

Exploring Competencies

*A preliminary study of Malaysian SH&E professionals
using the Delphi technique*

By Rabaayah Daud, Maimunah Ismail and Zoharah Omar

SH&E PROFESSIONALS ARE responsible for ensuring the safety and health of people at work as well as for ensuring that they are protected from hazards associated with occupational activities in various workplaces. Competencies of those who practice SH&E have become a concern because of the challenges now confronting the profession.

Blair (2004) suggests that not only has the SH&E profession grown in size and complexity, its primary emphasis has also shifted from safety engineering to safety management. As a result, SH&E professionals often struggle to clarify the specific roles and behaviors needed to reduce workplace injuries.

Furthermore, SH&E is a relatively new academic discipline. One of the profession's main weaknesses is its inability to affect an organization as an insider (Adams, 2003). MacLean (2007) notes that identifying and applying competency science to an SH&E organization can provide its personnel with the tools to improve their performance and meet business needs. Through this approach, SH&E professionals can also assert better influence on organizational safety systems and practices as outsiders.

Competency is a fairly deep and enduring part of an individual personality that affects behavior and performance (Spencer & Spencer, 1993). This article presents the preliminary results of a study that explored the competencies required by SH&E professionals in Malaysia in four core activities: standard setting, enforcement, promotion and specific function. It incorporates the Iceberg Model of Competency (Spencer & Spencer, 1993) and Leemann's (2005) Health, Safety and Environment Competency Model as a basis in theorizing these competencies. The model conceptualizes five types of competency characteristics: 1) knowledge; 2) skill; 3) social role and self-concept; 4) traits; and

5) motive. Figure 1 (p. 40) depicts a summary of these characteristics.

According to Spencer and Spencer (1993), knowledge and skill competencies tend to be visible characteristics that people can easily develop through training. Conversely, social role, self-concept, traits and motive competencies are more hidden and deep, and are central to personality. Core, motive and trait competencies are more difficult to assess and develop (Spencer & Spencer). Figure 2 (p. 41) presents a summary of the degrees of difficulties in execution, types and examples of competencies.

Spencer and Spencer (1993) suggest that motive, trait and self-concept competencies predict skill behavior actions which, in turn, influence job performance. Knowledge and skill competency also include a motive, trait or self-concept competency that provides the drive to use the knowledge and skill competency.

In a competency study, the most frequently used criteria are:

1) **Superior performance** which is defined statistically as one standard deviation above average performance, normally achieved by the top 10 persons in a given working situation.

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Abstract: *Competencies in the SH&E profession have become a focus in human resource management and development. This article presents preliminary results of a study which used the Delphi technique to explore the competencies required by SH&E professionals in Malaysia in four core activities: standard setting, enforcement, promotion and specific function.*

2) **Average or effective performance** is a minimally acceptable level of work, the lower cutoff point below which an employee would not be considered competent to do the job (Spencer & Spencer, 1993).

Competencies are further categorized into two groups—threshold and differentiating—according to prediction of the job performance criterion (Spencer & Spencer, 1993). Threshold competencies are the essential characteristics (knowledge, skills and ability) that a person needs to be minimally effective in a job. These competencies do not distinguish superior from average performers. Differentiating competencies are the characteristics or factors such as motive, trait and/or pattern of behavior that distinguish superior from average performers.

Leemann's Competency Model

Leemann (2005) developed the first competency model for SH&E professionals following McClelland's competency model. This model consists of roles, functions and competencies of safety professionals, industrial hygienists and environmental professionals. This model also distinguishes superior performer competencies (differentiating competency) as opposed to average performer competencies (threshold competency). He argues

that each competency identified must be mastered by professionals in order to become superior performers and only with that can they deliver business value to an organization. Leemann (2005, cited in MacLean, 2007) found that SH&E professionals need development and improvement in the cognitive, interpersonal and intrapersonal competencies.

One interesting finding in the application of the research is the understanding of the reasons safety and health jobs are so complex and difficult to perform (Leemann, 2005). Leemann adds that although more than a dozen specific competencies must be mastered, an individual's technical expertise was not differentiated between superior and average performance. When compared to other technical occupations, environmental professionals, industrial hygienists and safety professionals must master two to three times as many competencies in order to deliver superior performance.

As a result, the SH&E profession is considered a multifaceted function involving both technical and managerial skills in all aspects of engineering systems. In investigating the best competency model for SH&E professionals, the Delphi technique was chosen as the research methodology of this study.

