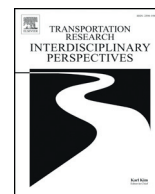




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# Activating inclusive growth in railway SMEs by workplace innovation

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### ABSTRACT

The digital revolution is happening, transforming the way we move and produce. Success in the digital revolution means that the rail industries need to use the best available technologies focusing on people. The managerial and organizational practices adopted by railway entities have considerable significance for Railway's ability to succeed in global competition. One of the challenges for railway entities is to deliver innovative products, offering quickness and flexibility to respond to changing demands from their customers. Non-technological innovations and especially Workplace innovation, have a key role to play in the digitalization and acceleration of technological developments, therefore in the railway sector competitiveness. This draws attention to the importance of innovation climate and employees' commitment aiming at improving staff motivation and working conditions, thereby enhancing labor productivity, organizational performance, innovation capability, reactivity to market change, and consequently business competitiveness. As with any emerging opportunity, there is no established path to follow to activate inclusive growth in railway SMEs to uptake Workplace innovation. To address these issues, this paper develops and tests a research model that covers individual behavior, organizational practices, and process practices of innovation among employees, analyzing the impact of Workplace Innovation on firm performance.

## 1. Introduction

The rail supply industry is considered an important sector for Europe, with a turnover of 49.2 billion and a value added of EUR 15.2 billion in 2017 (European Commission, 2019), employing 2.3 million people (Berger, 2018). The sector has seen a general growth and the overall industry is expected to grow further at a rate of 2.7% through 2023 (Berger, 2018). However, due to COVID-19 crisis the transport demand has been reduced by approximately 90% affecting the railway sector. Railway industry competitiveness and productivity growth are based, among other factors, on the capacity of the company to innovate, being railway research a key driver for maintaining Europe at the competitive edge of technical development.

The COVID-19 crisis has highlighted the need to fast-track the progress in the technological innovations developed up to date, being the digitalization the backbone of the industry. Consequently, the organizational culture of the entities must be prepared to the new revolution which will be based on technologies focus on matching the demand to supply. Regarding this situation, the role of workplace innovation as an engine to improve the innovative services and technological development will be even more important than it was before, especially among SMEs. What it is true is that learning from forced experimentation and investment in risk-mitigating technologies may help firms become smarter and more flexible. For exam-

ple, this forced experimentation has led to a better understanding of remote work.

The railway industry constituted 0.2% of all enterprises and 0.7% of all persons employed, 0.4% of turnover and 0.7% of the total value added in the EU manufacturing industry (European Commission, 2019).

Europe has got a highly competitive, professional and strongly integrated industrial railway sector though the growing mobility demands from society's-achieved by other conveyances. Railway industry implements the newest technologies developed in other industrial sectors. This presents an opportunity to lead the sector through innovation as a way to excellency.

In recent years, new business models and commercial strategies are being implemented, offering railway companies new technological possibilities, thus accelerating the innovation (European Commission, 2019). The digital revolution is happening, transforming the way we move and produce. Some sectors such as aerospace or automation have experienced fast and disruptive changes to maintain their competitiveness. However, the railway sector did not experience such fast-disruptive change as other transport modes regarding digitalization, automation and innovation in the whole system.

In the case of "digitization", the sector should focus on improving the efficiency of the current organizational structure. In these business models, however, new technologies are used to replace existing structures and eliminate traditional barriers. Railway's migration towards the Open Innovation business model has been driven by a confluence of social, economic and technological changes. Despite the great pressure of business environment

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trends, players in the railway sector are still reluctant to open their innovation strategy. Indeed, Workplace innovation (WI) has not been the priority for the sector to date, as firstly the sector has focused on technological innovation to adapt to market requirements. Thus, the big challenge for railway entities is to deliver innovative products, offering quickness and flexibility to respond to changing demands from their customers. Technological innovation needs to be implemented together with non-technological innovation and WI presents an opportunity for this, especially for Small and Medium Enterprises (SMEs), which are essential in the rail supply value chain.

This draws attention on the importance of innovation climate and employees' commitment for the adoption of WI techniques, aiming at improving staff motivation and working conditions, thereby enhancing labor productivity, organizational performance, innovation capability, reactivity to market change and consequently business competitiveness. As with any emerging opportunity, there is no established path to follow to activate inclusive growth in railway SMEs to uptake WI.

According to the [European Workplace Innovation Network \(EUWIN\)](#) initiative productivity was 20–60% higher in comparison with entities that implement traditional methods (EUWIN). Our key message is that WI is strongly related to the enhanced levels of employee engagement, innovation, improvement and customer care that build long term competitiveness.

To address these issues, this paper develops and tests a research model based on WI concept by considering the literature that covers individual behavior, organizational practices and process practices of innovation among employees and the impact on firm performance.

