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When operators become designers: microprojects, bricolage, and safety in high-risk systems

Quando operadores se tornam projetistas: microprojetos, bricolagem e segurança em sistemas de alto risco

Abstract

Objective: To analyze how the situated design, manifested in microprojects, contributes to safety on offshore platforms, investigating the role of autonomy and bricolage in managing operational uncertainty as a means of promoting occupational health and safety. **Methods:** Report on experience with qualitative approach based on Ergonomic Work Analysis, involving direct observations of cargo-handling activities at an oil production facility, followed by self-confrontation. **Results:** The case of moving a pump revealed that workers develop microprojects to construct ephemeral systems as a way to overcome design gaps and the contingencies of the operational context. The organization's role is central to this process, since, by understanding the true nature of the work, it can equip operators with material and immaterial resources, providing resources consistent with operational practices that enable safer and healthier work by the operators. **Conclusion:** Autonomy is an organizational condition that creates space for practical intelligence and shared learning among operators in the field. Recognizing these processes allows us to overcome the illusion of control, fostering coherent action between the organization that supports the activity and the operator who devises solutions in the field.

Keywords: Ergonomics; Safety Management; User-Centered Design; Technical Expertise; Oil and Gas Industry; Occupational Health.

Resumo

Objetivo: Analisar como a concepção situada, manifestada em microprojetos, contribui para a segurança em plataformas *offshore*, investigando o papel da autonomia e da bricolagem na gestão da incerteza operacional, como forma de produzir saúde e segurança no trabalho. **Métodos:** Relato de experiência com abordagem qualitativa baseada na Análise Ergonômica do Trabalho, com observações diretas da atividade de movimentação de cargas em uma unidade de produção de petróleo, seguidas de autoconfrontação. **Resultados:** O caso da movimentação de uma bomba revelou que trabalhadores desenvolvem microprojetos para construir sistemas efêmeros, como forma de superar lacunas do projeto e as contingências do contexto operacional. A ação da organização é central neste processo, pois, ao compreender a natureza real do trabalho, ela pode equipar a ação dos operadores com recursos materiais e imateriais, oferecendo recursos coerentes às práticas operacionais, que permitem uma ação mais segura e saudável por parte dos operadores. **Conclusão:** A autonomia é uma condição organizacional que dá espaço à inteligência prática e ao aprendizado compartilhado entre os operadores no campo. O reconhecimento desses processos permite a superação da ilusão de controle, numa ação coerente entre a organização que equipa a atividade e o operador que concebe soluções no campo.

Palavras-chave: Análise Ergonômica; Gestão da Segurança; Design Centrado no Usuário; Competência Técnica; Indústria de Petróleo e Gás; Saúde do Trabalhador.

Introduction

FPSO (Floating Production, Storage, and Offloading) offshore platforms, which are central to deepwater exploration in Brazil¹, operate according to the principles of continuous process industries (CPI). In this production model, unlike manufacturing, transformations occur in closed systems, making it impossible to directly observe the states of the process. This characteristic requires operators to rely on knowledge derived from indicators², which are inferred by instruments and sensors. The high level of automation and exposure to corrosion inherent in the marine environment demand intensive maintenance, mobilizing approximately 44% of the onboard personnel³ and necessitating the constant handling of heavy loads.

These operations are critical, accounting for between 35% and 40% of offshore accidents^{4,5}, in addition to requiring significant physical exertion⁶. The uncertainty inherent in these operations stems from the need for the crew to respond to varied operational demands for maintenance⁷. Operators handle a wide variety of materials and deal with variable environmental conditions (such as wind, rain, and waves), which increase operational risks^{5,8,9}. This scenario is exacerbated by the complexity of operations, resulting from coordination with other teams and the occurrence of exceptional events in a confined space¹⁰.

Safety management in this context requires a paradigm that recognizes the strategic importance of “work-as-done”¹¹, as defined by the Safety-II¹² perspective, without reducing safety to mere compliance with regulations. Recognizing everyday adaptations opens new possibilities for organizations to overcome the illusion of bureaucratic control and identify vulnerabilities before they turn into accidents^{13,14}.

Safety Built Through Action

Organizations often resort to formalizing practices, known as prescriptive safety, to demonstrate control and influence safety culture¹⁴. However, this focus on compliance can create an “illusion of control,” in which operators believe that strict adherence to rules and procedures guarantees safety^{14,15}. According to Dekker¹³, this approach can infantilize workers, depriving them of the autonomy needed to judge complex situations.