According to Leemann (2005), success in the SH&E profession is not based solely on technical expertise but also on how practitioners communicate that expertise to others and how they frame the information and strategies employed to gain and retain credibility with their various constituencies.

Leemann found that SH&E professionals are divided into three clusters of competency:

1) Cognitive competencies determine what causes a problem and what to do about it.

2) Interpersonal competencies explain how SH&E professionals deal with a wide range of stakeholders to gain agreement on an issue and garner commitment to identify and pursue solutions.

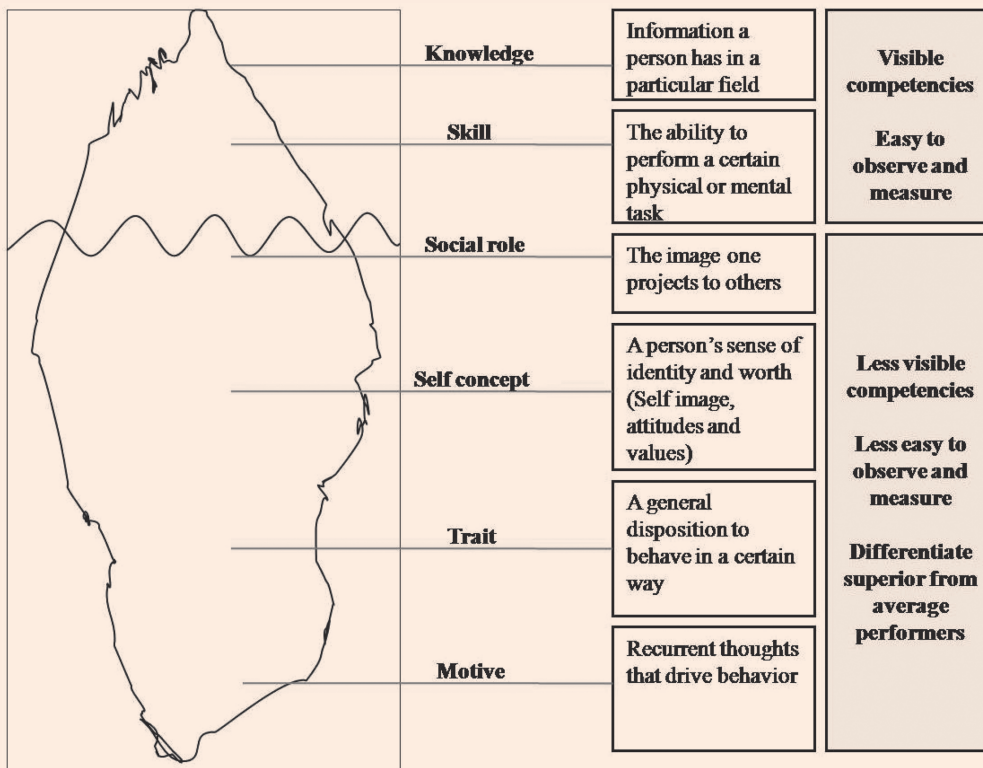
3) Intrapersonal competencies enable an SH&E professional to be successful.

Table 1 (p. 42) shows the clusters comprising cognitive, interpersonal and intrapersonal competencies for safety professionals, industrial hygienists and environmental professionals. A safety professional must master 11 competencies and three threshold competencies, while an industrial hygienist must master nine competencies and three threshold competencies.

The model conceptualizes five types of competency characteristics: 1) knowledge; 2) skill; 3) social role and self-concept; 4) traits; and 5) motive.

Figure 1

Iceberg Model of Competencies



Note. Adapted from *Competence at Work: Models for Superior Performance*, by L.M. Spencer Jr. and S.M. Spencer, 1993, New York: Wiley.

The SH&E Profession in Malaysia

The SH&E profession started in Malaysia near the end of the 19th century. In 1878, William Givan was appointed machinery inspector and he was assigned to inspect the safety of steam boilers used in tin ore mines. This marked the first occupational safety duties implemented in Malaysia.

In 1890, the state government of Perak implemented an individual inspection system where an individual who possessed qualifications in the field of steam boilers was granted a license of appointment as a boiler surveyor. However, when C. Finchman was appointed as the Inspector of Boiler in 1900, the system of boiler surveyor was made obsolete (DOSH, 2003).

With the passage of the Machinery Enactment of 1932, the inspection and registration as well as assembly inspection was enforced by machinery inspectors. At that time, machinery inspectors were within the Machinery Branch of the Department of Minerals.

