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AGENCY AND LEARNING IN THE WORK OF SOFTWARE PROFESSIONALS¹

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This chapter addresses software professionals' agency and learning in work characterized by a need for innovative learning and fluency in renewing work practices. The study presented was conducted with software professionals in a medium-sized Finnish company producing digital business applications. We applied a mixed-method approach to data collection and analysis. Regarding professional agency, we found a range of opportunities to influence work-related matters. The professionals were primarily able to influence their working hours and the order of their work tasks, but had fewer opportunities to influence customer projects, or their salary. To some extent they were able to develop themselves as individuals and to share practices and knowledge within professional groups and projects. However, they expressed concerns about the organizational aim of short-term efficiency, which they viewed as constraining long-term individual and organizational development. Based on the findings, we discuss how professional agency and learning at work are intertwined, and how they can be cultivated among professionals who create tools for digitalization.

Keywords: Professional agency; learning at work; information technology; software professionals

1. Introduction

Digitalization challenges old work practices, patterns, and services, creating a need to generate new ways of working, collaborating, and leading in a wide range of professional contexts (Alasoini, 2015; Bosch, 2017; Edwards & Fenwick, 2016; Haapakorpi, 2012). Furthermore, novel technology shapes professional identities, roles, and boundaries (e.g. Eriksson-Zetterquist, Lindberg, & Styhre, 2009). Digitalization also affects the content and context of the work done by professionals who creatively design digital tools, applications, and services (as opposed to transferring them mechanically to digital form). So far, the digitalization of work has mostly been addressed from the perspective of employees who utilize digital products, rather than that of the professionals who design and produce digital services and environments.

This chapter considers software professionals' agency and learning in their work. Professional agency – generally understood as exerting an influence and making a difference

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in a professional context – appears to be necessary in work that requires innovative learning, creative working, and the fluent renewal of work practices (Vähäsantanen, Paloniemi, Hökkä, & Eteläpelto, 2017a; Ylén, 2017). This applies to information technology, in which there is an urgent need for creativity (Collin et al., 2017; Ulrich & Mengiste, 2014), and the continuous development of expertise (Ha, 2015; Edwards, 2010; Edwards & Fenwick, 2016). According to Edwards (2010) a crucial aspect in developing a piece of computer software is also the enactment of relational agency. This involves recognizing how others interpret problems, and aligning one's own suggestions with theirs, in order to produce enriched practices. This kind of agency is needed insofar as professionals need to solve complex problems through collaboration with others (Edwards, 2010). Although there are many expectations regarding software professionals, it remains uncertain to what extent there are real opportunities for their agency and learning at work.

To gain a fuller understanding of software professionals' agency and learning, we conducted an empirical investigation in a medium-sized Finnish company which produces (among other things) digital business applications. Below, after presenting some theoretical considerations on professional agency and learning, we elaborate our methodological commitments. We then present our findings on the opportunities for being an agentive actor and for learning in software work. Finally, we set out some theoretical and practical conclusions, including how to promote professional agency and learning in work organizations.

2. Professional agency in work contexts

There is considerable discussion on agency in working life (see Eteläpelto, Vähäsantanen, Hökkä, & Paloniemi, 2013). On the one hand, professional agency is conceptualized as capacities and dispositions which enable to make choices and initiate actions based on those choices in relation to one's work practices and career (Goller & Billett, 2014; Harteis & Goller, 2014). On the other hand, professional agency refers to a more action-based notion, according to which professionals' agency is manifested via influencing, making decisions, and engaging in negotiations regarding work-related matters, such as professional identity and work practices (Toom, Pyhältö, & Rust, 2015; Vähäsantanen, 2015). In this chapter, we take up the latter theoretical notion; hence, we understand professional agency as involving influential activities and decisions that are related to one's work and shared work practices.

In the field of information technology, Ylén (2017) similarly conceptualizes professional agency in terms of influencing and participating in decision-making in the work community; however, she sees it as especially related to the moral dimension of work (e.g. professional

virtues, goods, and ideas). Working in the same field, Collin et al. (2017) have investigated professional agency in relation to creativity. They found that in matters of problem-solving, agentic activities included the selection of tools and work methods, the prioritization of work phases, exploration, and obtaining and exchanging information. In the development of working methods, agency was manifested as determination of the best working methods, experimentation, and the sharing of practices (Collin et al., 2017).

Although professional agency is often seen as resourced by individual backgrounds and characteristics, it should be noted that agency emerges within specific times, conditions, and relationships in the workplace. The subject-centered sociocultural approach in particular emphasizes the role of both social contributions (e.g. work cultures, material circumstances) and individual contributions (e.g. professional identity, competencies) to professional agency (Eteläpelto et al., 2013). Recently, leadership practices have also been emphasized as both resourcing and constraining professional agency in a variety of work contexts (Hökkä & Vähäsantanen, 2014; Ylén, 2017).

