

The Role of Competency in Safety Performance

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Abstract: The chemistry business is expanding rapidly. Advanced production and process control technologies are widely used to improve efficiency, product volumes and quality. In addition, the involvement of human resources in this industry is also increasing substantially. Chemicals are hazardous. Therefore, only competent workforce is capable to work safely in this environment. However, assessing an individual competency in chemical industry is a challenging task. Majority of contractors, if not all, might not have a formal safety education. Hence, exposure to hazards and the risk of injuries are high. So, assessing the role of competencies in relation with safety performance is crucial to protect the people, environment, assets and reputation of an organisation. This study examines this relationship using self-administered questionnaires distributed to 1100 respondents working in petrochemical industry. Regression analysis was performed on 663 returned questionnaires to determine the strength of this relationship. The findings show significant positive relationship between competency and safety performance, measured in the form of safety compliance and voluntarily participation in safety programmes. Therefore, it is concluded that competent workforce is necessary to drive safety performance. Competency programmes must be established and competency in safety should be paramount for hiring new employees and selection of contractors.

Key words: Competency • Safety performance • Perceived Behaviour Control • Safety Commitment

INTRODUCTION

The aim of this study is to determine the relationship between competency and safety performance among workers in petrochemical industry. This is due to lack of focus from past studies in this sector despite its nature of being a high risk industry. It is crucial to examine this relationship because modifying human behaviour through competency development will improve safety performance. While employees may have a better chance for safety education, the contractors may not have an equal opportunity due to lack of funding and safety awareness. Therefore, competency-based safety education shall be the basis for today's safe plant operation and man power planning.

There is no doubt that chemistry business is lucrative. However, accidents are equally disastrous. Fire, explosion and release of toxic chemicals had occurred in the past. Bhopal's and Chernobyl's tragedies are two renowned frequently cited cases, killing thousands of people and the impact is felt until the present day. Technology advancement has resulted in the improved

efficiency and productivity of outputs. Nevertheless, new hazards are being created in the scale unimaginable if we were to compare with traditional production methods used in the past. New and bigger equipment is being installed in industries to process and store hazardous chemicals. Almost all chemicals are toxic, if not flammable, corrosive or ignitable. Therefore, plant operators are at risk of being exposed to these hazards with severe health effects. Only competent workforce who had full knowledge and experience about chemical hazards and risks would be able to work safely in the chemical manufacturing facilities.

Safety performance of the workforce is measured in terms of safety initiative and safety compliance. Safety initiative is a voluntary participation in safety activities such as allocation of own time to conduct safety observation in the field. On the other hand, safety compliance is adhering to rules established by the organization to ensure safe operation of the plant. It is perceived that competent workforce will have initiatives to improve safety while not neglecting safety rules already in place. Past studies concluded that modifying

human behaviour is crucial for improving safety performance. This is because almost ninety percent of accidents were due to unsafe behavior. Thus, the journey to improve safety should begin with ingraining the concept of safety as an investment, not a cost factor. With this in mind, the effective allocation of resources to build competent workforce will proceed smoothly. Therefore, it is expected that there will be a significant positive relationship between competency and safety performance.

Literature Review: [1] stated that action is influenced by perceived behaviour control. This explains why some people are willing to go for sky-diving while others are afraid. The perceived behaviour control, on the other hand, is influenced by competency. Someone with knowledge and skills to handle a situation will be more willing to execute the actions because the perception that he is in control. Many studies in occupational safety concluded that human behaviour was the main cause of occupational injuries [2]. Therefore, managing safety performance is the key to improve safety performance [3]. [1] stated that employees' behaviour has to be guided to pathway that ensures their safety at workplace and the importance of safety rules and procedures should be stressed to guide these behaviours. The needs to guide the behaviours for those working in hazardous environment are more demanding than those employees working in other less hazardous industries.