With the passage of the Machinery Ordinance in 1953, the Department of Machinery was formed. In 1970, the department was renamed the Factories and Machinery Department when the Factories and Machinery Act (FMA) of 1967 was enforced. In 1994, the Occupational Safety and Health Act was enacted and the name of department changed to the Department of Occupational Safety and Health (DOSH). Inspectors are now known as occupational safety and health officers (DOSH, 2003). Today, SH&E activities in Malaysia are governed under FMA and OSHA.

DOSH is a department within the Ministry of Human Resources. It administers and enforces legislation related to occupational safety and health in Malaysia. DOSH is responsible for ensuring the safety, health and welfare of people at work and for protecting them from hazards that result from occupational activities.

Given the wide scope of their enforcement responsibilities, DOSH occupational safety and health officers are expected to be competent in enforcing and implementing laws and regulations in all work sectors. To ensure that DOSH is an active, motivated, forward-looking, wholesome, evolving organization, it must strive to equip its employees with the skills and knowledge to remain competitive in the globalized economy.


Purpose of the Study

A competency model for SH&E personnel in the public sector has already been developed in Malaysia (Yusoff, 2005). However, the model is too generic and not specifically suitable in this case because it does not distinguish between superior and less superior performers. Therefore, there is a need to develop a specific competency model for SH&E personnel to prepare them to be superior performers and to meet their various job challenges.

This study aimed to identify the necessary competencies in terms of threshold and differentiating competencies by using the Delphi technique.

Figure 2

Degree of Difficulty in Execution, Types & Example of Competencies

Degree of difficulty in execution	Types of competency characteristics	Example of competencies
Hard to observe and measure 	Motives	Achievement orientation, motivation, set challenging goals, personal responsibility, Use feedback to do better
	Traits	Self control, initiative, consistent response to situation
	Self concept	Self confidence, self understanding, attitude, values
	Social role	Involving others, coaching, personal influence
	Skill	Mental or cognitive skill include analytical thinking and conceptual thinking
Easy to observe and measure	Knowledge	Technical expertise, specific knowledge

Note. Adapted from Competence at Work: Models for Superior Performance, by L.M. Spencer Jr. and S.M. Spencer, 1993, New York: Wiley.

However, only the preliminary (Round I) results are presented. These results are expected to be used to validate the competencies of SH&E professionals identified in the consequent stages of a complete Delphi cycle, which consists of three rounds.

A historical perspective of the technique and its rationale is provided next, followed by a section on the Delphi process and its application, population, sampling and instrument design. Then, study results, discussion, conclusions and recommendations are presented.

The Delphi Technique: A Historical Perspective

The Rand Corp. developed the Delphi technique in the 1950s. It is a method for systematically soliciting and collating judgments on a particular topic through a set of carefully designed sequential questionnaires interspersed with summarized information and feedback of opinions derived from earlier responses (Delbecq, Van de Ven & Gustafson, 1975).

In its modern form, the technique is used to generate ideas from a group of experts within the field of investigation and to answer several questions (Edgren, 2006). The responses obtained are treated anonymously and sent back to the same group of experts who can express their opinions on the answers and enhance their own thoughts in light of the opinions held by other panel members.

According to the original model, several rounds are conducted until consensus is achieved. Edgren (2006) further clarified that the increasing use of this study technique within an area outside the original scope has led to several modifications of the original method. The technique has been used to generate forecasts about specific issues, build consensus and generate creative ideas. Adler and Ziglio (1996) assert that the method is based on a structured process of

Research suggests that motive, trait and self-concept competencies predict skill behavior actions which, in turn, influence job performance. Knowledge and skill competency also include a motive, trait or self-concept competency that provides the drive to use the knowledge and skill competency.

Table 1

Competency Model of Health, Safety & Environmental (Cluster & Type of Professionalism)

Competency cluster	Competencies	Safety professionals	Industrial hygiene professionals	Environmental professionals
Cognitive competencies	•Analytical thinking	C	C	TC
	•Conceptual thinking	C	C	C
	•Information seeking	C	-	-
	•Planning	C	-	TC
	•Technical expertise	TC	C/TC	TC
Interpersonal competencies	•Impact and influence	C	C	-
	•Involving others	C	C	C
	•Negotiating skills	C	-	-
	•Visioning	-	-	C
	•Translation capability	C/TC	C	C
	•Relationship building	TC	C	C
	•Concern with close relationships	-	TC	-
Intrapersonal competencies	•Achievement orientation	C	-	C
	•Order, accuracy and clarity	C	-	-
	•Perceptual objectivity	C	C	C
	•Self-control	-	C	C
	•Perseverance	TC	TC	TC
Number of key competencies and threshold competencies		11 competencies + 4 threshold competencies	9 competencies + 3 threshold competencies	8 competencies + 4 threshold competencies

Note: Adapted from "Delivering Business Value by Linking Behavioral EHS Competencies to Corporate Core Competencies," by J.E. Leemann, 2005, International Journal for Sustainable Business, 12(1), pp. 3-16.

