The Competency Model of Engineer in The Automotive Industry: The Data is Collected from Amata Nakorn Rayong

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Abstract

This research is aimed to create a competency model of engineer in the automotive industry. The data is collected from Amata Nakorn Rayong. The research is performed with two steps: 1) create an engineering competency in the automotive industry using Delphi technique with 17 experts. Then 2) review the engineering competency with the focus group of management staffs from automotive industry in Amata Nakorn Rayong. The statistics used in the analysis were percentage, median and inter-quartile range. The results show that 1) an engineering competency is consist of three parts. Part 1: management competency consisted of: 1) the management of operational performance, Part 2: functional competency consisted of 2) human resource management 3) project management and Part 3: production engineering characteristic consisted of 4) personal characteristics.

Keywords: Engineering Competency Model, Automotive Industry.

1. Introduction

The automotive industry in Thailand has been regarded one of the primary industries driving the country. The growth rate of the automotive industry in Thailand has been high constantly. According to the Federation of Thai Industries, amount of auto manufactured in 2012 was 2.45 million units, up to 68.32% increased from the year 2011, resulted that Thailand became one of the major automotive manufacturers in the world from formerly rank No. 14 to No. 10. In 2013, it's anticipated that number of the automobiles manufactured would grow to 2.6-2.5 million units, and becoming the world's 9th leading automotive manufacturers. Furthermore, government policy promotes Thailand as a hub of car manufacture in Asian region. As a result, the greater number of personnel is needed in the automotive industry, the lack of experienced engineering personnel at all levels; such as skilled labor, technicians and engineers. Thus, it is important to develop personnel in the automotive industry to be equipped with skills and productivity, including higher level of knowledge both quantitatively and qualitatively to cover the entire automotive industry.

According to report on Thailand's engineer production, both direct survey and published data of 75 universities across the country; comprising 24 state universities and 51 private universities, stating that 42 universities offering the Engineering Program during 2008-2015, the production of engineers has been somewhat constant; 13,500-14,000 people per year. Until during the year 2003-2007, it found the rising tendency from estimated 14,596 people in 2013 to 20,360 people in 2007. The fields demonstrating a maximum increase in students during 2003-2007 included computer engineering 124%, followed by environmental engineering and mechanical engineering 60%. This figures shown by both private and state universities focusing on engineering sciences primarily, especially private universities which are more likely to offer the engineering courses and more. As a result, the figures of production has soared higher than the that of the past 5 years, thereby resulted in a shortage of productive engineers who inspect quality, control, develop the engineering efficiently.

As problems mentioned above, to bring about the development of production engineers who are now demanded in large proportion over the automotive and parts industry to be equipped with knowledge and skills that can be competitive upon the opening the ASEAN

Community. In present study, the author has been of interest to examine the competency models of production engineers in the industry as realized that it would be useful to the entrepreneurships, educational institution, universities, and Thailand country when acquiring the virtual competency models of production engineers to further take action, improve, alter, and accommodate the ASEAN Community, improve the production engineers more efficiently.

2. Literature review

The competency model has been the studied in the literature from various perspectives. Boyatzis [1] refers as an underlying characteristic of a person which results in effective and/or superior performance in a job. Boam and Sparrow [2] proposed three categories for classifying competency in this area: 1) achieving results, 2) analyzing and deciding, and 3) working with people. Spencer and Spencer [3] proposed six categories for classifying competency in this area: 1) achievement and action, 2) helping and human service, 3) impact and influence, 4) managerial, 5) cognitive, and 6) personal effectiveness. Boyatzis [1] proposed six categories for classifying competency in this area: 1) goal and action management cluster, 2) human resource management cluster, 3) leadership cluster, 4) directing subordinates cluster, 5) focus on others, and 6) specialized knowledge cluster.
Hughes and Curphy [4] proposed six categories for classifying competency in this area: 1) management skill, 2) personal value and mastery, 3) vision and strategy, 4) aligning people and process, 5) sponsoring change, 6) motivation and development of other, 7) achieve results, and 8) communication skill. Schoenfeldt and Steger [5] proposed five categories for classifying competency in this area: 1) human resource management, 2) leadership, 3) directing subordinates, 4) focus on other, and 5) specialized knowledge. Jackson & Slocum [6] proposed six categories for classifying competency in this area: 1) communication competency, 2) planning and administration competency, 3) teamwork competency, 4) strategic competency, 5) global awareness competency, and 6) self-management competency. Sneed [7] proposed five categories for classifying competency in this area: 1) handle resource, 2) handle information, 3) interpersonal, 4) handle system, and 5) handle technology.
The research review has led to the synthesis of competency in enterprises Rayong province to adopt a competency management framework in the competency model of engineer in the the automotive industry in Amata Nakorn Rayong area by 4 competency : 1). management of operational performance 2) human resource management 3) project management, and 4) the personal characteristics.

