ELSEVIER

ERPA 2014

The development of competency model and instrument for competency measurement: The research methods

Nornazira Suhairom[a]*, Aede Hatib Musta'amal[b], Nor Fadila Mohd Amin[c] and Noor Khairul Anuar Johari[d]

[a,b,c] *Department of Technical & Engineering Education, Faculty of Education, Universiti Teknologi Malaysia, 81310 Johor, Malaysia*
[d] *School of Microelectronic Engineering, Universiti Malaysia Perlis, 02600 Arau, Perlis*

Abstract

The main purpose of this paper is to outline a systematic procedure in developing and validating a competency model and instrument to measure competency for Chefs who works in the hotel industry in Malaysia. Reviewing previous studies in the development and validation of competency models and measurement instrument for a profession had demonstrates that the methodological process starts with the identification of competency constructs and statements from literature review, document analysis and interviewing. The process is furthered by acquiring consensus from expert panel for content validity and questionnaire survey in order to validate the competency model. The methodological aspects described in this paper will present both qualitative and quantitative approaches.

© 2014 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license
(http://creativecommons.org/licenses/by-nc-nd/3.0/).
Peer-review under responsibility of the Organizing Committee of the ERPA Congress 2014.

Keywords: Competency model; research methods; Chef; instrument measurement

1. Introduction

For the past few years, there are significant joint effort from the government, culinary training and educational institutions and culinary industry in corresponding with the industry skill shortages and the need for effective training (Department of Skills Development Annual Report, 2012). Workers in the industry need to stay relevant with the latest trends and progress in the industry or else their knowledge and skills might become obsolete and

---

* Corresponding author. Tel: +6-013-779-0402; fax: +6-07-5536042.
  E-mail address: p-nazira@utm.my

irrelevant. For instance, retraining and skills upgrading is one of the way which of paramount importance to enhance the quality of the workforce so that is versatile and adaptable to the changing technological and business environment (Human Resources Development Fund Malaysia, 2013).

In today's modern society, there has been a growing interest in the concept of competence and competencies in the areas of education, human resource management, and training and professional development. In recognition of the importance of competency for an effective work performance, a competency-based training, Malaysia Skills Certification, a skill training program has also been introduced by the Malaysian government in order to give the potential workers an exposure to the world of vocation (Ramlee & Rohana, 2013). Further, the Department of Skills and Development (Ministry of Human Resources) and Ministry of Education Malaysia has established the skill standards development project which is called National Occupational Skill Standards (NOSS) that defines the employment level as well as essential competency level need to be fulfilled by employees in the industry.

Hospitality and tourism is one of the sectors listed in the NOSS directory pertaining skills profession related to Technical and Vocational Education Training (TVET). Sub sector that is related specifically to culinary art area is the kitchen management sector. These skill standards have been developed through job analysis procedure in order to provide guidance for workers with an ideal career pathway (NOSS Development Guideline, 2012). Table 1 below shows the field of study and category levels of Malaysia Skills Certification for the kitchen sub sectors.

Table 1.Sub sectors: Kitchen

Level of certification	Cooking	Pastry	Bakery	Butchering
L5	HT-012-5 Food Preparation and Production Service	HT-013-4 & 5 Pastry and Bakery Management		Not available
L4	HT-012-4 Food Preparation and Production Service	HT 014-3 Pastry Production	HT 013-3 Bakery Production	HT 011-3 Senior Butcher
L3	HT-012-3 Food Preparation	HT 014-2 Pastry Production	HT 013-2 Bakery Production	HT 011-2 Junior Butcher
L2	HT-012-2 Food Preparation			
L1	No level	No level	No level	
Level L3*	Hotel Culinary HL01 Hotel Culinary			

Source: Department of Skills Development (2013)

This literally highlights the importance of culinary as one important niche in the hospitality and tourism industry. Indubitably, culinary art field is a vital element in Malaysian hospitality and tourism industry as the travelling experience would be unforgettable and becoming the most invaluable part of the entire journey (Salehuddin, Hairi, Izzat, Salleh, & Zulhan, 2009). Accordingly, Shahrim Karim, Chua & Hamdin (2009) stated that culinary tourism has the potential to attract international travellers who are seeking for culinary pleasures. Thus, culinary tourism certainly presents a promising needs and demands for employment of competent, well-prepared, dedicated Chefs, administrators and managers in the areas of hotels, food service, restaurant, food manufacturers, catering and hospitality-related fields who could work together in providing the best food and services for guests and consumers (Rozila & Noor Azimin, 2011).

