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A Framework to Strengthen Learning Culture and Safeguards

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Abstract: Strengthening the learning culture and the safeguards in organizations can enhance safety and performance in preventing incidents. The effective implementation of human performance improvement and operational learning can support the organization in achieving these goals. However, there is no streamlined implementation framework that considers the alignment of strategic and tactical actions in the management system cycle to implement human performance improvement and operational learning. This paper presents an implementation framework that fills the above gaps. It consists of four steps: (1) establish/validate a strategic objective, (2) conduct an assessment, (3) develop a plan, and (4) execute the plan. The proposed framework also includes a site tour phase during operational learning as an alternative to storytelling, which has an inherent bias. This framework was tested in the land transportation system of one of Indonesia's biggest oil producers.

Keywords: implementation framework; human performance improvement; operational learning; integrated journey management system

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1. Introduction

Safety in the workplace is a basic right: people should be safe at work. Safety is the state of controlling hazards and their associated physical, psychological, and material conditions to protect people, assets, environments, and reputations [1,2]. Managing safety at work is a requirement for any employer, according to the law and its responsibilities to society, communities, and the environment [3]. Employers must consider the complexity of human and organizational factors when adopting industrial safety practices [4,5]. Industrial safety practices should include building a safety learning organization and by empowering the workers adapt to the complexity of the work when implementing safeguards [6–8]. Thus, it is crucial to establish an implementation framework that allows continuous learning and improves processes that are focused on strengthening the safeguards. Such a framework can be used to support the learning implementation that may be mandated by a country's laws. Human performance improvement (HPI) is a concept and tool to manage human and organizational factors and to strengthen the safeguards [9,10], whereas operational learning (OL) is an approach to operationalize human performance and to find better solutions by involving the people who are the closest to the work [11,12]. A streamlined implementation framework that combines the two domains can effectively assimilate HPI and OL implementation.

Over the past 20 years, the dominant views of safety within organizations have included theories of the high reliability organization [13], psychological safety [14], resilience engineering [15–17], human performance [9], Safety Differently [18], and Safety-I/II [19]. Most of the theories emphasize the importance of focusing on decentralization, particularly in building an organization's bottom layer's adaptive capacity. These approaches have also attracted greater attention from researchers and practitioners who put the concepts into practice, such as by introducing a guided adaptability management system [20],

integrating human and organizational performance [11,21,22] and human performance improvement [23], applying American Society for Training and Development models for workplace learning and performance [24], and implementing plan–do–check–act cycles for Learning Teams practice [12].

However, these studies do not provide an integrated approach to strategic and tactical actions, including critical steps for management system cycles. Furthermore, there have been arguments against the storytelling approach as utilized by Learning Teams. Learning Teams is an OL tool that can be used to develop a more in-depth story from workers regarding how work is performed [11,12]. The storytelling approach has weaknesses that involve subjectivity, leading to a lack of focus on the intention to learn [25,26]. Thus, it is difficult to inspire visible thinking among team members in order to understand the complex work process during learning mode discussions. These issues are likely to arise when the Learning Teams members come from different functional backgrounds. We expect that the implementation framework will generates solutions focusing on improving the safeguards and on addressing the weaknesses of organizations that trigger human mistakes.

The aims of this study are to propose an implementation framework to streamline HPI and OL, fully integrate them into the management system cycle, and improve the knowledge gap in the storytelling approach in Learning Teams. To develop the framework, we used two main stages of strategic actions by following the management system cycle and tactical actions by assimilating OL. We conducted a case study to prove the effectiveness of the framework. We selected proactive OL to reveal error precursors and missing safeguards from the integrated journey management system (IJMS) implementation of one of Indonesia's biggest oil producers. The case study involved people who are the closest to the work and who perform different functions, such as drivers, operators, vendors, field safety specialists, operations planners, programmers, and transportation safety advisers in the company, and the company's associated suppliers. The learning outcomes aimed at continuous improvement recommendations for the studied company, which could be extended to other industries with a similar land transportation system. Finally, the proposed framework can be used as a practical reference to build and sustain learning and to improve safety culture.

2. Materials and Methods

2.1. HPI Implementation

HPI enhances people's performance by controlling people's mistakes and by interacting with the organization, work system, procedure, and technology [27]. Some examples of HPI in safety applications are improving procedures by eliminating ambiguous instructions, using a verification checklist or particular communication protocol to reduce errors, and implementing stop–think–act–review, etc. Furthermore, the US Department of Energy introduced HPI guidance books as references to enhance HPI through concepts and tools [9,10]. Nowadays, industries widely use HPI to improve safe work practices [28–31].

The implementation of HPI in an organization requires an understanding its critical elements. The most critical element of integrating HPI into organizations is leadership because leadership can direct the organization in deploying the whole process [10,28,30]. Fostering HPI principles requires shifting leadership thinking through multiple leadership engagements, dialogues, and discussions [7,21,29]. Leadership plays a vital role in deployment, implementation, and stewardship when applying HPI principles. Leaders should encourage a healthy debate within their organizations in order to move away from blame and punishment and toward a readiness to learn and improve. Leaders must also react positively to failures to create a "just culture" working environment [5,9].

Building organizational capability in HPI is another critical element because it is related to those who perform critical roles [21,28,30]. Typically, this phase includes establishing governance and appointing essential roles, including management sponsors, champions, steering teams, and coaches. Several key activities to expand the fluency take place by cascading down or by providing training in the concepts of performance modes,

error precursors, latent conditions, drift, and HPI tools to the frontline supervisors and workers [7,9,10,32,33]. When the HPI organizational capability is ready, a company can assimilate these concepts into operational practices such as OL, implementing field coaching/inspection, improving the work procedures, and testing the safeguard's effectiveness. The company can also prioritize the implementation of HPI by following a gap assessment of the management system cycle.