3. Learning at work: professional agency and social conditions

Recent discussion has emphasized the crucial significance of professional agency for individual and organizational learning in working life (Billett, 2011; Harteis & Goller, 2014; Philpott & Oates, 2017; Tynjälä, 2013; Vähäsantanen, Hökkä, Paloniemi, Herranen, & Eteläpelto, 2017b). In other words, individuals' active actions and decisions are understood as a prerequisite for learning. According to Goller and Billett (2014), professionals can deliberately influence their professional development, for example, by seeking additional work experiences, deliberate information and feedback, and new learning opportunities (see also Harteis & Goller, 2014). Similarly, Pyhältö, Pietarinen and Soini (2015) suggest an interdependence between professional agency (e.g. the ability to transform work practices and actively seek help) and learning.

A similar interdependence was found in a study by Ylén (2017). This revealed four practices that enable agency and promote learning in software developers' professional work. These include: (i) the practice of *democracy*, i.e. a set of procedures built on ideals of openness and equality, enabling software developers' agency in the work community's decision-making; (ii) the practice of *experimentation*, related to goals of flexibility and constant improvement in the organization, enabling professional agency in relation to the development of work procedures and methods; (iii) the practice of *self-directed development*, making possible developmental-oriented and passion-based professional agency concerning one's own career;

(iv) the practice of *independent project teams*, enabling agency in relation to one's work. Despite such supportive practices for software developers' agency, Ylén (2017) also observed that they have no choice or decision-making power in all situations of the customer projects.

In this chapter, learning is understood notably as the development of individual and collective work practices, but also as the development of employees' professional skills and knowledge. According to Ha (2015) the professional expertise of IT professionals includes programming languages and software development tools. Their expertise further encompasses skills to deliver technical support to users and to maintain the IT systems of companies. The development of this kind of expertise occurs, for example, via self-directed learning (e.g. reading professional literature), but especially through participation in communities and through working on projects (Edwards, 2010; Ha, 2015). Generally speaking, learning occurs also through trying new things, collaborating and solving problems with others, and learning from errors (Eraut, 2011; Harteis & Bauer, 2014; Shepherd, Patzelt, & Wolfe, 2011; Tynjälä, 2013; Vähäsantanen et al., 2017a). In line with these notions, and with other authors (Harteis & Goller, 2014; Kira, 2010; Philpott & Oates, 2017; Vähäsantanen et al., 2017b), we understand learning at work as embedded in the social context and in relationships, although the enactment of professional agency is viewed as driving both individual development and organizational development.

4. The aim of the study

This study aimed to explore professional agency and learning in the work of software professionals within one private-sector organization. Thus, the research questions were as follows:

- (1) What kinds of opportunities for professional agency are perceived in the work of software professionals?
- (2) How is professional learning related to software professionals' professional agency and the social conditions of their work?

Bearing in the mind the notions outlined above, professional agency is here considered via two lenses. As regards the first question, professional agency is viewed as a matter of exerting influence at work. As regards the second question, professional agency is considered as a phenomenon encompassing development-oriented efforts and activities, touching on both individual and shared work practices.

5. Methods

5.1. Data collection

The study presented here applied a mixed-method approach to data collection, including interviews and quantitative questionnaire data. In the first place, the data derived from three focus group interviews with professionals who were working in a medium-sized Finnish company producing (among other things) digital commerce applications. These interviews were gathered with three professional groups in 2015. The groups consisted of (i) software developers ($n = 4$), (ii) installation experts ($n = 4$), and (iii) program testers ($n = 5$).

Most of thirteen interviewees were male ($n = 9$) and highly educated; thus 12 of the participants had at least a bachelor's degree or a polytechnic degree. Their age varied from 29 to 63 years (average 39 years), their working experience in the current job varied from one month to 11.5 years (average 4 years), and their working experience in the field varied from one to 35 years (average 12 years). The software developers interviewed mostly worked as experts in developing software and services. Their work was mainly project-based, including also responsibilities in the management of the projects. The installation experts notably addressed and solved problems relative to data systems, but they also designed data systems and the monitoring of web stores, and engaged in various services. The work of the program testers included the design of testing tasks relative to the projects, and implementation of the required testing designs; by this means information was gained on the functionality of the software and web services used.

The interviews addressed the software professionals' current and future work, their learning at work, their professional agency, and the work organization plus its leadership practices. Within the interviews, the questions were asked flexibly in relation to these themes (Kvale & Brinkmann, 2009). The aim was to encourage the interviewees to talk about the issues with each other, rather than to have each participant answer questions in turn. In this sense, the interviews refer primarily to informal discussions (Wilkinson, 2016).

