

Development and Validating of Measuring Tools in Occupational, Safety and Health (OSH) Culture

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Abstract

This paper aims to develop and validating of measuring tools in occupational, safety and health (OSH) culture. The development of the measuring tools is by incorporate the measuring tools for safety culture and safety climate. Questionnaire used to measure safety climate while maturity model used to measure safety culture. Measuring OSH culture is important for an organization to identify their current state and behavior of the organization's safety. By identifying the current state in the maturity model, organization can plan action to improve their current state or sustain their good state. The questionnaire will first develop based on five maturity indicators: (1) information and occupational safety, (2) operational learning, (3) involvement, (4) communication, and (5) commitment. After the development, the questionnaire needs to be validated by experts in order to ensure their validity and reliability as the validity and reliability of the tools might affect the quality of the data obtain. The questionnaire is not ready to be used to measure the OSH culture until it is validated. Based on the comments by experts, the improvement and changes made to improve the questionnaire. Once the questionnaire got validated by the experts then the questionnaire is ready to be use as the measuring tools for OSH culture.

Keywords

OSH culture, safety culture, safety climate, questionnaire, maturity model.

1. Introduction

Occupational, safety and health (OSH) culture is about how an organization's informal aspects influence OSH in a positive or negative way (Eecklelaert et al., 2012). Zwetsloot and Steijger (2013) also defined OSH culture as a culture where all members of the organization feel they are responsible for accident and injury prevention, and where this responsibility is translated into practice. OSH culture often related with safety culture and safety climate. Both safety culture and safety climate are interrelated but somehow different with each other based on most researcher. OSH culture requires a broad, holistic understanding of several knowledge domains, including features of risk management, information technology, business processes, human resources, personal and property safety, auditing and internal control, as well as legal and judicial requirements (Orlando, et al., 2019).

OSH culture can be measure through the measurement of safety culture and safety climate. This project will focus on developing measuring tool to measure and evaluate OSH culture in organization with the incorporate of measuring the safety culture, safety climate and implementation of safety culture maturity model. Filho et al. (2011) mentioned that an integrated approach to matters of occupational safety, environment and culture represents a great challenge for improving workplaces and reducing the number of accidents.

There are many measuring tool available to measure safety culture and safety climate. Questionnaire is one of the very common measuring tools in assessing and evaluating the safety culture and safety climate. However, there are not many questionnaires that is general and can be used by any industry. Most questionnaire developed and available are very specific and designed for specific industry. The current available measuring tool also assess whether safety culture or safety climate as individually. There is no measuring tool that can conclude the evaluation of both safety culture and safety climate.

1.1 Objectives

The objective of this study is to develop and validate a measuring tool that can be used by organization to measure their safety culture and safety climate. This study also aims to incorporate one of the tools to measure safety climate which is questionnaire with maturity model developed by Hudson (2007) to present and assess a system for the quantification of the OSH culture maturity model in any segment of industry regardless of what industry the organization operated in, offering recommendations that might help in the increase of safety awareness level. Once the current status and state of safety identified based on the maturity model, the organization can decide actions need to be taken to improve or sustain their safety within the organization.

2. Literature Review

2.1 Safety culture

Griffin and Curcuruto (2016) states that safety culture can be defined as the underlying assumptions and values that guide behavior in organizations rather than direct perceptions of individuals. This definition aligns with what stated by The Health Foundation, UK (2011) where safety culture is the norms, values, and basic assumptions of an organization. Tengilmoglu et al. (2016) defined safety culture as a product of the patterns of values, attitudes, competency and behaviors of individuals and groups which determine the adequacy, style and persistency of implementation of the organization's health and safety programs. These definitions aligned with definition by UK-based Health and Safety Executive which stated that safety culture is defined as the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine commitment to, and the style and proficiency of and organization's health and safety management (O'Neill, 2015). In simple words to summarize all the literature review stated above, safety culture is a combination of attitudes, beliefs, values, peer pressure, perceptions and taboos held by certain organization. As safety culture is the combination of attitudes, values and beliefs of all employees within the organization, it is very important to maintain a good safety culture. When everyone regardless of their position level or department uphold to the same value and belief about safety while practicing a good behavior, the risks of accident to occur can be reduce significantly (Australian Radiation Protection and Nuclear Safety Agency, 2020). Safety culture is very important, but it is time consuming to inspect and not easy to tackle. This topic usually will be discussed when there is inclination of the employees to follow rules or act safety or unsafely (Health and Safety Executive, 2021).