Besides enforcing safety rules and procedures to guide the behaviour, many studies had also shown that employee's safety performances were influenced by organisational safety climate and safety culture. [4] in a study among production workers in a metal processing plant found that organisational safety climate has significant negative relationship with unsafe behaviour and accidents. In another study among manufacturing and mining workers in Australia, [5] found that organisational safety climate has significant relationship with safety participation initiatives and compliance behaviour. In support of this relationship, [6] in a meta-analysis study linking organisational safety climate with employees' safety performance, occupational accidents and injuries found similar results. [7] in a study among production workers found safety climate moderated the effect of job insecurity on safety compliance. All of these studies concluded that organisation safety climate promotes personal safety ownership which drives employees to develop stronger norms on safety performance and would eventually engage in fewer unsafe behaviours. Furthermore, organisations that were

successfully improving their safety climate would achieve real benefits in terms of reduction in occupational accidents and injuries [6].

In addition, leadership and organisational safety commitment were shown to have significant positive relationship with safety performance. According to [8], "It is fairly commonly accepted that the relationship between management and safety outcomes has some form of intricate linkage". [9] in a study among line workers and supervisors working in maintenance of heavy duty equipment found improved frequency of safety related communication between supervisors and subordinates resulted in a significant decrease in micro accidents and increase in using personal protective equipment. It has been argued that the effectiveness of leadership among supervisors who are concerned about the welfare and safety of their subordinates improves safety records. [10] in a study among employees responsible for vehicle maintenance found organisational support in training to improve the competency of the employees' improved safety performance. On top of that, [11] stated that the success of safety programmes such as behaviour-based safety which was proven as a technique to reduce injuries and prevent accidents depending on the top management support, both through personal involvement, leading by example and allocating adequate organisational resources to promote workplace safety. [4] in a study among manufacturing employees producing commercial heating and air conditioning systems found organisational support on employee safety and the quality of exchange relationships among supervisors and subordinates improved safety performance and reduced accidents. [12] in a study among blue collar employees in wood-product manufacturing facilities found that positive leader-member exchanged relationship improved the safety performances of the employees. Accordingly, only the strong support and commitment from the management on safety would drive employees to reciprocate the deeds by demonstrating safe behaviours at workplace.

Safety performance measures seek commitment from both employees and employers. The main determinant is attitudinal and behavioural commitment to achieve safety goals. [9] and [13] concluded that management commitment is prerequisite for safety improvement. [14] proposed two important factors that should be included in safety management, namely safety performance and employee involvement. Similarly, [15] found that safety performance had an impact on employees' perceptions towards safety. In a high risk industry such as petrochemical industry, safety performance is crucial to sustain injury free environment. Thus, competency is

essential for the success of many organisations because it drives commitment towards safety. In this sense, a set of competencies applicable for every job level has to be formulated to ensure the highest performance by job holders. For example, plant operators should acquire technical knowledge and a few years of plant experience whilst engineers should be competent to analyze process changes and recommend improvement accordingly. Competent employees are visible from their attitude and behaviour. It is ingrained in the knowledge, skills and ability (KSA) which are associated with high job performance. It describes someone who has clear direction, self-control, confident, resourceful and analytical [16]. Many researchers agree that KSA is a basic ingredient for a competent worker while personal attributes and behaviour are additional elements associated with competency.

[17] discussed the match between the individual ability and the job. According to these authors, the individuals, over the course of their working experience, will sort themselves into jobs that are compatible with their interests, values and abilities. Furthermore, these individuals may be prompted to seek alternative employment in the hope of achieving better degree of fit. The findings suggest that the individuals with higher cognitive ability moved into jobs that require more cognitive ability. Similarly, the individuals with lower cognitive ability moved into jobs that require less cognitive ability. To apply this notion into occupational safety, the higher cognitive ability individuals are more competent to work in hazardous environment compared to the lower ones. [18] analysed occupational risks in industrial maintenance and concluded that poor ergonomics is the typical risk in maintenance operation. In their analysis, they found that about 40 percent of severe accident cases were fatal. In this case, the competency by practicing safe working environment can prevent accidents due to ergonomic factors.

