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Promoting learning in the rescue department: A community of practice perspective

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Abstract

The modern digitalised workplace requires continuous learning to maintain the skills and knowledge required for civil protection work. The purpose of this study is to identify the primary factors that enable learning in the rescue department. Data was collected in semi-structured interviews with firefighters and fire officers from a Finnish rescue department. The results of the study show that peer support and learning preference are valued across organisational ranks. Technology has a crucial role as it disrupts workflows and necessitates new work requirements, while serving as a tool in social interactions, learning and knowledge management. The findings contribute to research on workplace learning through the development of communities of practice for civil protection workers, emphasising the need for collaboration and adaptive strategies for learning in the workplace.

Keywords: workplace learning, communities of practice, technology, firefighters

Introduction

The contemporary workplace faces constant changes driven by technological advancements. Organisations adopt various technologies to enhance the productivity and efficiency of their workforce. For example, in the context of the fire departments in Finland, such new technologies include mission management and shift planning software, communications devices and drones. The adoption of new technologies alters the requirements for working and completing tasks. For officers, this means that decision making processes are made within the framework of the software design and its workflows. For firefighters, changes in equipment such as drones require training time,

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and careful planning, as they alter operational procedures. New skills, competencies and retraining opportunities are required by the workforce to use new technologies in their work (Shahlaei & Lundh Snis, 2022).

While standardised or institutional education provides a foundation for working, it may not cover the specific learning requirements of different workplaces. The education and pedagogic practices implemented need to suit the work activities and workplace, and should be done through working (Billett, 2021). In order to design learning suitable for the digitalised workplace and the changes that are necessary, both the workers and the organisation need to be considered (Ley, 2020). Employees value social interactions in learning, while the organisation can assist through the provision of learning opportunities and the promotion of autonomous learning (Amenduni et al., 2022).

As a theoretical point of analysis, the social domain in firefighter workplace learning aligns with Lave & Wenger's (1991) concept of communities of practice (CoP). The three fundamental components of CoP are domain, community and practice. Domain embodies the common interest, identity or purpose linking the members. Community refers to the social nature of learning, developing relationships, collaboration and nurturing a common sense of belonging. Practice refers to the shared resources, tools and activities that evolve organically over time (Lave & Wenger, 1991; Wenger, 1998).

Despite significant research on CoPs, little is known about their application in the context of learning in rescue departments. The aim of this study is therefore to identify the primary factors that promote learning in the workplace. Interviews with firefighters and fire officers were conducted to gain insight into learning preferences and current challenges in the design of a rescue department CoP. The following section discusses the concept CoP and its implication for individuals and the organisation. Afterwards, the methodological implementation and the results are presented and discussed.

Communities of practice

Understanding the essence of a CoP involves recognising it as a social structure, where individuals converge around shared expertise, engaging in continuous learning and collaboration (Handley et al., 2006). This shift in focus sheds light on the interconnected nature of workplace dynamics and the significance of collaborative practices within a CoP. For organisations such as the rescue department, CoPs are beneficial as they foster knowledge sharing, collaborative problem solving, professional development and enhance organisational performance (Wenger et al., 2002). Learning occurs both within and across CoPs. Therefore, CoPs present an opportunity for the rescue department workers to learn within their teams, other departments in the organisation, and through external networks. Within CoPs, individuals learn through repetition, gaining legitimacy and achieving mastery. Across CoPs, learning occurs by organising discussions, acknowledging other perspectives and challenging assumptions (Oborn & Dawson, 2010).

The role of the organisation is pivotal in facilitating learning experiences. Workplaces that succeed in promoting learning share some common characteristics: participation in multiple CoPs, providing access to learning opportunities, acknowledgement of the employee as a learner in the workplace, flexibility in working, clear role expectations, continuous support and facilitating the building of relationships (Steinert, 2014).

Within the broader discourse of learning in the workplace, the concept of learning organisations describes the capacity of a company to facilitate learning and transform itself (Senge, 1990). CoPs are an integral part of the learning organisation, representing

social units such as teams, who through learning, peer support and collaboration benefit themselves and the organisation at large. Dedicated CoPs allow teams to converge and interact in groups with either shared interests, expertise, roles or geographical location (Auer et al., 2020). In the rescue department, new applications and hardware present opportunities to promote learning and adoption of technologies through CoPs. This is particularly relevant for technologies that are unknown to the majority of employees. When new challenges emerge, solutions and experience may sit within individuals, and the organisation must find strategies to share knowledge and best practices (Smith Milway & Saxton, 2011).

The implementation of such strategies requires an understanding of the organisation, its resources and capabilities. For the organisation, the provision of support necessitates an understanding of its resources and capacities, and how they can be utilised. The resource-based view (RBV) is a framework used to analyse the organisations' competitiveness through its resources and capacities (Barney, 1991), and has applications in the public sector for strategic resource management (Beck & Storopoli, 2023; Kosiol et al., 2023). The resources of an organisation consist of tangible and intangible assets. Tangible resources are physical and material, while intangible resources include aspects such as knowledge, technology and reputation. RBV research on public organisations includes social capital and job expertise to enhance learning and knowledge management (Pee & Kankanhalli, 2016). The capabilities of an organisation consist of functional work needed to create value, and its ability to dynamically manage competences through learning and social relations (Lubis, 2022). This involves balancing individual needs with organisational engagement, aligning learning opportunities with career goals, development programmes and actual training needs, as well as facilitating the acquisition of essential skills and competencies. Individuals' interests must be openly supported by the workplace through formal and informal learning opportunities (Manuti et al., 2015).