2.2 Safety climate

Safety climate is a subset of safety culture where safety culture representing all aspects across the organization, but safety climate solely focuses on staff perception about specific aspect. Safety climate is a summary of holistic perceptions on work environment shared by workers (Zohar, 2011). Similar according to Chyene et al. (1998), safety climate is a broad notion that encompasses an organization's safety ethics and how employees perceive safety. Safety climate also can be defined as perceptions about many aspects of the work environment can be shared across teams, organizations, and other collectives (Griffin and Curcuruto, 2016). The Health Foundation, UK (2011) stated that safety climate is more specific than safety culture in term of referring to employees' perceptions about aspects in the organization. According to a different definition, safety climate is the embodiment of a culture and can be expressed through symbols and policies. It is also thought of as a gauge of how temporary safety culture is (Williamson, et al., 1997). As a subset of safety culture, safety climate is very significant as the accumulation of safety climate is what will develop safety culture of an organization. Figure 1 shows how safety climate will results in safety culture.

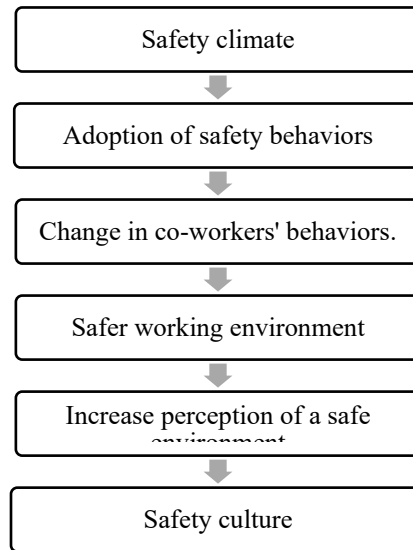


Figure 1: Development of safety culture from safety climate.

2.3 The iceberg metaphor

Arzahan et al. (2022) mentioned that in certain studies, term of ‘safety culture’ and ‘safety climate’ was used interchangeably. However, most researcher differentiate those two terms as it is easier to understand those two independently. Graham (2015) illustrates safety culture and safety climate using the iceberg metaphor to show better contrast of both terms. The iceberg metaphor is popular to illustrate visible and hidden culture of any subject. The top or tip of the iceberg showing the aspects of culture that are visible and obvious while the bottom of the iceberg which is larger compared to the top part, showing the hidden culture. Figure 2 shows how Graham (2015) illustrated the safety culture and safety climate using the iceberg metaphor.



Figure 2: The iceberg metaphor of safety culture and safety climate (Graham, 2015).

2.4 Measuring OSH culture

Measuring safety culture and safety climate aims to gain insights of how organizations stand on OSH issues and where to best concentrate resources to sustain and/or improve safety culture and safety climate. The measurement also wants to set a baseline to measure the effectiveness of initiatives to improve safety culture and safety climate. Other than that, is to monitor the progress to achieve good safety culture and safety climate (Vu & Cieri, 2015).

2.4.1 Measuring safety climate

Measuring safety climate is simpler than measuring safety culture. Depending on the requirements and capabilities of an organization, there are various techniques to measure the safety climate. It can be quantified formally using

measuring tools like surveys and questionnaires. The results of the surveys or questionnaires can be used throughout the organization, and there are numerous free tools accessible online that evaluate the safety climate (Queensland Government, 2019). Queensland Government (2019) also documented the right way to choose measuring tool to measure safety climate. Although there are numbers of surveys and questionnaires available online which were developed generally that can be used across all industries, there are some which were designed for specific industries. Thus, the industry of the organization needs to be considered before selecting the measuring tool. Other things need to be considered are the audience, company setting, and the length and complexity of the language used. The validity and reliability of the tools also need to be check as it might affect the quality of the data obtain. The survey's validity is determined by how well it captures the outcomes it claims on while the reliability is defined as its consistency where every time it is conducted, a reliable survey efficiently evaluates the safety climate.