2.2. OL Implementation

Learning from mistakes is essential to building safety resilience [7]. Learning activities are considered to be an effective mechanism to build trust and to create adaptive problem solving [34]. Learning activities that are related to operational issues and that involve frontline workers are referred to as OL. With this approach, a team is established to learn how work can be completed every day regardless of the outcome [11,22]. The practice of OL includes the use of Learning Teams. Learning Teams are defined as an OL tool that can be used to learn about how the work is completed and involves frontline workers and uses a storytelling approach. Typically, the team consists of workers who are guided by qualified facilitators and are fully supported by a sponsor [11,12]. Learning Teams promote Safety-I/II theories by applying learning reactively from failures/incidents and proactively from success. The learning process is focused on understanding how work is completed and requires frontline workers to solve the problems [18,19].

Safety-II has been widely adopted by various industries as part of their organizational learning practice [35–42]. In contrast, the Safety Differently concept has streamlined safety practices by emphasizing bottom-up methods to involve workers when deciding on rules and safe working practices [43], advancing performance by repealing bureaucracy [44–46] and enhancing learning from an event during investigation [47]. Furthermore, the learning application can proactively identify any improvement opportunities, i.e., when something does not feel right or has people concerned that there are ways to improve a situation, findings from verification activities, and other improvement opportunities identified during post-job reviews.

OL requires a fluent and grounded understanding of HPI because in practice, it explores the five HPI principles and their concepts, such as error precursors, latent conditions, and drift [7,11]. The learning process involves workers gaining more in-depth operational intelligence about completing work [12]. This aims to unlock the complexity, dynamics, trade-offs, and goal conflicts that are inherent in all work, organizational processes, and systems [11]. Although the process fulfills psychological safety implementation by creating an open communication of information, some information may be difficult for managers to hear [14]. Hence, learning outcomes can lead to better solutions and can typically improve the design, planning, and execution of work. OL should provide a high learning value to the organization when facing complex issues that are related to the organization's weaknesses, repetitive incidents, and drifting that may lead to severe incidents [22,48].

OL employs competent facilitators to guide the operational team in learning from how work is completed [11,12,22]. Typically, the facilitators are drawn from safety professionals who have been trained and mentored by experts to guide adaptive learning [20,49]. They should have excellent facilitation, communication, collaboration, critical thinking, and operational skills to guide the process [12].

Leaders play a crucial role in directly enabling OL implementation to create the organizational structures, establish the conditions necessary for learning to occur, and reinforce the team to learn. Leaders need to create a safe environment for learning by expressing enthusiasm for listening to how work is happening even though they are very likely to hear things that may surprise them [11,14]. Leaders should not react if they hear something that conflicts with their views. They must keep messaging and supporting the employees to promote and sustain a continuous learning and improving culture [14,50,51].

There have been studies on the operationalization of learning practices in several countries. A case study adopting organizational learning theory and applying thematic

analysis to understand the challenges of the rising demands for care services and limited resources in health care systems was conducted in England [52]. A case study to design a learning culture using evolutionary milestones took place in the US Forest Service [51]. A case study was undertaken to understand the human error that contributed to accidents in the coal and gas sector in China [53]. A case study to enhance the learning culture of patient safety using Colaizzi's method was conducted in an Indonesian hospital [50]. Those studies conveyed the importance of building a learning culture through a particular framework.

2.3. Study Design

The study does not reflect any individual or company. Anonymity is assured, and all of the involved parties were informed of this. All of the participants fully understood why the research was being conducted, how their data would be used, and that any risks associated must be disclosed in advance as per the Institutional Review Board (IRB) statement section. This section consists of two main streams. The first stream shows how the framework was developed, including the stages and steps. The second stream explains the framework.

2.3.1. Framework Development Process

The framework was developed based on the idea that HPI is closely related to OL. Hence, both concepts can be streamlined. HPI is an important concept, principle, and philosophical foundation for OL implementation [7,11]. HPI is a strategic initiative, and OL includes either tactical or operational practices. Thus, the ultimate goal was to embed HPI and OL to conduct business through a streamlined continuous improvement framework toward becoming a high reliability organization. This study used two main stages as the study design to develop the strategic and tactical action frameworks. The actions followed the operational excellence management system cycle and consisted of four steps [54–56] (Table 1).

Table 1. Framework development process.

Stages	Actions	References
Stage 1–Strategic actions following the management system cycle	Step 0: Define critical roles, responsibilities, and requirements. Step 1: Establish/validate the organization's strategic objectives to become a high reliability organization. Step 2: Conduct assessment (a). Check the progression based on HPI and OL maturity indicators. (b). Identify execution focus areas related to critical safety processes. Step 3: Develop the plan for OL implementation.	[54,56,57]
Stage 2–Tactical actions to assimilate OL	Step 4: Execute the plan following the five phases of OL: (1) learn, (2) reflect, (3) site tour, (4) improve, and (5) share.	[11,12,22,58–61]

Step 0–Define Critical Roles, Responsibilities, and Requirements

The organization must establish several critical roles when deciding to adopt HPI and OL. The critical roles are HPI management sponsor, HPI champion/mentor, leadership steering team, OL facilitator, and HPI trainers/coaches. Table 2 provides a brief description of the roles, responsibilities, and requirements. This information was included in the governance procedure of the framework.

Table 2. Critical roles in HPI and OL implementation.