Fostering learning through communities of practice

For the purpose of CoP implementation to improve learning practices, Pyrko et al. (2017) note that workers require problems or challenges they have in common to gather around and connect through. Such shared problems provide the firefighters and fire officers with challenges to engage with the group, have time to think together and mutually engage to sustain the shared practice. In addition, participation and identification with the group can be perceived as valuable and attract further participation (Pyrko et al., 2017). As technologies change working practices, through collaborative learning, the rescue department workers can develop a shared understanding of the work processes and tasks (Bittner & Leimeister, 2014). As the groups grow beyond the initial social or operational circle, the identity of the group and ways of working may change. This provides opportunities to invite novel perspectives, alternative experiences, diversity, and further social connections (Hughes, 2010).

Workers in high-pressure occupations, such as firefighters or healthcare professionals, benefit from a sense of community in the workplace. A positive perception of their workplace community and provision of support are beneficial for reducing stress (Cowman et al., 2004), and workers develop resilience through trust, peer support, effective leadership and wellbeing in the workplace (Conway & Waring, 2021)

While the study and application of CoPs has been limited in civil protection work, they are extensively used in healthcare (Noar et al., 2023; Ramazan et al., 2024). Both healthcare work and rescue services operate in high stress situations requiring preparedness and quick decision making. For both groups, specialised training

programmes are beneficial for stress management, reducing exhaustion and depersonalisation, and to improve coping skills (Vagni et al., 2022). Within healthcare, CoPs contribute to the development of competencies; reducing organisational, professional and geographical barriers; information sharing; reducing professional isolation; and facilitation of new processes and technology (Ranmuthugala et al., 2011). Participants value the opportunity to receive and provide feedback, periodic meetings with an open dialogue, and the opportunity to exchange experiences with participants outside their organisation (Jeffs et al., 2016).

A study by Shaw et al. (2022) notes that numerous and diverse applications of CoP's within healthcare exist. However, the design and implementation of CoPs vary as they are deployed for specific purposes and work areas within healthcare. Various CoP frameworks are used, necessitating careful considerations of the pedagogic design, implementation and quality assurance (Shaw et al., 2022). Therefore, CoP frameworks developed for healthcare cannot be applied to the rescue department context as such. The design of new learning interventions through CoPs requires consideration of the learning and working processes within the rescue department. The barriers to participation identified by Gimenez et al. (2017) provide a foundation for design considerations. The barriers include: unsuitable technologies for interaction, sharing and storing knowledge; no dedicated time within the work schedule; fear of criticism; lack of facilitation; and unclear benefits and procedures within the CoP (Gimenez et al., 2017).

Prior to the implementation of a CoP, factors perceived as beneficial to learning need to be identified. The identification and integration of learning enablers ensures commitment from both employees and the organisation (Wallo et al., 2022). Therefore, the research question is as follows: how can learning be promoted in the rescue department?

Methodology

Interviews and a qualitative analysis were used to collect rich and textured data, allowing the participants to express their thoughts, understandings, perceptions and interpretations (Knott et al., 2022). Qualitative insights are valuable for exploring the experiences and perspectives on learning and how to design a suitable CoP for learning. Officers hold knowledge and carry out administrative and managerial tasks. Firefighters perform rescue operations, maintain operational equipment and train for various emergency scenarios. Four officers and four firefighters were interviewed.

An initial expert interview was held to gain insights into the workplace and the surrounding contexts, to aid formulation of the research approach, and reach potential interview participants (Monke, 2007). After the first contact with the officer participating in the expert interview, snowball sampling was conducted to reach additional interviewees (Naderifar et al., 2017). The study was conducted in Finland, using the English language to communicate between the interviewer and interviewees. Therefore, knowledge of the English language was a criteria for participation in the interview. Prior to the interviews, the research was presented to participants, and consent was collected. The interviews were conducted at the main fire station of the rescue department. The eight interviews were recorded and transcribed, with the data pseudonymised using a random number between 1 and 8. The interview duration ranged from 24 minutes for the shortest, to 56 minutes for the longest, and yielded 20,542 words of data. The interview discussions focused on how learning is organised within the rescue department, the organisational perspective on learning; perceptions on learning processes, strategies, and roles of coworkers in learning; and the influence of technologies on learning.

The research began with a deductive approach to provide the initial structure and theoretical concepts on learning in the workplace, and moved onto inductive coding for immersion into the data to develop themes (see Table 1) (Skjott Linneberg & Korsgaard, 2019). As the aim of the study was to identify how learning can be promoted, the first round of analysis was focused on concepts of CoP, workplace learning, technologies in the workplace and the RBV. The transcripts were read through multiple times during the analysis of the collected data, and ten code categories were developed. The code categories were reviewed, refined and finally merged until a theme was identified.