In conjunction with the interviews, the participants completed an individual questionnaire on professional agency. To gain data on professional agency, in terms of exerting influence at work, participants were asked to what extent they could influence a range of matters related to their work. Altogether, thirteen aspects (such as ways of working, customer projects, and changes in the work community) were listed. A five-point response scale was used (1 = not at all... 3= enough... 5 = very much).

5.2. The data analysis

To analyze the focus group interviews (which amounted to 115 pages, Calibri font, 1.5 spacing) we applied qualitative content analysis, the aim being to produce a relatively comprehensive summary of the data as a whole (Wilkinson, 2016). The analysis was data-driven (Saldaña, 2013), but we also utilized current conceptualizations in order to identify expressions regarding professional agency.

For the first research question, the interviews were read in order to locate and extract the expressions concerning professional agency (in terms of exerting influence at work). Following this, the majority of the expressions could be listed and grouped under two categories; this was appropriate in terms of the variation between the perceived opportunities for professional agency. Thus, the bulk of the categories could be viewed as manifesting either (i) *ample* or (ii) *limited* opportunities for influence at work. To some extent these categories illustrate how far the organization created opportunities for people to affect work-related matters. It was further found that the opportunities to exert influence were connected to the professionals' individual and collective activities. Hence, a third theme was identified; this was named as *negotiated opportunities to exert influence at work*.

To answer the first research question, we also utilized questionnaire data concerning opportunities to influence a variety of work-related matters. Means and standard deviations were calculated for all the items presented in the questionnaire.

Concerning the second research question, all expressions pertaining to the software professionals' learning were identified and extracted from the interviews. These expressions also reflected organizational learning, and the kinds of agentic activities and/or sociocultural conditions that were related to the professionals' learning at work. Overall, six themes were found to cover this question. We also found an additional theme which encompassed suggestions for supporting the development of the individuals concerned, and the organization. The next two sections illustrate our main findings regarding professional agency and learning in software work.

6. Professional agency in software work

Current discussion (e.g. Toom et al., 2015; Vähäsantanen, 2015; Ylén, 2017) conceptualizes professional agency as primarily a matter of exerting influence on work-related matters. The sub-sections below present the opportunities available for influencing matters in software work. These findings are presented in the form of a blend (condensed) of both the interview and the questionnaire data.

6.1. Ample opportunities to exert influence at work

The findings of the questionnaire (see Figure 1) showed that the software professionals had rich opportunities to influence especially their working hours (mean = 3.92), the order in which they carried out their work tasks (mean = 3.83), the ways in which they carried out their tasks (mean = 3.77), and the selection of working tools (mean = 3.77).

In a similar manner to the questionnaires, the interviews indicated that the software professionals were mostly able to prioritize their work tasks and to determine their working hours. Their work also included a good many opportunities for seeking out the most suitable ways of working. As one software developer said *“I am able to affect how I do things, and along with that I can develop other things.”* Another software developer went even further: *“Speaking for myself I can affect everything at work... And I think that’s a good thing.”*

Within the interviews, the possibilities to have influence were experienced broadly as important, and as a basis for individual learning and meaningful work. In part, agentic opportunities were viewed as connected with a change towards self-directedness in the organization. At the same time, it was criticized in terms of leaving people without any supportive structures. It was nevertheless hoped that new control mechanisms would not be introduced in the future: such mechanisms were seen as harmful in work which includes continuous changes, and which requires great flexibility.

