

CONSTRUCTION WORKERS' SAFETY PERCEPTIONS AND JOB SATISFACTION: A COMPARATIVE ANALYSIS OF DENMARK AND PERU

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ABSTRACT

This study compares safety perceptions and job satisfaction among construction workers in Denmark and Peru using a descriptive survey approach. A total of 2176 and 290 survey responses from Dane and Peruvian construction workers respectively were collected. The analysis was designed to reveal the influence of four demographic factors (age, experience, type of contract, and skill) on eight questions related to safety perception and job satisfaction. The results highlight important differences between the two countries. In Peru, safety perceptions are more positive, reflecting a strong regulatory framework, but job dissatisfaction is more pronounced, influenced by factors such as limited project portfolios and rising living costs. In contrast, Denmark shows more balanced levels of satisfaction, although gaps remain in the knowledge and application of safety measures. While demographic factors such as age, experience, and skills have some influence on the findings, they are not the main determinants. The study emphasizes the need for tailored strategies to enhance safety perceptions and improve job satisfaction in both contexts, fostering greater productivity and well-being within the construction industry.

KEYWORDS

Job satisfaction, Survey, Respect of People, Health & Safety.

INTRODUCTION AND BACKGROUND

Job satisfaction is a widely studied topic that encompasses various aspects of work life, including Health and Safety (H&S), leadership and management practices, communication, employee engagement, workplace environment, rewards, and compensation (Memon et al., 2023). Numerous studies have explored factors affecting job satisfaction and employee well-being. Methods like questionnaires, interviews, and checklists provide insights into employee experiences and highlight areas for improvement, fostering a supportive work environment that benefits both employees and organizational performance.

Safety performance measures include lost workday, recordable injuries, first aid injuries, near misses, jobsite safety inspections, worker observations, and Experience Modification Rating (EMR) on the workers' compensation insurance and worker safety perception surveys

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(Hinze & Godfrey, 2003). Among the different safety measurements, worker safety perception surveys collect data that give a broader view of safety as it is being practiced on the jobsite. To a large extent, the information provides a measure of the quality of safety management at the jobsite as perceived by the workers. Thus, the information is more subjective than most of the other safety measures. The information gives a good sense of the nature of the safety culture at the jobsite and, to some extent, the quality of the safety management efforts (Hinze & Godfrey, 2003).

Research has consistently demonstrated a connection between job satisfaction and job perception. Judge et al. (2000) noted that *"research clearly supports the link between perceived work characteristics and job satisfaction."* Job satisfaction and job perception are also strongly correlated with the Lean Principle of Respect of People (RoP). The concept of RoP is not of the emotional kind, but rather *ought-respect*; in other words, respect is due consideration (Coetzee et al., 2019). RoP refers to increasing workers' engagement and encouraging their voluntary efforts to unlock their full potential. This definition could be summarized as: Toyota manufactures cars by leveraging the capabilities of its people (Ljungblom & Lennerfors, 2021). RoP acts as the foundation that shapes how employees perceive their work and their overall satisfaction. Organizations that actively promote respect create environments where employees feel valued, engaged, and motivated to contribute, resulting in higher job satisfaction and positive job perceptions (Howell et al., 2017).

Safety perceptions among construction workers are influenced by factors such as the physical work environment, access to Personal Protective Equipment (PPE), safety training quality, and organizational culture (Wandahl et al., 2024). Previous studies have shown that fostering a safety-oriented organizational culture has proven effective in reducing accident risks and enhancing workers' sense of safety (Marin et al., 2024; Pérez et al., 2024). Moreover, implementing Lean Construction practices along with digital technologies has been shown to improve project execution and workplace safety (Tezel et al., 2019). An example is the adoption of the Last Planner System and 5S management, which have proven effective in reducing accidents by improving organization and communication (Tezel et al., 2019).

Discrepancies in safety climate perceptions among workers, supervisors, and managers can lead to higher accident rates, emphasizing the need for interventions tailored to organizational hierarchies (Ni et al., 2020). Worker involvement in safety program implementation positively influences commitment and trust in safety measures (Hackler et al., 2019). In some developing countries, however, safety challenges are exacerbated by limited safety standards, contractor commitment issues, and poor alignment of organizational goals, which undermine safety performance (Nguyen & Watanabe, 2017). Additionally, perceptions of unsafe environments cause stress and demotivation, negatively affecting productivity and worker morale (Bashir et al., 2019). Recognition and participation in decision-making processes are essential to maintaining high levels of job satisfaction (Hackler et al., 2019). Initiatives such as continuous training and people-centered organizational cultures enhance employee well-being while improving project quality and efficiency (Tezel et al., 2019). Safety and job satisfaction are interdependent. A safe environment improves job satisfaction, boosting performance and motivation (Bashir et al., 2019). Comprehensive safety programs combined with recognition strategies reduce turnover and strengthen workers' trust in their organization (Hackler et al., 2019). Effectively managing safety perceptions and job satisfaction is vital for construction project success. While developed countries offer valuable examples, developing regions face unique challenges requiring tailored solutions.