Table 1. Examples of data analysis

Data sample	**Concepts**	**Code category**	**Theme**
First, I try to do it myself. I try to find some information on the internet or my previous notes and documents. *Someone from our organisation shows me how to use [technology] and I just use it. If something comes up, I ask them what and how to do it, and that way it goes into the workflow.* *I arrange a meeting and we discuss the problem, and everyone can say how they feel and what will be the conclusion or improvement of that problem.* *We encourage discussions among people, about what is happening and what everyone is working on. For example, I have to show interest in what others are doing and support it.*	Perceived sense of community among firefighters (Cowman et al., 2004) Perceived formal support, informal support, wellbeing and trust among firefighters (Conway & Waring, 2021)	Independent problem solving Trust in colleagues to aid in problem solving. Support for problems in the workplace. Support for work and individual development.	Peer support
Usually there are some videos on how to do things, then there is a PDF, which you can follow. In my private life, I have noticed that if I have to learn something, I open YouTube. *More independent learning opportunities are good, because then I can learn like, in my own way, and it is written based on my own calendar.* *...we have other rescue areas around if the problem is so big that we cannot handle it by ourselves. I can ask rescue chiefs all around Finland, 'How do you solve this kind of problem?' And that is, I think, that is the main way we do it.* *When delivering training to firefighters, we wouldn't need anything to show in person, and we could do it in Teams: there are cameras, and we can see our faces, something like that. But it is best when I go there.*	Formal and informal learning in the workplace (Manuti et al., 2015) Learning methods and contexts in workplace learning (Jacobs & Park, 2009) Learning in CoPs (Steinert, 2014)	Learning resources Learning suitable for the learner Maintaining knowledge through practice Learning preferences	Learning methods
If I am like old, I'm more of the 80s firefighters, and I think a drone is a bad thing. We explain first that this is a drone, this is how it works. This is where it helps.	The changing role of technology in knowledge	Affordances of technology	The role of technology

For example, in a forest fire, you do not have to walk two kilometres to watch the smoke. We can put the drone in the air, it flies, and it looks. It eases up your work and everybody else's work. *There are a lot of good videos [on YouTube] made by firefighters on how to control that burning electric vehicle. I send it to colleagues so they can watch.*	sharing (Pan & Leidner, 2003) Roles, modes of interaction and frameworks for virtual communities of practice (Shaw et al., 2022)	Knowledge sharing	

To ensure the reliability of the data analysis, stakeholder checks with research participants were performed (see Table 2). The first check was performed following the data analysis to verify the interpretation of the data, and the second check when a preliminary version of the paper was drafted (Thomas, 2003).

Table 2. Research approach

Time	**Activity**
October, 2023	Initial theory and structure written
October, 2023	Expert interview with fire chief
November, 2023	Eight interviews with firefighters and fire officers
January, 2024	Stakeholder check #1: Interview on preliminary analysis
February, 2024	Stakeholder check #2: Interview on preliminary findings

Results

Three main categories emerged from the analysis: 1) peer support, 2) learning preferences, and 3) the role of technology. Two of the themes, *peer support* and *learning preferences,* highlight the social dynamics of learning within the workplace. *Technology* is a core part of the contemporary workplace and an interconnector for individuals and communities. Extracts from the interviews demonstrate the themes and the influence on learning practices in the workplace.

Peer support

A recurrence throughout the interviews was the process of how individuals seek out help. When a problem is perceived as minor, employees attempt to solve it independently and learn from the attempt. One of the interviewees explained:

> If it's some kind of smaller problem, of course I try to handle it myself. I like to do it myself, figure it out myself if I can. (Participant 1, firefighter)

When employees perceive that a failed attempt would have severe consequences, coworkers are consulted. In particular, employees seek out coworkers they know are knowledgeable in the problem domain. The following extract illustrates this:

> If I need to fix or repair something, and I don't know how it's done, I don't want to damage it more from my actions, I'd rather ask for help. I ask, for example, (a colleague with technology competency) or some of my other co-workers. (Participant 4, firefighter)

A common notion was that the working culture in the organisation is built on trust and respect. The workplace fosters an environment of open discussions and helpfulness, inviting members of the working community to seek and provide help, and exchange knowledge and expertise. In this respect, one of the participants stated:

> I arrange meetings and we discuss the problem, and everyone can tell how they feel and what will be the conclusion or improvement of that problem. (Participant 3, officer)

Employees stated that they have a great degree of freedom and control over their work. This was apparent both among the firefighters and fire officers. The employees are trusted to carry out their duties and perform the tasks that are their responsibility without close control from a supervisor. The mention of freedom throughout the interviews was associated with employees having options in terms of how to accomplish their work. In addition, the employees noted that this allowed for flexibility in arranging their work priorities, as one interviewee explained:

> If you have some position in the structure, you know what you have to do. Everything depends on what kind of people we have here. I think that this organisation is good, because there are different breeds of people. Not everybody has to follow these rules too closely if somebody wants to try something new and thinks differently. (Participant 6, officer)

The freedom in work has given the employees agency to explore developments in the civil security domain. The employees identify knowledge gaps and share information with each other. In addition, the employees propose ideas to supervisors, seeking improvement in training and education to adapt with the latest developments in the security domain. One of the participants explained this as follows:

> If I tell my superior that we would like to learn about electric cars, could we check electric cars next month and see how they work. In that case, we do have some possibilities to affect what we are learning. (Participant 1, firefighter)

An officer who moved from a large fire station to a much smaller one compared the two workplaces. In the big cities, specialised departments consist of a large number of employees who are highly specialised in their particular working area. Such units were seen as organisations within the organisation. In the small fire station, individuals are tasked with specialised responsibilities, making the workplace more approachable and connected. The fire department units and areas of responsibility, therefore, do not seem as distant or disconnected from the surrounding units. One of the participants explained this aspect as follows:

> Before I came to this rescue department, I was in a much bigger fire department. There were dedicated departments for different responsibility areas. I think that it was so big that they didn't have as many discussions as we have here. But here, we are so small that we have to have a lot of multi skills. So, we try to continuously discuss things, and that is kind of a natural way to solve problems here. (Participant 7, officer)