3. Methodology

This research method comprised 7 steps as presented in Fig. 1.

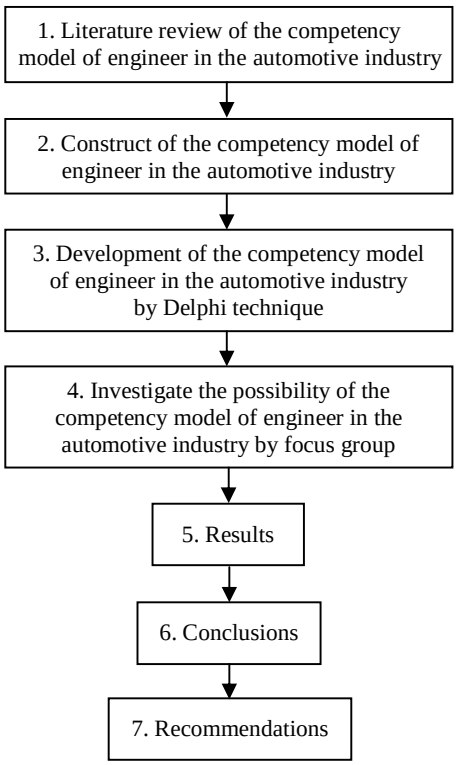

Fig. 1 The seven steps for this research

3.1 Literature review of the competency model of engineer in the automotive industry
The conceptual framework in this research concludes 1) management of operational performance 2) human resource management 3) project management, and 4) the personal characteristics.
3.2 Construct of the competency model of engineer in the automotive industry
3.3 Development of the competency model of engineer in the automotive industry using Delphi technique. The Delphi technique was applied in this research and comprised of three rounds:
3.3.1 Create questionnaires No.1 is interview semi-structure have question involve the competency model of engineer in the automotive industry number 4 dimensions is 1) management of operational performance 2) human resource management 3) project management, and 4) the personal characteristics. First round was structured interview with selection criterion that was higher than 10 percentages.

3.3.2 The text of the opinions of experts in the first round of questionnaires No.1 interviews with the corresponding 10 percentage or more. Second rounds create questionnaires No.2 consisted of 40 questions. The questionnaires scale 5 levels [1] as follows:
5 = Very high
4 = High
3 = Medium
2 = Low
1 = None
3.3.3 Create questionnaires No.3 consisted of 40 questions. The third rounds were used questionnaires to find median and inter-quartile range.
The Median (*M*) can be calculated as follows:

$$M = Lo + (N/2 - c.f.)\, i/f \quad (1)$$

where,
L_0 = Lower limit of median class.
c.f. = Cumulative frequency of the class preceding the median class.
f = Frequency of median class.
i = The size of median class interval.
N = The total frequency.
Analysis of the median in Eq. (1) consists of five rating scale:

≥4.5	Strongly agree
3.5-4.49	Agree
3.49-2.50	Neutral
2.49-1.50	Disagree
≤1.49	Strongly disagree