2.4.1 Measuring safety culture

Measuring safety culture is more complex and involved different sets of assessment techniques. It is influenced by safety culture, norms, customs, beliefs, and practices. A safety culture assessment uses both qualitative and quantitative data to examine these factors. Safety culture assessment procedure includes: (1) review relevant documentations, programs, and policies, (2) discuss the goal of the assessment with employees, (3) conduct location walks, (4) communicate with management and key person about safety leadership, (5) distribute safety climate survey and (6) report on actionable items (Queensland Government, 2019). Galloway (2010) added another one procedure can be used to measure safety culture which is (7) conduct group and individual interviews.

2.5 Safety culture maturity model

Maturity model involve defining maturity stages or levels that use several multidimensional criteria to evaluate how complete the analysis objects (organizations or processes) are (Wendler, 2012). Filho and Waterson (2018) describe maturity as a model that is descriptive in the sense that it identifies the key characteristics that should distinguish an organization at a given level. Filho et al. (2009) mentioned maturity can assist organizations in establishing their current level of safety culture maturity and identifying the actions needed to improve or sustain their culture. Hudson's safety culture maturity model consists of five levels; pathological, reactive, calculative, proactive, and generative, pictured in Figure 3. As the level move from one level to another level, the information and trust within the organization will increase as well.

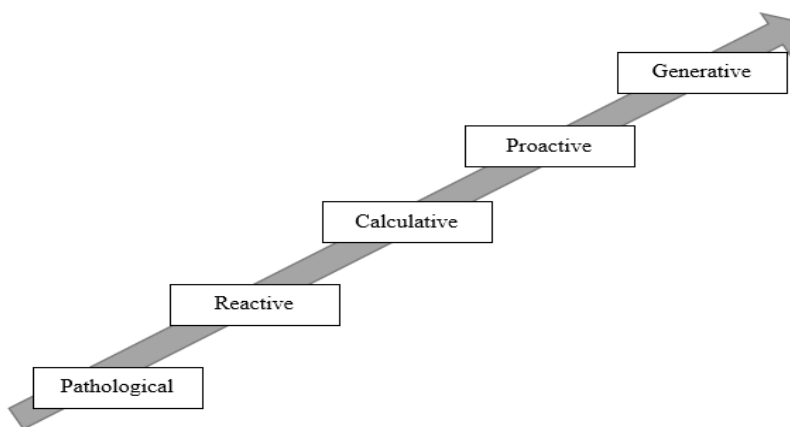


Figure 3: Hudson's safety culture maturity model (2007).

Each level in the maturity model describes different behavior of the current safety state in the organization. Pathological stage, or the lowest stage describe that the organization aims to only comply with legal requirements. They implemented no care culture (ie. near misses not considered, negligence, dishonesty, hiding the incidents). They also have poor or no communication and no or very little training about OSH matter. At reactive stage, OSH actions taken only after accidents happened. Implemented blame culture (ie. some near missed reported, disciplinary action). Training is minimum or inconsistent and have basic communication only. At calculative stage, the organization has a system in managing risk but the vision of OSH still minimum. Implemented compliance culture (ie. some participation, near miss discussions). Have good communication channels, regular people involvement and acceptable training and

awareness for OSH matter. For proactive stage, describe that the organization conduct continuous improvements and aims for problems not to reoccur. Implemented Ownership culture (ie. involvement at all levels, act on near misses). Have high level of training and awareness as well as communications. The organization also did not hide any incidents happened in the organization. The final stage or the best stage, generative, describe the organization has the knowledge needed to run its OSH system and always looking for more effective ways to manage risks. Implemented way of life culture (ie. personal involvement by all to prevent incidents). The training and communication at the best level as everyone in the organization has complete understanding about OSH and receives about any information always delivered.

2.5.1 Maturity indicator

To measure safety culture using maturity model, maturity indicators of safety culture need to conduct. Based on the literature reviews, the five most common factors been mentioned are (1) information and occupational safety, (2) operational learning, (3) involvement, (4) communication, and (5) commitment. All these five factors will be included in the development of safety culture measuring tools. Table 1 shows the definition of each factor based on literature reviews.