The value of learning preferences for acquiring skills and knowledge

When the participants were asked how they learn, the primary difference was between the learning of the firefighters and officers. Training was reported to be more prevalent for the firefighters, as training exercises are scheduled regularly and serve to maintain the readiness of the team for emergencies. Through education, knowledge is disseminated on new technologies, practices and threats in the domain, as the excerpt from the data below illustrates:

> If we think of the year as a clock, we have specific things that we train for at specific times. Then we might have some experts from outside our rescue department to give us lectures, for example, on some [electric] car accidents. We can train for different scenarios with other departments, with people that know the thing better than we do. (Participant 2, firefighter)

Officers do not have planned regular training sessions as part of their work. Dedicated training sessions are held on mission management tasks, while the majority of the learning is aligned with the officers' position and responsibilities. Depending on the person's position and interest, they can choose the learning they require to perform their work, as one of the participants explained:

> Firefighters have to do the scheduled training. But I don't have that kind of training. So, it's like, in my own interest, motivation to find my own training. (Participant 7, officer)

The participants highlighted the significance of learning in an environment where knowledge sharing is motivated by the organisational culture. The participants mentioned having trust in coworkers who are knowledgeable in the domain they teach and appreciated feedback in the learning process, as the following interview extract illustrates:

> If you know the drone, you know how it works. It relieves my stress when I think I know it and I show it to you. And you, for example, are the professional in that field and you give the feedback to me that 'yeah, you know it and you can do it'. (Participant 4, firefighter)

The above example highlighted that employees value the acceptance from experienced co-workers. They gain confidence when their skills can be demonstrated to the teacher and receive constructive criticism. To be able to provide feedback to the learner requires the teacher to have practical experience with the technology as well as explicit knowledge of how it works. One of the participants explained:

> For example, colleagues if they know the thing, if they are experienced and they really know. But if a drone is new to me and to my colleague, I don't feel confident if my colleague says ''yeah, you can go and fly it''. It has to be someone that has done it and knows it and can evaluate my skills and give me feedback. The feedback is the most important thing. (Participant 2, firefighter)

When asked about their preferred learning methods, the participants preferred that the introduction be given by a teacher, regardless of whether the knowledge delivery would be theoretical or practical. Learners want opportunities to learn independently, whether it is in between scheduled learning sessions or after the end of the planned learning. This requires learning materials to be suitable for the learning subject, and to involve video tutorials, texts, or space for practice. In addition, the participants reported valuing learning materials which would allow for more flexibility in scheduling their learning. The fire

station works in four shifts, and it requires adaptation and multiple sessions to ensure all employees have completed the learning. One of the participants explained:

> Most people do things partially. They have to do something else also. So, they don't have a large amount of time to teach people, for example. Those [learning] materials could always be better, so that people are able to study independently. (Participant 5, officer)

When the participants elaborated on teaching and training, the majority of the negative sentiment revolved around financial and time limitations. A limited budget means that often external expertise cannot be hired to deliver teaching to the staff, or participation in paid courses cannot be done. One of the interviewees explained:

> Money is always something we don't have enough of, and time also. And maybe teachers also, we don't have enough teachers. So, the same workers have to compensate for the lack of time and money and teach everybody else. (Participant 8, officer)

The role of technology in teaching, learning and collaboration

Technology adoption has resulted in greater productivity in the workplace. With software decision making is becoming digital, processes are automated and streamlined. The need for fewer employees leads to the concentration of responsibilities and tasks within the remaining workforce. Employees require knowledge specific to their roles, as well as knowledge to perform administrative tasks. One of the participants explained:

> [Technology] is making work faster and faster. If, 20 years ago, you had a position like this [officer], there would be a lot of meetings and secretaries. Sitting in meetings, you make some decisions, and that's it. But nowadays, all the time, you get so many more tasks which you have to finish the same day. There is email, and a lot of different programs which are becoming more complicated all the time. Ten years ago, we had people to help do some things. But now you have to do those things by yourself. (Participant 5, officer)

To acquire knowledge in the civil security domain, workers use technologies to explore the practices of their peers. Knowledge is available in forms of articles, videos and social media. The interviewees connect with their colleagues to learn practices from across the country and abroad. Technology has provided practitioners with access to observe and learn from peers from across the globe. One of the participants explained:

> I see what some other countries do, what it's like in the USA, what it's like in Sweden, what it's like in Norway; that is something where I might find new ideas, new things that I could bring and try in Finland. (Participant 2, firefighter)

Networks are formed where knowledge is exchanged, and individuals ask for advice and opinions on the latest developments in the domain. Although more common among officers as representatives of departments, annual events, such as seminars and conferences allow for learning and the exchange of knowledge among experts. Employees also have alumni networks and acquaintances from joint exercises where connections are established and serve similar purposes. One of the participants explained:

> I have discussions with colleagues from other rescue departments. If something new comes here and I don't know what it is, I might call the colleagues from, let's say Helsinki or Espoo. ''Oh, do you have this? What do you think? Have you used it on missions?'' [Technology] is something that always intrigues us, but does it really work in the mission? Does it bring us anything good? (Participant 1, firefighter)