Critical Roles	Main Responsibilities	Requirements
HPI management sponsor	- Steward HPI in the organization - Ensure the plan is in place and executed, informed, and consulted by the leadership steering team	- Fluent in HPI concepts - Influential in the organization (senior leadership position is strongly recommended)
HPI champion/mentor	- Create the execution plans, arrange resources, and track and report progress - Serve as a focal point for HPI and OL adviser - Facilitate the organization's maturity assessment in implementing HPI and OL	- Ability to devote a portion of time - Fluent in HPI concepts - Ability to influence and demonstrate good project management skills - Possess a strong commitment to and passion for continuous learning and improvement - Complete HPI and Learning Teams training
Leadership steering team	- Review the plan and make recommendations to the HPI management sponsor - Message and support the implementation of OL - Assess the organization's maturity in implementing HPI and OL	- The mix of leadership, middle management, managers/supervisors, i.e., from operations and maintenance, facility engineering, safety, project, and business partner management, among others
OL sponsor	- Establish an environment of trust and open communication - Provide support and resources to implement OL - Establish and kick off the OL - Approve OL's recommendations and ensure the actions are effectively closed	- Managers or supervisor level within the organization as process owners of OL session - Ability to establish an environment of trust, open communication, and psychological safety - Influential in the organization
OL facilitator	- Facilitate the preparation and implementation of the OL process - Write the report as per the template and ensure that OL's actions are input into the action tracking system	- Have personal characteristics of being respected by others, flexible, open-minded, resilient, and optimistic - Operations experience - Good oral communication, interpersonal, and facilitation skill - Ability to build rapport and documentation
HPI trainers/coaches	- Advocate HPI in organizations - Coach managers, supervisors - Assist the deployment activities - Teach training classes	- Passionate to learn HPI - Influential and having good presentation skills to teach others

Step 1—Establish/Validate Organization's Strategic Objectives to Become a High Reliability Organization

The strategic objective is a big-picture vision to direct the company/organization to achieve a particular goal [62], i.e., to prevent serious incidents and fatalities, to decrease production loss, and to deliver base business value. The implementation of HPI and OL iteratively within the organization can create a better learning, just, flexible, and

reporting culture. These characteristics are in line with the practices and features of a high reliability organization. In this step, the company's top management needs to increase open communication/trust, sharing information, and accountability as per the generative safety culture of the Hudson model [63]. They are also required to establish new strategic objectives with a solid willingness to advance, learn, and improve the safety culture. One action includes validating the existing strategic objective at the beginning of the year as part of the annual business planning cycle. Subsequently, the strategic objective must be communicated and cascaded down by top management to all organizational levels. This is to ensure a bold alignment when prioritizing tactical actions.

Step 2a—Check the Progression Based on HPI and OL Maturity Indicators

In this step, it is essential to check the progression of the organization in implementing HPI and OL. The progression should be condition-based and not time-based. The champion and leadership steering teams must assess their organizations' maturity progression to reflect their leadership and safety culture changes. The gap assessment (Safety-I) and opportunity register (Safety-II) can be completed by alerting leadership to the critical indicators in implementing HPI and OL.

Step 2b—Identify Execution Focus Areas Related to Critical Safety Processes

An assessment is conducted to understand the gaps (Safety-I) and to identify opportunities proactively (Safety-II) in particular execution focus areas. The gap assessment and opportunity register are part of a continual improvement process of specific areas that are related to safety. Typically, this part of the safety management system follows industrial standards, i.e., International Standard Organization 45001, operational excellence management system, and OHSAS 18001. HPI and OL can be integrated into execution focus areas. HPI is assimilated in those processes to recognize and manage error-likely situations, whereas OL can be used proactively as a learning tool (Safety-II) to understand and improve the process implementation continuously.

This study defined eight execution focus areas to prioritize HPI and OL implementation: (1) transportation safety; (2) managing safe work practices; (3) process safety management; (4) organizational learning; (5) fatality prevention; (6) risk management; (7) management of change; and (8) incident investigation.

Step 3—Develop a Plan of OL

A plan is developed to address the gaps identified during the assessment in Steps 2a and 2b. The resolutions are integrated into a business plan. The plan should include improvement actions to move the organization with HPI and then start with OL. The plan should consist of the topics for proactive OL in execution focus areas. OL can explore routine, normal, or successful work with high potential consequence and critical activities. The leadership steering team can encourage the organization to learn and improve from suspected deficiencies (i.e., repetitive findings from field inspection/verification/audit; when something does not feel right, people have concerns about ways to improve) and drifting practices captured by the workers. This stage's outcome is improvement actions based on the organization's maturity in implementing OL. For a ready organization, another outcome of this stage is the list of opportunities for OL proposed by HPI champion/mentors and the leadership steering team. At the same time, the detailed OL execution plan is developed by the appointed OL sponsor and facilitator by considering the learning value, the scope, and the members.

Step 4—Execute OL

In this step, an organization focuses on executing the developed plan. We operationalized OL from the organization's selected topics or the occurred incident/near-miss in this stage. This study executed five phases of OL, emphasizing the importance of conducting a "site tour" to fill the Learning Teams gaps [11,12,22,58]. This phase can allow the team to be more focused on safeguard learning and practice visible thinking when learning through the direct observation the actual work. Subsequently, the team can propose better solutions to strengthen the safeguards. The proposed OL steps outline is as follows:

Phase 1—Learn

The OL's sponsor establishes a team to learn and improve from a particular scope involving the frontline [22]. The sponsor should kick off the session and establish an environment of trust and open communication [11,12]. The facilitator plays a critical role in guiding the team's discussion. All information must include safeguards that are not in place/functioning. Error precursors are captured to understand the work's context. The focus is on learning how to complete the jobs. Before the end of this session, the team members need to discuss what processes or activities they want to learn about more deeply during the site tour.

Phase 2—Reflect

Reflection time is required to rest the brain after learning deeply [11,12,22]. All team members need reflection time to identify if any new/important information can be shared. The team should step away from the room to do something else. Teams are strongly encouraged to take an overnight break since this allows the brain to rest.

Phase 3—Site Tour

A site tour is similar to a Gemba walk in the workplace is conducted [61]. When conducting the site tour, the team is expected to practice active listening and to respectfully ask probing questions based on three key activities: go see, ask why, and show respect. The Gemba kaizen encourages participants to come to where things happen and to the people who work closely in that process [59]. The team can use a site tour to define the problem based on the truth and to minimize personal bias or subjectivity resulting from assumptions.