C = differentiating competency; TC = threshold competency

A safety professional must master 11 competencies and three threshold competencies, while an industrial hygienist must master nine competencies and three threshold competencies.

collecting and distilling knowledge from a group of experts by means of a series of questionnaires interspersed with controlled opinion feedback.

Since getting experts together to discuss the matter is time and cost consuming, many studies have used a modified Delphi technique to seek experts' opinions (Jed, 2006; DeLeo, 2004, Brauer, 2005). Jed (2006) recommends a web-based technique as the most practical method to seek consensus among a group of busy and geographically distributed participants. Participants need not be in the same place to have a discussion. Within the SH&E field, a modified method has been used to identify competencies of an occupational safety and environmental health doctoral degree (DeLeo, 2004) and in evaluating curriculum for professional safety practice (Brauer, 2005).

The technique features some basic characteristics. The first is the anonymity of the experts with a controlled feedback from interaction and statistical group response. This prevents the dominance of the most outspoken and influential people, which often occurs in a focus group discussion. The experts represent different backgrounds based on their tasks. This helps support the validity and reliability of the Delphi technique as an acceptable method of data collection from

an identified group (Dalkey, 1968; Helmer, 1983).

Second, the technique offers efficiency in decision making where order of magnitude estimates are required. Generally, it is a fast, cost-effective, easy-to-understand and versatile approach that can be applied wherever an expert is believed to exist (Siebert, 2004). Rapid consensus can be expected with no face-to-face discussion since participants can be located anywhere provided they are competent in SH&E. Panel participants, therefore, can express opinions freely and have flexibility in responding to the questionnaire and adequate time to think and respond (Linstone & Turoff, 1975; Weaver, 1988; Ruhland, 1993).

Although the technique is widely used in research, some debate its scientific merit. It has been argued that studies using Delphi techniques tend to overlook the reliability measurements and scientific validation of findings (Thangaratinam & Charles, 2005). This technique relies on knowledge and experience of experts to resolve situations where no definite evidence is required. Therefore, using the same validation criteria as for

hard sciences might not be appropriate. However, Thangaratinam and Charles defend that validating a study's finding using this method could be confirmed or tested by another study with different samples.

The method's credibility also can be determined by proper selection of panel experts, data gathering procedures, justifiable consensus level identification and explanation of how the process is implemented. Based on some limitations of the technique, du Plessis and Human (2007) note that it could be best viewed as subjective opinions regarding exploration of certain issues such as competencies, training needs and on-the-job problems that are less suitable to be identified through the use of more scientific and objective instruments.

Study Methods

Delphi Process & Its Application

This study used a modified Delphi technique to identify competencies for SH&E professionals. It is called modified because the questionnaire contained guided questions that included clues derived from literature reviews. This is slightly different from the original technique, which uses open-ended questions or has no guided questions. This modified

technique consisted of a series of round-survey questionnaires sent to panel experts. The researchers followed eight steps:

- 1) Formed a review panel to undertake and monitor the Delphi process and selected panel experts.
- 2) Communicated with panel experts via e-mails, letters and phone calls.
- 3) Developed and tested Round I, II and III survey questionnaires.
- 4) Round I: Developed the list of competencies and rated the competencies for preliminary consensus.
- 5) Analyzed and filtered Round I responses.
- 6) Round II: Grouped Round I competencies into categories and ranked them.
- 7) Round III: Analyzed consensus and developed competency model.
- 8) Summarized and prepared report.

As noted, this preliminary study presents the results of activities involving the first four steps, referred to as Round I. Figure 3 provides an illustration of this systematic and iterative process.

Population & Sampling: Panel Experts

The first step was to identify expert participants. The technique used was nonrandom sampling including purposive and snowball sampling. A total of 105 invitation letters were sent, along with qualification criteria forms, to potential participants. The potential panelists were also identified based on criteria such as background and work experience (Armstrong, 2000).