Recent studies in Denmark highlight key factors influencing job satisfaction among construction workers. Lean practices, particularly those that lead or require RoP, impact more on job satisfaction. For example, "keep workers informed about matters affecting them" and "allow the workers to evolve and improve" significantly influence job satisfaction. Hence, RoP

practices significantly enhance manager-worker relationships and overall satisfaction (Pérez et al., 2024). Unrealistic planning and limited communication have been identified as critical challenges despite incentives encouraging workers to suggest improvements (Salling et al., 2023).

Although significant research has been conducted on safety perceptions and job satisfaction among construction workers in developed countries, there is a notable gap in the literature regarding these topics in developing countries. Few studies have explored how organizational culture, safety practices, and job satisfaction differ between developed and developing nations. For the above reason, this study aims:

- To compare safety perceptions and job satisfaction among construction workers in a developed country (Denmark) and a developing country (Peru).

RESEARCH METHOD

This study adopted the Descriptive Survey method as the primary research method. Descriptive Survey research seeks to explore the significance of a specific phenomenon and examine its distribution within a population (Forza, 2002). In this study, the phenomenon being investigated is the Safety Perception and Job Satisfaction of construction workers. The survey was initially developed to apply to construction workers in the Danish Construction Industry. After the publication of its results in Salling et al. (2023), the survey has been applied in other countries. In this paper, the survey population comprises construction workers employed in Denmark and Peru. The sequence of activities for the survey development and application is listed as follow:

Step 1: To link to the theoretical level: Primary, the literature review of survey studies in different industries helps the authors to identify the main themes analyzed to understand workers satisfaction, those being: (1) Contractual characteristics, (2) Rewards, (3) H&S, (4) Relations with management, (5) Relations with coworkers, (6) Communication, (7) Worker engagement, (8) Work Environment (WE) and culture, and (9) Project management (PM). Those job satisfaction themes were grouped into three: PM, WE, and H&S.

Step 2: To design the survey. The first version of the questionnaire comprised 48 questions grouped into four sections of 12 questions: (1) demographics; (2) PM; (3) WE; and (4) H&S. The questionnaire was available in the official languages spoken in each country, Danish in Denmark and Spanish in Peru. Moreover, it was also translated to the other three predominant languages spoken on Danish job sites: Polish, Romanian, and Italian. The 12 demographic questions, initially developed to characterize the Danish construction sector, were also adapted to fit the Peruvian sector.

Step 3: To run a pilot test. The test of the survey was conducted in two rounds of assessment, including an online meeting with experts and individual evaluations, resulting in a final 39-question questionnaire. The questions are grouped into: (1) 12 Demographic Factors (DFs); (2) 12 questions related to PM; (3) 8 questions of WE; and (4) 7 questions of H&S.

Step 4: To collect data. The survey was conducted in two different ways according to the context of each country. In Denmark, most workers are used to digital devices and use personal e-mail on a daily basis. The survey was distributed through SurveyXact via email to all construction workers affiliated with a union and working in Denmark as this survey was a cooperation between one of the authors of this research and the Danish unions in the construction industry, called BAT (Danish: *Bygge- Anlægs- og Trækartellet*). The collected answers were from January to March of 2023; a sum of 3393 survey participants responded. The survey was conducted manually and digitally in Peru from May 2024 to December 2024. A total of 333 surveys were collected from five construction projects in Lima. The mixed approach was necessary because not all construction workers in Peru are familiar with or know how to use digital tools. Consequently, 70% of the surveys were conducted digitally, and 30% manually. The surveys were conducted on five projects, reflecting a micro-ecosystem of

construction projects in Peru. By focusing on complete projects, the data capture the reality of formal construction sites.

Step 5: To clean the data. To ensure result consistency, unanswered or mostly incomplete surveys were discarded. The percentage of responses per survey was calculated, and only those with 20% or more responses were considered. This resulted in a set of 2176 and 290 surveys answered from the Danish and Peruvian applications. The sample size varied due to practical constraints, such as the manual data collection method in Peru.

Step 6: To define the type of analysis. The analysis was designed with the aim of revealing the influence of four DFs (age, experience, type of contract, and skill) on questions related to H&S. Four questions related to safety perceptions were analyzed: Q1 - The amount of safety training in the current project is sufficient; Q2 - I (or someone I know) have ignored a safety procedure to meet the schedule; Q3 - I know what to do if a H&S issue occurs; and Q4 - There is a H&S representative on my jobsite. Four additional questions related to job satisfaction were also analysed: Q5 - Satisfaction with current salary package; Q6 - Satisfaction with job security and stability; Q7 - Satisfaction with performing preferred tasks; and Q8 - Satisfaction with workload. A data visualization analysis was undertaken to illustrate the workers' responses using 100% stacked bar chart, which effectively displays the composition of responses across the four DFs studied. This chart type facilitates comparisons between diverse groups or categories using a qualitative approach.

