnaire satisfy the reliability test requirement. This qualify the research study to further accomplish into completion.

The following section describe the analysis of primary data with suitable descriptive statistics will be summarize in the next article to conclude the whole research study.

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