The candidate pool included SH&E officers/practitioners and enforcement officers from various types of organizations such as policy and research, industrial safety, industrial hygiene and ergonomics, chemical management, occupational health, offshore, major hazard in the public and private sectors in Malaysia. Participants were also contacted via phone or e-mail and were informed about the study.

Of the 105 candidates contacted, 36 agreed to participate. They submitted their qualification forms via e-mail for confirmation. Of the 36 participants, 8 were from the private sector and the rest were from the public sector.

Turoff (1970) and Mullen (2003) suggest that at least three separate groups of individuals who perform three different roles should participate in a Delphi study: 1) decision makers who expect some sort of product from the exercise; 2) a group that designs the initial questionnaire, summarizes the returns and redesigns follow-up questionnaires; and 3) a group whose judgments are being sought and asked to respond to the questionnaires (Delbecq, et al., 1975). Powel (2003) also notes that success of a Delphi study depends on a combination of participants who make up the panel, the number of panel experts and their qualifications.

Instrument Design

In Round I, panelists were asked to identify the competencies for SH&E professionals, including cog-

nitive, interpersonal and intrapersonal with threshold and differentiating competencies that represent each area of work functions. The competencies were listed in a form based on a literature review.

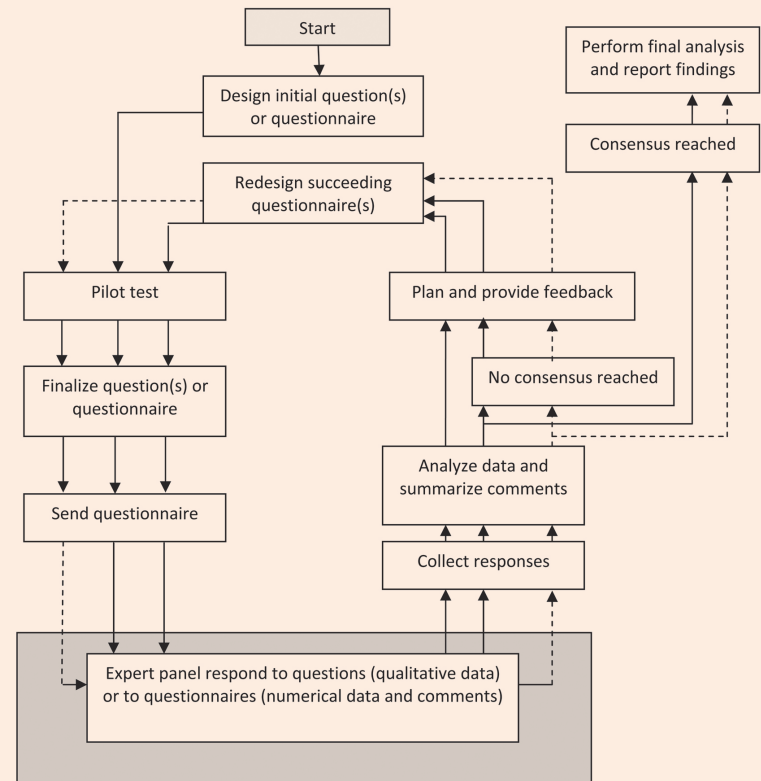
After reviewing responses, the review panel prepared a comprehensive summary. The group identified any duplicate responses, eliminated redundancy and generated identified competency items. The items were categorized as differentiating and threshold, and divided into cognitive, interpersonal and intrapersonal categories in order to remain consistent with Leemann's model.

However, panel members were free to include any competencies they felt SH&E professionals needed even if they were not included on the list provided. Questions were pre-tested with three participants for readability, understanding and clarity of instructions. As a whole, results of the pilot study showed that items developed in the questionnaire were clear and easy to understand; the items were used in the later stages of the study.

In general, the Delphi technique is a systematic process that includes iterative and repetitive processes in two or three rounds until consensus is reached.

Figure 3

Process Followed in the Delphi Technique



Multiple arrows indicate repeated rounds

Note. Adapted from Couper as cited in "The Art of the Delphi Technique: Highlighting its Scientific Merit," by E. du Plessis and S.P. Human, 2007, Health SA Gesondheid. Retrieved Aug. 25, 2010, from <http://www.thefreelibrary.com/print/PrintArticle.aspx?id=173465242>.

The group identified 8 cognitive, 9 interpersonal and 10 intrapersonal competency clusters as needed for SH&E professionals to perform excellent job performance. Of these, 13 have been categorized as threshold competencies and 14 as differentiating competencies.