[18] found competent Production Supervisors were significant contributors to help their companies to stay in business during economic downturn. The authors identified four thresholds and nine distinctive competencies to form superior manufacturing capabilities that can withstand tough business environment. The threshold competencies are essential to performing the jobs and include efficiency orientation and people management cluster. The nine distinctive competencies are related to superior performance and include planning and attention; persuasion, self-confidence and development of others; use of concepts, networking, use

of technologies and social objectivity. These competencies foster efficiency in manufacturing and drive performance improvement while at the same time making the organisational communication more efficient, motivating workers and reducing conflicts. Therefore, the role of employees' competency in safety performance has to be determined to support and reinforce the beliefs that competency is required to enhance safety performance.

MATERIALS AND METHODS

The population in this study is the staff and contractors involve in manufacturing, marketing and distribution of petrochemical products in Peninsular Malaysia. The number of registered workforce in this sector is more than 5, 000 people (Malaysian Petrochemicals Association, 2006). According to [19], when the population size in 5, 000 or more, the sample size of 400 should be adequate. In order to reach valid conclusions about population from samples, random sampling was adopted to gain the ability to generalise the characteristics of the population [20]. The samples were collected from the companies who were willing to participate in the research. The survey questionnaire was adopted from previous studies and represents a compilation of survey items already tested for reliability. To establish operational validity, a minimum of three questions were developed to measure a given variable. The survey questionnaire utilized the closed-ended question format that gives a uniform frame of reference [21].

Safety performance was measured by safety initiative and safety compliance. Three items derived from [5] were used to measure safety compliance. In addition, safety initiative was measured using eight items derived from [22]. Safety initiative describes the behaviour that support safety activities such as participating in safety programmes while safety compliance explains the core activities that need to be carried by employees to ensure the areas are protected from injuries such as complying with safety rules and safety procedures. All of these measurement tools use 5-point Likert scale. Employees' competency was measured by 10 items derived from [23] who tested the instrument on workers in Malaysia Railway System. Responses were scaled on 5-point Likert type scale and range from "Strongly disagree" (1) to "strongly agree" (5). Higher scores will reflect higher employees' competency. Statistical Package for Social Science (SPSS) version 11 software was employed for data analysis.

The first process was to conduct a pilot test and to determine the reliability of the items used in the questionnaire. The alpha coefficient of more than 0.60 is acceptable according to [20]. Linear regression analysis was used to test the relationship between competency and safety performance. It also measures how much variance in the dependent variable is explained by independent variables. Before confirming these relationships, the analysis was conducted to determine underlying assumptions of regression analysis, namely the normality, homogeneity, multicollinearity and linearity. Reliability measurement provides information about consistency of the variables used in the measurement tools [24]. Therefore, internal consistency method was adopted in this study. It measures the degree to which the items in the scale measure the same underlying attribute [24] and measured in term of Cronbach's coefficient alpha.

RESULTS AND DISCUSSION

Demographic profile. A total of 17 petrochemical companies agreed to participate in this survey. A total of 663 usable questionnaires were received, representing 66 per cent response rate. This profile shows that 605 of respondents were males and the remaining 58 respondents were females. The higher number of male population was visible in the operation of petrochemical manufacturing facilities in locations where the questionnaires were distributed. Majority of them were shift workers and it is normal to find male domination in operating continuous manufacturing process facilities especially in high risk industry in Malaysia. Female employees were in a smaller group and all of them worked during normal working hours. The Malays were the dominant groups (615) followed by Chinese (25), Indian (19) and 4 respondents belong to neither of these ethnic groups. The majority of the respondents were in the age between 26 and 33 years old (243) while those in the other age group were 18-25 years (120), 34-41 years old (190), 42-49 years old (87) and the respondents who were in the fifties or above consisted of 23 respondents. The high peak of the middle age groups (26-33 years old) in the employment time frame was clearly supported by the distribution of their working experience in which majority of them had worked between 6 to 15 years. There were permanent employees (541), contractors (104) and temporary staff (18). In terms of the employment service, the highest number of the respondents had stayed with the present companies at the time of this survey within 6 to 10 years (259) followed by 1-5 years (221), 11-20 years (103), less than 1 year (73) and more than 20 years (7).