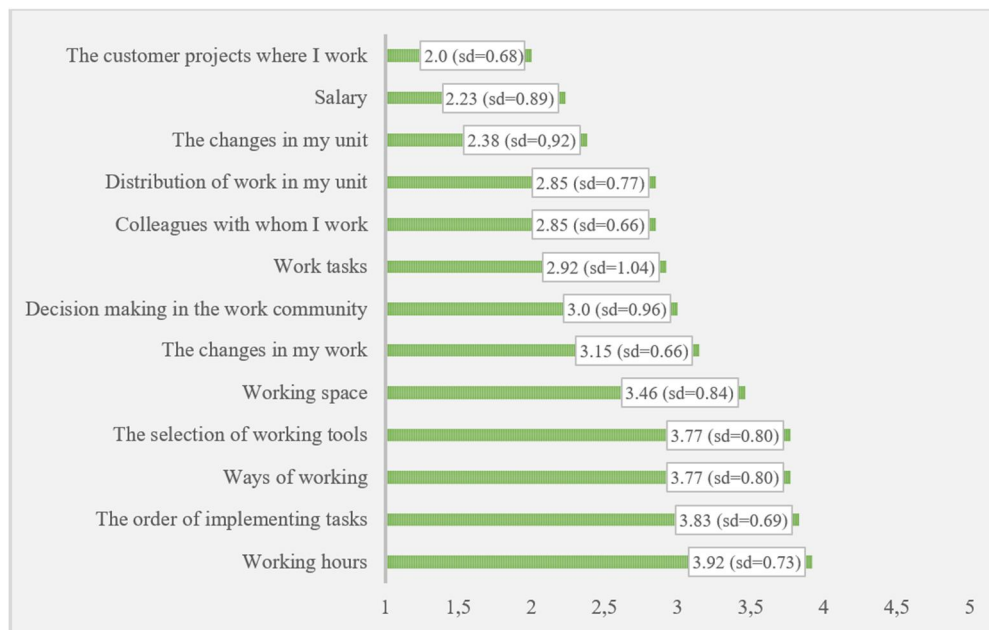


Figure 1. Opportunities to influence work-related matters, presented as means with standard deviations (Scale: 1 = not at all... 3 = enough... 5 = very much).

6.2. Limited opportunities to exert influence at work

The questionnaire (Figure 1) indicated that the professionals had actually limited possibilities to influence some work-related matters, particularly regarding the customer projects that were taken on (mean = 2.0), their salary (mean = 2.23), and the changes in the work unit (mean = 2.38).

Similarly, the interviews revealed that the professionals had only some opportunities to choose which customer projects they could be involved in. The interviews also illustrated that the projects and their different stages determined a large proportion of the work tasks. Furthermore, it was not always possible to determine one's working time: people could be forced to do overtime. This was in part due to the strict timetables for projects. There was also mention of difficulty in influencing matters (e.g. customer contracts) that had a strong bearing on their work. As one installation expert emphasized:

I can do my own work as I like; I think nobody actually wants to interfere with that. The main thing is that the work gets done. But the area in which you can make decisions yourself is quite small. So a worker has no power to make the kind of significant decisions that could substantially change the way things are done. For example, we can't change customer contracts in such a way that we could proceed to do the work some other way. We, the people who do the main job, have no power to affect that... So self-direction occurs within that space, even if, in order to get things to work better, we ought to have the power to influence matters that are outside that space.

From the point of view of agency, the project leaders were also seen as significant actors. They were able resource or constrain other professionals' possibilities to affect the work.

Although generally speaking the professionals' agency was fairly constrained in customer projects, the perceptions of their agency varied. On the one hand, the customer was seen as a boss, someone who decided what to do and the timetable for doing it. On the other hand, the professionals also saw themselves as active actors in collaboration with the customers, for example, in terms of suggesting to customers workable practices, alternatives, and ways of executing the project.

The professionals also reported weak opportunities to affect organizational practices, decisions, or strategies. They hoped for changes in the goals and strategies of their organization (e.g. the aims regarding short-term efficiency and economic productivity), but did not see real opportunities to influence these. It was possible to make developmental suggestions, but the perception was that nobody truly listened, and that the suggestions seldom resulted in any real changes.

6.3. Negotiated opportunities to make a difference in the work organization

Despite the difficulties in influencing significant matters in the work organization, it seemed possible to have an influence on smaller matters through being active, either individually or with colleagues. Some professionals saw possibilities to change organizational practices (e.g. in how testing practices were included into the projects) when they convincingly presented their opinions. The significance of activeness for changing contracts was described by one software developer as follows:

Participation is one way to influence matters. I participate in shared events. You just have to speak up in conversations, saying like, hey, from now on let's not do it like this or have these kinds of contracts. You can change the model of acting, when you go with and participate in the forming of contracts and such like.

Some software professionals further said that it was easier to put forward successful developmental suggestions, or to take actions, if one did so with colleagues rather than alone; also, one could be more influential if one knew the right people to fight the case.

7. Learning at the heart of individual activities and social conditions

The software professionals were eager to develop the practices in their own work, and more generally in the work environment. Based on the interviews, we illustrate below how professionals' learning at work and organizational development occurred, and how it was related to professional agency and social conditions in the work.

7.1. Complex problems enabling agentic activities for individual learning

Previous studies, including those in the context of information technology (Collin et al., 2017; Goller & Billett, 2014; Ylén, 2017), have suggested that professional agency includes experimenting and solving problems. Our findings showed that challenging work facilitated professionals' agentic activities. These included finding errors, addressing challenging and long-term problems, experimenting, and finding solutions to the problems. These manifestations of professional agency around complex problems were seen as an important element in meaningful work. They also created a foundation for learning at work. As one software developer emphasized:

Meaningful and effective learning occurs when you have the possibility and ability to do some experiments, and from that get new ideas.