- The questions asked were:
- **Question 1.** What generic competencies do you feel an SH&E professional needs in order to provide excellent performance?
 - **Question 2.** What specific or functional competencies do you feel an SH&E professional needs to provide excellent performance?
 - **Question 3.** What threshold competencies do you feel an SH&E professional needs to provide excellent performance?
 - **Question 4.** What differentiating competencies do you feel an SH&E professional needs in order to provide excellent performance in their work area or division?
 - **Question 5.** What other competencies do you feel that an SH&E professional needs in order to pro-

vide excellent performance in enforcing or implementing the laws related to safety and health in the workplace?

In each round of the Delphi technique, a consensus level of 75% agreement was accepted since limiting the round could preclude the total consensus (Edgren, 2006). The competencies listed and suggested by panel members were then rated using a Likert-type scale: 0 = not important, 1 = slightly important, 2 = moderately important, 3 = important and 4 = critical. The mean and median were calculated based on the scale of 0 to 4 points.

It was then decided that a mean of 3.0 or greater and a median of 3.0 or greater suggest that the panelists rated the competency items as important. A competency item with a standard deviation of 1.00 or less would indicate the percentage that the experts were in consensus on a given competency item rating. Therefore, a competency statement with a mean of 3.00 and above and a standard deviation of less than 1.00 was selected for the next questionnaire.

The data were executed in a series of rounds and systematic control. This approach enhanced the objectivity and validity of the results obtained (du Plessis & Human, 2007). All collected data were computed and analyzed using SPSS V15.0. The central tendency measures were taken to represent descriptions about the sampled group.

Study Results

In Round I, the response rate was 100%. All participants agreed that the listed competencies were needed according to the main activities of SH&E profession. Based on Leemann's (2005) model, the agreed competencies were then categorized according to differentiating and threshold categories. The competencies were further grouped into three types of competencies: cognitive, interpersonal and intrapersonal according to their level of importance. The complete list contained 27 generic competencies and 21 specific or functional competencies. The results showed that the grade of importance was different for each competency. Participants also categorized the compet-

Table 2

Round 1 Generic Competencies for SH&E Professionals (n = 36)

Category of Competency Cluster	Threshold competencies (TC)				Differentiating competencies (DC)			
	Competency	Mean	Composite Mean	SD	Competency	Mean	Composite Mean	SD
Cognitive (8)	Technical expertise	3.66	3.37	0.47	Planning	3.50	3.09	0.53
	Analytical thinking	3.44		0.58	Conceptual thinking	3.46		0.45
	Business acumen	3.01		0.74	Management skills	3.14		0.61
					Knowledge of business, accounting and marketing	2.70		0.73
					Economic analysis and risk assessment	2.66		0.75
Interpersonal (9)	Impact and influence	3.43	3.24	0.51	Translation capability	3.41	3.24	0.58
	Teamwork and cooperation	3.33		0.65	Involving others	3.28		0.58
	Accepting responsibility	3.12		0.56	Visioning	3.26		0.63
	Relationship building	3.08		0.60	Negotiation skills	3.24		0.63
Intrapersonal (10)	Communication	3.58	3.35	0.52	Interpersonal understanding	3.03	3.30	0.63
	Concern of order, accuracy and clarity	3.52		0.58	Achievement orientation	3.62		0.52
	Customer service orientation	3.30		0.548	Information seeking	3.22		0.62
	Self confidence	3.30		0.56	Initiative	3.20		0.63
	Perseverance	3.21		0.57	Perceptual objectivity	3.17		0.54
	Self control	3.19		0.58				
Number of competencies (Total = 27)	TC = 13		3.32		DC = 14		3.21	

Note. Competency accepted as needed is stated with means of 3.0 or higher and standard deviations below 1.0.

cies into threshold or differentiating groups.

The group identified 8 cognitive, 9 interpersonal and 10 intrapersonal competency clusters as needed for SH&E professionals to perform excellent job performance (Table 2). Of these, 13 have been categorized as threshold competencies and 14 as differentiating competencies.

The mean for competencies ranged from 3.66 to 2.66. The highest rated competency was technical expertise with a mean score of 3.66; it is also a threshold and cognitive competency. The second highest rated competency was achievement orientation with a mean of 3.62; it was also a differentiating and intrapersonal competency. The third highest rated competency was communication, also a threshold and intrapersonal competency. Meanwhile, the lowest rated competency was economic analysis and risk assessment with a mean score of 2.66.