Phase 4—Improve

The team reconvenes in this phase to discuss the findings from the learning and site tour phases. The team changes from the learning mode to analyze drift, hazards, and safeguards and to brainstorm possible solutions to strengthen the safeguards. The team prioritizes the areas that need improvement and what actions will address the gaps [11,12].

Phase 5—Share

The final phase is to document the results and communicate them to the sponsor [11,12]. In the form of a summary, a brief report is developed to inform and educate the sponsor about the story of the findings and the team's suggestions. Once approved by the sponsor, it is strongly recommended to track the action closure and to share the results with others.

2.3.2. Managing the Plan Execution Health Check Using a Dashboard

The HPI champion's activities include a periodic review to monitor the progress and effectiveness of the plan. The use of the dashboard can help the organization track the status, evaluate the effectiveness, and report the findings to the leadership steering team. The dashboard also provides resources that load information for facilitators, sponsors, and mentors. It can be very discouraging to target OL implementation within the organization since this can create the wrong message of building a learning and improvement culture. Figure 1 provides an example of the dashboard's template to summarize the progress and to monitor the closure of actions.

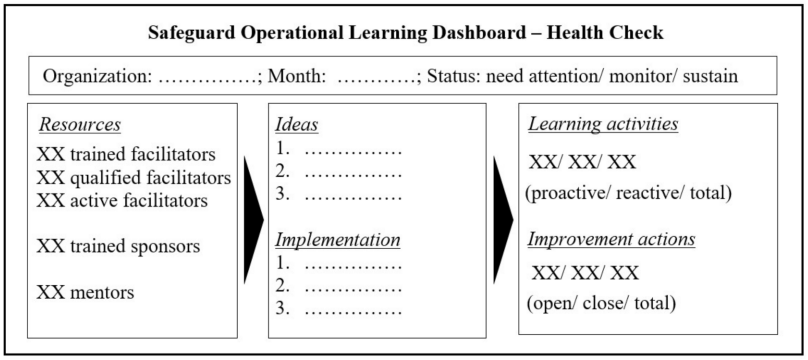

Figure 1. Template of OL dashboard.

2.3.3. HPI and OL Implementation Framework

Figure 2 provides the implementation framework for HPI and OL. This framework consists of strategic (Steps 1–3) and tactical actions (Step 4). This framework can also provide further direction to the organization regarding the focus on OL. The maturity indicators of Step 2a reflect the self-readiness check of the organization's progression in implementing HPI and OL, whereas the execution focus areas of Step 2b guide the organization to focus on the high critical values of proactive learning. The results from OL implementation in Step 4 can be the inputs to top management when revalidating the strategic objectives. The OL result is considered to be the workers' voice. Thus, top management needs to receive feedback from them. In Step 4, the focus is to execute/implement OL for a particular topic and to manage the execution's health check using the dashboard.

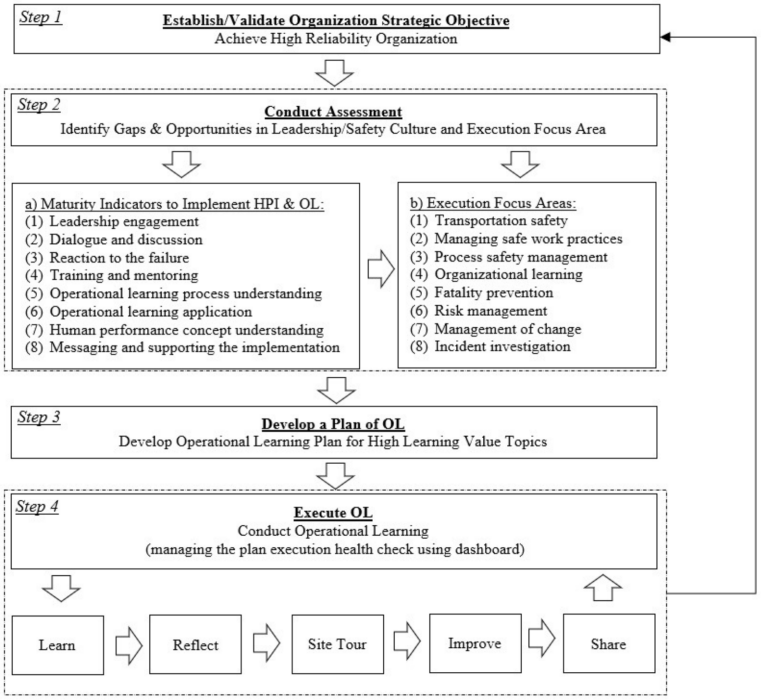

Figure 2. HPI and OL implementation framework.

3. Case Study

We conducted a case study implementing the proposed framework in an actual IJMS implementation in one of Indonesia's biggest oil producers, which manages ~4000 motor vehicles in oil field operations in Sumatera, Indonesia. The learning outcome was to identify missing safeguards and error precursors to providing continuous improvement recommendations through the team's brainstorming and observation during Phases 1

to 4 of the OL implementation. The IJMS framework enhances a conventional journey management plan. It also integrates existing personal radio frequency identification and driving monitoring system devices through centralized fleet control rooms for online monitoring, alert management, and route selection.

The IJMS framework consists of infrastructure, features, and reporting. Infrastructures are related to the platform, infrastructure technology requirements, data, and a global positioning system gateway. Features are alert/alarm and fleet management. Reporting is related to action management, data analysis, and key performance indicator monitoring. Likewise, typically, vehicles are equipped with the global positioning system device functioning as a signal receiver of the global positioning system satellite and the global system mobile transmitting to the commercial telecommunication network. Meanwhile, the global positioning system server is connected through an Internet web service to the firewall and geographic information system server. Hence, each fleet control room can access the geographic information system web application. Figure 3 illustrates the IJMS's framework of the studied company.