1.1. Development of competency model

Extensive research on competency modeling has efficaciously identified specific competencies required for success in various professions such as in healthcare, management and engineering professions. Competency models play role as a reference platform for workforce competency management. For the competency model development process, the current study builds on Boyatzis (1982) and Spencer & Spencer (1993) methods in developing and validating competency model.

1.2. Importance of competency model

The value of competency models is that a whole-person assessment or holistic approach (Mansfield, 2005; and Rodriguez, Patel, Bright, Gregory, & Gowing, 2002) can be developed to examine the competencies that an individual possesses and may still need to acquire as required by a given industry or occupation. The information can then be used successfully by human resources development (HRD) or workforce development professionals in various applications with the workforce. A competency model for a specific job is one that represents types of people whom will be effective and competent in the organization. According to Boyatzis (1982), competency model is a template "that is used to assist the management in the selection and recruitment process". A competency model will provide a fundamental guideline for employees in how they should act and what they should be doing. Later on, with the utilization of a competency model, the management could be informed on which characteristics of the employees are related to superior performance.

1.3. Development of competency instrument

Competency-based assessment throws up some challenges to the professions; however the rewards are potentially very substantial. The creation of a genuinely valid competency-based assessment strategy can yield great benefit, not only to the professions, but to the whole community. Under a competency-based assessment system, assessors make judgments, based on evidence, about whether an individual meets criteria specified in the profession's competency standards (Gonczi, Hager, & Athanasou, 1993). There are a number of methodologies are noted in the development of competency-based assessment measures, as mentioned by Nicholson, Griffin, Gillis, Wu, and Dunning (2012). Bashook (2005) emphasized on psychometric requirements in developing competency assessment. When measuring the competencies of an individual during training or in practice, the goal is for each assessment to be an accurate measure of the person's knowledge, skills, abilities, or performance. Accuracy means that the scores from the assessment are reliable and a valid measure of that person's performance.

1.4. Importance of competency measurement instrument

There is a need to extend the competency modeling approach in technical and vocational area as competency was also the critical aspects in the assessment of vocational performance. As stressed out by Greenstein (2012) and Yahya (2005), competency assessment is a process to gain evidence and judgment on the levels of competency among individuals in performing task based on the identified standards.

Similarly, Gonczi, Hager, & Athanasou (1993:23) defines competency-based assessment as "assessment of a person's competence against prescribed standards of performance. Thus, if a profession has established a set of, say, entry level competency standards, then these detail the standards of performance required of all new entrants to that profession. Competency-based assessment is the process of determining whether a candidate meets the prescribed standards of performance, i.e. whether they demonstrate professional competence..."

However, previous studies provide little evidence on the existence of such assessment tool for Chefs who are already in the industry. There is also limited indication on the existing instrument of competency measurement at workplace that can be identified from the literature. The primary purpose of this paper is to describe the systematic procedures followed in developing and validating a competency model and an instrument to measure the identified competencies of Chefs at Malaysian hotel industry.

1.5. Research questions

The main research question for this study is to seek answers for:
- What is the competency model for Chef's superior work performance in culinary profession?
- What is the instrument to measure Chefs' competencies for superior work performance in culinary profession?

In detailed, a specific research questions has been develop to answer the main research question. The following Table 2 depicts the summary of the research from its purposes to data analysis.