That is, individuals' knowledge and skills were developed through challenging work that involved seeking solutions to problems. However, from the perspective of shared learning, the challenge was that these activities tended to be done on an individual basis, even if shared experimentation, and problem solving with colleagues, did sometimes occur. The individualistic way of working promoted the personal learning of those concerned, but not organizational development, as one installation expert emphasized:

In my opinion, when there's problem-based learning, it means that each employee studies the same things, and in such a way that the individual learns, but the organization doesn't really learn.

To sum up, one can say that individual learning – but only rarely organizational learning – emerged when challenging work tasks brought with them agentic activities related to complex problems.

7.2. Routinized and hectic work as a threat to innovativeness

The software work was not purely an arena for addressing complex or long-term problems, since it included many routine tasks. These tasks did not facilitate learning through problem solving; nor did they bring about much joy in the work. As the installation experts put it:

Interviewee 5: In my case it brings joy when a challenging problem is solved. The thing is, some problems are quite irrelevant, for example when a customer is worried because something is the wrong color somewhere, or stuff like that. But then there are those real problems, like if something is broken and we try to figure out how to fix it. Those situations can be challenging, but it's rewarding when we can solve them. But there isn't much of that sort of thing. In relation to the number of tasks, routine work dominates.

Interviewee 6: Well it's pretty much the same for me. The nicest thing is when you can solve a long-term problem.

Interviewee 7: It's also nice when you learn something while working – this happens usually when there is some challenging problem. Learning seldom arises from the basic work.

In a similar manner to routine work, hectic work was seen as an obstacle to learning and innovative working, as a software developer indicated:

In my opinion knowledge work requires enough time, if we really want innovations and development... If you have too many things to do all the time, you never reach the right frame of mind to think and do things innovatively.

As compared to innovative and regenerative working, amid hectic work the professionals relied on current ways of working, doing their tasks in familiar routinized ways. As pointed by a

program tester: “*When there is a rush with the projects, you have no chance to think about and develop these things or of approaches to the work.*” The main reason for rushing was that the projects were designed with tight timetables, in order thus to gain maximum efficiency and economic profit. Overall, work that was routine or hectic did not create an optimal arena for experimenting or trying out new ways of working; nor was there innovative development through such activities.

7.3. Outdated technologies hindering learning at the individual and organization levels

The developers discussed technologies as they affected learning. The technologies used were described as somewhat outdated and complex, thus leading to hurry and stress. Although these technologies hindered working, they continued to be used; this was seen as due to the fact that the organization did not want to engage in technological development. The managers did not want to put new technologies into operation, since the current technologies still produced good financial results. This was emphasized in the discussion as follows:

Interviewee 1: The logics and models of business support the use of this old technology, and at the moment we are achieving good financial results. Since the numbers look really good, it's difficult to aim for changes in that direction.

Interviewee 2: The problem is that decision makers don't experience technology the same way as we do, the developers and the people dealing with it. Decision makers can't understand how oppressive it can be to use old and inferior technology.

The outdated technologies did not merely bring about annoyance and stress; having to use them was experienced as an obstacle to learning. If the interviewees wanted to learn new technologies, they had to do this in their free time:

Technology changes rapidly, and that requires continuous learning. It means that you should be able to do more with the newest technology. The main challenge is that we have a large technological debt in this company; we have only out-of-date technology. One thing that particularly bothers me is that we should be more radical in adopting new technology, but learning is our own responsibility. We can't use working time for learning, so we have to use our own time for that.

All in all, the failure to use the most advanced technologies meant more haste and difficulties in the work. It also created constraints on individual learning and organizational development. A need was seen for more resources and more time to implement advanced technologies. This was required for the sake of innovative individual learning, but also for the future success of the company as a producer of high-quality software applications.

7.4. Learning framed by variable practices for seeking and giving help and feedback

According to scholars (e.g. Goller & Billett, 2014), professional agency encompasses activities such as seeking help, feedback, and knowledge. The software professionals were active in seeking help and information in order to develop their work. They further reported that the culture of their work organization generally encouraged people to seek feedback and novel tools for their work. Despite this kind of supportive culture, haste at work created obstacles to gaining help from others, or for sharing knowledge. A program tester noted that people were unwilling to disturb colleagues who were busy:

We have good dialogical connections. But learning is highly restricted by the rush. When developers have a terrible workload, even if I would like to know more about something, I prefer not to interrupt them. Interruption always breaks their flow and it takes a lot of time to get back into productive work.

The professionals further emphasized that feedback on one's work is important for professional development. Although some practices existed for giving and gaining feedback, it was quite rare for feedback to be given, especially the kind of feedback that promoted one's own learning. Getting feedback depended mainly on how active the professionals were themselves (i.e. in asking for feedback) and on the personal enthusiasm of leaders and colleagues. Overall, it seemed that the enactment of professional agency could support professionals' learning. However, the rush and the lack of feedback practices tended to weaken the foundation for agentic activities and learning in the work.