Real work always differs from what is prescribed. Even well-designed protocols developed in consultation with the workforce have limitations in anticipating the contingencies of practice, leading individuals to adjust their actions to perform the work well^{11,16}. This dichotomy is central to new approaches to safety, which have translated these ideas into the concepts of “work-as-done” and “work-as-imagined”¹². In this context, the normative approach to safety must be integrated with safety constructed through action. Unanticipated situations depend on local resources and real-time management, in which operators draw on their experience and skills to transform available resources into safe responses to operational uncertainty^{14,17}.

In complex systems with a high level of uncertainty, workers often finish the design of imperfect technologies, applying tacit knowledge and local adaptations to fill gaps not anticipated by engineers¹⁸. Based on their expertise, they develop shared and situational ways of acting that enable organizational objectives, even if they diverge from procedures¹⁹. Thus, reducing excessive controls and placing trust in self-organization and horizontal coordination allow for increased efficiency, safety, and occupational health, to the extent that they lead to the development of operators’ responsibility and autonomy¹³.

The microproject as a tool for promoting safety

Human activity is not limited to the execution of predetermined plans but emerges from dynamic interaction with specific circumstances²⁰. This requires that the design of work systems be grounded in actual usage situations and integrate the cooperative nature of real work²¹. Since design is a desire for transformation that presents an opportunity to establish new modes of engagement for actors within organizations²², situated design responds to the context of action, with solutions constructed in the field by operators^{23,24}. This process involves a “dialogue

with the situation,” mobilizing embodied knowledge and a predictive perception of consequences on the part of practitioners^{25,26}. Thus, situated design enables interaction with the problems that emerge in professional practice and with the changing environment²³.

Microprojects are a form of situated design that emerges in operational contexts marked by high uncertainty and the impossibility of fully planning tasks in advance²⁷. These are design activities led by supervisors or operators that, although short-term, exhibit the fundamental characteristics of project management: they are goal-oriented, subject to time constraints, and carried out by interdependent actors²⁸.

Far from being mere improvisations or “miniatures” of classical projects, microprojects represent a redefinition of the activity. Faced with demands that are often incomplete and unstructured, operators construct local, provisional, and adaptive logics that not only make action possible but also reconfigure it in real time. Thus, they assume the role of designers of their own work system, expanding their capacity for action and enabling the fulfillment of organizational demands²⁹.

In this process, the operator adopts a rationality typical of bricolage³⁰, characterized by the use of experience and skills built up through work practice to select, combine, and transform a set of limited and previously available resources to solve complex problems. Abraçado et al.²⁹ identify two phases of bricolage associated with the microproject: one prior to action, to conceive and construct the technical system, and another during implementation, to correct the system and adapt to unforeseen circumstances.

Finally, microprojects are ephemeral and unique in nature. They are developed to solve a specific problem within a given time and space, and the system is dismantled once the task is complete. Although the material solution is temporary, the lived experience has the potential to enrich the operator’s repertoire, or their “library of situations”²⁵. This transience, however, poses a practical challenge: the consolidation of learning is not a process that occurs automatically. Operators structure the activity around schemas, that is, the invariant organization of the activity for a class of situations. The identification of invariants allows the action to be organized and reproducible, while gaps are filled by the operator according to the specific circumstances of the situation^{31,32}. Beyond the local context, this construction depends on the sharing and collective validation of these strategies among peers, which, over time, can be translated into concepts^{33,34}.

Cargo handling on offshore platforms, given the uncertainty inherent in this type of operation, often requires operators to develop situated solutions. This situated design would take the form of microprojects, which would be central to promoting occupational health and safety.

Autonomy at work, power to act, and the promotion of safety at work

Terresac³⁵ defines autonomy at work as something that emerges from the gap between what is prescribed and what is real, encompassing what is actually necessary for the system to function efficiently and safely. The concept transcends the worker’s mere freedom of action, manifesting itself as an expression of practical intelligence and the ability to create one’s own rules based on experience. It is a process of continuous social learning, grounded in reciprocity and an “invisible social contract”: to be autonomous, the individual must recognize and validate the autonomy of others.