Table 2. Sub sectors: Kitchen

No	Research Objective	Approach	Analysis
1	To identify constructs for culinary competencies required for Chefs' superior work performance in the culinary profession from the literature and perceptions of culinary educators and high performers	Qualitative 1.Document analysis 2.Culinary educators interviews 3.High performers interviews	Frequency matrix table
2	To develop a competency model for Chefs' superior work performance i. To develop the lists of competencies required for Chefs' superior work performance	Qualitative 1.Document analysis 2.Culinary educators interviews 3.High performers interviews	A table of competency dictionary lists
3	To validate the competency model i. To identify the level of competencies importance as perceived by the Chefs ii. To identify the level of competency based on Chefs' self-reflections on their own competency iii. To identify any significant differences in the importance ratings based on the Chefs' job position, years of experience and culinary education iv. To identify any significant differences in the level of competencies based on the Chefs' job position, years of experience and culinary education	Quantitative Survey using questionnaire	SPSS Software (Statistical Package for Social Science version 22) -Descriptive analysis -Anova
4	To develop a valid instrument to measure Chefs' competencies for superior work performance *(Star-Chef Instrument)* i. To test the reliability of *Star-Chef Instrument* based on Rasch Measurement Model ii. To examine any significant differences among Chefs' perceptions towards the constructs in the Star-Chef model measurement with regards to their background of culinary education, experience and gender	Quantitative Survey using questionnaire	Winsteps Software -Unidimensionality - PCA -Item fit/Person fit -Item/person separation - Reliability co-efficient -Item polarity -PTMEACORR value -Differential Group Functioning (dgf) using Winsteps
5	To develop a Malaysian Chef's competency profile based on the *Star-Chef Instrument*	Quantitative Survey using questionnaire	Norms and profiling using Winsteps
6	To identify any significant relationships between competencies and superior work performance	Quantitative Survey using questionnaire	AMOS Model validity using Structural Equation Model

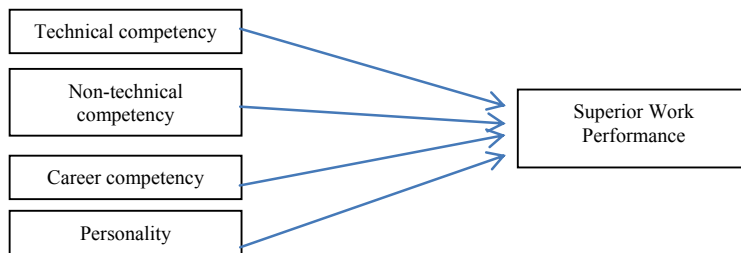Conceptual framework for the study is presented in the Fig. 1.