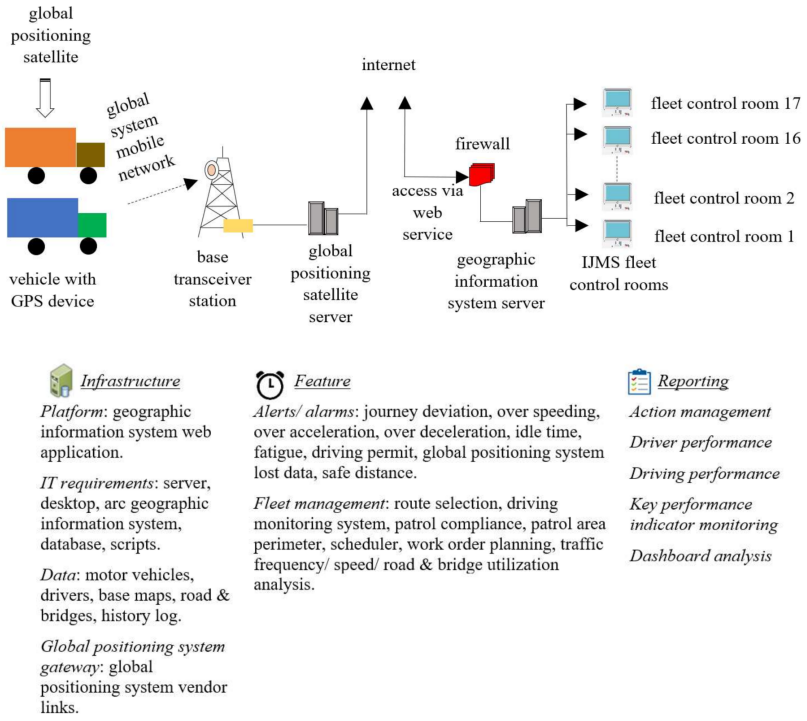

Figure 3. The IJMS strategic framework of the studied oil producer.

Step 1–Establish/Validate the Strategic Objective of the Studied Company

The studied company puts safety as the highest priority when conducting business. At the beginning of the year, the top management conducted a meeting to validate the strategic objective as part of the safety commitments. They reviewed the historical motor vehicle crash data and were very concerned about reducing motor vehicle crash cases. They decided that one of their strategic objectives was to achieve safe, effective, and efficient vehicle operations to build a high reliability organization.

Step 2a–Check the Progression Based on HPI and OL Maturity Indicators

The assessment was conducted involving the HPI champion of the studied company to check HPI and OL maturity progression. The HPI champion conveyed that all of the managers, including the logistics manager, had been fully engaged with the HPI concept and were already familiar with Learning Teams. The studied company experienced frequent dialogues and discussions about HPI in the past. We contacted the logistic manager to discuss how he typically reacts when his team encounters unexpected incidents.

He responded positively by encouraging the team to learn together. He also conveyed that he had been the sponsor for several Learning Teams and that he was very impressed with the approach. He had a solid willingness to learn how the workers implement IJMS daily, the missing safeguards, and what needs to be improved. He was also committed to learning and improvement messaging.

Furthermore, the studied company had qualified Learning Teams facilitators and extensive previous experience in facilitating Learning Teams. We concluded that the organization was highly mature to pilot the proposed implementation framework of the IJMS topic. We needed to briefly introduce the logistic manager and facilitators to OL to ensure alignment as per the implementation's framework expectations.

Step 2b–Identify Execution Focus Areas Related to Critical Safety Processes

IJMS implementation was selected as part of the transportation safety execution focus area. The case study result was initiated as part of the assessment result conducted by the studied company involving the logistics manager, transportation safety adviser, and safety team. It was found from the inspection and audit results that there were repeated cases of fleet control room personnel who were unable to perform daily tasks, there was inconsistency in implementing IJMS procedure, corrective actions were not followed, not all drivers were aware of IJMS, and the actions that were required to meet the transportation safety requirements were unclear. The case study was conducted to support lookback implantation in the studied company. Furthermore, the company's top management expected to obtain inputs and recommendations from the study to strengthen transportation safety safeguards. In this step, the results of the assessment recommend moving to the next step.

Step 3–Develop the Plan on OL

The operationalization of IJMS required HPI interacting with the work process, work system, equipment, and culture of daily operation activities. There were 12 workers who were involved: two drivers, three IJMS operators, two global positioning system vendors, one field safety specialist, one operational planner, one programmer, one transportation safety adviser, and one project team member. The logistic manager was appointed as the sponsor. This learning was facilitated by two qualified facilitators from the company's safety professional. The detailed plan is shown in Table 3 and summarizes the preparations for OL.

Table 3. OL plan for the IJMS.

Items	Information
Topic and scope	Learning from the IJMS implementation to reduce error precursors and strengthen the safeguards of transportation safety.
Learning value	Operating the IJMS is directly related to HPI aspects: Work systems: standard operating procedure of the IJMS operator includes monitoring key performance indicators. Process: three-way communication when following up alarms/deviations. Equipment: global positioning system and driving behavior monitoring system following fleet control rooms. Culture: coaching and following up alarms/deviation. The learning is intended to identify error precursors, repetitive issues, and safeguards.
Sponsor	Logistics manager
Facilitator	Competent facilitators
Members	IJMS operators, field safety specialists, drivers, global positioning system vendors, programmers, operational planners, transportation safety adviser, project team members

Step 4–Execute the Plan on OL

The main focus of this step was to execute the plan of the IJMS's OL. Considering a policy that restricted people gathering during the coronavirus pandemic, learning was

conducted virtually. Hence, extra offline engagements were required by facilitators in advance for all team members to ensure that they were aware of the need to participate through the Webex Meeting application.

Phase 1–Learn

The sponsor kicked off the session and the set expectations for learning and improving from the perspective of the safeguards. After the introduction, the sponsor left the meeting, and the facilitators introduced the process to ensure that all of the team members understood how the process worked. This session focused on understanding HPI aspects, identifying safeguards that were not in place and functioning, and discussing error precursors and the normal work variability.