As Table 2 shows, six cognitive competencies had means greater than 3.0: technical expertise, analytical thinking and business acumen. These items were categorized as threshold competencies. Panel members categorized the other three—planning, conceptual thinking and management skills—as differentiating competencies.

Although most of the competency items were identified as important, two items were identified as moderately important and reported as not needed by SH&E professionals. The mean score of both items was less than 3.0. These items were knowledge of business, accounting and marketing, and economic analysis and risk assessment.

In addition, Table 2 shows that nine interpersonal competencies were identified, all with means greater than 3.0. The threshold competencies were: impact and influence, teamwork and cooperation, accepting responsibilities and relationship building. The differentiating competencies were translation capability, involving others, visioning, negotiation skills and interpersonal understanding.

The intrapersonal competencies consist of 10 items with 6 threshold and 4 differentiating competencies. As shown in Table 2, the highest mean score for threshold was communication, followed by concern of order, accuracy and clarity, customer service orientation, self-confidence, perseverance and self-control.

The highest for differentiating competencies, as shown in Table 2, was achievement orientation, followed by information seeking and initiative. The lowest was perceptual objectivity.

As shown in Table 3, the composite mean for threshold competencies in cognitive competency was 3.37 and the composite mean for differentiating competencies was 3.09. For interpersonal competency cluster, the composite mean for threshold and differentiating competencies were similar at 3.24. Meanwhile, the composite mean score for threshold

Table 3

Composite Mean Score for Threshold & Differentiating Competencies

	Cognitive	Interpersonal	Intrapersonal
Threshold (TC)	3.37	3.24	3.34
Differentiating competencies (DC)	3.09	3.24	3.30

competencies in intrapersonal competencies was 3.34 and differentiating 3.30. Overall composite means for threshold and differentiating competencies were 3.32 and 3.21, respectively.

In specific activities such as providing technical expertise, of the 21 competencies listed, 18 were accepted as needed (Table 4, p. 46). Knowledge of SH&E laws, regulations and standards was the highest rated competency, followed by OSH scientific and technical expertise, which was a threshold competency, and industrial hygiene, also a threshold competency. The lowest rated competency was institutional safety management. This was also a moderately important range but the panelists perceived it as not important for SH&E professionals. Seven differentiating competencies and 11 threshold competencies were accepted in specific activities.

As noted in Table 4, SH&E management consists of 9 competency items, including 2 threshold and 7 differentiating competencies. The highest mean score was hazard identification, which is a differentiating competency. The lowest mean in SH&E management was institutional safety management.

In occupational safety, there were 7 competencies items with 5 threshold and 2 differentiating competencies. As shown in Table 4, the highest mean was OSH scientific and technical expertise and the lowest was process knowledge. Occupational safety had only 4 threshold and no differentiating competencies. The highest mean was industrial hygiene and the lowest mean was environmental safety.

The composite mean score for provision of legislation related to SH&E was 3.67. This functional competency had no differentiating competency. The composite mean score for threshold competencies under OSH management was 3.42 with differentiating competencies 3.26.

For occupational safety, the threshold competencies composite mean score was 3.11 and differentiating competencies composite mean score was 3.03. Occupational health only had threshold competencies with a composite mean score of 3.28 and no differentiating competencies. Overall composite score for the threshold competency was 3.37 and differentiating competency was 3.15.

Discussion, Conclusions & Implications

This study has identified the competencies needed by SH&E professionals in Malaysia in the four main activities: standard setting, enforcement, pro-

The composite mean for threshold competencies in cognitive competency was 3.37 and the composite mean for differentiating competencies was 3.09. For interpersonal competency cluster, the composite mean for threshold and differentiating competencies were similar at 3.24.

motion and specific function based on Round I of a modified Delphi technique.

A total of 27 generic competencies and 21 specific competencies for SH&E professionals were identified. The competencies were categorized according to threshold and differentiating categories and concurrently grouped into three areas: cognitive, interpersonal and intrapersonal competencies. This provides a three-dimensional picture of competencies where threshold competencies are more than that in the differentiating categories.

Of the 27 generic competencies, two cognitive competencies were perceived as not important for SH&E professionals: knowledge of business, accounting and marketing. This is counter to Blair (2004), who stated that these two topics are important for

SH&E practitioners' functions. This result is likely due to the fact that 28 panelists (78%) were public-sector enforcement officers concerned more about quality service delivery rather than profit making.