Fig.1. Conceptual framework

2. Research methodology

2.1. Research design

The current study will adopt mixed method research design that will include both qualitative and quantitative approach in an attempt to answer each research questions posed. This study will employ two-phase mixed method approach which is exploratory sequential design where the study will begin with qualitative data collection and analysis, follow up with quantitative data collection and analysis, and eventually come up with the interpretations (Creswell, 2012). By employing qualitative methodology at the initial stage of the study, the views from the professional chefs relative to successful culinary competencies can be better achieved. The research operational framework is shown in Fig. 2.
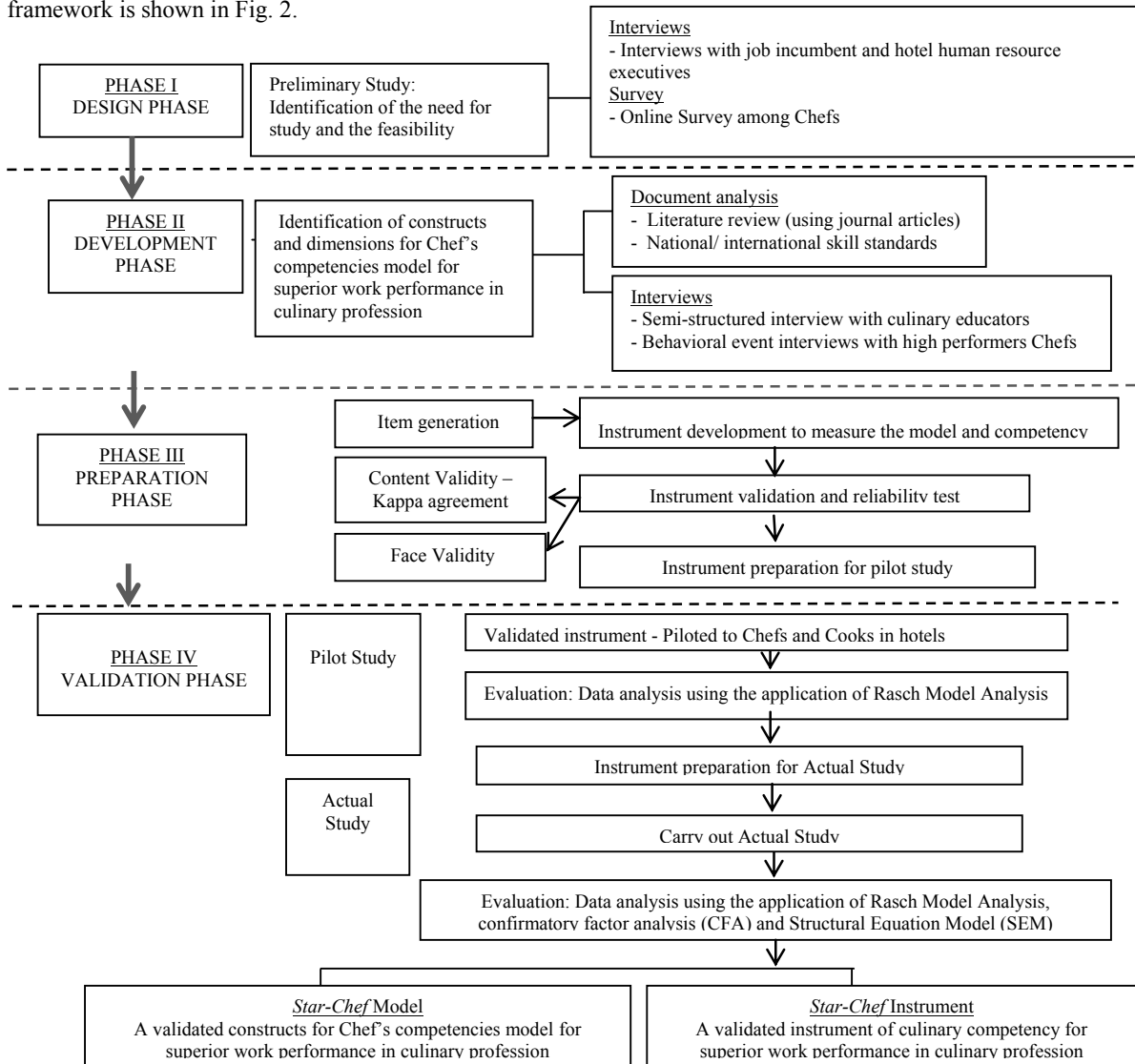

Fig.2. Operational research framework

2.1.1.Phase 1: Initial phase

The main purpose of this phase is to refine the research purposes by conducting a preliminary study. Interviews with hotel human resource executives and Chefs in the industry have been carried out to explore the issues and challenges related to the current study. Additionally, an onlinesurvey through social media networking has been conducted among Chefs who joined the Facebook Group of the Chefs Association of Malaysia and Malaysia Junior Chefs.This is an initial attempt to explore issues in the culinary industry in order to strengthen the research background and problem as well as to support the identification of research purposes and targeted sample.From the researchers' point of view, this is a good platform that provides the opportunity for initial exploration before embarking for further in-depth actual study.