The analysis is an overview of the first results obtained by RailActivation project, which has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 861887. The project starts by investigating and analyzing the key competences and skills that presently characterize the railway manufacturing sector, to draw a general picture of how these are developed, in which context, and through which particular mentoring process. The project is carried out by an international consortium formed by: MAFEX, TECNALIA, DITECFER, BTS and QUINN.

This paper also shows that WI is an opportunity for SMEs, we show series of indicators providing the improvement of productivity at companies as engaging and empowering employees has shown performance improvements is different studies made in Finland, Netherlands, Sweden and the US.

We present a theoretical background drawing from a sample of 203 railway entities. Then, data analysis and results are examined. Finally, the research findings are discussed, including the limitations and concluding remarks.

## 2. Theoretical background and hypotheses

### 2.1. Approach to workplace innovation

Workplace Innovation (WI) is a relatively new concept ([Commission, 2014](#)), being a combination of structural and cultural practices that enable employees to participate in organizational change and renewal. Hence, improving the quality of working life and organizational performance ([Oeij et al., 2017](#)).

WI lies at the intersection of skills, technology and human resources management ([Beblavý et al., 2012](#)). According to the literature, we can see the European workers percentage involved in improving work organization or processes is not really high (47%), neither the percentage of consulted employees before setting the targets for their work (47%) ([Totterdill et al., 2014](#)). Studies confirm that the entities that implement both technical and organizational innovation gain competitive advantage ([Evangelista and Vezzani, 2010](#)).

WI focuses on organization of work as a form of innovation and employee participation, which aims to improve the quality of work and organizational performance. These strategies aim to promote innovative work behaviors to create, introduce and apply new ideas, processes and products

intentionally ([Bos-Nehles et al., 2017](#)). The drivers for WI implementation are divided into two main groups ([Oeij et al., 2016](#)). On the one hand, the improvement of the organization economic goals and performance quality (e.g. increase of productivity, manufacturing quality, customer service, financial performance and profitability etc.). On the other hand, the quality of working life and employee engagement (e.g. increases employee motivation and well-being, playing a particularly important role in reducing stress, enhancing job satisfaction and mental health, and improving retention etc.).

The influence of combined organizational factors and individual employee behavior adoption has not been thoroughly analyzed in the railway sector. However, research among European firms indicates a positive relation between non-technological innovation and organizational performance, all resulting in more dynamism, innovation capacity and competitiveness.

Direct employee participation impacts on productivity, innovation and quality. This has been evidenced by The Employee Participation and Organizational Change (EPOC) survey which analyzed 6000 workplaces in Europe. Organizations with semi-autonomous groups had 68% reductions in costs, 87% of these entities reduced production times, 98% improved their products/services, and 85% increased their sales ([Totterdill et al., 2014](#)). A Swedish study supports there is a positive relation between flexible, empowering forms of work organization and performance: flexible organizations were more productive (+20–60%), showed a lower rate of personnel turnover (–21%), and a lower rate of absence due to illness (–24%) ([Kroupa, 2007](#)). A review of some sixty American articles shows that WI has an impact on efficiency and performance of entities, with improvements of between 15% and 30% in the performance of those companies ([Totterdill et al., 2014](#)).

Therefore, WI not only aims at fostering innovation capacities but also allows the businesses to remain innovative and adapt to changes more quickly and smoothly. WI enhances the innovative capability of an organization via its dual focus on promoting both high-quality jobs and good organizational performance ([Oeij et al., 2019](#)). Technological research represents only 25% of innovation and the remaining 75% of the innovation that makes the technology successful is related to management, organization and work practices at the business level ([Totterdill et al., 2014](#)) ([Volberda and van den Bosch, 2004](#)) ([Pot et al., 2009](#)). According to the literature, leaders are those in charge of building an innovative climate and motivate the team towards innovation ([Wipulanusat et al., 2017](#)). Leader boosts innovative behaviors and attitudes that are conducive to innovative initiatives ([Oke et al., 2009](#)).

### 2.2. Hypothesis for the research

Based on the literature review we can confirm that in the digital transformation is influenced by the culture of innovation, the high levels of employee commitment and the capacity for organizational and individual transformation. Digital transformation is the key to business competitiveness in a changing and increasingly demanding market. However, to be successfully in the railway technological transformation, a culture that promotes innovation and creativity is needed. While the technological investment increases, the digital revolution raises other needs to complete successfully the transformation. In this sense, the adaptation of values, procedures and experiences that define the entity through its employees is one of the greatest challenges in the digital age.

RailActivation project focuses on employees within the company. WI needs managers and employees to acquire skills needed to cope with the digital transformation.