Thus, autonomy provides the worker with room to maneuver, allowing them to go beyond the strict and blind application of formal rules, and becoming an indispensable tool for the very survival of organizations. It is an organizational condition for the manifestation of the power to act, that is, the worker’s ability to influence their work environment, expanding their repertoire of responses to real-world situations. The power to act manifests itself when the worker ceases to be a passive executor and instead actively transforms the activity³⁶.

In this sense, by assuming the role of designer of their work system, workers expand their power to act, broadening the possibilities for performing work in a safe and healthy manner. In situations of great uncertainty, this autonomy for situated design becomes central to improving working conditions and safety.

This report analyzes how situated design, manifested in the form of microprojects, understood here as dynamic and collective strategies mobilized by teams and guided by the rationality of bricolage, contributes to the construction of safety in environments of high uncertainty. To this end, a specific case involving cargo handling on offshore platforms was used, studied through an ergonomic work analysis (EWA).

Methods

We adopted the EWA approach, which is based on observations and statements from operators and aims to understand the actions they perform in their work and the adaptations they implement to solve problems on the job. EWA integrates the characteristics of the activity, its determining factors, and its effects and outcomes³⁷. The analysis was conducted on a ship-type platform operated by a Brazilian oil production company and followed three main phases: (a) an examination of the organization's operations and the workforce; (b) an analysis of the technical process and tasks; and (c) an analysis of the activity. Based on these analyses, a diagnosis was established¹¹.

The study of the organization's operations and the understanding of work processes were based on company documents—onboard crew roster, organizational charts, facility layouts, and prescribed cargo-handling procedures. This information was supplemented by open-ended interviews with team members. The data obtained in this first stage provided insight into the team's relationship with the organization and the characteristics of its members.

Next, the platform layouts, the philosophy, and the cargo-handling procedures were analyzed. The objective was to understand the designed handling methods. This information proved essential for distinguishing the situated solutions, conceived in the field, from the original procedures and plans specified during the formal design process.

These phases were carried out as part of the general study of the analyzed cases³⁸. In this general study, it became clear that, on oil platforms, situated design is not driven by isolated operators. The cargo handling team reports to the Vessel Coordinator. It is led by the logistics and transportation technician (LTT), who is responsible for managing and overseeing cargo handling operations, as well as for tracking and controlling cargo arriving at and departing from the facility.

The crane operator is solely responsible for operating the crane, which is considered the platform's primary cargo-handling resource. He operates automated devices, such as pneumatic hoists and overhead cranes, constantly contributing to the execution of maneuvers on site.

The supervisor, who spends most of his time in the cargo-handling area, is responsible for the team's on-site activities, including the planning of their tasks. He is responsible for microprojects, although in many cases this planning is a collaborative effort involving assistants and, in more complex cases, even members of other teams (engineers, operations, and maintenance teams).

The assistants handle all cargo movements weighing more than 25 kg. Handling services can be provided upon request by any team on the platform, but the maintenance team generates most of the requests. Roles for each task are assigned by the supervisor, who makes the decision based on the operators' expertise. In practice, they often participate in discussions about the design of microprojects, although this is not a formal responsibility.

In all observed cases, the cargo-handling team consisted solely of men. The operators were young (25–45 years old), due to the physical demands of this work. The supervisor was generally the most experienced member of the team (sometimes over 45 years old). The cargo-handling team observed consisted of 11 operators, including one supervisor and one crane operator per shift, with the rest of the team made up of assistants. The team composition is established by contract and may vary from unit to unit.

The analysis of the activity was based on direct observations of real work¹¹. The objective of the observations was to identify, analyze, and discuss situations representative of real work and to examine how workers dealt, in real-time, with operational uncertainties and with solutions arising from formal design. A situation representative of the work performed by the team responsible for cargo handling was selected to demonstrate how operators

implement microprojects and employ the rationality typical of *bricoleurs* to promote occupational safety and health.

These observations served as a basis for conducting interviews, with the goal of obtaining workers' perceptions of their activities. We employed a self-confrontation approach³⁹. The operators were confronted with their own activities and asked to describe the reflections that accompanied their actions. These interviews allowed us to understand specific dimensions of the activity that cannot be observed in the field but that guide the decisions made by the operators. The motivations behind key actions taken by the supervisor or the operators were also explored to understand non-observable aspects of the activity. The situated design has a strong cognitive dimension that cannot be understood without confronting workers with their own activity.