Thus, the majority of teaching has to be delivered internally, by employees. However, the employees do not always possess the expertise needed to teach on certain topics. The second constraint is time, as their preparation is limited in how many hours they can dedicate to preparation and delivery. The participants highlighted that a broader participation in the selection of technology could be beneficial. Having more employees trial new technologies and exchange opinions would provide more insight into its suitability for the workplace. When purchasing the new technology, experts should be hired to provide the teaching to the first group, ensuring that multiple employees have knowledge which can be disseminated internally. One of the participants explained:

> And when the technology has been bought, and we are trying to use it, at that stage, we should use the money to hire a professional person to teach us how to use it, instead of someone on our own staff who may be not that good at using it or teaching that technology, trying to teach the other individuals. Then no one knows how to use it. That's the stage when the money should be spent and not let it go to the stage when employees say ‘‘we don’t want to use it’’. (Participant 6, officer)

Discussion

This study aimed to identify factors which could be beneficial to learning in a rescue department. By identifying factors beneficial to learning, a CoP can be designed to support competence development in the organisation. The results highlight the need for peer support, supporting learning preferences, and the role of technology in design considerations for a rescue department CoP.

Peer support in the workplace context is contingent on interpersonal relationships. Workers value trust, honesty, collegiality and communication as determinants of peer support. This result is in line with previous research reporting on the importance of peer to peer support towards positive perceptions of the workplace and the use of CoPs (see Deraney, 2022). Providing help and feedback, discussing errors and trust were mentioned by the participants, all conducive of a supportive learning environment. Similarly, perceptions of support from the supervisor are indicative of having support from the entire organisation. Organisations providing a supportive learning environment and development opportunities are more likely to retain talent (Grohnert et al., 2021; Lehtonen et al., 2022). Support from supervisors and peers are positively correlated with job performance, job satisfaction, and role clarity (Agarwal et al., 2020). Support is required by the organisation in establishing the CoP. Over time however, the leadership and facilitation must be driven by the participants. Such responsibility should not be determined by one’s position within the organisational hierarchy. Instead, the potential leader must know how to inspire, provide guidance, validate ideas, foster imagination, exploration and discovery (Serrat, 2017).

The help seeking behaviours present in individual cases could be transferred to group settings. Within the CoP context, help seeking practices would benefit the group in facilitating interactions and deliberations. Rather than disrupting existing processes, these identified preferences for peer support and learning methods could be implemented within the CoP. For the rescue department, the practices include active sharing, the provision of lessons, a knowledge database and the capture of knowledge through reflection, experimentation, and communication (Oktari et al., 2020). As such the rescue department can make use of informal learning opportunities to support its staff. A role dedicated to learning support, such as a mentor, in collaboration with the CoP leadership could aid in identifying challenges and actively support participants to benefit from the CoP. Such roles within the CoP necessitate training and knowledge to support workers

(Viking & Nilsson, 2024) but offer a means to strengthen organisational competencies as well as improve on the understanding of roles and responsibilities (Foglesong et al., 2022).

Learning preferences refer to the varied needs and learning requirements necessitated between individuals, and between firefighters and fire officers. For the firefighters, pre-planned training provides a helpful structure and annual goals. Although the training is focused on each individual, the participants note that learning from experienced members provides a safe space to practice and receive support. Fire officers shared the same notion. Although the officers do not have training exercises, administrative work is individual and role specific, while organisational and national policy meetings allow for social learning and knowledge exchange. This suggests that within mandated learning structures the working community provides valuable support in learning, creates a sense of belonging, generates meaningful social connections, and improves self-confidence (Maccabe & Fonseca, 2021). The social learning process is a desirable addition to necessary learning materials and supplements the methods through which knowledge is represented. Learning materials in the form of videos, presentation and meeting documentation present learning artefacts to reflect on learning and collect knowledge for sharing and preservation. One of the design considerations of the CoP is therefore knowledge management and means of interactions that allow the collection of knowledge and various means of representation.

Considering peer support and learning needs, the technological requirements of the CoP are framed. The diversity of ranks and roles in the rescue department requires systems which are suitable for the collection, storage and classification of information. Therefore, multiple tools may be required to establish and manage groups, in which CoP interactions and learning occurs, external connections are made, and resources and capabilities are developed and monitored. The use of multiple technologies would allow the CoP to adapt and change when necessary to retain members, knowledge and its aims. Prior research confirms the adaptive power of CoPs and their potential in surpassing challenges across organisational boundaries (Garavan et al., 2007) . The need for internal teaching provides opportunities to define adaptive roles within the community, having knowledgeable facilitators through learning exercises and collaborative tasks. The organisation's support for CoP would fortify its validity as an avenue for peer support and learning, as well as a means to further the resources and capabilities of the organisation.

As noted by *participant 8*, an officer, resource constraints limit the capacity of the organisation to prepare teaching materials and deliver the teaching. An employee-driven learning approach could alleviate the resource restrictions while making productive use of the employee's own capacities. RBV research on public organisations shows that top management and the human resources (HR) department are critical in enacting such changes to increase human and social capital (Collins, 2021). HR strategies need to consider employees, their experience, knowledge and how to utilise their potential. The employees, technical infrastructure, processes, working culture, and values of the rescue department provide the fundamental resources, from which an organisational transition begins and is shaped to develop its new learning strategies (Szymaniec-Mlicka, 2014). The CoP provides an opportunity to alleviate resource constraints by moving the responsibility of teaching from officers to the individuals. As an intermediary, the CoP provides individuals with peer support and collaboration, while officers transition from an active teaching role to a mentorship role.