Companies must pay attention to the environment to identify the barriers that prevent teams to be more productive. By identifying these barriers can create more dynamic spaces benefiting employee's well-being and performance. Therefore, managers must believe in the WI and commit the team, as they will be the responsible of implementing the new tools and measure results to progressively move towards a full open culture that promotes digital transformation.

From the point of view of WI introduction on enterprises, the methods have been divided into 4 main groups: Individual level, organizational level, process level and results demonstrability and usefulness of innovation. Based on these groups we developed the research model (Fig. 1) and the following hypotheses:

• **Hypothesis 1.** The innovation stimulation at the organizational and process level (autonomy, team voice, innovative behaviors) and the more participatory implementation of employees is related to the positive perception of innovation.

• **Hypothesis 2.** Positive perception of innovation (result demonstrability, usefulness,) is positively related to higher innovation adoption.

### 3. Methodology

#### 3.1. Data and sample

The entities selected for this study are European entities from the railway sector. The data used was collected randomly by an online survey drawn out based on the results of the benchmark and European WI concept and indicators (Kesselring et al., 2014). The online survey was defined according to the hypotheses in order to measure WI and its influence in the rail industry. The survey was divided into three sections:

- The first section refers to the individual level and consists of 7 questions.
- The second section refers to the organizational level and consists of 15 questions.
- The third section refers to the process level, consisting of 6 questions.

Finally, we have defined a final results section, to measure the effect of these three sections on the company's WI, consisting of 6 questions. The employed questions are shown in Table 1.

The typology of questions used has been varied, using open answers, multiple-section, one-choice questions, and Linkert scale to measure the degree/disagree level. The multiple-choice and one choice questions measure the degree of WI through previously defined scores based on the literature and discussed with rail experts when compiling the measurement items.

Data was collected over 54-day period (between 02/12/2019 and 24/01/2020) and the final sample included 203 respondents from 16 European countries. (Spain, Italy, Poland, Latvia, France, Bulgaria, Sweden, Turkey, Netherlands, Check Republic, UK, Switzerland, Lithuania, Germany, Bosnia Herzegovina, Estonia). This variety of countries enriches the sample of respondents shown in Fig. 2.

Regarding the quantitative analysis, considering that European Rail Industry employs nearly 400,000 people (Berger, 2018) the study has a confidence level of 95% and a margin of error of 7%.

#### 3.2. Measurement

The autonomy and participation were measured by asking respondents to assess the decision-making structure of daily tasks and follow up results. More in detail:

- The degree of employee participation in the decision making, by employee undertaking the tasks, manager or work supervisors, or both managers and employees. A six-item scale was used to capture the innovative behavior of firms by measuring the methods implemented in the last three years for stimulating new ideas or creativity among the staff.
- The process level by the involvement of employees in improving the work organization or work process in the department or organization. This was measured by 7 item scale. Usefulness Innovation by the changes implemented in the entities. WI aims to encourage employees in the organizational changes; thus, it is measured the importance of change in work time arrangements, the use of technologies, in the recruitment policies, and changes in ways to coordinate and allocate the work to employees. Results demonstrability through the importance of organizational innovation, analyzed by confirming the importance of improved ability to