SAMPLE CHARACTERIZATION

The demographic profile of the respondents according to the four DFs selected for this study is shown in Figure 1. There are important differences in age and years of experience in the construction sector between workers from Denmark and Peru. In Peru, workers tend to be younger, with 29% under the age of 29 compared to 19% in Denmark. Additionally, the proportion of workers with less than five years of experience is significantly higher in Peru (38%) compared to Denmark (23%), reflecting a higher influx of new workers into the sector. Consequently, Denmark has a more experienced workforce, with 42% of workers aged 50 or above and 38% having more than 26 years of experience, compared to just 3% in Peru.

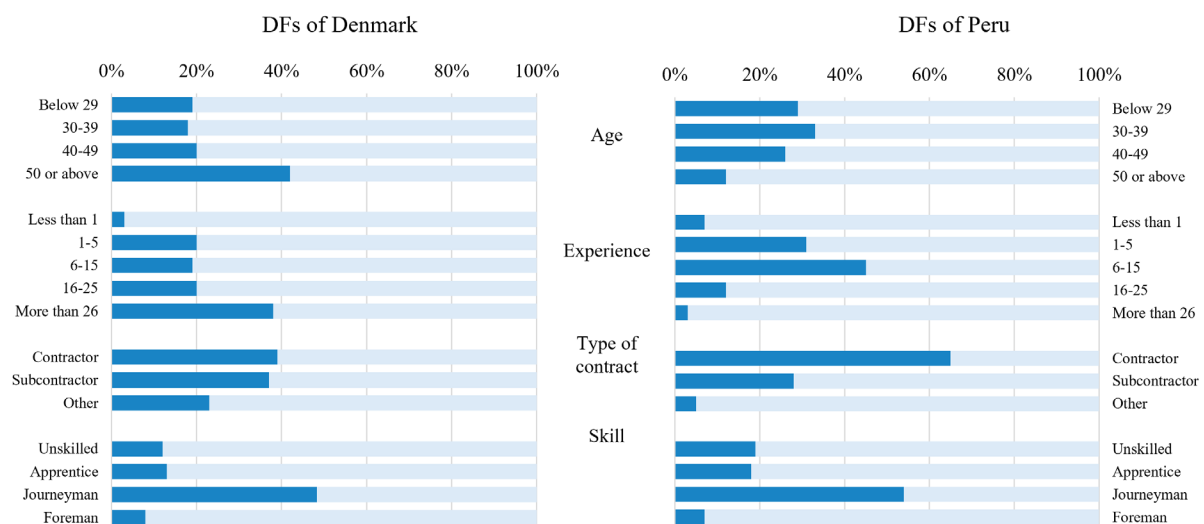


Figure 1: Sample characterization: (a) Denmark and (b) Peru

RESULTS

HEALTH AND SAFETY PERCEPTIONS

The analysis of data on workplace H&S perceptions reveals notable differences between Denmark and Peru. Below is a summary of the results obtained across the four aspects studied.

Regarding **Q1 - The amount of safety training in the current project is sufficient** (Figure 2), in Denmark, 22% of workers agreed or strongly agreed that the training provided is sufficient, while 41% expressed a neutral stance and 31% disagreed or strongly disagreed. Workers with the most experience (26 years or more) had the most favorable perception, with 26% agreement. In Peru, 66% of workers agreed and strongly agreed that they received sufficient training, with apprentices (70%) and those with less than five years of experience reporting the highest safety training perception. It is observed that in Denmark, foremen show higher acceptance of training programs, with 37% of workers indicating that they agree or strongly agree. This represents a significantly higher difference compared to other occupational categories, which may be attributed to the advanced knowledge and skills required in their role to effectively manage workplace safety. On the other hand, in Peru, no notable differences are observed among occupational categories, as all groups report acceptance levels above 60%.

As for **Q2 - I (or someone I know) have ignored a safety procedure to meet the schedule** (Figure 3), 42% of workers in Denmark reported either having done this themselves or knowing someone who did, with the groups aged 30-39 (54%) and under 29 (49%) being the most likely to engage in this practice. In Peru, 29% of workers acknowledged this behavior, with subcontractors (38%) and reporting higher levels. It is worth noting that DFs seem to play a role in Denmark. Workers aged 50 or older, those with more than 26 years of experience, and foremen tend to report different behaviors compared to middle-aged and unskilled workers, suggesting that experience and roles may influence the likelihood of ignoring safety procedures. Meanwhile, in Peru, DFs do not appear to have a significant impact, as responses are relatively consistent across different categories.