The first limitation of this study is the focus on the Finnish context. It is possible that the inclusion of additional countries in the study would produce different results. The

focus on a small subgroup of practitioners does not produce outcomes that are necessarily applicable to other countries. In addition, the use of English may influence the expression of thoughts and their interpretation.

The second limitation is the limited scope of the study. The study examined only firefighters and fire officers, limiting the findings to the rescue services domain. While the outcomes are primarily relevant within the rescue services domain, they may offer valuable insights into the promotion of learning within the context of rescue departments.

Conclusion

The contemporary workplace, driven by technological advancements, is undergoing constant changes necessitating the adoption of various technologies for enhanced productivity. The transformative impact of technology on work tasks mandates continuous learning and the acquisition of new skills by the workforce (Shahlaei & Lundh Snis, 2022). Workplace learning encompassing formal and informal methods is essential for individual development and organisational development, emphasising the need to align learning opportunities with career goals and organisational needs (Jacobs & Park, 2009; Manuti et al., 2015).

This study delves into the workplace learning of firefighters, examining the influences on learning within a framework of communities of practice (CoP). Communities of practice (CoP) serve as social structures, where individuals converge around shared expertise, fostering continuous learning and collaboration (Lave & Wenger, 1991; Wenger, 1998). CoPs within workplaces, whether in-person or virtual, contribute to knowledge sharing, collaborative problem-solving and professional development (Wenger et al., 2002).

The research methodology involved purposive sampling and semi-structured interviews with firefighters and fire officers, exploring learning strategies, the impact of technology on learning, and influences on workplace learning. The analysis identified three main categories: peer support, learning preferences, and technology. Peer support emerged as a vital aspect, emphasising the culture of trust and open discussions within the organisation. Resource constraints, particularly financial and time limitations, contextualised the challenges in learning arrangements. To ensure the reliability and validity of data, stakeholder checks were performed with research participants during data analysis and the draft version of the paper.

Technology adoption played a crucial role in knowledge acquisition within the civil security domain, enabling practitioners to explore global practices and connect with peers for knowledge sharing (Pan & Leidner, 2003).

The study recommends a more inclusive approach to workers' learning practices. It underscores the significance of carefully assessing workplace dynamics and requirements before introducing new technologies and needs for learning. Workplace dynamics can be assessed through the organisation's employee engagement strategies, such as practices for communication, recognition, and growth of employees. In addition, by examining the work culture in the organisation, the dominant values, norms, and social engagement can be observed. Employee engagement strategies and working culture both influence job satisfaction (Khan et al., 2024). CoP design should therefore include opportunities for workers to improve their self-efficacy, strengthen relationships and build their collective identity (González-Anta et al., 2023). Trust and commitment by members and the organisation are fundamental in both the design and implementation processes. Members require facilitation and a stimulating environment to engage (Shaw et al., 2022).

Further research on CoPs for the rescue department is needed to understand the practical implications of how to motivate workers to join, continue participating, and manage knowledge within the CoP. Enabling workers to learn through work promotes the working environment as a learning practice (Billett, 2023), highlighting the potential of CoPs to help overcome resource constraints and fostering workplace learning.

Declaration of conflicting interests

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References

Agarwal, B., Brooks, S. K., & Greenberg, N. (2020). The Role of Peer Support in Managing Occupational Stress: A Qualitative Study of the Sustaining Resilience at Work Intervention. *Workplace Health & Safety*, *68*(2), 57-64. https://doi.org/10.1177/2165079919873934

Amenduni, F., Ryymin, E., Maetoloa, K., & Cattaneo, A. (2022). Facing Disruptive Changes With Informal Workplace Learning Strategies: The Experience of European Companies. *Frontiers in Psychology*, *13*, 889850. https://doi.org/10.3389/fpsyg.2022.889850

Auer, A. M., Hanson, P., Brady-Fryer, B., Alati-it, J., & Johnson, A. L. (2020). Communities of practice in Alberta Health Services: Advancing a learning organisation. *Health Research Policy and Systems*, *18*(1), 86. https://doi.org/10.1186/s12961-020-00603-y

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, *17*(1), 99-120. https://doi.org/10.1177/014920639101700108

Beck, D., & Storopoli, J. (2023). *Strategic resource management in private, public, and mixed-owned organisations in cities: The power of strategic urban networks*. *14*(2), 198-223. https://doi.org/10.1504/IJSEM.2023.131134

Billett, S. (2021). Mediating worklife learning and the digitalisation of work. *British Journal of Educational Technology*, *52*(4), 1580-1593. https://doi.org/10.1111/bjet.13115

Billett, S. (2023). Relevance of Workplace Learning in Enterprise Transformation: The Prospects for Singapore. *Singapore Labour Journal*, *02*(01), 6-21. https://doi.org/10.1142/S2811031523000128

Bittner, E. A. C., & Leimeister, J. M. (2014). Creating Shared Understanding in Heterogeneous Work Groups: Why It Matters and How to Achieve It. *Journal of Management Information Systems*, *31*(1), 111-144. https://doi.org/10.2753/MIS0742-1222310106

Collins, C. J. (2021). Expanding the resource based view model of strategic human resource management. *The International Journal of Human Resource Management*, *32*(2), 331-358. https://doi.org/10.1080/09585192.2019.1711442

Conway, R. R., & Waring, S. (2021). Facilitators and barriers to developing firefighter resilience. *Disaster Prevention and Management: An International Journal*, *30*(3), 327-339. https://doi.org/10.1108/DPM-06-2018-0186