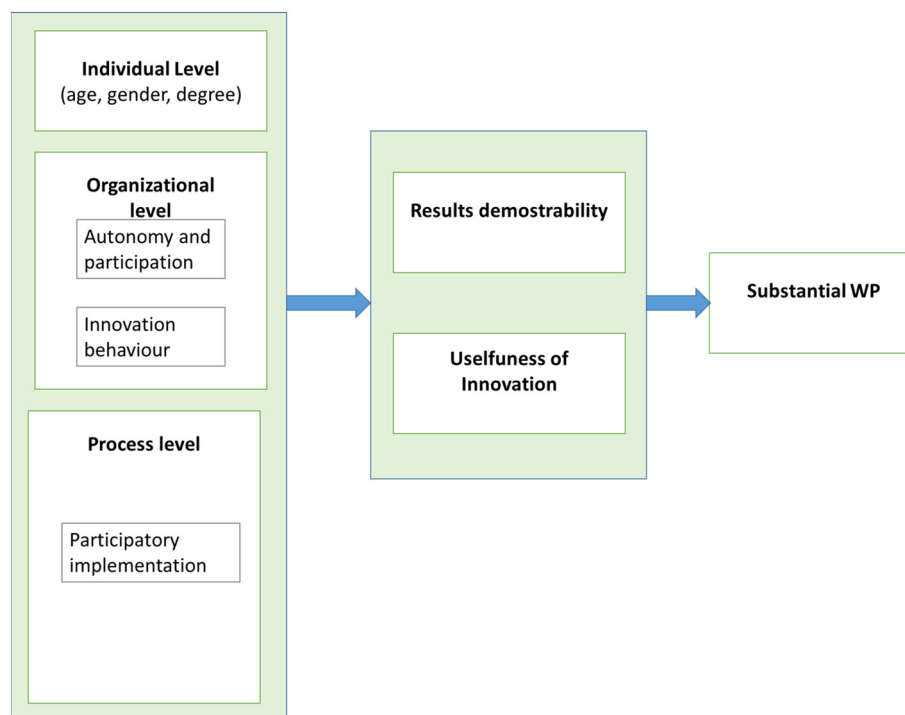


Fig. 1. Research model.  
Source: RailActivation Project

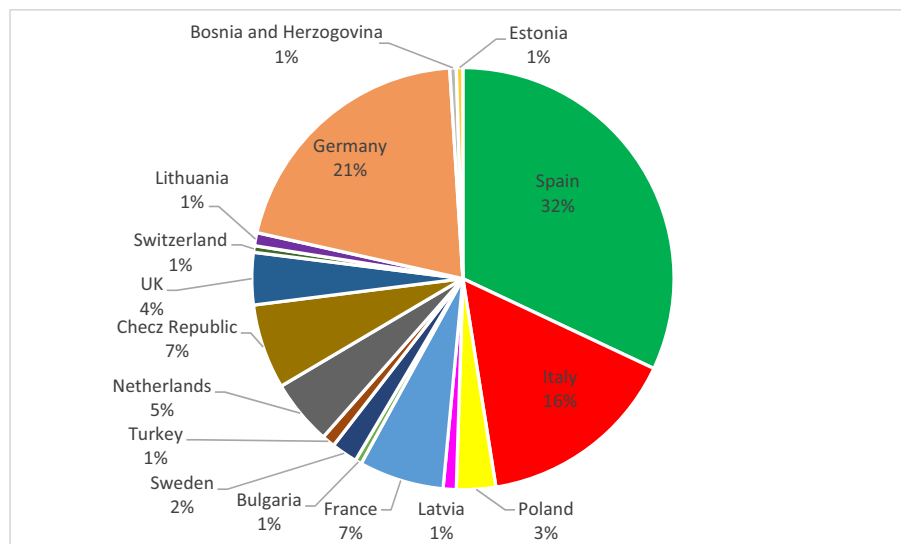
**Table 1**  
Questions employed to conduct analysis.

Individual level	Q1.1: Role in your entity. Q1.2: Gender. Q1.3: Age range. Q1.4: Education. Q1.5: Income per year. Q1.6: Year of foundation the entity. Q1.7: Location.
Organizational level	Q2.1: Have you developed any kind of these innovations in the last three years? Q2.2 How important were each of the following objectives for your enterprise's organizational innovations introduced during the last three years? Q2.3: Who developed product/process innovations? Q2.4: Which department is in charge of this innovation? Q2.5: Which of the following practices are used to involve employees in how work is organized? Q2.6: During the last three years, how important to your enterprise's innovation activities were each of the following information sources? Q2.7: During the last three years, did your enterprise use any of the following methods to stimulate new ideas or creativity among your staff? Q2.8: For each of the following statements, please select the response which best describes your work situation. Q2.9: In general, your immediate manager/supervisor: Provides you with feedback on your work, respects you as a person, is good at resolving conflicts, is good at planning and organizing the work, encourages you to participate in important decisions. Q2.10: Which of the following alternatives would best describe your skills in your own work? Q2.11: Does your job involve rotating tasks between yourself and colleagues? Q2.12: Do the tasks require different skills? Q2.13: At your workplace, does management hold meetings in which you can express your views about what is happening in the organization? Q2.14: Do employees in this establishment document and keep records of their good work practices or lessons learned, with the purpose to share these with other employees? Q2.15: Does this establishment monitor external ideas or technological developments for new or changed products, processes or services?
Process level	Q3.1: With regard to the employees doing teamwork, do most of them work in a single team or do most of them work in more than one team at the same time? Q3.2: Does the external cooperation monitor external ideas or technological developments for new or changed products, processes or services? Q3.3: Decision Making structure: Who usually makes a decision of the following matters: a) Daily work tasks, b) Follow up results Q3.4: Characteristics of Work Teams applicable for those workplaces that have teams: how well the following features correspond with the features of the teams. Q3.5: What is the proportion of employees in the workplace who have an individual training and development plan? Q3.6: Where and how actively and regularly workplaces seek new ideas for developing the operations.
Results level	Q4.1: During the last three years, has there been any organizational change? Q4.2: During the last three years, has there been any of the following changes? Q4.3: During the last three years, did your enterprise introduce: Q4.4: Non-R&D innovation expenditures. Q4.5: Does your entity introduced a new product or a new process to one of their markets in the last three years? Q4.6: does your entity introduced a new marketing innovation or organizational innovation to one of their markets.

develop new product and process, reduce time to respond customers or suppliers need, reduction of costs, improvement of quality of services or the improvement of communication and information sharing within the enterprise. Substantial WI was measured by the methods used to introducing WI, if these are focused on organizing work responsibilities and decision making, on new business practices for organizing work procedures and improved methods of manufacturing, logistics and maintenance.