In terms of **Q3 - I know what to do if a H&S issue occurs** (Figure 4), 33% of workers in Denmark stated they are aware of formal procedures, while 29% said they have an idea of what to do, and 9% reported not knowing what to do. In Peru, 75% of workers are familiar with formal procedures, and 10% have an informal understanding of how to act. In Denmark, apprentices exhibit the lowest levels of knowledge (20%), while in Peru, unskilled workers report the lowest levels of knowledge (65%), highlighting the need for improved training within these groups. It is important to note that in Denmark, there is a clear trend where DFs, such as age, experience, and possibly skill levels, influence the level of knowledge about safety procedures. In Peru, a notable difference is observed among workers new to the sector, particularly those with less than one year of experience.

Finally, concerning **Q4 - There is a H&S representative on my jobsite** (Figure 5), 40% of workers in Denmark reported knowing who their representative is, while 24% said there is no representative and 20% claimed they do not know. In Peru, 82% of workers reported knowing and identifying their representative, with significant variations depending on skill and experience levels. For instance, apprentices in Peru achieved 92% recognition, compared to 23% in Denmark. It is important to highlight the comparison of the lack of awareness of the H&S representative (red bar) between the two countries. In Denmark, 24% of workers reported not knowing their representative, while in Peru, this is significantly lower, reaching only 6%.

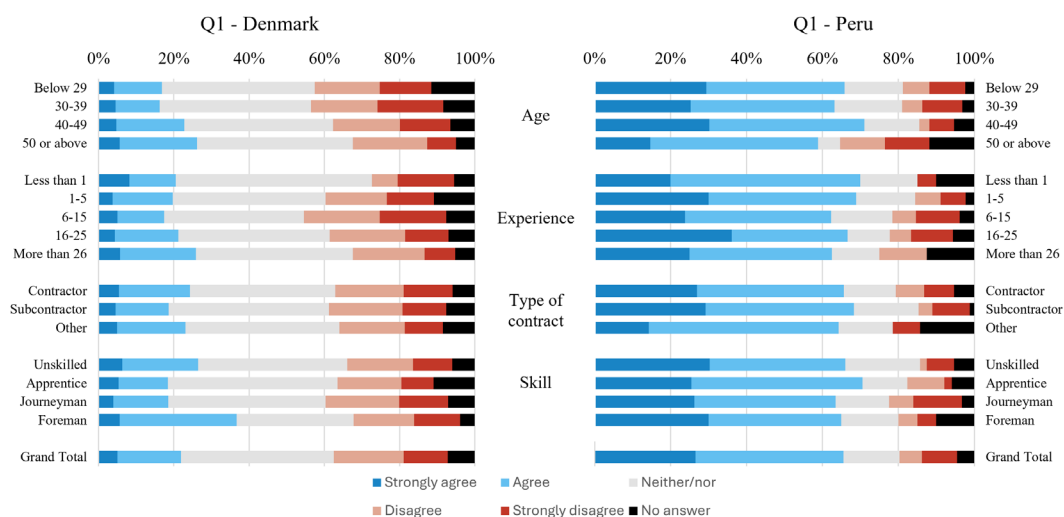


Figure 2: Q1 - The amount of safety training in the current project is enough

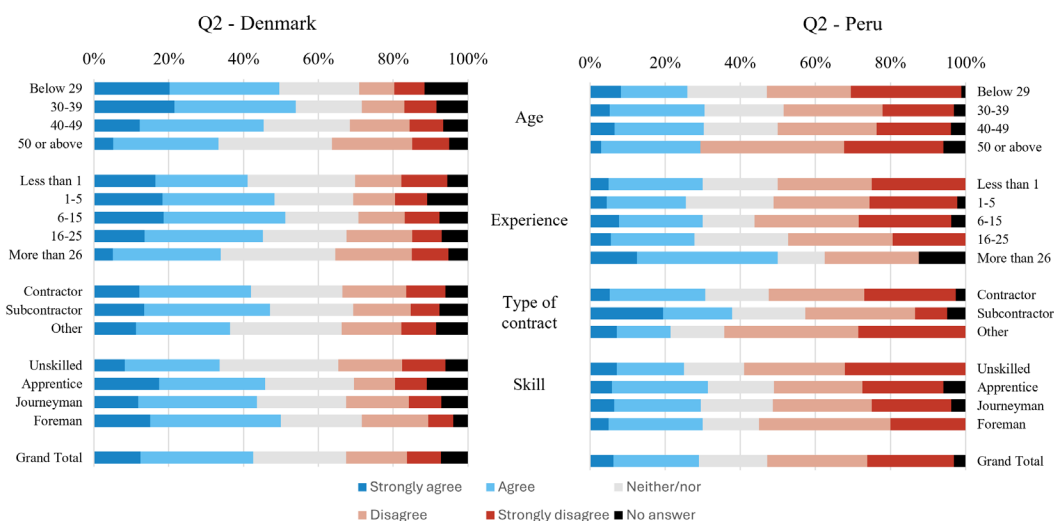


Figure 3: Q2 - I (or someone I know) have ignored a safety procedure in order to meet the schedule