2.1.2.Phase 2: Development phase

In this phase, this study will qualitatively address the topic of culinary competencies for superior work performance in culinary profession with a small sample. This qualitative approach, by means of document analysis and interviews with culinary educators and high performers Chefs aims at establishing the constructs, dimensions and item generation for the instrument.

i. Document analysis - Initial literature exploration will be carried out in order to gather data on the main constructs and dimensions in culinary competencies. Meta data analysis will be done to serve this purpose. Tentatively, there are six main journal articles that serve as document analysis sources, namely; Birdir & Pearson (2000), Zopiatis (2010), Hu (2010a), Hu(2010b), Bissett et al. (2010a) and Bissett et al., 2010b). Additionally, the latest culinary job descriptions for culinary practitioners developed by Malaysia Skill Development Department will be identified.The documents that will be reviewed are Malaysian National Occupational Skills Standard (NOSS) (2013), Handbook of the World Association of Chefs Societies (WACS) Global Culinary Certification Scheme (2014) and Ontario Apprenticeship Curriculum Standard for Chef (2008). Through an extensive document analysis, a list of culinary competencies will be constructed and established. Based on this list, a frequency table will be developed contain constructs that appropriately represents a superior culinary competence.

ii. Interviews with culinary educators - A semi-structured interviews with culinary educators from culinary educational settings will be conducted in order to identify culinary competency constructs and dimensions. The interviews will cover issues and topics including major work responsibilities and job tasks as culinary practitioners; requisite knowledge, skills and abilities in culinary area; and detailed instances of competency-related behaviour.

The aim of these interviews is to identify:

- Technical competencies (job responsibilities) that distinguishes a high performer chefs from the average chefs
- Non-technical competencies that distinguish a high performers among professional chefs from those who perform at average
- Career competencies that are should be possessed by the Chefs
- Personality attributes that distinguish a respected exemplar among professional chefs from those who are less successful

iii. Interviews with high performers Chefs - A behavioral event interview (BEI) will be conducted at this phase, as suggested by Shyr (2012) this is the most suitable method to gather information for defining and developing competency. In behavioral event interviews, high performers are interviewed individually about what they did, thought, said, and felt in challenging or difficult situations.

2.1.3.Phase 3: Preparation phase

This will be the preparation phase for the *Star-Chef* instrument. After the constructs and dimensions of culinary competencies have been identified, the researcher will develop items that will measure the culinary competencies according to each constructs and dimensions. McClelland (1973) conferred that for instrument development, there are rigorous preliminary works that need to be done in order to establish a good instrument. Radhakrishna (2007)

outlines four steps in developing a validate questionnaire, and adapted by the researcher to address specific objectives of the current research, which are:

i. Step 1 (development) - identification and clarification of research purposes, hypothesis, sampling procedure and methodological considerations

ii. Step 2 (conceptualization) – identifying constructs and generate lists of statements for each of the constructs

iii. Step 3 (format and data analysis): writing statements and designing the questionnaire layout, selecting an appropriate scale of measurement and proposed data analysis techniques that will be able to answer each research questions

iv. Step 4 (establishing validity): culinary competencies questionnaire will be constructed to measure the level of culinary competencies

2.1.4.Phase 4: Implementation phase

There will be two stages in this phase: the pilot study and the actual study. The validated instrument (questionnaire) will be administered for a pilot study. The purpose of this pilot study is to test the reliability of the instrument. After the construct validity is achieved, the actual study will be conducted.

2.2. Data analysis

In qualitative studies, data analysis is the most crucial stage where the researcher seeks to gain the depth of their understanding on what they have studied and continually refine their interpretations. Self-evaluation on their own data is the most common data analysis method practiced by qualitative researcher (Basit, 2003). For this study, the process of qualitative data analysis will be guided by means of the approach suggested by Creswell (2012) which comprises six stages as followed: (1) preparation and organization of data for analysis purposes, (2) data coding, (3) description and theme identification, (4) reporting qualitative findings, (5) interpretation of findings and, (6) validation of findings. The utilization of electronic methods in assisting data coding process has been widely used by researchers. The researcher will use Atlas.ti software to assist in the management of qualitative data. Data gathered from the interview sessions will be interpreted using thematic code. Interview findings together with data from document analysis will then be used to build a preliminary Chef's competency model for superior performance in culinary professions. The draft of the model will present lists of constructs and dimensions for culinary competencies. Further, results from this qualitative exploration will then be used to develop an instrument for measuring Chefs culinary competencies.