Table 1: Maturity indicators.

Indicators	Definition	Literature reviews
Information and occupational safety	Characterized by people's trust in the organization to disclose errors, mishaps, and incidents – a crucial component of building an informed culture. Indicators created by the company to track workplace safety performance are also included.	Reason (1997), Hudson (2001), Association of International Education Administrators (2002)
Operational learning	Characterized by how the organization handle of the information it receives, how accidents and incidents are investigated, whether corrective actions are suggested and put into action, whether or not the staff is informed of these actions, and whether or not ongoing efforts are made to enhance occupational safety procedures.	Reason (1997), Association of International Education Administrators (2002)
Involvement	Characterized by staff participation in safety-related activities, such as accident and incident analysis, risk identification and analysis, proposal, and implementation of actions for improving occupational safety, creation and revision of procedures related to their work, planning of their work, participation in safety committees and meetings, etc.	Choudhry et al. (2007), Gordon et al. (2007)
Communication	Characterized by the ease and promptness with which communications about occupational safety issues are carried out; by the existence or absence of an open channel of communication between subordinates and superiors in the organization. Additionally, it has to do with whether the employees of the company receive the information, comprehend it, and whether the organization evaluates its success.	Cooper (1998), Glendron and Stanton (2000), Mearns et al. (2003), Westrum (2004) Olive et al. (2006),
Commitment	Characterized by the quantity of resources and general support dedicated to occupational safety management, by the current state of occupational safety in relation to production, and by the presence of an occupational safety management system that includes the organization's vision and goals, a definition of duties, its training policy and requirements, procedures, rewards, sanctions, audits, and training requirements. True commitment entails more than just verbal dedication to workplace safety and written policies. There must be consistency between what is said and done.	Flin et al. (2000), Association of International Education Administrators (2002), Dejoy et al. (2004), Olive et al. (2006).

Filho and Waterson (2018) stated that choosing a maturity model over alternative techniques of evaluation (such as focus groups, surveys, and enquiries) should not be considered as a mutually exclusive choice; rather, one model should be employed or the other. The flexibility offered by the maturity models, according to the authors, may be viewed as a positive in comparison to other techniques for evaluating OSH culture. This is why this project incorporate questionnaire and maturity model as the measuring tools to measure the OSH culture in organization.

3. Methods

Figure 4 shows the flowchart of developing and validating of the measuring tools for OSH culture.

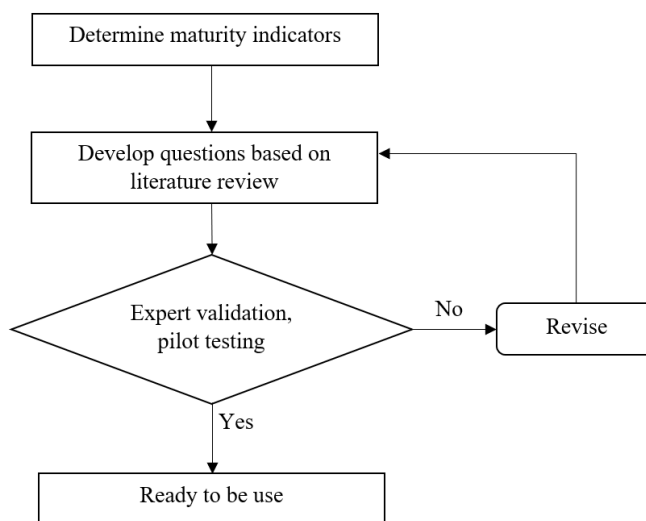


Figure 4: Flowchart of developing and validating of the measuring tools for OSH culture.

Based on Figure 4, the development of measuring tool for OSH culture will start by determining the maturity indicators that will be evaluated in the questionnaire. The maturity indicators have been selected earlier. Then, the questions will be developed. There are two parts in the questionnaire. Part 1 is about the demographic questions with common elements include gender, age, education level, department, position level, working period and overtime frequency. These demographic data are important to analyze the result obtain for Part 2. Part 2 is where the maturity indicators will be used to evaluate the safety culture of an organization. There are five questions be assigned under each factor of maturity indicators. The respondents required to put scale for each question with range of scale 1 to 5, with 1 the least agree and 5 the most agree. Questionnaire developed aims to evaluate organizations regardless of their industries. The questions were developed in two languages: English and Malay. Table 2 shows the list of question for Part 2.