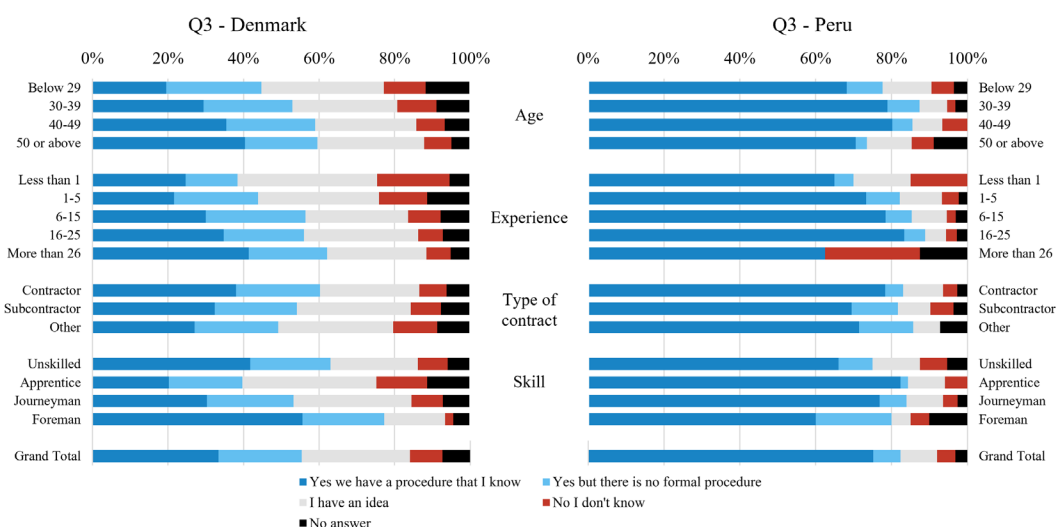


Figure 4: Q3 - I know what to do if a H&S issue occurs

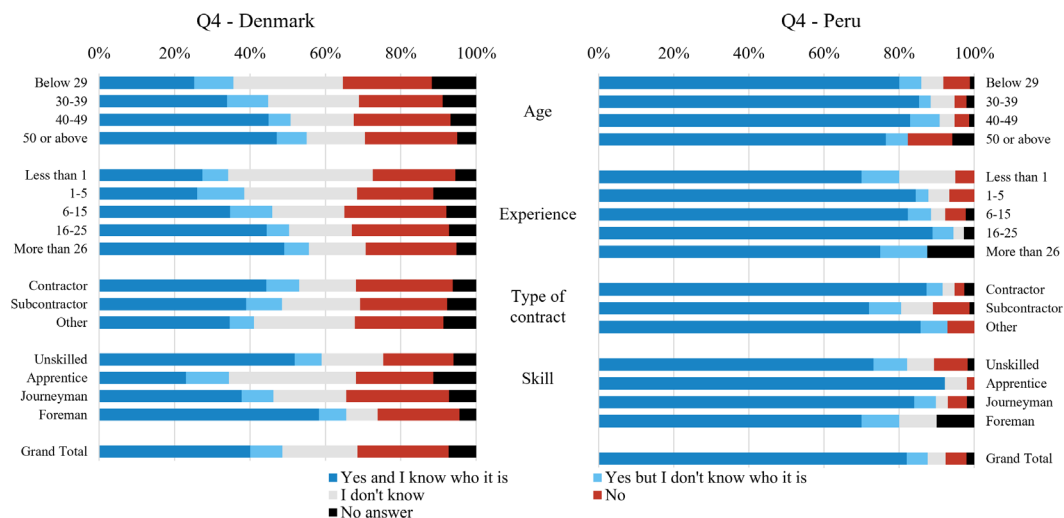


Figure 5: Q4 - There is a H&S representative on my jobsite

JOB SATISFACTION

The evaluation of job satisfaction data reveals important differences between Denmark and Peru. Presented below is an overview of the findings across the four questions assessed.

In terms of **Q5 - Satisfaction with Current Salary Package** (Figure 6), in Denmark, 52% of workers reported being satisfied or very satisfied with their salary, while 19% expressed dissatisfaction. Workers over 50 years old showed the highest satisfaction levels (56%), while younger workers under 29 had 44% satisfaction. Workers with more than 26 years of experience reported 59% satisfaction, and foremen had 60% satisfaction with only 16% dissatisfaction. In Peru, 54% of workers were satisfied or very satisfied with their salary, while dissatisfaction was higher at 29%. Among younger workers under 29, dissatisfaction reached 28%, and subcontractors reported 38%, reflecting concerns about perceived fairness in compensation.

