ABSTRACT

Development of the OSH Pillar with a Digital Technology-Based System "SmartSafety"

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Abstract. In the current era of digitalization, efforts to increase productivity have become commonplace in various business sectors. By integrating occupational safety and health management through the use of website based digital systems and mobile applications, a planned, scalable and structured system can be realized. "SmartSafety" (Safety Management and Reinforcement Technique) is an application design to implement an OSH Management System digitally. The design of this application refers to Government Regulation Number 50 of 2012 concerning the Implementation of the Occupational Safety and Health Management System (OSHMS). The features offered include e-permit, e-bidding, e-procurement, e-auditing and online recapitulation. The process management system can be modified through the "SmartSafety" application while still adjusting to the required criteria. The method used is descriptive method through literature study and adapted to the needs of the industry. The development of the OSH pillar, in this case the OSH Management System aspect based on digital technology, is expected to be able to reduce the high number of work accidents as well as easy and fast access to business processes.

Keywords*: OSH Management, Digital Technology, Digitization of SmartSafety*

INTRODUCTION

1. Background

The development of the world of Occupational Safety and Health (OSH) continues to decline from time to time. This development began since humans lived in caves and other natural shelters for their safety and for their group (survivability). At this time, humans began to make tools such as the forester shaft, the square shaft, etc. to meet their needs. Over time, variations are present in the safety aspect. In the era of the industrial revolution, precisely in the 18th century, the development of safety began to be seen in the change in the work system from using human power to machine power such as a steam engine. At the beginning of the process of adapting the use of machines that are prone to work accidents, they succeeded in spawning work procedures and work organizing systems.

Furthermore, the development of safety continued in the industrialization era and the management era. The era of industrialization, which is around the 1970s to 1980s, was a period of birth and take-off. In Indonesia, the development of safety is marked by the birth of a safety law and a national OSH council. Entered in the next period, namely in the 1990s which focused on line management. At this time, the OSH system has improved with the increasing involvement of the company's management. The systematic implementation of OSH Management System (OSHMS) or called safety managament system was first implemented in 1996.

In the 2000s era, a period of more focus on management systems began. The view that workers are the

cause of work accidents due to human error has begun to shift to management responsibility. In this era, it is clear/affirmed that the management has a role and responsibility for the system that is run by workers. Work systems based on standard operating procedures, work instructions, work permits and related rules are increasingly emphasized by the management.

Around 2010 until now is a period that focuses on the integration of safety aspects with the company's management system. Integration by utilizing digital technology is aimed at synchronizing as well as supporting the implementation of safety holistically. In this period the focus on the OSH aspect is not only limited to workers, but also to machines and information systems. Changes in the direction of management towards the safety aspect which was originally only the responsibility of the safety director, turned into the responsibility of top management and all workers so as to make the system run better and other OSH standards further strengthens the system that is oriented towards the 45005 program zero accident. Therefore, it is very important for safety officer to implement the application of technological innovations in carrying out their work.

The use of digital technology is presented in the form of an application or website platform which contains features related to safety aspects. In the preparation of this research, it will be explained about digital technology innovation on the implementation of a mobile application-based safety management system named "*SmartSafety*". The purpose of packaging safety aspects into a digital system is to cut bureaucracy, cut time, minimize interaction, especially when it is still the Covid-19 pandemic and create a system that can be accessed anytime and anywhere in real time.

2. Problem's Formulation

Based on this background, the problems in the preparation of this research can be formulated as follows: (1) How is the SmartSafety application design in supporting the implementation of OSHMS? (2) What are the obstacles that can hinder the use of the SmartSafety application in the implementation of OSHMS?

3. Research Purposes and Objectives

The aims and objectives of this research include: (1) As input and suggestions for expressing ideas in developing the application of OSHMS by utilizing digital technology. (2) Mapping and finding solutions to the obstacles that hinder the implementation of the SmartSafety application.

LITERATURE REVIEW

1. Occupational Safety and Health Management System (OSHMS)

Every company has a structured organization consisting of elements of management and elements of workers. These two elements are interrelated and support each other during the work process. The existence of this relationship indicates that the system is running. According to Prof. dr. Umar Fahmi Achmadi, MPH, Ph.D, the system is an arrangement that describes a series of interrelated components and has the same goal in a balanced, harmonious and coordinated manner, and continues to run within the planned time frame.