7.5. (Non-)learning in and across professional groups and projects

Collaboration was emphasized as important for learning. According to the accounts given, a basic element in learning and feeling joy in the work consisted of the possibilities to share with others new experiences, tools, and practices. As one installation expert told:

It brings joy at work when you develop or find the new ways of acting or more advanced ways of doing things. And then you can share them with others and they are utilized in practice. It is amazing.

These kinds of agentic activities (e.g. sharing experiences and practices) emerged in particular with colleagues who were carrying out similar tasks or working on the same project, even if there were, in addition, some orchestrated arenas for sharing knowledge and experiences on matters of common interest.

It was also emphasized that experiences were rarely shared, other than within professional groups and projects. Therefore, new knowledge and practices did not transfer across the

boundaries of the professional groups and projects. This was seen as hindering individual learning and organizational development; however, it was also seen as related to the broader organizational strategy, as one software developer indicated:

All this is related to our strategy that customer projects are done separately, and really, hardly anybody shares anything like information or the code base. Everybody more or less need to start with a clean sheet in each project. This is also influenced by the strategy, in the sense that the aim is to achieve as much billable work as possible.

Overall, the sharing of experiences, knowledge, and tools was seen as rewarding, and as aiding learning. However, the enactment of such agentic activities was more feasible within projects and professional groups than across them. The boundaries between projects did not support individuals' collaboration or shared development.

7.6. Short-term efficiency – freezing development?

According to those interviewed, the main principles of the organization were short-term efficiency and economic growth. As mentioned above, these principles were also intertwined with other aspects of the work (the rush, the use of outdated technologies, and bridges between customer projects) and learning at work. This was also pointed out by an installation expert:

The primary emphasis at management level is for the company to make a profit. Decisions are based on that strategy, and that's why, for example, developing and testing new operations and ways of working has been given a low priority, and doesn't move forward.

The main concern of the interviewees seemed to be that the guiding principle of short-term efficiency and economic profit did not support genuine innovativeness or development in the organization – this despite the fact that official organizational discourse highlighted the importance of development. The interviewees saw the goal of short-term productivity as inconsistent with long-term development at individual and organizational levels. An installation expert viewed the issue in the following terms:

There's a conflict that I would like to point out. That our company's values have included growth, cost-effectiveness, and development in recent years. In my opinion the first two of these have been achieved, but the third hasn't. So learning, development, and increasing competence are important, according to what company management says. But in practice they have a very low priority.

The general view seemed to be that the management's business orientation did not offer enough time, resources, or support for the kind of learning that would promote the development of the organization.

According to the interviewees, the principles of maximizing profit and efficiency also created an atmosphere that did not encourage people to truly try out new things, or take risks, since all possible failures had to be minimized. Overall, it seemed that the case here could be one of short-term efficiency at the heart of the organization, with long-term learning and development (both individual and organizational) suffering as a consequence.

7.7. Towards novel thinking and practices – unlearning and learning something new

The findings illustrate opportunities and constraints for professionals' agentic activities and development, both at the individual and organizational level. The interviews also revealed ideas for promoting more comprehensive learning and development within the organization. These ideas are presented below. To some extent they indicate means to address the challenges to learning and development described previously.

A lower priority for the principle of efficiency. According to the interviewees, a lower priority could be given to the short-term focus on efficiency and economic growth. Although these goals are always present in any business, there should also be room for new ways of acting and thinking to support learning. For example, it was hoped to be more opportunities for shared problem solving, collaboration, and practices across customer projects, possibilities to use new technologies, and more time to learn (as opposed to merely carrying out tasks mechanically). This could lead to better services and applications, to individual and collective learning, and to an even higher reputation for the organization in the future.

The (un)learning of individuals. While there was scope for transformation in organizational practices, it was also noted that individuals, too, could learn new ways of thinking and acting. There also seemed to be a need for *unlearning*; in other words, individuals should withdraw from familiar routine ways of working, and experiment more creatively at work, in order to learn. There was also a need for a culture that would support experiment and risk-taking without fear of failure. As pointed out by a software developer:

You must have the opportunity to try and to fail, because that's how learning happens. We should have a more permissive organizational climate so that we would not be pressurized into sticking to old, safe ways of doing things. People should understand that if they are allowed to make mistakes, so that you can let go of old habits.