**3.3. Instrument validation**

The validation of the analysis has been evaluated through the discriminant validity, measuring to what extent the different constructions diverge from each other. According to **Fornell and Larker (1981)** there is discriminant validity between two latent variables if the shared variance between pairs of constructs is less than the variance extracted for each construct (**Fornell and Larker, 1981**). We could see in Correlation Matrix in **Table 4**



**Fig. 2.** Sample description (countries).  
Source: RailActivation Project

that all the constructs met this criterion. The validity is evidenced analyzing diagonal and outside diagonal elements, in which the square root of the average variance extractors for each element is higher than the absolute value of the correlations between each item. Table 4 also shows the means, standard deviations and correlations between the measurement indicators.

To ensure the common variance method is eligible, respondents were informed that there were no right or wrong answers and their participation was anonymous (Podsakoff et al., 2003). In order to avoid deviation from the scale validation process, the measurement constructs were reduced. In this manner, unrealistic high reliability coefficients ( $r > 0,90$ ) were avoided, ensuring the validity of common method bias. The correlation matrix did not indicate any highly correlated variables. However, we should mention that common method bias is not a serious threat for our study.

#### 4. Activating workplace innovation

The paper analyzed which individual, process and organizational factors are related to the perception of innovation of employees in the railway sector, and how does this relate to the actual use of innovation by employees in organizations.

In our sample, 25% of respondents are female and 75% male. This confirms railway is male-dominated industry. According to the Community of European Railway and Infrastructure Companies—CER, the average share of women in the railway companies is about 20% (CER – ETF – EIM, 2016).

The employees' main function is mostly managerial (55%), being 28% director, 16% assistant and 1% other. Seventy-nine percent of employees work in organizations that during the last three years have introduced new products or new processes to the market. At the same time, 60,2% of the respondents confirmed that marketing innovation or organizational innovation were introduced in their companies.

##### 4.1. Current approach to innovations and development

Among organizational innovation the most frequent are the new business practices for organizing procedures (62.3%). The digitalization of the entities at this level is mostly focused the innovation in supply chain management, business re-engineering, knowledge management, lean production and quality management. More than a half of the respondents confirmed the entity implemented new methods for organizing work responsibilities and decision making in their enterprises. These improvements are focused on the use of a new system of employee responsibilities, teamwork, decentralization, integration or de-integration of departments, and education/training systems. The remaining 40.7% introduced new methods of organizing external relations with other firms or public institutions. These changes were mostly focused on the use of alliances, partnerships, outsourcing or subcontracting.

Among the objectives for enterprises' regarding organizational innovations during the last three years the higher importance was given to the improvement of goods or services quality (60%), the reduction of time to respond to customer or supplier needs (57.5%) and the improvement of the ability to develop new products or processes (47%). Companies that work in the European railway sector are prompt to introduce changes in their internal processes. In particular, great changes in the use of

technology in the ways to coordinate and allocate the work to employees, in the remuneration system, in recruitment policies and in the working time arrangements had been confirmed.

With regards the changes in the external processes, these seem to be less important than internal ones. More than half of the respondents have confirmed that their entities have implemented new methods of organizing work responsibilities and decision making. They introduced new systems of employee responsibilities, teamwork, decentralization, integration or de-integration of departments, as well as education/training systems.

##### 4.2. Perception of the organizational context

Organizational variables concern the context in which work is carried out. Technological innovation is considered a necessary condition for change and improvement, but not a sufficient one as long as WI is lacking. Therefore WI, refers to necessary accompanying organizational changes that boost technological innovation to successfully embed, being applied by employees. We measured this with the variables of autonomy and participation and the innovation behavior of employees.

Autonomy and participation concerning the degree to which employees can decide the way their work is carried out. Almost half of respondents indicated that in their company's decisions about everyday work are taken in collaboration between employees and managers. Employees are not involved in less than a quarter of their daily work decisions. Fewer employees are involved in following up results, and almost always it is done together with their managers as it is shown in Fig. 3.

Innovation behavior concerns the extent to which employees feel they are involved in the development of innovation and renewals. For all job levels, highest percentage of employee's involvement was in the development of process innovation (58,45%), as well as for product innovation (57,67%). The study reveals that employees do not feel really engaged in organizational innovation. Table 2 shown the results obtained.

Fig. 4 show the position perspective on involvement of employees into development of different types of innovations.