The running of the process of a system is influenced by elements of management. Management is a science about the art of leading an organization which includes planning, organizing, leading and controlling limited resources to achieve organizational goals and objectives effectively and efficiently.

Based on Government Regulation Number 50 of 2012 concerning the Implementation of Occupational

Safety and Health Management Systems, what is meant by OSHMS is part of the overall company system that focuses more on risk control efforts in preventing or minimizing the occurrence of work accidents and occupational diseases as well as creating a safe place to work. safe, efficient and productive work. Meanwhile, Occupational Safety and Health are all activities that guarantee the protection of the safety and health of workers by preventing work accidents and occupational diseases.

The purpose of implementing OSHMS in companies is to optimize the effectiveness of planned, structured, measurable, and integrated OSH protection; prevent or minimize the occurrence of work accidents and occupational diseases by involving all parties, both management and workers; and create a safe, comfortable, healthy and productive workplace. According to Tarwaka (2008), there are several benefits of implementing OSHMS for companies, including being able to identify the weaknesses and short comings of the operational system; can find out a detailed description of the performance of OSH; can meet the laws and regulations related to OSH; can increase knowledge, understanding, skills and awareness of OSH especially workers related to the audit process; and can increase work productivity. The guidelines for implementing OSHMS in Indonesia are based on Government Regulation Number 50 of 2012, namely as follows:

1. Determination of OSH Policy

Employers and administrators must establish OSH policies which are carried out through an initial review of OSH conditions, observations of performance improvement OSH management, and involve workers by taking into account their various inputs. In setting the OSH policy, it must clearly state the aspects that are considered, the goals, objectives, commitment and determination of the company in carrying out OSH and include a comprehensive vision and work program related to the company's activities, both general and operational.

The OSH policy must be documented and socialized to all parties including workers, contractors, suppliers, guests and customers. This OSH policy is dynamic which must be reviewed periodically and adapted to changes in company conditions and laws and regulations. The implementation of OSHMS in the company can run optimally if all parties show commitment to safety by participating in the implementation of safety management system.

2. OSH Planning

In preparing the OSH plan, the entrepreneur and management must pay attention to the results of the initial assessment of the safety condition by identifying potential hazards, conducting assessments and controlling these hazard risks. Work with high risk is prioritized in the preparation of the OSH plan so that control efforts can run optimally. OSH planning is adjusted to the laws and regulations and other requirements. Resources owned by the company such as competent human resources, infrastructure and budget related to the implementation of OSH must also be considered in the preparation of the OSH plan.

The things listed in the OSH plan include goals and objectives; priority scale; hazard control efforts; determination of resources; implementation period; achievement indicators; systems accountability. In order for the implementation of safety to be carried out properly, the preparation of the plan must involve all parties including workers, safety experts, the Safety Committee and other parties related to the company.

3. Implementation of the OSH Plan

The implementation of the OSH plan is supported by Human Resources and the provision of adequate facilities and infrastructure. Required a procedure in the procurement of human resources tailored to the needs of the company. HR must have competence as evidenced through a license or certificate and proof of

a work permit or letter of appointment from the authorized agency. The facilities and infrastructure provided by the company include the organization responsible for safety, budget, work instructions as well as operating/work procedures and information.

The organization responsible for safety in the company is the safety committee. The committee was formed as a forum for cooperation between employers and workers to interact and participate effectively in implementing and developing safety. The task of the committee is to provide advice and input to entrepreneurs and management regarding safety issues. In implementing safety, the company must provide a comprehensive budget for organizational sustainability, HR competency training and procurement of facilities and infrastructure related to safety.

Procedures and work steps for each type of work must be made in the form of Standard Operating Procedures through a job analysis based on safety. In addition to work procedures, procedures are also made in terms of delivering information, reporting and documenting safety activities. Every work implementation must be ensured that it is in accordance with safety requirements by making an order both written and unwritten which is compiled in the form of work instructions.

Fulfillment of safety requirements is carried out through risk control measures; design and engineering; work procedures and instructions; cooperation in the delivery of part of the implementation of the work; procurement of goods and services; final product completion; efforts in dealing with emergencies; as well as emergency plans and recovery.