Regarding **Q6 - Satisfaction with Job Security and Stability** (Figure 7), 66% of workers in Denmark expressed satisfaction, with 11% reporting dissatisfaction and 20% neutrality. Foremen stood out with the highest satisfaction (78%), while younger workers under 29 reported satisfied level of 62%, indicating a moderate sense of security early in their careers. However, this figure remains lower compared to the levels reported by other demographic groups. In Peru, satisfaction was slightly higher at 69%, while 18% expressed dissatisfaction and 11% neutral. Workers with 16-25 years of experience showed the highest satisfaction at 73%, while foremen also reported high satisfaction levels (70%). Apprentices and unskilled workers showed relatively lower dissatisfaction, suggesting adjusted expectations in these roles.

Looking at **Q7 - Satisfaction with Performing Preferred Tasks** (Figure 8), in Denmark, 53% of workers were satisfied or very satisfied with their tasks, while 32% expressed neutrality. Foremen had a satisfaction rate of 68%, reflecting stronger alignment with their responsibilities and experience. In Peru, satisfaction was notably higher at 73% and 13% neutrality. Journeymen showed the highest satisfaction (77%), while foremen reported 75% satisfaction and 20% dissatisfaction, possibly due to the pressures of their roles. In Denmark, however, a significant portion of workers (32%) remain neutral, while 12% express dissatisfaction. DFs are more evident in Denmark, where age, experience, and skill levels significantly influence satisfaction with performing preferred tasks. As workers gain more experience, spend more years in the sector, and advance to higher categories, their level of satisfaction increases, demonstrating a clear upward trend. In Peru, although these factors are less pronounced, differences related to experience and skills are also observed.