Calculate of inter-quartile range (*I.R.*) follow:

$$IR = Q_3 - Q_1 \quad (2)$$

where,
Q_3 = Third quartile
$Q_1 = Lo + i\{(N/4) - c.f.\}/f$
Q_1 = First quartile
$Q_3 = Lo + i\{(N/4) - c.f.\}/f$
L_0 = Lower limit of inter-quartile class.
c.f. = Cumulative frequency of the class preceding the inter-quartile class.
f = Frequency of inter-quartile class.
i = The size of inter-quartile class interval.
N = The total frequency.
Analysis of inter-quartile range in Eq. (2) value in the range:
≤ 1.5 Consensus
≥ 1.5 Not Consensus
3.4 Investigate the possibility of the competency model of engineer in the automotive industry by focus group
The competency model of engineer in the automotive industry was approved by experts, academicians and officers and a total of 8 persons participated in focus group discussions.

4. Results

In this section, the results of Delphi technique of experts are shown in the Table 1, the questionnaire No.1 can be calculate percentage of interviews.

Table 1: Analysis of the competency in data

The competency model of engineer in the automotive industry	*Number*	*%*
1. Management Competency		
1.1 Strategy management	17	100.0
1.2 Logistics and supply chain management	12	68.7
1.3 Technology management	13	74.5
1.4 Safety and health management	12	68.7
1.5 Tool management	11	55.6
1.6 Quality management	13	74.5
1.7 Risk management	14	83.3
1.8 Organization management	15	87.4
1.9 Environmental management	16	90.3
1.10 Financial management	13	74.5
2. Human Resource Management		
2.1 Recruitment for production	11	55.6
2.2 Consulting	17	100.0
2.3 Corroboration	13	74.5
2.4 Ability to delegate	13	74.5
2.5 Training and support	15	87.4
2.6 Labor law	14	83.3
2.7 Leadership	16	90.3
2.8 Negotiation	12	68.7
2.9 Organization development	15	87.4
2.10 Employees motivation	15	87.4
3. Operational Performance		
3.1 Problem solving	17	100.0
3.2 Productivity for production	16	90.3
3.3 Maintenance tools and equipment	15	87.4
3.4 Planning and scheduling	15	87.4
3.5 Controlling and monitor machine	12	68.7
3.6 Continuous improvement production	14	83.3
3.7 Decision making process	14	83.3
3.8 Research and development	16	90.3
3.9 Reporting or recommendations	16	90.3
3.10 Focus on customer	17	100.0
4. Personal Characteristics		
4.1 Leadership	14	83.3
4.2 Development teamwork	15	87.4
4.3 Thinking logically	16	90.3
4.4 Coordination of work	14	83.3
4.5 Communication skills	15	87.4
4.6 Take responsibility	17	100.0
4.7 Intelligence quotient (I.Q)	13	74.5
4.8 Emotional quotient (E.Q)	12	68.7
4.9 Creativity quotient (C.Q)	11	55.6
4.10 Ethics	12	68.7

The Delphi techniques of experts in round 2 are shown in the Table 2, Table 3, Table 4 and Table 5, respectively. Therefore, the number of competency value median more than 3.5 and value inter-quartile range less than 1.5 number total 40 competency.

Table 2: Management Competency

Management Competency	*M*	*I.R.*
1. Strategy management	5	0.00
2. Logistics and supply chain management	4	0.50
3. Technology management	4	1.00
4. Safety and health management	4	0.50
5. Tool management	4	0.50
6. Quality management	5	1.00
7. Risk management	4	0.50
8. Organization management	4	0.50
9. Environmental management	4	0.50
10. Financial management	4	1.00

Table 3: Human Resource Management

Human Resource Management	*M*	*I.R.*
1. Recruitment for production	5	0.00
2. Consulting	5	0.50
3. Corroboration	4	1.00
4. Ability to delegate	5	0.00
5. Training and support	5	1.00
6. Labor law	4	0.50
7. Leadership	5	1.00
8. Negotiation	4	0.50
9. Organization development	4	1.00
10. Employees motivation	4	0.50