One facilitator encouraged the team to think broadly and deeply. Simultaneously, another facilitator captured all of information without editing or filtering it. The second facilitator took computer notes as a "wall of discovery" [11]. This phase took 2 h to complete. The session was streamlined into these HPI aspects: the work process, work system, equipment, and culture. The results of the learning phase are summarized in Table 4.

Table 4. The findings of the learning phase.

Work Process		**Work System**
(1)	The drivers execute daily work orders and drive to the work location by following the approved journey management plan.	Journey deviation and alarm monitoring were the most occupied IJMS features. The loss of the global positioning system signal frequently occurred, resulting in less driving monitoring system availability. The change of fatigue alert monitoring mechanism from a vehicle to a driver-based measure. There was no menu to differentiate light and heavy vehicle types in the contractor compliance performance management system. Some fleet control rooms had an imbalance ratio between the number of IJMS operators and vehicles (3 to 5 times from the ideal ratio 1:100).
(2)	The IJMS operator compares the vehicle registration database with the submitted journey management plan.	
(3)	The route selection feature allows the selection of the safest and fastest route for the journey management plan.	
(4)	The reporting covering key performance indicators and making recommendations is performed weekly and monthly.	
(5)	Fleet control room performs daily validation of the vehicles with the deviation. The process comprises communications between the IJMS operator and driver.	
(6)	The infrastructure technology team manages the updated geographic information system map as per recommendation from the road hazard assessment team.	
Equipment		Culture
(1)	The lower reliability and accuracy of global positioning system devices when vehicles were operating in bad/remote areas.	The company and contractors have the best driver program to reward the drivers. Coaching is encouraged to learn from deviations, and a leader's positive reaction is exercised when receiving reports with many deviations. IJMS is strongly perceived to positively change driving behavior. The team realized that department leaders' support is essential to implement and monitor the IJMS.@Lack of coordination meetings between fleet control rooms and the project team.
(2)	The use of different color codes to indicate the vehicle status, i.e., green indicates the appropriate vehicle movement, gray indicates the car is idle, and red indicates the car is in the active/alert state.	
(3)	Multi-parties are involved in IJMS operationalization, i.e., global positioning system vendor for the device maintenance/installation, infrastructure technology team owning the web system/infrastructure, and functional team owning the fleet control room.	

Before the end of the learning phase, the team agreed that the site tour would include virtually visiting the fleet control room of the drilling completion and facility engineering departments. Both fleet control rooms were the most productive fleet control rooms regarding the task of monitoring the number of operating vehicles with a high load. Furthermore, the team desired to observe the following: preparing route selection for the journey management plan, performing IJMS surveillance, and managing the deviation.

Phase 2–Reflect

An overnight reflection time took place to allow the brain to rest. The reflection time was critical for the team to remind themselves of any new/vital information to be shared with the group. Furthermore, teams used this moment to think about what questions to ask during the site tour.

Phase 3–Site Tour

After completing the reflection phase, all of the team members took a site tour by visiting the fleet control rooms. The site tour session was also intended to verify and validate that the safeguards were in place and functioning. The process took ~1 h for each fleet control room. All of the members participated every session. During site tours, the key activities included observing the processes, understanding the challenges, receiving input or feedback, and appreciating the work. The team used this session to define the problem from direct observation. Hence, the team could discuss more visibly to reveal the problems. The team summarized the results into two main streams for each task: the safeguards that were missing and the error precursors that existed (see Table 5).

Table 5. The findings of the site tour phase.

Tasks	Safeguards That Were Missing	Error Precursors
Preparing route selection for JMP	Hardware *IJMS map*: Inaccurate base maps of IJMS. Some of the public road maps and toll roads were not in place. This condition led to plotting the map sketch manually.	Human factor *Stress/frustration:* IJMS operators need to prepare the map for route selection manually.
Performing IJMS surveillance	Hardware *Speed zone geofence*: Inaccurate geofence setting in the transition speed zone. *Alarm/alert notification*: False signal due to inaccurate vehicle position detection for very low vehicle movement (i.e., less than 5 km/h and more than 10 min).	Organizational factors *Lack of equipment interface:* Inaccuracy of geofences can cause human errors in detecting and recording deviations in the system. *Confusing system feedback:* Lower global positioning system signal accuracy can cause misjudgment as a potential deviation.
Managing the deviation	Human action *Communicating the deviation*: Misinterpretation of the alert status's color due to inaccurate vehicle position detection.	Organizational factor *Limited system feedback:* The global system mobile network stability can result in a time delay in monitoring. It can provoke misjudgment of a potential deviation.

Phase 4–Improve

The team defined the problems and identified the key learnings. The facilitator drew three lines to guide the conversation. The black line represents work as imagined; the blue line indicates work as it was completed, and the red line indicates the hazard (see Figure 4). The graph illustrates that safeguards are essential to create spaces between the work and the hazard, while work as imagined is considered an ideal state. Subsequently, the team

discussed the normal work variability, evaluated hazards, and identified critical safeguards observed from both the learning and site tour sessions.