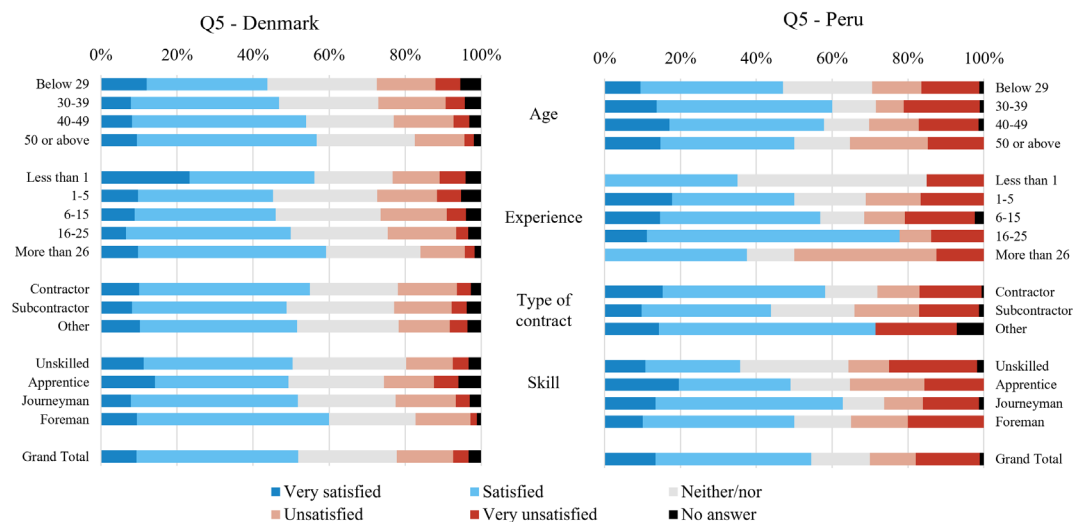


Figure 6: Q5 - Satisfaction with current salary package

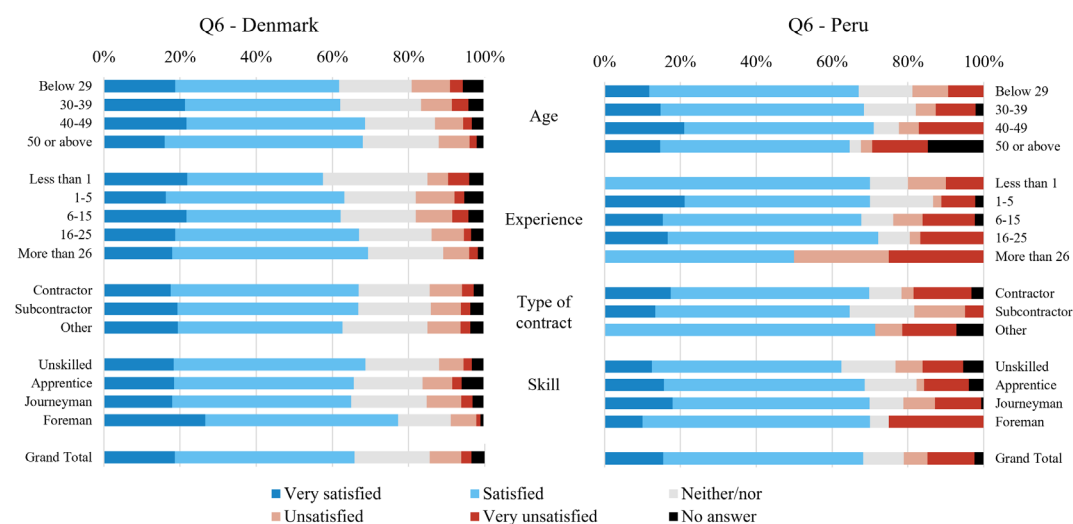


Figure 7: Q6 - Satisfaction with job security & stability

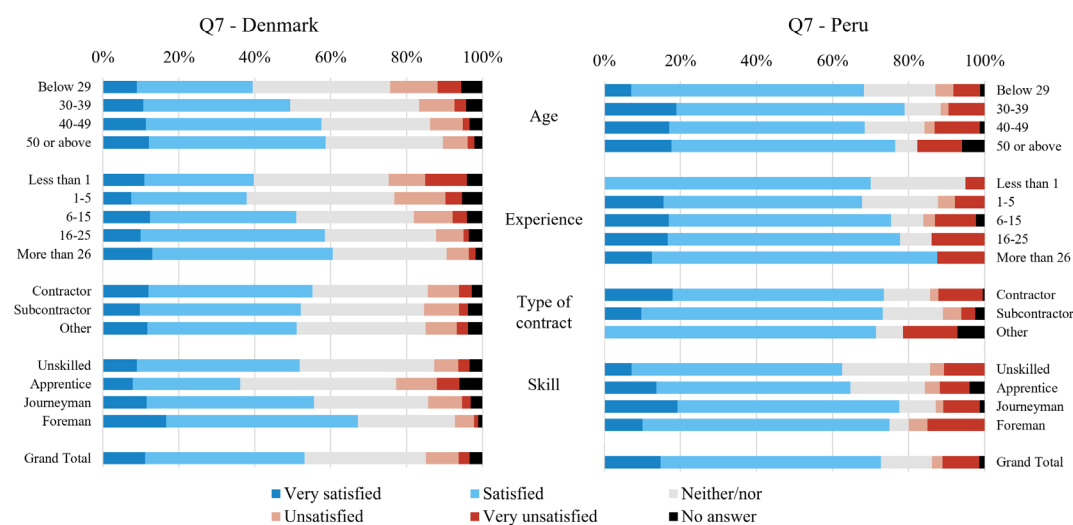


Figure 8: Q7 - Satisfaction with performing preferred tasks

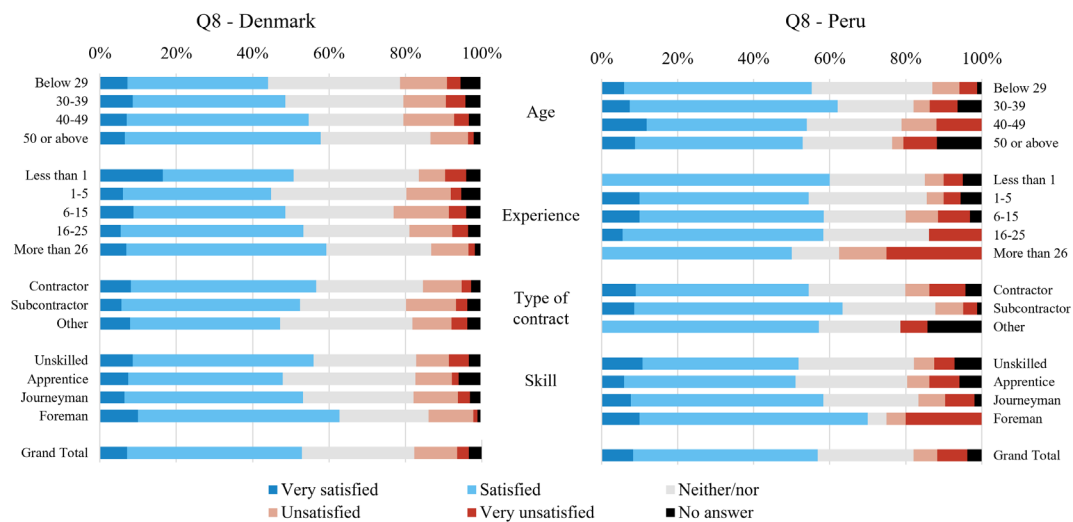


Figure 9: Q8 - Satisfaction with workload

Concerning **Q8 - Satisfaction with Workload** (Figure 9), in Denmark, 53% of workers expressed satisfaction and 14% dissatisfaction. In Peru, satisfaction was slightly higher at 57% and 14% dissatisfaction. It can be observed that unskilled workers and apprentices reported the lowest levels of satisfaction. This may be due to the nature of their roles, which often involve repetitive or less fulfilling tasks, or a mismatch between their expectations and the actual workload assigned. In Denmark, DFs such as age, experience, and skills, have a more prominent influence, showing a stepwise progression which satisfaction increases as these attributes develop. In Peru, the primary DFs affecting perceptions of workload is the skill level.