Table 4: Operational Performance

Operational Performance	*M*	*I.R.*
1. Problem solving	5	0.00
2. Productivity for production	4	0.50
3. Maintenance tools and equipment	4	1.00
4. Planning and scheduling	4	1.00
5. Controlling and monitor machine	5	0.50
6. Continuous improvement production	4	0.50
7. Decision making process	5	1.00
8. Research and development	4	0.50
9. Reporting or recommendations	4	0.50
10. Focus on customer	5	0.50

Table 5: Personal Characteristics

Personal Characteristics	*M*	*I.R.*
1. Leadership	5	0.00
2. Development teamwork	4	0.50
3. Thinking logically	4	1.00
4. Coordination of work	5	0.50
5. Communication skills	4	0.50
6. Take responsibility	4	0.50
7. Intelligence quotient (I.Q)	5	1.00
8. Emotional quotient (E.Q)	5	0.50
9. Creativity quotient (C.Q)	5	1.00
10. Ethics	5	1.00

In this paragraph, the results of the Delphi techniques of experts in round 3 are shown in Fig. 2 competency model of engineer in the automotive industry is consist of three parts. Part 1: management competency consists of: 1) the management of operational performance, Part 2: functional competency consists of 2) human resource management 3) project management and Part 3: production engineering characteristic consist of 4) personal characteristics. With focus groups of the experts can also be used to identify confirms the competency model of engineer in the automotive industry.

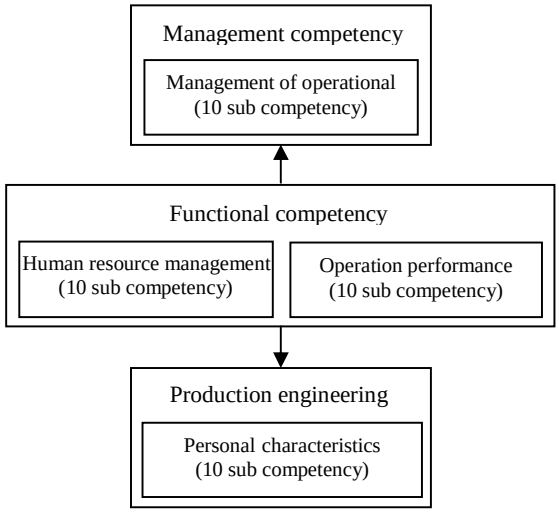

Fig. 2 The competency model of engineer in the automotive industry

5. Conclusions

In this paper, we create a competency model of engineer in the automotive industry. The data is collected from Amata

Nakorn Rayong. The results determine competency is consists of three parts. Part 1: management competency, consists of 1) the management of operational performance (with 10 sub competency), Part 2: functional competency consists of 2) human resource management (with 10 sub competency) 3) project management (with 10 sub competency) and Part 3: production engineering characteristic consist of 4) personal characteristics (with 10 sub competency).

6. Recommendations

6.1 The competency model of engineer in the automotive industry from this study should be used to make factor analysis in factor responsible.
6.2 For future research includes providing competency model in industrial other.

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References

[1] R. E. Boyatzis, The Competence Manager: A Model for Effective Performance, 1982.
[2] R. Boam, and P. Sparrow, Designing and Achieving Competency, New York: McGraw-Hill, 1982.
[3] L. M. Spencer and S. M. Spencer, Competence at Work: Models for Superior Performance, 1993.
[4] R. Hughes and G. Curphy. LEADERSHIP : Enhancing the Lesson of Experience, New York: The McGraw-hill Publishing Companies, 2002.
[5] L. F. Schoenfeldt and J. A. "Steger Identification and Development of Managerial Talent". Research in Personnel and Human Resources Management, 1989, Vol. 7, pp.121-181.
[6] J. W. Slocum, S. E. Jackson and D. Hellriegel, Competency–Based Management. Ohio: South-Western Cengage Learning, 2008.
[7] J. G. Sneed. The Effectiveness of School Quality Review in stimulating school, Abstracting from ProQuest File: Dissertration, 1996.