For the quantitative data analysis, the questionnaire will be analyzed using Winstep software, software based on Rasch measurement model for reliability test. Specific to Rasch measurement application analysis, the following aspects of the reliability of the Star-Chef instrument will be identified:

i. The reliability of the respondent as well as the reliability of item

ii. The point of polarity items where the point measure correlation coefficient of each item. Items with negative value will be dropped from the lists to ensure the quality of developed instrument

iii. Range of infit mean-square as well as the range outfit mean-square value

If the test results indicate the suitability of item does not meet the specified value, some items will be modified for the actual study to ensure the quality of the actual study.

iv. The value of standardized residual variance through the unidimensionality test.

v. The most difficult item as well as the easiest item

Structural Equation Model (SEM) application using AMOS software will be employed for confirmatory factor analysis and model validity. For the current study, AMOSwill be used to test and estimate causal relationships between key constructs in this research. According to Zainudin Awang (2013), AMOS is able to analyse theoretical framework directly, able to find models that best fit data in hand and able to test the inter-relationships among constructs whereas confirmatory factor analysis (CFA) is a special form of factor analysis employed to test whether the measures of a construct are consistent with the researcher's understanding of the nature of that construct. Both of this analysis method will be used to test the research model and verify the hypotheses.

3. Conclusion

In summary, this paper describes the methodological process involved in developing and validating a competency model as well as instrument for measuring the competencies. In terms of methodological contribution of the study, the study used refined statistical procedure which is not yet utilized in similar studies. In this case it is necessary that the improved statistical procedure could contribute to the existing body of knowledge. Effort in competency modeling should be based on research, aligned with the organizational culture and management strategies. The competency models should be incorporated into the human resource management especially in talent management.

Acknowledgements

References

Bashook, P. G. (2005). Best practices for assessing competence and performance of the behavioral Health workforce. *Administration and Policy in Mental Health and Mental Health Services Research*, *32*(5-6), 563–592. doi:10.1007/s10488-005-3265-z

Basit, T. (2003). Manual or electronic? The role of coding in qualitative data analysis.

Birdir, K., & Pearson, T. E. (2000). International Journal of Contemporary Hospitality Management Emerald Article : Research chefs ' competencies : a Delphi approach Research in brief Research chefs ' competencies : a Delphi approach.

Bissett, R. L., Cheng, M. S. H., & Brannan, R. G. (2010a). A Qualitative Assessment of Culinary Science Competencies Defined by the Research Chefs Association. *Journal of Culinary Science & Technology*, *7*(4), 285–293. doi:10.1080/15428050903572680

Bissett, R. L., Cheng, M. S. H., & Brannan, R. G. (2010b). Research in Food Science Education A Quantitative Assessment of the Research Chefs Association Core Competencies for the Practicing Culinologist, *9*, 11–18.

Boyatzis, R.E. (1982) The competent manager. A model for effective performance. John Wiley and Sons Inc, United States of America.

Boyatzis, R. E. (2008). Competencies in the 21st century. *Journal of Management Development*, *27*(1), 5–12. doi:10.1108/02621710810840730

Cohen, L., Manion, L., & Morrison, K. (2005) Research Methods in Education, Fifth Edition, Taylor & Francis, e-library, 2005.

Cresswell, J. W., & Plano Clark, V. L. (2011) Designing and conducting mixed methods research, Second Edition, United States of America.

Department of Skills Development Annual Report (2012). Ministry of Human Resources Malaysia.

Gonczi, A., Hager, P., & Athanasou, J. (1993). The Development of Competency-Based Assessment Strategies for the Professions. *National Office of Overseas Skills Recognition, Australia*, *Research P*.

Greenstein, L. (2012). *Assessing 21st century skills: A guide to evaluating mastery and authentic learning*. SAGE.