##### 4.3. Individual level

By individual features of employees, we mean domain-specific attitudes concerning innovation, as well as their individual characteristics, such as age and gender.

The highest level of involvement in innovation development is to the product innovation, both for women and men. The lowest level of involvement for innovation development is for organizational innovation. The only type of innovation where the probability of involvement of women is higher than men is in management innovation, with about 19% of the difference. The drawn up cross-tabulation (Table 2) allows us to see that all age groups are participating in the development of all four types of innovation.

The middle-aged employees (36–55 years old) have the highest frequency of participation in innovation development. However, if we pay attention to the average probability of participation in the innovation development for different age groups, we will see that the highest probability of involvement in innovation development are 56–65 years old (50%). The second highest involvement in innovation development is among

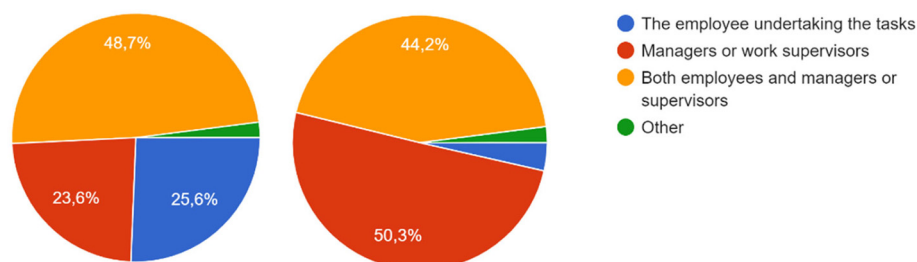


Fig. 3. Difference between decision taking for Daily work tasks and follow up results. Source: RailActivation Project.



**Table 2**  
Type of developed innovation/role in entity income crosstabulation.

Developed innovation	Position						Total (row)
	Assistant		Director		Manager		
	f	%	f <sup>a</sup>	%	f <sup>a</sup>	%	
<b>Product innovation</b>							
No	13	56,5%	13	32,5%	30	38,0%	56
Yes	10	43,5%	27	67,5%	49	62,0%	86
Total	23	100,0%	40	100,0%	79	100,0%	142
<b>Process innovation</b>							
No	9	39,1%	15	37,5%	35	44,3%	59
Yes	14	60,9%	25	62,5%	44	55,7%	83
Total	23	100,0%	40	100,0%	79	100,0%	142
<b>Marketing innovation</b>							
No	8	34,8%	23	57,5%	46	58,2%	77
Yes	15	65,2%	17	42,5%	33	41,8%	65
Total	23	100,0%	40	100,0%	79	100,0%	142
<b>Organizational innovation</b>							
No	17	73,9%	20	50,0%	53	67,1%	90
Yes	6	26,1%	20	50,0%	26	32,9%	52
Total	23	100,0%	40	100,0%	79	100,0%	142

<sup>a</sup> f = frequency.

**Table 3**  
Type of developed innovation/age crosstabulation.

Developed innovation	Age						Total (row)
	18–35		36–55		56–65		
	f	%	f <sup>a</sup>	%	f <sup>a</sup>	%	
<b>Product innovation</b>							
No	13	65,0%	42	36,5%	15	46,9%	70
Yes	7	35,0%	73	63,5%	17	53,1%	97
Total	20	100,0%	115	100,0%	32	100,0%	167
<b>Process innovation</b>							
No	13	65,0%	55	47,8%	9	28,1%	77
Yes	7	35,0%	60	52,2%	23	71,9%	90
Total	20	100,0%	115	100,0%	32	100,0%	167
<b>Management innovation</b>							
No	9	45,0%	66	57,4%	19	59,4%	94
Yes	11	55,0%	49	42,6%	13	40,6%	73
Total	20	100,0%	115	100,0%	32	100,0%	167
<b>Organizational innovation</b>							
No	12	60,0%	75	65,2%	21	65,6%	108
Yes	8	40,0%	40	34,8%	11	34,4%	59
Total	20	100,0%	115	100,0%	32	100,0%	167

<sup>a</sup> f = frequency.

young employees (41,25%), and the lowest (37,63%) is among middle-aged employees (36–55 years) (Table 3).

4.4. Process level

Process level concerns to the development of new methods/practices as a result of the implementation of different WI instruments, measured by the influence of methods to stimulate new ideas or creativity among the staff and Influence of sources of new ideas.

During the last three years, the majority of enterprises which have introduced both new product/new process or new marketing innovation/organizational innovation to one of the markets were using methods to stimulate new ideas or creativity among their employees. The most frequent was the combination of brainstorming sessions, work in multidisciplinary or cross-functional work teams.

Therefore, the entities are aware of the importance of WI. In order to measure the relations at different levels, the correlations between the different elements are shown below.