Eight technical visits to offshore platforms were conducted from 2013 to 2017. The total time spent on analysis was 32 days onboard were analyzed. The presented work situation encompasses situated designs carried out by operators and is representative of the dataset obtained in the field. In this specific situation, the action was carried out by the supervisor and the assistants, and the self-confrontation was conducted individually with the supervisor and the LTT, who observed the execution. The self-reflection process took place during 40-minute meetings, in which the participants explained the reasoning behind their actions with the aid of photos of preselected situations presented using PowerPoint. In total, however, were included 18 real-world cases, some of which can be found in the studies by Abraçado⁴⁰. The case involving the movement of the pump in the machine room was selected for the robustness of the data and the clarity with which it reveals different situations of situated design.

Results

Case: Moving a Pump in the Engine Room

The mechanical maintenance team requested the removal of a hot-water pump (weighing approximately 600 kg) from the engine room for repairs ashore. The objective was to transport the equipment to a hatch (a vertical opening that passes through different levels of the ship) equipped with an automated hoist (a device for raising and lowering loads), which served as the interface between the engine room and the main deck. The supervisor began planning the operation and, upon inspecting the site, determined that he would need to remove the pump from its cradle on the mezzanine and move it to the hoisting point, while dealing with spatial and structural constraints. The very feasibility of the operation using the original resources was considered uncertain, which would require the construction of a temporary structure to allow for safe execution without compromising the operators' health:

"We're going to use hoists to remove [the pump] from here [the mezzanine], but we're figuring out where to set them up. There's a monorail, but it doesn't run over the pump. Then we'll have to lower the unit down to the main floor". (Supervisor)

The supervisor identified potential locations for installing auxiliary hoists on the room's structures, which would allow the pump to be aligned with the automated hoist with significantly reduced effort and in a more stable, rhythmic, and safe manner. Next, the assistants arrived with the materials needed for the task and began discussing where to install the equipment. They mounted the hoist on the monorail (a suspended structure used to move a load horizontally) to better visualize the optimal locations for the other hoists; this allowed them to simulate and determine which positions for the auxiliary hoists would provide the greatest stability during the maneuver:

They saw that the monorail was there, but since it wasn't aligned, it was going to sway, right? This kind of work—using more than one hoist to stabilize the load—happens because things aren't always where we need them to be. You just have to make do. (LTT)

Two beams were improvised as anchor points using straps. Since the monorail wasn't aligned with the cradle, the other hoists were used to create a counterbalance, preventing a pendulum-like motion that would pose risks to the operators and could cause damage to the site's structures. After a first failed attempt due to a jammed support, the

team returned the pump to the cradle, removed the obstruction, and, on the second attempt, lifted the load using guide cables. Upon reaching sufficient height, they gradually loosened the auxiliary hoists to align the pump with the monorail (**Figure 1**).



Figure 1 Lifting, removal of the pump from the cradle, and alignment with the monorail

Source: prepared by the authors.

While moving the pump along the monorail, the team encountered new obstacles: the descent path was obstructed by other equipment. The solution, decided by the operators during the operation, was to install a winch (a portable device for dragging, lifting, and tensioning heavy loads in any direction) to pull the pump sideways (**Figure 2**), bypassing the obstructions until it was positioned on the lower floor. In this way, the operators created a stable system for pulling the 600-kg pump, reducing the manual handling effort and the risks posed by the instability of the suspended load.



Figure 2 Operators pull the pump with the winch to navigate around obstacles

Source: prepared by the authors.

Due to safety regulations, the activity was paused for a break. Operators are allowed to stay in the utility room for only 40 minutes for safety reasons. After that, they must rest for 15 minutes outside the room before resuming operations. During the break, they planned the final stage of the maneuver: *“We’re going to go down with a cart [in this case, a pallet jack] to move this pump to the hatch. The floor all the way there is level; we won’t have any problems”* (Supervisor).

Upon returning, they lowered the pallet jack down the shaft. One of the assistants received the pallet jack in the machine room and moved it to the pump. To position the pump on top of it, they mounted a new hoist on a

beam located above the pallet. To control the pendulum motion, two operators used the “cable wrap” technique (**Figure 3**), creating friction against the room’s structure to reduce physical exertion and ensure a gradual and stable descent, with risks and effort mitigated. Finally, the pump was moved to the hatch, connected to the main hoist, and hoisted to the deck. Once the maneuver was complete, the team dismantled the temporary systems (hoists, winches, straps, and cables), restoring the original configuration.