4. Monitoring and Evaluation of OSH Performance

It must be carried out by the company through inspection, testing, measurement and internal audit activities of OSHMS. These activities are carried out by personnel who have adequate experience and competence. The results of monitoring and evaluation of safety performance will be documented and used for corrective actions for the implementation of OSHMS in the company. Inspection, testing and measurement activities must be carried out in accordance with established procedures and in line with safety goals and objectives. The frequency of implementation of these activities is adjusted to each object based on applicable regulations and standards. To find out how effective the implementation of safety management system in the company, it is necessary to conduct an internal audit of OSHMS.

5. OSHMS Performance Review and Improvement

It is carried out on a regular and ongoing basis. This activity aims to overcome all problems related to safety aspects, both from programs, products, and their impact on company performance. Matters related to the review of the implementation of OSHMS include evaluation of OSH policies, audit findings, evaluation of the effectiveness of program implementation, evaluation of needs for development, as well as OSH objectives, targets and performance. Improvements performance are carried out by considering changes that include changes in regulations, changes in products, activities and the company's organizational structure. In addition, consideration also needs to be made on the development of science and technology; demands from related parties and the market; the results of the analysis of accidents and occupational diseases; reporting related to safety; as well as suggestions and input from workers.

2. Assessment of OSHMS Implementation

Assessment of OSHMS implementation is carried out through audits that are guided by the 12 elements of the OSHMS audit criteria. Its elements include development and ensuring the implementation of commitments; making and documenting OSH plans; control of contract design and review; document control; product purchasing and control; work safety based on OSHMS; monitoring standards; reporting and

correcting deficiencies; management of materials and their movement; data collection and use; OSHMS examination; and development of skills and abilities.

Of the 12 elements of the audit criteria will be described in more detail into 166 criteria. The implementation of the OSHMS assessment is divided into 3 levels based on 166 audit criteria, namely initial level, transition level and advanced level. The initial level assessment is based on 64 criteria, while the transition level assessment is carried out on 122 criteria. And for the advanced level assessment carried out on the overall criteria, namely 166 criteria. The three levels of assessment are also used in the provisions for evaluating the results of the OSHMS audit, namely the initial level category, the transition level category and the advanced level category.

3. Digital Technology

Over time, technology continues to evolve from the technological era in agriculture, industry, to the era of communication and information technology. These technological developments have a major impact on life, namely the shift from manual/traditional systems to digital systems. Digital technology is an information technology that prioritizes computer-based activities (digitalization) rather than human-powered activities. Digital technology tends to use an automatic and advanced operating system with a computer system.

A number of fields have carried out digital transformations such as education by implementing e-learning, banking with e-banking, to government with e-government. Of course, there are many other fields that also apply digital transformation in the implementation of their work. Companies that do not follow developments in the digital era will experience problems that have an impact on the efficiency and effectiveness of company performance.

METHOD, DATA, AND ANALYSIS

1. Method

Research on the implementation of "*SmartSafety*" as a support for the implementation of OSHMS based on digital technology is carried out using a descriptive method through a comprehensive literature study tailored to the needs of the industry.

2. Data

In research, data and information are needed that are accurate, relevant and adapted to the object of research. The type of data used is secondary data. It is data related to the problems studied obtained from other parties. These data are sourced from books, journals, and articles from the internet.

3. Analysis

1. Identify the topic of the problem to be raised as a discussion

These problems are relevant and adapted to technological developments and industrial needs.

2. Data collection

Data collection was carried out by studying literature that related to the problem as research material.

3. Synthesizing the results of literature extraction

At this stage, extracting the essence of each relevant literature on the concept of application ideas will be carried out. The core taken relates to material and theory about safety. It is safety development, digital technology and other literature that can help solve problems.

4. Application concept design

Designing the concept of an application based on digital technology in the form of a mobile app that packs OSH aspects to support the implementation of OSHMS in a company. Initially it was conceptualized in a book sheet, then poured in the form of a display design through the Corel Draw application and then entered into the application system.

RESULT AND DISCUSSION

"*SmartSafety"* is an application that was created to cut the stages in the process related to aspects of safety. The name of the application "*SmartSafety*" is taken from the word smart and the word safety. From these two words, it can be concluded that the "*SmartSafety"* is an application in the field of safety that has advantages and intelligence based on digital technology. In its application includes three aspects, these are safety, health and environment.