Taking into account the correlations, the relationship matrix summarized in Fig. 5 was developed. The research model show below indicates the relations between the indicators defined in the study according to the correlation matrix results.

The study aimed to examine which organizational, process and individual factors play a role in innovation adoption at the employee's level. Based on the findings, we conclude that four elements are relevant to successful innovation adoption: participatory implementation, innovation behaviors, the usefulness of innovation and results demonstrability. Participatory implementation at the process level is positively related to results demonstrability and usefulness of innovation.

As expected, there is a positive relation between innovation behavior and usefulness of innovation. But more relevant is that participatory implementation has an influence on all elements of the innovation perception of employees (results demonstrability and usefulness of innovation). Finally, autonomy and participation did not play a relevant role in the analysis, showing there is no significant influence between the perception of innovation or innovation adoption among employees.

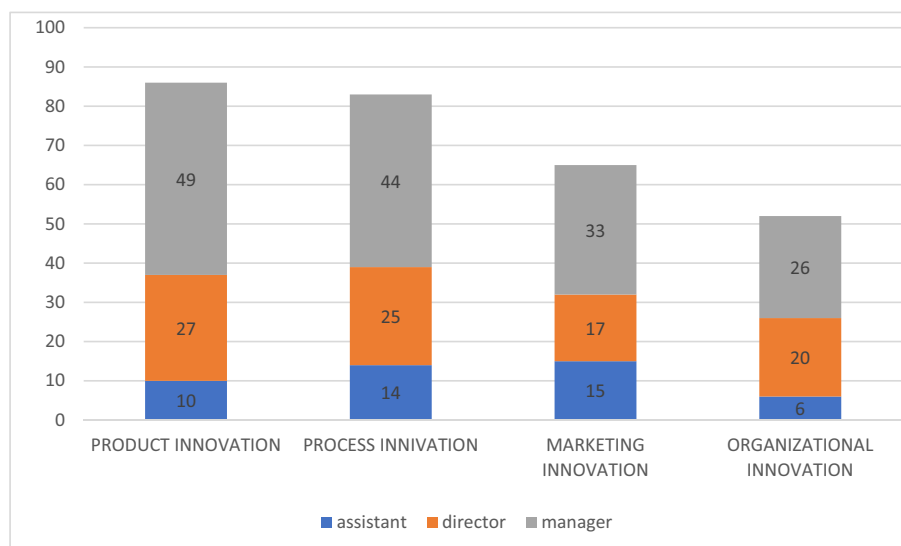


Fig. 4. Position perspective on Involvement of employees into development of different types of innovations (in frequency of participation).

**Table 4**  
Correlation matrix.

Constructs	Av	Sd	(1)	(2)	(3)	(4)	(5)	(6)
Autonomy and participation	4,46	3,05	<b>3,05</b>					
Innovation Behavior	3,11	2,29	0,02	<b>2,29</b>				
Participatory implementation	4,66	3,33	0,10	0,33	<b>3,32</b>			
Results demonstrability	4,58	2,86	0,04	0,01	0,14	<b>2,85</b>		
Usefulness of innovation	3,65	2,83	0,02	0,59	0,32	0,10	<b>2,82</b>	
Substantial WPI	3,18	2,19	-0,29	0,17	0,07	0,19	0,13	<b>2,19</b>

Significance levels:  $p < .05$ , na.

Diagonal values in bold represent the square root of the AVE.

**5. Conclusions**

The COVID-19 changes the status quo in most of EU countries. New habits and practices have been raised, which apparently have come to stay. This fact has also broken into the supply chain, affecting the railway industry. Consequently, many railway entities are rethinking their business models prior to the pandemic, which may affect in some ways to the innovation way in the organizations as the market demand is technology innovation driven.

With this in mind success in the digital revolution means the rail industries need to use the best available technologies by focusing on the human factor. This is our main resource in Europe and we do not use it enough to make our best. The managerial and organizational practices adopted by railway entities have considerable significance for Railway's ability to succeed in global competition.

From this research, we conclude as well that certain organizational aspects of WI as defined by innovation behavior are important for successful implementation of innovation. Employee engagement is an essential driver of WI (Oeij et al., 2017). At the organizational level, the results revealed that organizational factors have different impacts on innovation climate. While the everyday evolution of WI practices and incremental changes are influenced by employee-driven innovation (Høytrup, 2012), most railway entities do not use their autonomy to develop WI practices. These findings depart from the WI existing studies that suggest job autonomy can be

relevant to guide one's behavioural intentions and has influence positively the company performance (Preenen et al., 2016).