The study also found that technical expertise is the most important competency needed and included in the threshold category. As the literature indicates, SH&E professionals are expected to have thorough knowledge of the technical aspects of the profession. For SH&E professionals, average performance cannot be achieved without technical expertise. This finding supports Leemann's (2005) argument about the need for technical expertise even though the data do not yet distinguish superior and average performance. Further analysis of this technique is needed to determine whether the technical

competencies can be divided into superior and average performance.

The composite mean of threshold competencies was higher than the differentiating competencies in the cognitive competency cluster. This shows that technical expertise and analytical thinking were more important as a basis for the job of SH&E professionals.

In interpersonal competency cluster, composite scores were almost the same for both threshold competencies, which consisted of impact and influence, teamwork and cooperation, accepting responsibility and relationship building. Differentiating competencies included translation capability, involving others, visioning, negotiation skills and interpersonal understanding. These findings show the importance of both competency categories.

In the intrapersonal competency, the composite mean score for threshold competencies were higher compared to differentiating competencies. Threshold competencies were communication, concern of order, accuracy and clarity, customer service orientation, self-confidence, perseverance and self-control. Achievement orientation in differentiating competencies was still the most important competency in intrapersonal competencies.

According to Leemann (2005), intrapersonal competencies were all about personal effectiveness and maturity,

The study found that technical expertise is the most important competency needed and included in the threshold category.

Table 4

Round I Competencies for Specific Activities (Providing Technical Expertise) (n = 36)

Category of competency Functional competencies	Threshold competencies (TC)				Differentiating competencies (DC)			
	Competency	Mean	Composite Mean	SD	Competency	Mean	Composite Mean	SD
Provision of legislation related to OSH management	Knowledge of OSH laws, regulations and standards	3.67	3.67	0.68				
	Preparing safety rules and policies Inspection, investigation and audits				Hazard identification and control	3.53		0.56
					Measuring safety performance	3.47		0.56
			3.47	0.51	Safety research and risk assessment	3.44		0.50
				3.42	Loss control, loss prevention and risk control	3.36	3.26	0.64
			3.36	0.64	Incident investigation, analysis and prevention	3.31		0.52
					Risk management	3.22		0.80
					Institutional safety management	2.50		0.61
Occupational safety	OSH scientific and technical expertise	3.58		0.50				
	Occupational safety	3.28		0.51	System and process safety	3.19	0.58	
	Construction safety	3.14	3.11	0.83				
	Transportation safety	3.00		0.72	Process knowledge	2.86	0.80	
	Fire protection engineering	2.56		0.61				
Occupational health	Industrial hygiene	3.56		0.56				
	Chemical process safety	3.42		0.50				
	Ergonomics	3.14		0.72				
	Environmental safety	3.00		0.79				
Total number of competencies	TC = 12		3.37		DC = 9		3.15	

Note. Competency accepted as needed is stated with a mean of 3.0 or higher and a standard deviation below 1.0.

which are internal traits that permit an individual to be successful. Effective communication is important in any profession, and especially in the SH&E profession. These results support the findings of Blair (2004) who reported that effective communication is vital in SH&E because failure to communicate critical information to employees and upper management in a timely, effective manner can result in injuries or fatalities.

For specific activities, such as providing technical expertise, the competencies identified as important were more related to the job of enforcing and implementing SH&E-related acts and regulations. Knowledge of relevant laws, regulations and standards was the most important competency for SH&E professionals, followed by scientific and technical expertise, and hazard identification and control. All are vital when measuring safety and health performance in the workplace. Therefore, SH&E professionals must have mastery in these competencies.

Round I of this Delphi study identified competencies SH&E professionals need to perform excellently, in terms of threshold and differentiating competencies. These two categories also include cognitive, interpersonal and intrapersonal competencies. The grade of importance and category of competencies depend on job situations or activities such as standard setting, enforcement, promotion or specific activities.

Unlike other technical professions, SH&E professionals must master many more competencies to be excellent in their jobs. This is because of the field's broad range and complexity. The results of this study could provide a basis to develop a comprehensive competency model for SH&E professionals in Malaysia that would be continued in Round II and III of the Delphi technique.

The researchers also concluded that competency studies should be conducted periodically to prepare SH&E professionals to work in the current global environment. The results of such studies could be used to guide decisions about academic curricula. In addition, SH&E-related organizations from various industries could use these basic competencies to prepare industrial training programs for junior and mid-level professionals. It would also help human resource managers in recruiting and in identifying appropriate functions for SH&E professionals based on their competencies. ■

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