Figure 3 System with hoists and cables for mounting a pump on a pallet jack

Source: prepared by the author.

Analysis of the Work Situation

The specific case presented here allows us to observe that the microproject contributes to operational safety by filling the gaps left by the unit’s design and prescribed procedures, which often do not correspond to the complex reality of offshore operations.

The construction of ephemeral systems, adapted to the context of the operation and capable of filling the design gaps, allowed the organizational demand to be met in a safer and less arduous manner. Faced with the breakdown of the original resources present in the environment, such as the misalignment of the monorail with the pump’s installation site, which would have caused a dangerous pendulum-like motion, the team developed a system using mobile hoists installed on the beams, supported by straps. This context-specific design created a “counterweight system” that stabilized the load, mitigating the risk of collision and ensuring the physical safety of those involved in removing the equipment. Similarly, at a later stage, a temporary system was also devised to lift the pump to the main floor for placement on the pallet rack.

Furthermore, it became clear that the microproject continued during the course of action, as it was impossible to anticipate all contingencies of the work situation. Ensuring safety depended on the ability to adapt to unforeseen events during the execution of the maneuvers. This became evident when the team realized that the pump’s support was stuck; instead of insisting on an unsafe aerial maneuver, the operators chose to return the load to the cradle to safely lower it to the ground. Similarly, upon noticing obstacles that blocked the direct descent of the load onto the main floor of the room, the operators improvised by using a winch to pull the pump and maneuver around the obstacles, thereby avoiding instabilities not foreseen in the initial plan.

Finally, the microproject directly contributed to reducing the operators’ physical exertion. The team adopted strategies such as using the “cable wrap” technique to reduce the physical effort required to secure the load and choosing a pallet jack for horizontal transport, thereby avoiding excessive strain when handling 600-kg equipment.

These examples indicate that, by acting as designers in their work and as “*bricoleurs*,” the operators transform limited resources into solutions that make the work not only feasible but also safe and healthy. The uncertainty

inherent in the operational environment requires operators to make use of the set of pre-existing resources—in this case, mobile hoists, winches, guide cables, and others. They combine, adapt, and transform these elements of the system to construct contextual solutions to achieve organizational objectives.

Finally, it was observed that, once the handling maneuvers were completed, the makeshift systems were dismantled and removed, highlighting the ephemeral nature of these microprojects, which are used to solve specific problems locally. Although skill development occurs through practice, the solutions are designed to be context-specific, situated in time and space. This transformation occurs through a dialogic process between the supervisor and the entire team. It is a collective process marked by divergent views and the consideration of different perspectives to arrive at a solution.

Discussion

The results of this study indicate the limitations of the organizational safety approach, which is based on the illusion of control through excessive formalization and strict compliance with regulations. As indicated in the case of the pump operation, industrial safety in highly complex environments does not result from the elimination of variability, but from the system's ability to absorb it through “normal work” or work-as-done¹². Operators create ephemeral systems, temporarily transforming the environment using the available resources—a process characterized by different perspectives.

In this context, there is a need to design for uncertainty or for situations where the intended use is not yet known, recognizing that formal design contributes to safety, provided that it serves as a support for real activity. The organization plays a central role in this process by understanding work practices and incorporating them into the design, providing both material resources (tools, devices, spaces) and immaterial resources (autonomy, time) to support the action and, consequently, the rationality of bricolage³⁰. Thus, it expands the operators' room for maneuver, allowing them to complete the original design and transform an environment of uncertainty into a safer and healthier operation.

Impacts of bricolage on industrial safety

The results presented support the hypothesis that, in environments marked by uncertainty and variability, such as offshore platforms, operations do not depend solely on compliance with standards¹⁸. Industrial safety is a continuous and adaptive process of construction, in which operators' ability to devise on-the-spot solutions through microprojects^{27,29} is central to safety and operational efficiency. This approach follows the logic of bricolage³⁰, drawing on experiences and skills and building their libraries of situations²⁵.

