Challenges in Mobilizing Workers' Experience and Development in a Technological Transition Project

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Abstract. Studies drawing attention to the importance of considering the different users, including operators, at all stages of a technology introduction project are becoming increasingly frequent. However, other studies point out that operators are often only included in reskilling training courses to deal with the technologies introduced. In this qualitative study carried out in a company in the Portuguese industrial sector, we sought to analyze a technological transition in an inbound warehouse (use-case pallet tracking) and understand the challenges posed by mobilizing the experience of workers throughout the process. The results show that operators were only taken into account during the implementation phase and that no formal moments of development were associated with the technology. However, casuistic factors (regarding collective work and leadership) were identified, contributing to the general perception that it was a successful process. Intentionalizing these factors in future projects could contribute to work sustainability and the development of workers.

Keywords: Technological Transition · Work Analysis and Training · Experience

1 From Reskilling to the Possibility of Mobilizing Experience

Following the publication of the Ergonomic Work and Analysis and Training network's participation in the IEA Congress in Toronto [1], some challenges were identified for future reflection. Among them was the need to "qualify the sustainability conditions and criteria of learning situations in training and at work" (p. S149), associated with technological and environmental changes that have an impact on workplaces.

Several documents [2–4] outline the challenges associated with Industry 4.0 and point to the skills gap that threatens to delay companies' ability to introduce new technologies into their contexts. The solution to this gap seems to involve these workers in upskilling and reskilling processes so they can be better prepared to work with new technologies. The discussion in these documents is, therefore, no longer based on the more catastrophist view that anticipated the disappearance of thousands of jobs as a result of

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the technological revolution, but rather on its profound change. This change will require workers to get involved in initial or continuous qualification training processes to update their qualifications. In the words of Silva [5], who systematizes the position of these documents, "Workers will either 'adapt' to technological imperatives or else they will have to face the obsolescence of their know-how, which is becoming more and more labile as the capabilities of the machine advance" (p. 47).

Therefore, the reference to learning in the context of technological transition processes is not innovative. However, as the analysis carried out by Barcellini et al. [6] points out, in these processes, workers' participation is often limited to training sessions, which are designed without necessarily taking into account previous experience and skills developed because they are perceived as being out of step with the new needs of interacting with technology.

However, if "the industry of the future must be built around people and their know-how" [7 , p. 40], can we limit their participation to training moments when all the decisions have already been made? Moreover, can we undervalue the contributions that result from acquired work experience, knowing how important it is for carrying out current and future work [8, 9]?

2 Digitalization of an Inbound Warehouse Activity: A Pallet Tracking Use-Case

2.1 Case Study Conducted

This research is an exploratory case study [10], seeking an in-depth understanding of a project to digitalize work in an inbound warehouse.

Qualitative and participatory methodologies, anchored in the analysis of work activity, were used to anticipate forms of activity that may emerge in I4.0 environments [11], associated with the possibilities of mobilizing experience and developing skills.

In this study participated 10 Logistics operators, ages between 26 and 57 years old ($M = 40$) and a seniority between 1 and 26 years old; 1 Team Leader (TL); 1 Project Manager (PM); and 1 Human Resources (HR) team member.

2.2 Context of the Study

The study is part of a technological transition project developed by a supplier of technology and services company from the industrial sector in Portugal.

As the project is still in progress, at this stage, our study focuses on one of the use-cases that the company intends to test, corresponding to a pallet tracking system in the inbound warehouse. This use-case aims to introduce a technology that enables the reorganization of the warehouse, making it more reliable and agile, ensuring product traceability.

The inbound warehouse work process is divided into three parts: unloading goods and recording software, labelling the products, and storage. The technologies developed corresponded to integrating a sensor for identification and creating a pallet ID and, consequently, software to support product verification and labelling. Two workstations interact differently with these technologies. Workstation 2 (product verification and labelling) directly interacts with the software and perceives the work pace's imposition derived from the sensor's registration of the palette at Workstation 1.

2.3 Data Collection and Analysis

This section presents the data collection and analysis process carried out so far.

Data collection corresponded to the analysis of micro demographic data and documents relating to the function and process of introducing the technological system (TS); Meetings with PM and TL (3) and with an HR team member (1); and observations of Logistics operators' work activity (logistics warehouse).

Data analysis consisted of the descriptive analysis of micro-demographic data, the production of tables/schemes summarizing the observations, the synthesis of the verbalizations collected. The *Enabling Collaborative Situation* (ECS) framework [12] was used to systematize and present the analysis of the work situation.

The results that will be presented focus on the analysis of those involved during the process of introducing the new technology into the warehouse, the current work situation of the operators at workstation 2, and their training and learning processes.

3 Activity Evolution in Interaction With Technology and Workers' Experience

3.1 Management of the Process of Change Through the Introduction of New Technology

From the reconstitution of the technology implementation process in the meetings with the PM and TL, it emerged that the operators were only involved in the implementation phase of the first version of the technology (May 2022), being absent from the decision-making and design periods (beginning in 2018).

The figure of the TL in the design and implementation phases stands out for his knowledge of the operators' activities and close involvement with them.