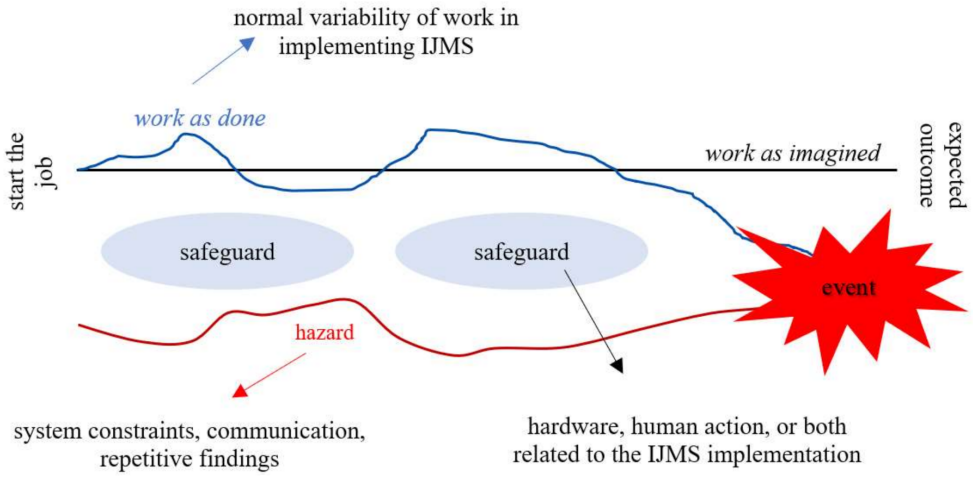

Figure 4. Illustration of the variability of work of the studied IJMS adapted from [11].

There were three main items when considering normal work variability: (1) the IJMS operators performed additional revalidation efforts on vehicle databases; (2) The fleet control room monitored more vehicles than usual; (3) some challenges included preparing route selection for the journey management plan, performing surveillance, and managing the deviation. Furthermore, there was an unclear boundary between project and operating phase. The team also found limited/confusing system feedback (geofencing, road map).

The team identified the potential hazards leading to incident risks, such as the inaccuracy of the vehicle database, geofence areas, route selection/journey management plan, and deviation alerts. Furthermore, the misjudgment or miscommunication between the IJMS operator and the driver was seen as a risk that should be anticipated through appropriate communication protocol implementation.

Moreover, the team found critical safeguards related to IJMS implementation. They included the following: (1) reliability of the global positioning system signal and availability of global system mobile network coverage in all areas; (2) the performance of proper monitoring, communication of if any deviations, and ensuring actions are taken immediately; and (3) follow up on the recommendations to close the gaps.

The team also prioritized the areas that needed improvement and explored what actions would address the gap as safeguards. The results of the critical learnings and proposed solutions are presented in Table 6.

Table 6. The key learnings and proposed solutions formulated through OL.

Key Learnings	Recommended Solutions
Common issues related to data discrepancies between the IJMS and actual condition might have occurred owing to some factors: - *Global positioning system and global system mobile signal are unstable on site.* - *The driving monitoring system /global positioning system device is not well maintained.* - *The geofence area setting is inaccurate.* - *The vehicle database is inaccurate.* - *The geographic information system road map is inaccurate.*	Establish an IJMS preventive maintenance program. Improve the contractor compliance performance management system. Engage global system mobile network operators to test and measure the remote blind spot area.

Table 6. *Cont.*

Key Learnings	Recommended Solutions
Human fallibility might have occurred owing to some reasons: - *The alert system did not work correctly as designed.* - *Some IJMS features (i.e., smart map/route selection) are lacking.* - *Higher task demand created an imbalance ratio between the number of IJMS operators and vehicles.*	Conduct regular inspection and vehicle alarm calibration. Improve existing IJMS features and conduct testing before commissioning. Review the fleet control room's resources and make an adjustment to balance across the fleet control rooms.
Managing and implementing the IJMS requires effective and smooth 360° communication methods including the following: - *IJMS operators performed horizontal communication.* - *IJMS operators performed diagonal communication for coordination.* - *IJMS operators performed vertical communication following the organization line hierarchy.*	Improve the communication protocol procedure. Conduct monthly check-in and coordination meeting between the project team and fleet control rooms.

Phase 5–Share

The final step was to document the learning results and recommended solutions into a simple format report, capturing more in-depth stories to inform and educate the sponsor about the study's story and the team's suggestions. The goal was to help the sponsor understand the context and organizational factors that helped support the improvement.

Subsequently, the facilitators communicated the results of the OL to the sponsor. Surprisingly, there were findings related to the items where the IJMS operator still needed to draw the route of journey management plan manually, wherein the operator could spend almost half an hour to prepare every single journey management plan as requested by the driver. The other two surprising findings were related to potential misjudgment that might occur due to global positioning system/global system mobile signal instabilities and the failure of the contractor compliance performance management system to accurately provide vehicle database integration for the IJMS. The sponsor stewarded and endorsed all of recommended solutions, assigned the actions to the appropriate people in charge, and tracked the closure using the existing system. Meanwhile, the safety team supported the sponsor to share the OL key takeaways across the organizations.

Feedbacks and Evaluation Review

After completing the session, we conducted a roundtable discussion with all of the team members and the sponsor to hear their feedback and thought about the new framework. They stated that the framework was better than the previous Learning Teams and could be applied to other learning topics. They also mentioned that the new framework includes a sequential checking where the organization should understand the HPI principles before conducting OL. The new framework could direct the right topic selection process based on the high learning value, focus area, and defined appropriate learning scope. They also noticed that the site tour session helped them to better understand the context of learning, especially when the team members came from different backgrounds. The enhanced process could identify error precursors and safeguards more visibly than Learning Teams could when employing a storytelling approach.

4. Discussion

4.1. Streamlining HPI and OL Implementation Framework into the Company Management System

This study delivered a streamlined implementation framework for HPI as a strategic initiative and for OL implementation as either tactical or operational practices that are fully integrated into the management system cycle. The proposed framework provides significant improvement over previous studies that developed an individual framework for Learning Teams [12], OL [11,22], and human organizational performance [7,21]. Furthermore, companies or organizations seeking a simple way to implement HPI and OL can adopt the proposed implementation framework. This study provided generic references and steps incorporated into other management systems, i.e., International Standard Organization 45001 and International Standard Organization 9001. We also identified critical roles, responsibilities, and requirements as the benchmarks of the organizational capability of becoming a high reliability organization.