Amalberti^{41,42} argued that every activity requires a cognitive commitment, which begins before the activity (diachronic) and involves anticipation, representation, and the creation of scenarios; and continues during the activity (synchronic) through reasoning, regulation, and adaptations constructed in the course of action. These two moments of cognitive engagement are consistent with the observation. However, in the model presented, cognitive engagement prior to action is associated with a concrete act of situated transformation of the work environment: a design of an ephemeral system, which characterizes the microproject model. A first instance of bricolage was observed when the team analyzed the environment, conceived, and implemented temporary arrangements and systems. The second instance of bricolage was observed in the design of solutions during implementation, confirming that the microproject continues in action.: when faced with unforeseen issues that arose during execution, the team adjusted its approach in real time.

Situated design, prescription, and autonomy in the context of safety

The uncertainty inherent in the operational context reveals a tension between what is planned and what is actually carried out in the offshore environment. In a scenario where rules are generic (for example, do not walk under

suspended loads) and in which operators are subjected to a wide variety of situations, many of which are not anticipated in the formal design, safety cannot be achieved through strict adherence to prescribed procedures, as these often contain gaps that can lead to accidents or health problems.

It is in this gap that autonomy manifests itself as a condition for the expansion of the operators' power to act³⁶. When the unit's original design proves to be out of step with real needs, the worker assumes the role of designer of their own work system. When developing a microproject, the worker draws on the rationality of bricolage, selecting and transforming available resources (hoists, straps, winches, among others) to create temporary solutions for specific organizational demands, thereby expanding their power to act. If the organization restricts this initiative through excessive controls, it may compromise health and increase the risk of accidents.

In this sense, to maximize the positive impacts of this situated approach, the organization must grant autonomy to operators and provide resources to foster their capacity for action, recognizing the legitimacy of bricolage in the process of building safety. The conditions for microprojects to flourish include the availability of material and immaterial resources for action—consistent with operational demands—that can be mobilized by operator-*bricoleurs*, as well as the encouragement of horizontal coordination¹³. This can enable the “library of situations”²⁵ accumulated by the most experienced operators to be shared and utilized in the development of local solutions when there are spaces for exchanging experiences and debating work-related issues.

Thus, occupational safety and health in the offshore sector depend on the recognition that operators do not merely operate systems, but that they continually supplement and modify them through their microprojects, transforming the uncertainty inherent in the environment into safe and efficient production.

Limitations and Boundaries of Generalization

The manifestation of microprojects is not ubiquitous in cargo-handling operations. Routine handling tasks, such as receiving food supplies or transferring materials to workshops and warehouses, occur regularly and follow established systems. In these scenarios, even though variability exists and requires adjustments, microprojects emerge only under specific circumstances, such as the blocking of an original route or the malfunction of a planned material-handling device.

However, expanding the practical repertoire does not guarantee that a viable solution will be devised on-site, nor does it eliminate the risk of accidents. Workers operate within adaptive constraints and rely on organizational support to cope with uncertainties. Formalizing bricolage practices and discussing work in these situations can help expand operators' power to act and contribute to the construction of safety.

Finally, regarding generalizability, the results reflect the unique context of *offshore* platforms. However, the conceptual framework of microprojects and bricolage can be extrapolated to other situations of great uncertainty, in which it is necessary to design for unforeseeable uses. CPI in general³ and construction sites⁴³ are typical environments where this type of situation occurs, as they are adaptive environments with a high level of coactivity.

Conclusions

We conclude that, in highly complex and uncertain environments such as offshore platforms, industrial safety is related to operators' ability to devise solutions in real time. The results align with the idea that situated design, manifested through microprojects, fills the gaps not addressed by prescriptive standards and inherent in local execution conditions^{29,39,40}.

It is also suggested that the actions of cargo-handling teams follow the logic of bricolage within a dual temporal framework: first, in the design and construction of ephemeral systems that mitigate design flaws; and second, in continuous adaptation during execution to respond to unforeseen physical interferences. These practices have proven to be effective strategies for reducing physical strain and the risk of accidents, contributing significantly to the improvement of working conditions.

Promoting safety and health in these environments depends on expanding workers' agency. When the operator assumes the role of designer, they expand their capacity for action as an agent of health and safety. However, for this autonomy to be effective, the organization must actively contribute by providing flexible resources that are consistent with the workers' activities and by legitimizing the teams' practical intelligence.

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