The absence of an assessment of the future usefulness of the technology and monitoring of the implementation process was attenuated precisely by the TL's knowledge of the work activity in the warehouse and the proximity recognized by the operators.

3.2 Analysis of the Work Situation According to the ECS Framework

Concerning the first ECS criterion [12]—*learning a new and more efficient way of doing things*—the operators recognize that working with this new software allows them to get the job done faster and with fewer errors. However, they identify moments when the software is unstable: "*Work goes faster if* [the software] *is working well. Otherwise it delays more than it helps*" (Log. Op. 3). This instability leads operators to keep redundant operating modes, which they have from previous work experience, to make sure that they don't miss any critical information or make any mistakes.

Regarding the second ECS criterion—*to increase the available possibilities and ways of doing things* -, quality instructions guiding the workflow were identified. However, operators have the autonomy to introduce variations to speed up the work process, with room to manage non-conforming situations. The operators feel that their activity is not hindered by technology and is supported by the leadership ("*The guideline is to leave it alone when a* [purchase order] *has no data, but what we do is call the buyer or leave a message*" (Log. Op. 4).

In the third criterion—*adjust the human-machine couple attributes according to the evolution of situations over time*—in addition to the possibilities of autonomy to get the job done, the operators have the opportunity to participate in improving the system: they make suggestions which are analyzed and implemented according to their expertise ("*The inputs* [for improvement] *were always from the operators*" (TL); "*The operation always has to be part of* [the implementation]" (TL)). The autonomy granted to the operators comes from the management's recognition of their experience and ability to solve problems, particularly those related to improving technology: " *When the ideas are from the operation, they stand out a lot*" (TL). The operators perceive the work pace as the result of the quantity of products they receive from the pallet registration at Workstation 1 and not as an imposition by the software. In fact, when the software is working well, the pace of digital processing is slower than that of the worker, and there is a need to slow down to do a job well done.

3.3 Training and Learning Issues in the Analysis of the Work Situation

In addition, the study made it possible to highlight issues from the point of view of the conditions created for the learning and training of operators in the technological transition.

It was clear from the start that there were no formal training moments for using the new software. Still, the learning took place between colleagues, according to the needs they felt, and with the support of TL: "*I learned from my colleagues*" (Log. Op. 2); "*He [TL] came to work with the team to explain how it was done. He had a night with the team on shift*" (Log. Op. 1). *In fact, the company's choice seems to favour a close relationship between leadership and operations since the training is designed by a department associated with the plant's operations and not the people management department.*

However, it was also found that in the current situation, the activity is perceived as a learning opportunity due to (i) the possibility given to workers to manage problems when interacting with the system: "*Everything helps us to grow. If everything is easy we don't have any difficulties, but if there are deviations from the process it will help us grow*" (Log. Op. 4); (ii) the perception that this is a variable and challenging job, which requires new and adapted responses: "*you never do the same thing here and that's why I like this job*" (Log. Op. 2).

This would not be possible without the mobilization of previous individual experience and the use of an experienced work collective, visible in the recognition of the specificities of suppliers and purchase orders that determine the way of interacting with the software or the different products that require different handling and determine the forms of spatial and temporal organization in the interaction with the software.

4 Challenges and Criteria for the Development of the Activity and Workers

The analysis of this use-case allows for identifying some of the challenges that, although not new, make it possible to understand the difficulties workers face in technological transition projects and which can condition the 'use' of their know-how and experience throughout the transition process.

Firstly, we can identify the moment they were involved in the transition project. In this use-case, as pointed out in other studies [6], the operators were only considered when they needed to interact with the system to produce. In other words, they were part of the actual use of the technology. One possible consequence of this late introduction of the operators may have been the inability to find a technological alternative to the need felt by the operators at station 2 to slow down their work pace to keep up with the machine.

Alongside this challenge, the absence of a formal training and skills development strategy for operators to develop new ways of carrying out the activity was also identified. The project managers did not foresee the upskilling of these operators, contrary to what is widely believed [2–4]. Although learning took place with colleagues and TLs, there was no planning or intervention on the part of the design team to anticipate any difficulties the operators might have or to develop skills for using the system.

Despite this, the overall positive perception of the introduction of the new system seems to be due to some conditions that reveal themselves as ways to take into account the know-how of workers in technological transition processes and that can contribute to the sustainability of learning situations in training and at work [1]:

- possibility of mobilizing and developing the knowledge and skills they have, making use of their work experience, mainly because there was no disruption concerning their previous work;
- recognition by the TL of the activity carried out by the operators in interacting with the technology and solving problems arising from their work in the warehouse;
- perception by workers that the software introduced is functional and allows for the development of new ways of working and taking into account the evolution of work situations;
- having the possibility to make suggestions for improving the system and to use it collectively in a process that contributes to the development of shared skills.

While these aspects seem to us, as they do to other authors, to be essential for the sustainability of the work [8, 13], in this use-case they are the result of a favourable, but casuistic, combination of factors. However, in order to contribute to this sustainability, it would be important that these conditions were intentionalized during the project.

The operators' contribution to the success of this use-case is clear, even though they were only integrated during the use phase. As pointed out by Sgarbossa et al. [14], the underperformance of some aspects of the new system could have been minimized if the operators had participated in the different decision-making moments.

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