Table 2: Part 2 of questionnaire.

Information and occupational safety <i>Informasi dan keselamatan pekerjaan</i>					
Questions <i>Soalan</i>	1	2	3	4	5
Employees at every position level report on every abnormal incident happened in the company, regardless on the severity of the accident. <i>Pekerja di setiap peringkat jawatan melaporkan tentang setiap kemalangan yang berlaku di dalam syarikat, tanpa mengira tahap keseriusan kemalangan tersebut.</i>					
Employees in every department report on every abnormal incident happened in the company, regardless on the severity of the accident. <i>Pekerja di setiap jabatan melaporkan tentang setiap kemalangan yang berlaku di dalam syarikat, tanpa mengira tahap keseriusan kemalangan tersebut.</i>					

Employees not only report on abnormal incident happened within their department, but also other department when required. <i>Pekerja bukan sahaja melaporkan tentang kemalangan yang berlaku dalam jabatan masing-masing, tetapi juga dalam jabatan lain apabila perlu.</i>					
Employees report on any abnormal incident happened immediately. <i>Pekerja melaporkan tentang kemalangan yang berlaku dengan kadar segera.</i>					
Employees comfortable (trust the company) to report any abnormal incident happened in the company. <i>Pekerja berasa selesa (percaya kepada syarikat) untuk melaporkan tentang kemalangan yang berlaku di dalam syarikat.</i>					

Operational learning <i>Operasi penerimaan</i>					
Questions <i>Soalan</i>	1	2	3	4	5
Company's assessment of abnormal incident capable to identify the root cause of incident. <i>Penilaian syarikat terhadap kemalangan mampu mengenalpasti punca kemalangan.</i>					
Company's assessment not restricted to identification of immediate causes only. <i>Penilaian syarikat tidak terhad pada mengenalpasti punca serta-merta sahaja.</i>					
Company strives to improve occupational safety in every sector (not only at accident prone sector). <i>Syarikat berusaha untuk menambah baik keselamatan pekerjaan dalam setiap sektor (bukan hanya pada sektor yang berisiko tinggi).</i>					
Company assesses all the abnormal incidents, regardless on the severity of the accident. <i>Syarikat membuat penilai ke atas semua kemalangan, tanpa mengira tahap keseriusan kemalangan tersebut.</i>					
Company revise the occupational safety procedure regularly. <i>Syarikat sentiasa menyemak semula prosedur keselamatan pekerjaan.</i>					

Involvement <i>Penglibatan</i>					
Questions <i>Soalan</i>	1	2	3	4	5
Employees at every position level involved and participate in occupational safety matter in the company. <i>Pekerja di setiap peringkat jawatan melibatkan diri dalam hal keselamatan pekerjaan di syarikat.</i>					
Employees in every department involved and participate in occupational safety matter in the company. <i>Pekerja di setiap jabatan melibatkan diri dalam hal keselamatan pekerjaan di syarikat.</i>					
Company encourages employees to involved and participate in occupational safety matter in the company.					

<i>Syarikat menggalakan pekerja untuk melibatkan diri dalam hal keselamatan pekerjaan di syarikat.</i>					
Head of department ensure that employees involved and participate in occupational safety matter in the company. <i>Ketua jabatan memastikan pekerja melibatkan diri dalam hal keselamatan pekerjaan di syarikat.</i>					
Employees involved and participated in occupational safety matter not only to fulfil the training requirement. <i>Penglibatan pekerja dalam hal keselamatan pekerjaan tidak hanya untuk memenuhi syarat latihan semata-mata.</i>					