Cowman, S. E., Ferrari, J. R., & Liao-Troth, M. (2004). Mediating effects of social support on firefighters' sense of community and perceptions of care. *Journal of Community Psychology*, *32*(2), 121-126. https://doi.org/10.1002/jcop.10089

Deraney, P. (2022). "Because more trust now": The Role of Peer Observation of Teaching in Building a Faculty Community of Practice. *Qualitative Research in Education*, *11*(3), 270-297. https://doi.org/10.17583/qre.10266

Foglesong, D., Spagnolo, A. B., Cronise, R., Forbes, J., Swarbrick, P., Edwards, J. P., & Pratt, C. (2022). Perceptions of Supervisors of Peer Support Workers (PSW) in Behavioral Health: Results from a

National Survey. *Community Mental Health Journal*, *58*(3), 437-443. https://doi.org/10.1007/s10597-021-00837-2

Garavan, T. N., Carbery, R., & Murphy, E. (2007). Managing intentionally created communities of practice for knowledge sourcing across organisational boundaries: Insights on the role of the CoP manager. *The Learning Organization*, *14*(1), 34-49. https://doi.org/10.1108/09696470710718339

Gimenez, R., Hernantes, J., Labaka, L., Hiltz, S. R., & Turoff, M. (2017). Improving the resilience of disaster management organizations through virtual communities of practice: A Delphi study. *Journal of Contingencies & Crisis Management*, *25*(3), 160-170. https://doi.org/10.1111/1468-5973.12181

González-Anta, B., Pérez De La Fuente, I., Zornoza, A., & Orengo, V. (2023). Building Sustainable Virtual Communities of Practice: A Study of the Antecedents of Intention to Continue Participating. *Sustainability*, *15*(21), 15657. https://doi.org/10.3390/su152115657

Grohnert, T., Meuwissen, R. H. G., & Gijselaers, W. H. (2021). Retaining the learning professional: A survival study on workplace learning in professional service firms. *Human Resource Development Quarterly*, *32*(4), 577-595. https://doi.org/10.1002/hrdq.21436

Handley, K., Sturdy, A., Fincham, R., & Clark, T. (2006). Within and Beyond Communities of Practice: Making Sense of Learning Through Participation, Identity and Practice*. *Journal of Management Studies*, *43*(3), 641-653. https://doi.org/10.1111/j.1467-6486.2006.00605.x

Hughes, G. (2010). Identity and belonging in social learning groups: The importance of distinguishing social, operational and knowledge-related identity congruence. *British Educational Research Journal*, *36*(1), 47-63. https://doi.org/10.1080/01411920902834167

Jacobs, R., & Park, Y. (2009). A proposed conceptual framework of workplace learning: Implications for theory development and research in human resource development. *Human Resource Development Review*, *8*(2), 133-150. https://research.ebsco.com/linkprocessor/plink?id=b3f06f6e-6405-3aa6-8862-d7e975f02c21

Jeffs, L., McShane, J., Flintoft, V., White, P., Indar, A., Maione, M., Lopez, A. J., Bookey-Bassett, S., & Scavuzzo, L. (2016). Contextualizing learning to improve care using collaborative communities of practices. *BMC Health Services Research*, *16*(1), 464. https://doi.org/10.1186/s12913-016-1566-4

Khan, S., Thomas, G., & Malik, A. (2024). Quantifying Workplace Dynamics: A Mathematical Model Examining the Interplay of Work Culture, Employee Engagement and Job Satisfaction. *Applied Mathematics & Information Sciences*, *18*(2), 367-377. https://doi.org/10.18576/amis/180212

Knott, E., Rao, A. H., Summers, K., & Teeger, C. (2022). Interviews in the social sciences. *Nature Reviews Methods Primers*, *2*(1), 73. https://doi.org/10.1038/s43586-022-00150-6

Kosiol, J., Fraser, L., Fitzgerald, A., & Radford, K. (2023). Resource-based View: A new strategic perspective for public health service managers. *Asia Pacific Journal of Health Management*, *18*(1). https://doi.org/10.24083/apjhm.v18i1.2053

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Lehtonen, E. E., Nokelainen, P., Rintala, H., & Puhakka, I. (2022). Thriving or surviving at work: How workplace learning opportunities and subjective career success are connected with job satisfaction and turnover intention? *Journal of Workplace Learning*, *34*(1), 88-109. https://doi.org/10.1108/JWL-12-2020-0184

Ley, T. (2020). Knowledge structures for integrating working and learning: A reflection on a decade of learning technology research for workplace learning. *British Journal of Educational Technology*, *51*(2), 331-346. https://doi.org/10.1111/bjet.12835

Lubis, N. W. (2022). Resource Based View (RBV) in Improving Company Strategic Capacity. *Research Horizon*, *2*(6), 587-596. https://doi.org/10.54518/rh.2.6.2022.587-596

Maccabe, R., & Fonseca, T. D. (2021). 'Lightbulb' moments in higher education: Peer-to-peer support in engineering education. *Mentoring & Tutoring: Partnership in Learning*, *29*(4), 453-470. https://doi.org/10.1080/13611267.2021.1952393

Manuti, A., Pastore, S., Scardigno, A. F., Giancaspro, M. L., & Morciano, D. (2015). Formal and informal learning in the workplace: A research review. *International Journal of Training and Development*, *19*(1), 1-17. https://doi.org/10.1111/ijtd.12044

Monke, S. (2007). *The expert interview as a method of qualitative social research*. GRIN Verlag. https://www.grin.com/document/1158768