This application has the advantage of being able to simplify process stages such as minimizing interaction, cutting time, saving paper, accommodating information systems that can be accessed by anyone, anywhere, anytime and making the system more open. Broadly speaking, the features of the "*SmartSafety"* application are packaged in 6 main menus, these are documents, services, facilities and infrastructure, history, weather and scans.

1. **Interface Design**

To clearly describe the shape of an application, it is necessary to design an interface that displays the menu or program of the application. The following is the interface design for the mobile "*SmartSafety*". Before the application shows the main menu, an initial screen will appear when opening the application, which is called the splash screen. The splash screen can give the user a glimpse of what the application is about.

2. Document Menu Interface Design

When the user selects the Document menu, a document menu interface will be displayed in which there are several submenus. As previously explained, all documents related to safety must be disseminated, informed and communicated to all parties, both management, workers and other parties related to the company such as visitors, contractors, subcontractors and suppliers. Information related to these documents is important for all parties to know considering the conditions in a company or workplace that have potential hazards.

1. OSH Policy

A feature that displays documents regarding OSH policies that have been made, approved and used as a reference to be implemented in the company.

2. Standard Operating Procedures (SOP)

Features which contain document instructions for doing technical things in the company, for example procedure for working at heights, chemical management, etc.

3. Work Instructions

The "*SmartSafety"* feature contains technical work instructions in the field such as scaffolding work instructions and log out tag out (LOTO) work instructions.

4. Forms

"*SmartSafety"* feature that packs document forms digitally so that all workers can access them, such as document forms that can be accessed are the risk management form and the personal protective equipment renewal application form.

5. Regulations and standards

Sub menu containing detailed references to regulations and standards used by the company in carrying out business processes.

6. Work environment

This feature contains regulations and technical instructions regarding the measurement of working environmental conditions such as UKL UPL, dust measurement, ergonomics, chemical hazard threshold values and psychosocial hazard factors.

7. OSH Symbols

A sub menu that includes all symbols in the company such as evacuation routes, road markings, and symbols related to chemicals according to the material contained in the globally harmonized system (GHS).

8. Safety data sheet (SDS / Chemical safety data sheet)

A document menu feature that facilitates workers in handling chemicals.

9. Safety induction

A document feature that accommodates safety induction from all divisions in the company. This is intended to exchange information regarding OSH so that it becomes a support system in building a safety culture.

3. Service Menu Interface Design

Similar to the document menu, if the user selects the Service menu, several submenu features. A more complete explanation of these features include:

1. News

A sub menu feature that presents the latest news or information about OSH and the environment. This feature can be accessed in real time and can be commented on by workers.

2. e-reporting

A feature related to reporting which includes reporting of incidents, reporting of non-conformities, reporting of safety performance and reporting of hazard source identification. It is also accompanied by an assessment of the dangers of the incident so that it does not happen again.

3. e-procurement

Procurement feature that is packaged online to cut down on bureaucracy and minimize interaction, especially during a pandemic this feature is very effectively implemented in the workplace to prevent the spread of COVID-19 transmission.

4. e-bidding

A feature that accommodates the selection of vendors/contractors who will cooperate with the company. The selection process that refers to the company's criteria is carried out online and openly so that the level of accountability is very high.

5. e-permit

System that packages the licensing system into a flexible digital form while taking into account the substance. So the essence remains intact, only the medium is different.

6. Training

A sub menu feature that shares or informs workers regarding schedules, materials, places and training

instructors. The material can be downloaded by workers who already have access to the application.

7. e-consultation or online consultation

A feature that contains media to convey complaints, questions or complaints to the HSE division while keeping employee profiles confidential. This is to maintain dignity and so that related workers can communicate without pressure.

8. Recapitulation

This feature provides a recapitulation of the latest occupational accident and disease data. This is intended as a reminder for workers to be careful in carrying out their work.

4. Facilities Menu Interface Design

As with the document menu and service menu, in the facilities menu there are also several submenus. In the facilities menu interface, there are six sub menu features, namely:

1. Safety committee

The identity of the safety committee structure is displayed so that workers recognize their figures and responsibilities.

2. Personal Protective Equipment (PPE)

The scope of this PPE includes specifications, how to use it, how to store and how to handle PPE waste. It is intended for workers to be able to use PPE properly.

3. Safety equipment

In this sub menu of safety equipment contains the number of equipment, its location, how to use it and a checklist of the latest conditions. Updates to the latest conditions can be done online by taking photos of the equipment condition inspection and then uploading them to the *SmartSafety* application. Thus the data will always be in real time in the application database that can be accessed by workers and stakeholders.