Communication <i>Komunikasi</i>					
Questions <i>Soalan</i>	1	2	3	4	5
The information about occupational safety made by company reaches the employees. <i>Maklumat tentang keselamatan pekerjaan diterima oleh pekerja.</i>					
Company always opens the communication channel on occupational safety, not only when severe accident happened. <i>Syarikat sentiasa menyediakan saluran komunikasi untuk hal keselamatan pekerjaan, bukan hanya ketika berlaku kemalangan yang serius sahaja.</i>					
The occupational safety procedure made by company are diverse and covers the use of Personal Protective Equipment (PPE), accidents indicators, results of analysis of abnormal incident, health protection etc. <i>Prosedur keselamatan pekerjaan yang disediakan oleh syarikat perlu merangkumi maklumat berkaitan penggunaan alat pelindung diri (PPE), penunjuk kemalangan, keputusan analisis kemalangan, perlindungan kesihatan dll.</i>					
Occupational safety procedure enforced by company can be understand by all employees. <i>Prosedur keselamatan pekerjaan yang digunapakai oleh syarikat boleh difahami oleh semua pekerja.</i>					
Company open to any suggestion from employees about occupational safety matter. <i>Syarikat terbuka untuk sebarang pandangan daripada pekerja tentang hal keselamatan pekerjaan.</i>					

Commitment <i>Komitmen</i>					
Questions <i>Soalan</i>	1	2	3	4	5
Company fully aware with the occupational safety when hiring subcontractors. <i>Syarikat sedar sepenuhnya tentang keselamatan pekerjaan ketika mengambil subkontraktor.</i>					
Company prioritized occupational safety not only in case of severe accident. <i>Syarikat tidak hanya mengutamakan keselamatan pekerjaan dalam kes kemalangan serius sahaja.</i>					

Current occupational safety procedure enforced by company not only aimed at accident prone area. <i>Prosedur keselamatan pekerjaan sedia ada tidak hanya fokus pada kawasan berisiko tinggi sahaja.</i>					
Company's occupational safety planning integrated with every department's occupational safety planning in the company. <i>Rancangan keselamatan pekerjaan syarikat bersepadu dan selaras dengan rancangan keselamatan pekerjaan di setiap jabatan dalam syarikat.</i>					
Company have an occupational safety support team. <i>Syarikat mempunyai pasukan sokongan keselamatan pekerjaan.</i>					

4. Data Collection

After developed the questions, the questionnaire needs to be validated. As mentioned earlier, questionnaire's validity is determined by how well it captures the outcomes it claims on. To validate the questionnaire, there are few procedures that can be take. The validation can be based on literature review where the questionnaire developed in this project by adopting and adapting from Orlando et al. (2019) and Filho and Andrade (2009). Then the questionnaire also was submitted to one practitioner in the safety field and one academician who is very knowledgeable about OSH culture to be validated. The validation from practitioner and academician also can measure the reliability of the questionnaire to show its consistency where every time it is conducted, a reliable survey efficiently evaluates the safety climate. If the questionnaire not valid, the questions need to be revise back. The questionnaire cannot be distributed to the respondent until it got validated.

5. Results and Discussion

The questionnaire was sent to practitioner and academician to be validated. The result from each validation presented in Table 3. The table listed out the background of the validator and the comments on the questionnaire developed and improvement as well as amendment should be made on the questionnaire.

5.1 Graphical Results

Table 3 shows the comments on validation made by experts.

Table 3: Comments on validation by experts.

Expert	Affiliation/position	Comments
Expert 1	DOSH Terengganu	Section: Communication (Question 3). <ul style="list-style-type: none"> What if only partially, for instance, it only PPE is covered in the procedure, while other elements are excluded, (e.g. health protection, results of analysis of abnormal incident and accidents indicator) – which Likert scale would be suitable?
Expert 2	Safety and health officer	Section: Involvement <ul style="list-style-type: none"> Include "... communicate, involve and participate in OSH matter and program in the company" for every question. Section: Communication (Question 3) <ul style="list-style-type: none"> Include "...and covers the provision, issuance of appropriate Personal Protective Equipment (PPE), accidents indicators, results of analysis of abnormal incident, health protection etc."
Expert 3	Safety and health manager	Section: Part 1 <ul style="list-style-type: none"> Educational level: add on professional certificate. Position level: need to have dictionary to describe each position level