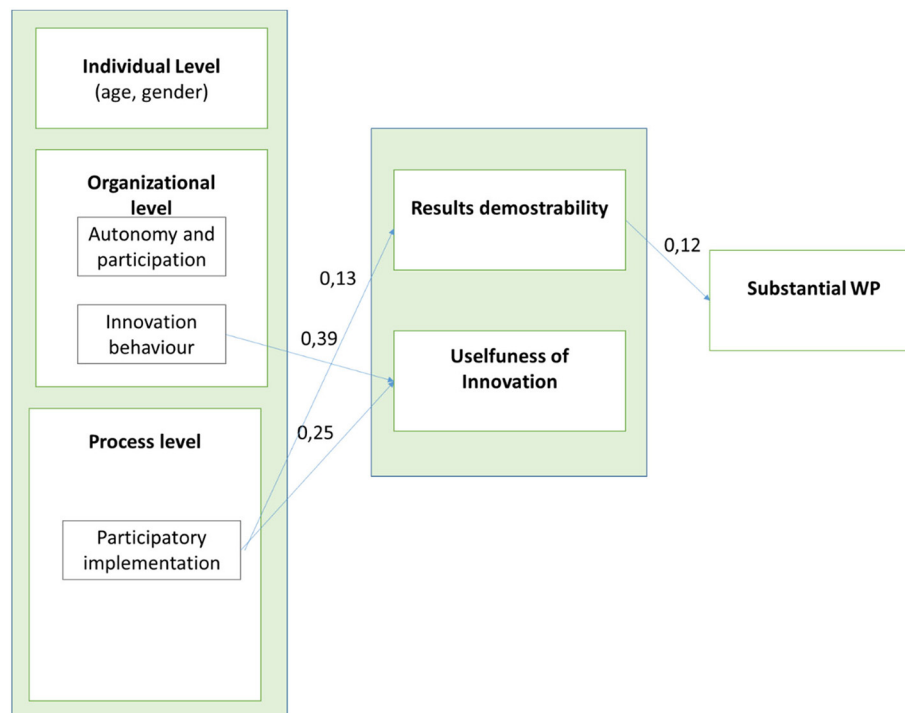
However, within the process level, the result suggest that participatory implementation has a central role in the WI Implementation. This finding is consistent with previous studies that confirm teamwork, internal cooperation and dialogue will facilitate responding to new ideas and challenges. In the correlation analysis we can see that the priority of the railway industry is to guarantee the future adapting to market trends, instead of having an organizational model focused on the performance or quality of working life. However, in order to be prepared for the future, railway entities must adapt to changes, given that the change is inevitable.

Due to the COVID-19, the short-term challenge for railway entities is to match the demand with supply, which Will require a better planning capacity, therefore, it will be necessary to speed up the management through digitalization. The biggest challenge at process level is to promote planning as the main element of management to deal with the uncertainty and complexity generated by the COVID-19 crisis. This means providing the sector with a roadmap and the capacity to make the right choices to respond future crisis that may come in the future.

Therefore, railway entities need to use their autonomy in WI to face these challenges.

There is evidence that participatory work environments and mechanisms for employee voice are associated with higher levels of innovative behavior (Beugelsdijk, 2008). Therefore, the management procedures in the railway industry should include autonomic teamwork. This means that the management should engage, stimulate and support the team apart from just suggesting ideas. Then, employees will have the opportunity to suggest in what way the ideas could be developed based on their expertise and point of view (Oeij et al., 2017) (Totterdill and Exton, 2017). The challenge now is to bridge the gap between employees and management for WI.

The sample of the companies is not enough to draw a conclusion about the WI practices applied and developed. Nevertheless, some observations can be made from these cases and we could confirm the railway industry is closely involved in the transformation towards WI practices at the process level.



**Fig. 5.** Research model correlations.  
Source: RailActivation.

The survey data shows that work teams are increasingly substituting from individual employees. The decisive issue is how work teams are put in practice in entities with hierarchical internal division and how decisions are made within the teams. A tentative conclusion of the analysis is that the change in the work system must be combined with a greater participation of the employees. Employees can commit to an innovative culture through the development of personal competences, but above all, it is important that employees have enough information to know where the company wants to evolve.

Future research would be necessary to analyze the preconditions for participatory structures within work teams. This is an essential factor in the WI since it is also related to the innovative behavior of employees and their commitment to the company. Companies in the sector need committed workers who are willing to face the industrial revolution of the sector. The European railway industry can be extremely competitive, but it will not be so in a few decades if we do not promote the transformation of workplaces to attract engage and retain young talents. As previously mentioned, the railway sector is a traditional sector, and to face the changing environment it must be prepared with an innovative culture that allows continuous change to the demands of the market. Furthermore, further research should be made on the factors that could affect railway performance in the future due to COVID-19 and to promote the acceleration of railway strategies ensuring long term sustainability of the sector.

#### Availability of data and material

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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