DISCUSSION

The Danish Working Environment Authority (WEA) provides guidelines to help management and workers follow safety protocols (Arbejdstilsynet, 2024a). WEA mandates that employers offer comprehensive training and guidance to ensure employee safety, regardless of experience level or project size. However, according to the Danes's answers to Q1 and Q2, these guidelines appear insufficient. This also can be seen in answers to Q3, in which, in most cases, workers do not have clear ideas about what to do in case an H&S issue occurs. Danish work environment regulations may explain the relatively large number of Dane workers who don't know their H&S representative on site as they stayed to question Q4. These require an H&S organization, including a designated representative, only when more than five workers from the same company are on-site for more than 14 days (Arbejdstilsynet, 2024b). Companies with more than nine employees must appoint H&S representatives based on workforce size (The Ministry of Employment 2021). Thus, regardless of the project budget, small projects may be exempt from these requirements.

The Peruvian implementation of a strong normative system, reinforced by Law 29783 on "H&S in the Workplace" and the construction-specific safety standard G.050, has significantly contributed to the safety culture in Peru. The presence of a well-defined regulatory framework and a conservative organizational environment has strengthened compliance among organizations, ensuring adherence to rigorous safety protocols. As a result, workers' safety perceptions, as reflected in Q1 and Q2, remain strong, demonstrating a collective commitment to upholding workplace safety standards. Key safety procedures, such as induction sessions, occupational medical examinations, provision of PPE, and the requirement for daily work permits validated by supervisors and site engineers, have established strict operational protocols for every construction task. These routines have become deeply embedded in the organizational

culture, reinforcing workers' training and knowledge of safety practices, as evidenced in Q3 and Q4. Furthermore, Continuous training programs have been vital in making workers feel supported and protected. These practices have become cultural norms in the industry, reinforcing safety as a core value. However, despite strong safety regulations, high turnover persists, as workers value job continuity, relationships, and respect more than wages. Many leave voluntarily for better conditions, such as long-term contracts or more supportive environments, showing that financial compensation alone isn't enough for retention.

While job satisfaction levels are similar in Denmark and Peru, dissatisfaction is higher in Peru. This may be due to cultural differences: Danish workers tend to choose "neither/nor" answers, reflecting neutrality and a focus on conflict prevention, which aligns with Scandinavian values of avoiding confrontation. In contrast, Peruvian workers, influenced by Latin American culture, are more likely to express their feelings and avoid uncertainty. Demographics also impact job satisfaction; in Denmark, less experienced workers are more dissatisfied, contributing to the issue of youth shortages in the construction industry. Meanwhile, in Peru and other developing countries, workers aged 40-50 often leave due to physical limitations, and older workers face job insecurity and difficulty transitioning into new roles due to outdated technology and equipment.

CONCLUSION

This study is part of an ongoing research project that aims to understand workers' job satisfaction in the construction industry worldwide through a survey application. Understanding workers' job satisfaction represents the first step for the development of new strategies for unions of trades and policymakers to improve the well-being of construction workers aligned with their real professionals' attitudes, needs, and hopes. The survey was initially developed to understand the Danish construction sector. However, the questionnaire represents an adaptable and flexible tool that researchers and practitioners in other countries can apply. This study compares two main aspects: (a) safety perception and (b) job satisfaction between a developed country (Denmark) and a developing country (Peru).

This study found that safety perceptions in Peru are higher than in Denmark, driven by a strong normative environment and a conservative culture embedded in organizational practices and daily routines for construction workers. Moreover, overall job satisfaction is similar between the two countries, except for the satisfaction of doing their preferred tasks, where Dane workers report less satisfaction than their Peruvian counterparts. However, dissatisfaction is notably higher among Peruvian workers, particularly regarding salary and job security. This study also addressed how four demographic factors impacting Safety Perception and Job Satisfaction. Regarding age and years of experience, the results showed similar answers in both countries. The middle-aged group in Peru and Denmark generally showed higher safety perception and job satisfaction levels. Concerning the type of contract involvement, subcontractor workers generally constitute an outlier in a negative direction in both countries. Looking into the level of skills, unskilled and apprentices in Denmark present lower levels of satisfaction. However, in Peru, this demographic factor seems not to impact their perception.

The study has two significant limitations. Firstly, the varying sample sizes were determined based on the characteristics of the population (e.g., Peruvian workers with limited familiarity with filling digital forms) and the data collection process. As this paper exclusively presents a qualitative analysis to capture diverse perspectives, the smaller size from Peru was adequate. However, a larger sample will be used in the quantitative phase to ensure statistical validity. Second, only eight survey questions were presented, offering a limited view of workers' perceptions on health and safety. Analyzing more questions and using additional data, such as semi-structured interviews, will provide a more comprehensive understanding.

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