In terms of competency level, the analysis showed a good blend between the respondents who had college degrees and those who had secondary schools certificates. At the very least, they understood the contents of the questionnaire and understood the basic safety requirements to protect themselves against danger at the workplace. There was also a good mixture between the most experienced respondents and those who had just started their career so that well-balanced responses were obtained from the survey. The important point was that they had technical background to operate the plant safely. The experienced employees passed down their knowledge and shared their experience with the juniors through informal method, mostly by verbal interaction and demonstrating the correct way to perform a job. This will enhance the competency level of newer employees in plant operation. Some employers make it compulsory for employees working in this field to attend various competency trainings to improve the knowledge and skills such as hazard identification, behaviour-based training and technician development programme.

Table 1: The demographic profile of the respondents

Parameter		Frequency	Percentage
Gender	Male	605	91.3
	Female	58	8.7
Ethnicity	Malay	615	92.8
	Chinese	25	3.8
	Indian	14	2.1
	Other race	4	0.6
Marital status	Single	180	27.1
	Married	477	71.9
	Widow	2	0.3
	Widower	4	0.6
Age	18-25 years old	120	18.1
	26-33	243	36.7
	34-41	190	28.7
	42-49	87	13.1
	50 and above	23	3.5
Highest education level	Primary school certificate	22	3.3
	SRP / SPM / STPM	315	47.5
	Diploma or equivalent	224	33.8
	Bachelor's degree or equivalent	95	14.3
	Master's degree or higher	7	1.1
Job category	Non-executive (e.g., operator)	375	56.6
	First line supervisor	95	14.3
	Middle management	107	16.1
	Top management	16	2.4
	Others	70	10.6
Employment status	Permanent	541	81.6
	Contract	104	15.7
	Temporary	18	2.7
Working experience	0-5 years	196	29.6
	6-10 years	223	33.6
	11-15 years	122	18.4
	16-20 years	71	10.7
	20 years or more	51	7.7

An important determinant influencing safety performance proposed in this study was employees' competency. The results of the regression analysis showed a strong positive relationship ($\beta = .465$, $p < .001$, $R^2 = .215$) and therefore supported the hypothesis that employees' competency has a positive relationship with safety performance. The variance of safety performance explained by employees' competency was 21.5 percent.

High performance attributed by competent people can be viewed in many ways. It can be a high-sales volume or ability to withstand the downturn effect of global financial crisis. In occupational safety, high performance of an individual can be viewed as complying with safe operating procedures, active in promoting safety programmes and ability to identify risks and mitigate those risks to as low as reasonably possible. Ultimately, this kind of safety performance is expected from all employees and contractors. Notwithstanding the expectation, competency varies among individuals and therefore the output changes accordingly. Therefore, achieving high safety performance is a timely process and has to begin with hiring competent employees.

The Malaysian Occupational Safety and Health Act under Section 15(2b) places the responsibility on the employer to provide sufficient information and training to ensure employees are safe and healthy at workplace. These provisions can be interpreted as a signal on the requirement to have competent employees who are well-trained and have sufficient information about the risks and the protection against those risks so that they are able to take care of themselves and other people working with them. The strong positive relationship found in this study supports the notions that competent workers are safe workers. Moving towards self-regulation on safety, the Malaysian government hopes the organisations shall abide with the requirements to develop competent employees for good safety practices at the workplace.

CONCLUSION

This study shows strong positive relationship between competency and safety performance. Therefore, the managers should seriously invest the resources in every avenue that only competent people are hired while at the same time continue to educate the presence ones. Future studies should focus on other factors such as commitment to safety and motivation to improve safety performance at the workplace.

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