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball Sampling: A Purposeful Method of Sampling in Qualitative Research. *Strides in Development of Medical Education*, *14*(3). https://doaj.org/article/7d473881f49b44c2b410f61eeadbc61d

Noar, A. P., Jeffery, H. E., Ponniah, H. S., & Jaffer, U. (2023). The aims and effectiveness of communities of practice in healthcare: A systematic review. *PLOS ONE*, *18*(10), e0292343. https://doi.org/10.1371/journal.pone.0292343

Oborn, E., & Dawson, S. (2010). Learning across Communities of Practice: An Examination of Multidisciplinary Work. *British Journal of Management*, *21*(4), 843-858. https://doi.org/10.1111/j.1467-8551.2009.00684.x

Oktari, R. S., Munadi, K., Idroes, R., & Sofyan, H. (2020). Knowledge management practices in disaster management: Systematic review. *International Journal of Disaster Risk Reduction*, *51*, 101881. https://doi.org/10.1016/j.ijdrr.2020.101881

Pan, S. L., & Leidner, D. E. (2003). Bridging communities of practice with information technology in pursuit of global knowledge sharing. *The Journal of Strategic Information Systems*, *12*(1), 71-88. https://doi.org/10.1016/S0963-8687(02)00023-9

Pee, L. G., & Kankanhalli, A. (2016). Interactions among factors influencing knowledge management in public-sector organizations: A resource-based view. *Government Information Quarterly*, *33*(1), 188-199. https://doi.org/10.1016/j.giq.2015.06.002

Pyrko, I., Dörfler, V., & Eden, C. (2017). Thinking together: What makes Communities of Practice work? *Human Relations, 70*(4), 389-409. https://doi.org/10.1177/0018726716661040

Ramazan, F., Graham, Y., & Hayes, C. (2024). Communities of practice: An alternative approach to bridging the theory-practice gap in radiography? *Radiography*, *30*(4), 1167-1172. https://doi.org/10.1016/j.radi.2024.05.015

Ranmuthugala, G., Plumb, J. J., Cunningham, F. C., Georgiou, A., Westbrook, J. I., & Braithwaite, J. (2011). How and why are communities of practice established in the healthcare sector? A systematic review of the literature. *BMC Health Services Research*, *11*(1), 273. https://doi.org/10.1186/1472-6963-11-273

Senge, P. (1990). *The Fifth Discipline: The Art and Practice of the Learning Organization*. Doubleday/Currency.

Serrat, O. (2017). *Knowledge Solutions. Tools, Methods, and Approaches to Drive Organizational Performance.* Springer Singapore.

Shahlaei, C. A., & Lundh Snis, U. (2022). Conceptualizing industrial workplace learning: An information systems perspective. *Journal of Workplace Learning*, *35*(9), 1-21. https://doi.org/10.1108/JWL-04-2021-0048

Shaw, L., Jazayeri, D., Kiegaldie, D., & Morris, M. E. (2022). Implementation of Virtual Communities of Practice in Healthcare to Improve Capability and Capacity: A 10-Year Scoping Review. *International Journal of Environmental Research and Public Health*, *19*(13), 7994. https://doi.org/10.3390/ijerph19137994

Skjott Linneberg, M., & Korsgaard, S. (2019). Coding qualitative data: A synthesis guiding the novice. *Qualitative Research Journal*, *19*(3), 259-270. https://doi.org/10.1108/QRJ-12-2018-0012

Smith Milway, K., & Saxton, A. (2011). The Challenge of Organizational Learning. *Stanford Social Innovation Review, 9*(3), 44-49. https://doi.org/10.48558/DGE6-XZ93

Steinert, Y. (Ed.). (2014). Learning from Experience: From Workplace Learning to Communities of Practice. In *Faculty Development in the Health Professions: A Focus on Research and Practice* (Vol. 11). Springer Netherlands.

Szymaniec-Mlicka, K. (2014). Resource-based view in strategic management of public organizations – a review of the literature. *Management*, *18*(2), 19-30. https://doi.org/10.2478/manment-2014-0039

Thomas, D. R. (2003). A general inductive approach for qualitative data analysis. *American Journal of Evaluation, 27*(2), 237-246. https://doi.org/10.1177/1098214005283748

Vagni, M., Maiorano, T., Giostra, V., Pajardi, D., & Bartone, P. (2022). Emergency Stress, Hardiness, Coping Strategies and Burnout in Health Care and Emergency Response Workers During the COVID-19 Pandemic. *Frontiers in Psychology*, *13*, 918788. https://doi.org/10.3389/fpsyg.2022.918788

Viking, T., & Nilsson, L. (2024). Ideas of how peer support workers facilitate interprofessional learning in mental health care teamwork: Conceptual paper. *Mental Health and Social Inclusion*, *28*(2), 116-123. https://doi.org/10.1108/MHSI-01-2022-0004

Wallo, A., Kock, H., Reineholm, C., & Ellström, P.-E. (2022). How do managers promote workplace learning? Learning-oriented leadership in daily work. *Journal of Workplace Learning*, *34*(1), 58-73. https://doi.org/10.1108/JWL-11-2020-0176

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

Wenger, E., McDermott, R., & Snyder, W. M. (2002, March 25). Seven Principles for Cultivating Communities of Practice. *Harvard Business School Press*. https://www.clearwatervic.com.au/user-data/resource-files/7Principles_Community-of-Practice.pdf