Controlled self-directedness. The move towards self-directedness in the organization was not seen as truly successful. For example, opportunities to affect certain work-related matters, such as projects, were still seen as limited. In addition to having more agentic opportunities, the professionals hoped for a clear organizational vision, with social affordances for them to frame their self-directed activities. In the absence of these, the work was experienced as extremely challenging. The professionals were further concerned that they were not doing enough work together, or learning together. As one software developer pointed out, one of the main challenges of self-directedness was that individuals would learn, but not the organization: “*It’s simply not enough that individuals learn; rather, the whole organization should learn more, in a controlled way.*”

Orchestrated feedback and training practices. Although current feedback practices were in part workable, there was a wish for more systematic and constructive feedback for the sake of continuous personal development. Furthermore, there was a need for regular processes and collective practices for discussing, evaluation, or for giving/receiving feedback. This would enable to identify which shared matters were workable, and which matters needed to be developed – together with ways of furthering that development. Furthermore, the interviewees wished for more arenas (formal and informal) for sharing knowledge, practices, and tools. These could involve orchestrated training and discussion around relevant topics, whether within or outside the organization.

8. Discussion

As regards the *first research question*, we found that the professionals were able to influence, in particular, their working hours, and the order in which they approached their tasks. On the other hand, there were fewer opportunities to influence customer projects, or their own salary. There were also challenges in making a difference in shared matters, or on practices within the organization (involving, for example, the failure to adopt the most advanced technologies, and the company’s orientation to short-term efficiency). Overall, the organizational and leadership practices appeared to be closely connected to the professionals’ agency, creating both opportunities for and limitations to agency in the professional context in question (see also Hökkä & Vähäsantanen, 2014; Ylén, 2017).

At the same time, it must be noted that some professionals indicated that it was possible to affect some organizational matters (e.g. project practices) through their own activities and collaboration with colleagues. In line with previous notions (Eteläpelto et al., 2013; Harteis & Goller, 2014), this illustrates the point that the structures and conditions of work organizations

do not comprehensively or exclusively determine professionals' agency; agency is also embedded with professionals' own individual and social resources.

Overall, in the present study, the software professionals had variable opportunities to enact professional agency at their work. In this sense, our study did not paint as optimistic a picture of software professionals' agency as the study of Ylén (2017); this indicated that a Finnish information technology company offered almost only ample arenas for software developers' agency. As always, one must bear in mind the context: our study was conducted at a specific time and within a single organization.

The findings relative to *the second research question* are summarized in Figure 2. Professional agency was manifested via a range of agentic activities (such as finding solutions to complex problems, asking for help, and sharing knowledge). These were at the heart of learning at work. Without such activities, it can be suggested that individual and organizational development cannot occur in any sustainable way. However, the findings also underlined the notion that learning is not separate from the sociocultural circumstances of the work and the organization. In particular, the nature of the work (in terms of being, to a considerable degree, challenging, hectic, and routine) both resourced and constrained agency and learning at work. Sharing practices and knowledge with colleagues promoted learning, but the boundaries between the projects and the professional groups, plus unavailability of the most advanced technologies, hindered both individual and organizational development. In this sense, relational agency and expertise (Edwards, 2010) emerged here more within the projects than across project boundaries.

The study also indicated that the organizational aim to achieve economic growth and short-term efficiency was an obstacle to individual and organizational development. This aim was connected to the hectic pace of the work on the one hand, and to the use of outdated technologies and routines on the other. In similar manner, a study by Haapakorpi (2012) indicated that opportunities for creative work and learning diminish with decreasing resources and new project management patterns, conjoined with a profit-making orientation.

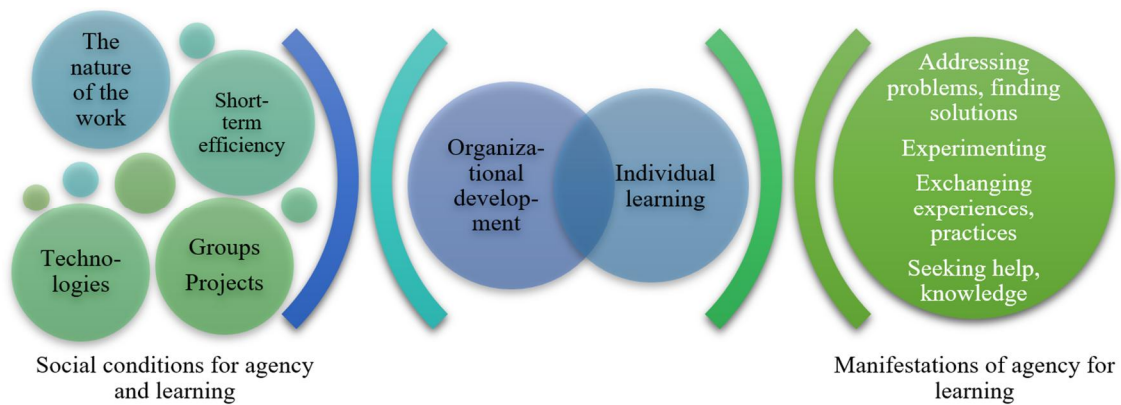


Figure 2. Social conditions and manifestations of professional agency connecting to learning in software professionals' work.