4. Emergency response equipment

The categorization of emergency response equipment is almost the same as the safety equipment sub menu, except that it is divided into different channels to make controlling.

5. Evacuation equipment

This sub menu explains personal in charge (PIC), placement, use and how to update conditions.

6. Control equipment

This sub menu covers aspects of digital control equipment. It includes PIC, placement, SOP and how to update conditions. If there is damage, it can be maintained and immediately addressed. In this sub menu there are also notifications to the relevant divisions if further action is needed, such as repairs or procurement.

5. Using the *SmartSafety* application

With *SmartSafety*, the process of implementing OSHMS becomes more systematic and practical. *SmartSafety* converts the time duration between conventional work completions into digital ones, and also supports the paperless to reforest the earth. All documentation activities that use paper can be substituted using screen panel media. Of course this is the answer to the confusion/problem of the archiving process in synergy with the environment.

Talking about archiving, the *SmartSafety* feature is proven to be able to complete the process very optimally. Information related to OSH can be found easily through this application. Meanwhile, other features also support the archiving process to be easier. Maybe this does not immediately provide an answer

to overcome existing work accidents. However, if we want to explore, from conventional to digital transformation, it can actually be the initial axis of the deceleration of work accidents.

Fast and transparent filing will facilitate access and reduce the existing bureaucracy. The accident reporting process becomes easier for many parties to know. This will certainly be a lesson for various parties to be investigated more deeply.

It needs to be reiterated that *SmartSafety* is not just a name. *SmartSafety* is the answer to the ever-increasing digital transformation. Its features provide considerable benefits in reducing the number of accidents. *SmartSafety* provides strategic breakthroughs with its agility features that are able to cut bureaucracy so as to accelerate work stages in a company. More than that, *SmartSafety* is able to map potential hazards, mitigate risks very quickly and comprehensively and provide a recapitulation of the history of employee and company activities

CONCLUSION

The breakthrough of the *SmartSafety* application is expected to reduce the number of work accidents and provide effective work acceleration. This is in accordance with the objectives of the OSHMS itself, namely to minimize occupational diseases and work accidents. The rationale behind this strategic result lies in ease of access, optimization of elements and ease of monitoring. The *SmartSafety* application design uses Artificial Intelligence or manipulative intelligence that can replace all administrative and supervisory deficiencies that are less than optimal by humans. Intuitive and smart interface makes this application easy to use by any safety.

The agility offered in the *SmartSafety* feature has the potential to increase the effectiveness and efficiency of work in the company. This can be seen from the reduced use of paper, reduced travel time, minimized interaction, cut red tape and ease monitoring that can be accessed by anyone, anytime and anywhere in real time. Through this *SmartSafety* application, the security of user data is also well protected, only the HSE can review the data for workers' needs. For example, for the e-consultation, employee data is kept confidential to maintain dignity, privacy, and so that workers can consult comfortably without any pressure. This is certainly a solution to the problem of stress in the workplace, supporting psychosocial factors that are far more optimal.

This benefit is a supporting aspect to provide a safe and comfortable workplace. The end of the *SmartSafety* application is the deceleration of work accidents and occupational diseases. As we know that this is the goal of the implementation of OSHMS.

IMPLICATION/LIMITATION AND SUGGESTIONS

The implication of using the application lies in access synchronization. It is not easy to give an understanding to the safety who are used to conventional methods. This can be overcome with informative and persuasive education. After all, the purpose of procuring this application is to facilitate work in the safety aspect. It is hoped that the existence of *SmartSafety* can be the answer to the complicated administrative process that is often faced by the safety. Shock culture may still be found in some OSH actors who are not familiar with the use of digital technology. Digital features still need to be socialized in depth and comprehensively. Of course, the socialization process takes a long time.

The limitations of the realization of this application are also due to the technical process. We know that making an application requires a large amount of money and takes a lot of time to optimize. Not to mention

the problem of beta testing which may require several times of testing until this application can actually be launched. Other obstacles may be overcome over time, but to be a perfect application, *SmartSafety* needs to go through several stages of public demo**.** This process will again be time-consuming and costly. However, we are optimistic that this can be overcome with high ideals that this application is very worthy to be launched regardless of the obstacles.

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