		<ul style="list-style-type: none"> Working period: consider use < 1 year, < 2 years, < 5 years, 10 – 20 years. Overtime frequency: Not relevant as sometimes overtime only applicable for non-executive position, while for executive and above some companies did not entitle for that. <p>Section: Information and occupational safety (Question 1)</p> <ul style="list-style-type: none"> Wording bit confusing <p>Section: Communication (Question 3)</p> <ul style="list-style-type: none"> Too broad and difficult for layman person to understand. <p>Section: Commitment (Question 1)</p> <ul style="list-style-type: none"> Maybe narrow to procurement process directly, because when talk about contractor/subcontractor/vendor, mostly company are aware on procurement process.
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After receiving back the feedback and comments from the experts, shown than there are some amendment and improvement need to be made on the questionnaire before it can be used as the measuring tools for the OSH culture. Following the flowchart in Figure 4, if the questionnaire cannot be validated then the questions need to be revise back.

5.2 Proposed Improvements

The improvement for the questionnaire will be made by revising and changing the questions based on the comments made by experts in Table 3. Table 4 below shows the changes made in the questionnaire according to the recommendation by experts.

Table 4: Revised and changed questions.

Part 1		
Section	Current question	New question
Educational level	High school, undergraduate, postgraduate.	High school, undergraduate, postgraduate, professional certificate.
Position level	Entry level, non-executive, executive, manager, senior manager.	Entry level, non-executive (position which gives advise but not responsible for decision making), executive (responsible for decision making), middle management (assistant manager – manager), management (senior manager and above).
Working period	Below 1 year, 1-3 years, 3-5 years, above 5 years.	Below 1 year, below 2 years, below 5 years, below 10 years, 10-20 years.
Overtime frequency	Every day, once per week, once per month, never.	Expert said this part is not relevant as some company does not entitled overtime for executive and above position. Thus, this part will be removed.
Part 2		
Information and occupational safety	Employees at every position level report on every abnormal incident happened in the company, regardless on the severity of the accident.	Employees at every position level report on every abnormal incident happened in the company.
Involvement	Employees at every position level involved and participate in occupational safety matter in the company.	Employees at every position level communicate, involve and participate in OSH matter and program in the company
	Employees in every department involved and participate in occupational safety matter in the company.	Employees at every department communicate, involve and participate in OSH matter and program in the company

	Company encourages employees to involved and participate in occupational safety matter in the company.	Company encourages employees to communicate, involve and participate in OSH matter and program in the company
	Head of department ensure that employees involved and participate in occupational safety matter in the company.	Head of department ensures that employees communicate, involve and participate in OSH matter and program in the company
Communication	The occupational safety procedure made by company are diverse and covers the use of Personal Protective Equipment (PPE), accidents indicators, results of analysis of abnormal incident, health protection etc.	The occupational safety procedure made by company are diverse and covers the provision, issuance of appropriate Personal Protective Equipment (PPE), accidents indicators, results of analysis of abnormal incident, health protection etc.
Commitment	Company fully aware with the occupational safety when hiring subcontractors.	Company fully aware with the occupational safety regarding procurement process.

After revised and constructed new questions for the questionnaire based on the comments by experts, the questionnaire will need to undergo the validation process again to be validated. The questionnaire will only be ready to be use once all questions are validated by experts and confirmed to be good enough to measure the OSH culture in organization which then from the results collected through questionnaire can be compare with the maturity model to determine the current state of safety of an organization in the maturity model.

6. Conclusion

Measuring OSH culture through safety culture and safety climate is significant in order to identify the current state and behavior of an organization's safety. Current available measuring tools does not incorporate the measurement of safety culture and safety climate thus the development and validating of the measuring tools in this research aims to incorporate the questionnaire and maturity model to determine current state of organization's safety. By determining the current state, the organization get to know about their current behavior. With that, the organization can plan for any action of improvements or changes to improve their current state by moving to the next level in the maturity model or to sustain their current good state.

To have good and reliable measuring tools, validation from experts is required in order to ensure their validity and reliability as the validity and reliability of the tools might affect the quality of the data obtain. The survey's validity is determined by how well it captures the outcomes it claims on while the reliability is defined as its consistency where every time it is conducted, a reliable survey efficiently evaluates the safety climate. Thus, the measuring tools need to be validated before being use to collect the data.

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Biography

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