Handbook of the World Association of Chefs Societies (WACS) Global Culinary Certification Scheme (2014)

Hu. (2010a). Developing a core competency model of innovative culinary development. *International Journal of Hospitality Management*, *29*(4), 582–590. doi:10.1016/j.ijhm.2009.10.024

Hu. (2010b). Discovering culinary competency: An innovative approach. *The Journal of Hospitality Leisure Sport and Tourism*, *9*(1), 65–72. doi:10.3794/johlste.91.227

Human Resources Development Fund Malaysia (2013), retrieved on 17 June 2014, http://www.hrdf.com.my/wps/portal/PSMB/MainEN/ Corporate-Profile/About-HRDF

Karim, M. S. A., & Chua, B. (2009). Malaysia as a culinary tourism destination : international tourists ' perspective. *Journal of Tourism, Hospitality & Culinary Arts*, 63–78.

Malaysian National Occupational Skills Standard (NOSS) (2013)

Mansfield, B. R. S. (2005). Practical Questions in Building Competency Models. *Workitect*.

Marrelli, A. F., Tondora, J., & Hoge, M. a. (2005). Strategies for Developing Competency Models. *Administration and Policy in Mental Health and Mental Health Services Research*, *32*(5-6), 533–561. doi:10.1007/s10488-005-3264-0

McClelland, D. C. (1973). Testing for competence rather than for" intelligence."*American psychologist*, *28*(1), 1.

Nicholson, P., Griffin, P., Gillis, S., Wu, M., & Dunning, T. (2012). Measuring nursing competencies in the operating theatre: Instrument development and psychometric analysis using Item Response Theory. *Nurse education today*, 6–11. doi:10.1016/j.nedt.2012.04.008

NOSS Development Guideline (2012).Ministry of Human Resources Malaysia.

Ontario Apprenticeship Curriculum Standard for Chef. (2008).

Radhakrishna, R. B. (2007). Tips for developing and testing questionnaires/instruments. *Journal of Extension*, *45*(1), 1-4.

Rahmat, H., Salehuddin, M. Z., Salleh, M. R., & Saidatul Afzan, A. A. (2010). Malaysian Hospitality Managerial Knowledge : A competence model approach. *2010 International Conference on Science and Social Research (CSSR 2010), December 5 7, 2010, Kuala Lumpur, Malaysia*, 730–735.

Ramlee, M., & Rohana, R. (2013). Integration of social skills and social values in the National Dual Training System (NDTS) in the Malaysian automotive sector : employers ' perspective, (1), 1–15.

Rodriguez, D., Patel, R., Bright, A., Gregory, D., & Gowing, M. K. (2002). Developing competency models to promote integrated human resource practices. *Human Resource Management*, *41*(3), 309-324.

Rozila, A., & Noor Azimin, Z. (2011). What it takes to be a manager : the case of malaysian five- star resort hotels, 2040–2051.

Salehuddin, M., Hairi, M., Izzat, M., Salleh, & Zulhan. (2009). Gastronomy : An Opportunity for Malaysian Culinary Educators. *International Education Studies*, *2*(2), 66–71.

Shyr, W. J. (2012). Industry-Oriented Competency Requirements for Mechatronics Technology in Taiwan. *Turkish Online Journal of Educational Technology-TOJET*, *11*(4), 195-203.

Spencer, L.M., & Spencer, S.M. (1993). Competence at work models for superior performance. John Wiley and Sons Inc, United States ofAmerica.

YahyaEmat, (2005) PendidikanTeknikdanVokasional di Malaysia, IBS BukuSdn. Bhd. Selangor, Malaysia.

ZainudinAwang (2013) Structural equation modeling using AMOS Graphic, Penerbit Press UniversitiTeknologi Mara, Selangor, Malaysia.

Zopiatis, A. (2010). Is it art or science? Chef's competencies for success. *International Journal of Hospitality Management*, *29*(3), 459–467. doi:10.1016/j.ijhm.2009.12.003