In line with previous discussions (Harteis & Goller, 2014; Philpott & Oates, 2017; Vähäsantanen, 2015), we found professional agency to be embedded with development and learning in the workplace. Individuals' agentic activities worked as a means for learning at work, although the sociocultural conditions of the work also framed learning, through either supporting or hindering the emergence of individuals' actions. The study also confirms previous notions of the pivotal role of other people and of exchanging experiences (Ha, 2015; Collin et al., 2017; Tynjälä, 2013) and solving problems (e.g. Eraut, 2011) for employees' learning and creativity, and underlines the importance of professional boundaries – and the crossing of them – for individual and organizational development (Fuller & Unwin, 2011; Kira, 2010).

9. Theoretical and practical conclusions

The findings suggest that learning at work should be understood as intertwined with the enactment of professional agency, and embedded with the social conditions of workplaces. This kind of thinking resembles the notion of learning at work as negotiated phenomena, operating between (i) individuals' preferences and activities, and (ii) the sociocultural environment of the workplace (Billett, 2011; Vähäsantanen et al., 2017a, b). Since professional agency and learning can be seen as intertwined, we suggest that the most applicable phrase would be *agentic learning at work*. This means that learning at work will occur via the enactment of professional agency in the sociocultural context of the workplace. The findings also support the notion that it is the opportunities to be an active actor and learn that make work meaningful and joyful (Kira & Balkin, 2014; Vähäsantanen, 2015).

To enhance the bloom of digitalization in working life (see also Bosch, 2017), there is a need to discuss how software professionals' agency and learning can be supported in work organizations. It is possible to promote professional agency via agency-promoting leadership

practices in the daily work of professionals (Hökkä & Vähäsantanen, 2014; Ylén, 2017). This means that professionals need sufficient opportunities to influence their work and to shared matters in the work organizations. In line with the opinions of the professionals interviewed for this study, we would also advocate specific structures and a shared vision for working and acting. This will make it much more feasible to collaborate in working towards common targets.

This study showed how learning and development at the individual and collective levels appeared to be embedded in organizational aims and strategies. The professionals in the study hoped for the kind of changes in organizational practices that would promote both individual learning and development. The view taken among the professionals was that the aim should not merely be higher productivity in the short term but sustainable, long-term development in work organizations (see also Ramstad, 2009). As they saw it, there was a need for more resources and more time for experimentation at work, in addition to the adoption of advanced technical tools; all this would help in promoting innovative individual learning and in maintaining the success of the company as a producer of high-quality software applications.

All in all, one can say that in seeking to support learning at the individual and collective levels, it is important to have an organizational culture that allows people to address problems and experiment collectively. The culture should be one that allows people to make mistakes and learn from their errors, without being afraid of failure (see also Harteis & Bauer, 2014; Shepherd et al., 2011). It is also important to encourage the crossing of boundaries between different groups and projects, as other scholars have also suggested (Fuller & Unwin, 2011; Kira, 2010). Even if there is a need to create agentic arenas for daily work and learning, not all responsibilities should be placed on the shoulders of the leaders. Professionals, too, need to take responsibility for their learning, to be ready to be active and creative, and to abandon old ways of thinking, even if these are experienced as safe. In particular, agency in its creative and relational forms is needed in the field of information technology, which includes development-oriented collaboration, since it is seldom possible to create innovative solutions for the digitalizing working life and solve difficult problems by oneself (Collin et al., 2017; Edwards, 2010).

The study addressed software professionals' agency and learning and revealed some optimal sociocultural conditions for them. As described above, previous studies have supported quite similar notions of learning and/or agency in different professional domains. Our study also showed that it is not self-evident that work organizations enhance employees' agency and learning, even if their emergence is pivotal for the employees themselves and the success of the organization. Haapakorpi (2012) has also found that even the media industry, which requires

innovative working and high-quality competencies of employees, does not create optimal conditions for the employees' creativity and learning when new management and business-like management are adopted. In this sense, our findings might be quite transferable to other work contexts. Simultaneously, one could say that compared to the other professional domains, the digitalization processes in working life applies more pressure on software professionals and the organizations in which they work. They must provide high-quality software products and services to the clients at a fast pace, in which case there is not necessarily time and optimal circumstances for creative experiments and long-term development. The goals of achieving economic growth and short-term efficiency might also be more pronounced in private-sector organizations in the field of information technology than in other domains and public-sector organizations.

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