This study also revealed that a site tour phase is an important step to enhance the Learning Teams tool of conducting the storytelling approach. In the feedback and evaluation results from the team members and sponsor, they stated that the site tour phase could reveal error precursors and necessary safeguards more visibly compared to the previous process using a storytelling approach. We strongly believe that this is necessary to minimize bias in order to focus on safeguard learning. At this point, we support the argument of the storytelling approach's limitation [25]. Thus, we strongly recommend including this phase as a good practice. The case study also demonstrated the applicability of OL in the actual work process. The case study's processes showed that the more the team understands the work is conducted, the more the team can sharpen the discussion to identify better solutions.

4.2. Build a Learn and Improve Culture through OL Implementation

The implementation of OL can unlock human and organization factors. Suppose the company chooses to implement this tool in many focus areas as the primary way to learn proactively and reactively. It can create a "snowball effect" from the bottom of the organization for continuous improvement. This tool puts psychological safety advancement into practice better when frontline workers feel more valued in sharing their ideas without worrying about being blamed or punished. We support the just culture theory [5] where workers feel free to talk about failures and help companies learn from them.

When we reviewed the process of this case study more deeply, we found a similarity to the typical process improvement tools (i.e., lean, six-sigma, and kaizen, among others) that incorporate the spirit of collaboration to understand the problem and find the solutions. Thus, we support the insights from [11,12,22] that, similar to Learning Teams, OL can be used as a process improvement tool. The tool promotes the HPI view and builds more trust toward increasing organizational safety culture. Meanwhile, more learning means increasing capacities and adapting to the changes. At this point, we support the approach of creating organizational resilience to become more adaptive to operational complexity [6,64]. The learning organization culture generated from OL implementation also supports a conceptual framework of guided adaptability management system implementation to increase safety resilience [20].

4.3. Strengthening Land Transportation Safeguards from OL Implementation

We conducted proactive learning for the IJMS implementation to reveal the system's problem in advance of any incident or failure. Hence, the company could take actions to improve its safety from the solutions recommended by OL. The OL findings revealed that organizational and system factor weaknesses were most likely to cause human errors as error precursors. When assessing any deviation that occurred, they found that the false alert, geofence areas, vehicle database, and geographic information system map could lead to unintentional mistakes by the IJMS operator. Improving the communication methods

between the IJMS operator and other parties was crucial to clarifying this situation. The imbalance ratio between the number of IJMS operators and vehicles was considered a critical organizational factor that could create higher work pressure leading to human error. These findings were aligned with the concept of latent error [9,65]. With that in mind, the company needs to resolve the latent organizational conditions rather than ask the IJMS operator not to make a mistake. These actions should fix the system level to sustain process improvement.

The recommendations proposed by the team were part of the continuous improvement efforts by the company to strengthen transportation safety safeguards. The learning outcomes could be extended to other industries with a similar land transportation safety system. By implementing the IJMS effectively, the company can positively drive motor vehicle safety practices to focus on leading indicator improvements such as journey management plan implementation, road hazard reduction, coaching/training implementation, and driving performance improvement. The features and data from the IJMS can be utilized as alerting, measuring, evaluating, learning, and rewarding tools for the company's overall land transportation safety management. Furthermore, the effective use of the IJMS also supports the company in meeting the International Oil and Gas Producers land transportation safety recommended practice requirement 365-12. The document describes in-vehicle monitoring system applications [66] and provides additional insight for the bow-tie of managing land transportation risks, including the applied specific IJMS alerts being used by the studied company to monitor safe distance, idling time, and fatigue break time [67].

The case study's findings also revealed room for improvements in in-vehicle monitoring systems using the geographic information system, global system mobile, and global positioning system technologies commonly used by industries. The reliability and quality of signals are crucial in practice, especially for industries operating vehicles in remote areas such as forests and plantations. Likewise, for the infrastructure technology system maintenance requirement [68,69], this study recommends companies establish a regular IJMS preventive maintenance program and not just the corrective one covering the testing of the system, signal stability, geofencing, and geographic information system road map verification. The blind spot areas need to be defined in advance during the planning of the framework's deployment. Hence, the company can encourage the global system mobile providers to improve the network's quality in some operation regions.

In daily operations, an IJMS operator is required to communicate to the drivers and other stakeholders both effectively and simultaneously. The ways to provide information, obtain clarity, and share the deviations as per communication protocols are crucial to avoiding miscommunication and ensuring that directions are followed correctly. The situation is similar to that of the control room operator or air traffic controller operator. An IJMS operator should be able to articulate the complex of socio-technical systems to interact successfully. This argument supports the fact that technical skills are essential, and the non-technical skills, including human-to-human interaction, cognitive, and emotional controls, are notable in the operational environment when considering human talent enhancement [70,71]. With that in mind, a company needs to provide technical and non-technical training for IJMS operators.

5. Conclusions

This paper proposes an implementation framework for streamlining HPI and OL that aligns strategic and tactical actions and is fully integrated into the management system cycle. The proposed framework consisted of four major steps: (1) establish/validate strategic objective; (2) conduct an assessment; (3) develop a plan; and (4) execute the plan. An important added step was a site tour to reduce the bias inherent in the storytelling approach. A case study of a major oil and gas company was conducted to pilot the implementation of the framework. The result showed something promising for the future implementation.

This particular case study demonstrated that the additional site tour could close the gaps in the storytelling approach and could make the learning mode more visible to the learning subject. The effective result of the case study in this paper generated ideas to leverage the framework application for other learning topics. Furthermore, the IJMS case study provided insights into land transportation safety, particularly in relation to managing human performance aspects. Hence, it is crucial for the companies to understand the work as it is completed and to prioritize system improvements whereby technology is used rather than fixing the individual behavior.

This research can be extended in various directions. First, there are ample opportunities to explore further the use of OL combined with other process improvement tools. Second, researchers can study vehicle monitoring technology advancement and its more reliable framework in remote areas. Third, researchers can develop a comprehensive maintenance framework for the vehicle monitoring system. Lastly, researchers can study the effects of HPI and OL implementation on firm performance.

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