The Intersection Between Information Systems and Workplace Learning:
A Systematic Review and Research Agenda

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Abstract

Information Systems (IS) research has extensively studied change in relation to digitalization. However, less attention has been paid to both individual and organizational change from a learning perspective. There is a need for a deeper understanding of how changes are fostered and how and why learning in the circumstances of digital practices occurs. This interdisciplinary systematic review shows how workplace learning has been addressed within IS, bringing together workplace learning theories and the field of IS. The results show that research on the role of knowledge in IS tends to rely on established and conventional theories without explicitly articulating the learning aspects. We call for more IS research that explicitly addresses digital change as learning. This paper provides a research agenda via three research directions for IS researchers interested in work and learning, aiming for a theoretical discussion to advance our field.

1. Introduction

The digitalization of society and work brings new challenges for the field of Information Systems (IS) research [1, 2]. Work is, and will be, fundamentally transformed due to technological developments and new digital services at hand. Not merely by automatization of existing tasks and routine jobs, but also by redefining competence and reshaping the already existing professions [3]. The role of knowledge for organizations and individuals has been studied extensively within IS and prior studies have built up a strong sense for the opportunities that emerge from new forms of communication and collaboration enabled by digitalization [4]. However, the focus has mainly been

on technology and external factors while overlooking internal factors such as the need for learning and the need for new competencies and challenges at the individual level [5, 6]. Zuboff [7] recognized early on that the *informated organization* is a learning institution, and one of its principal purposes is the expansion of knowledge; not knowledge for its own sake, but knowledge that comes to reside at the core of what it means to be productive. Learning is not something that requires time out from being engaged in a labor, i.e. being in a productive activity. Instead, learning is the heart of productive activity and hence, "learning is the new form of labor" [7]. Furthermore, Zuboff [7] interprets what she calls the abstraction of work due to digitalization, in terms of demands for designing learning contexts. Such contexts are supported by taking part in providing employees with skills and knowledge that enables them to monitor their own learning abilities or to become better learners in organizations.

Based on that notion, there is room for a wider discussion on the topic of learning at work within IS. We argue that the field of IS should engage in issues regarding the design of good learning conditions where digital work and digitalized organization are at the core. For that reason, we argue that it is powerful to utilize learning theories and more specifically to emphasize the part of learning theories that outline the learners' understanding of the learning object. The learning object in digitalization efforts is often understood as learning to operate digital objects, or through the capability such an object with a focus on the development of specific software. However, contemporary workplaces demand competencies that call for understanding new learning and leadership practices in digital work [8-10]. Thus, a deeper understanding of learning in the circumstances of digital practices is important [11, 12]. Despite that, there has been a significantly small effort to address the notion of embracing theoretical underpinnings from other fields

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to enhance our understanding of learning at work [13, 14].

Bringing IS and Workplace learning theories together in a systematic review to examine the intersection between the two has, as far as we can find, not been addressed as a topic previously. Therefore, a systematic review of this kind makes the two-fold contribution of adding a novel perspective to the role of knowledge and learning in IS, while also providing useful insights into how theories from workplace learning have been applied, could be utilized, and further developed within the field of IS. The purpose of this systematic review is therefore: i) to map how workplace learning has been studied within IS and ii) to identify how contributions can be made to the field of IS by utilizing workplace learning theories. Our aim is to provide an alternative perspective to advance the understanding of the intersection between digitalization and learning at work in IS research. The research question that this paper explores is: *How are workplace learning theories applied and used within the field of Information Systems (IS)?* The main contribution is two-fold; on the one hand through the systematic review and on the other hand by providing a research agenda for learning at work for the IS literature.

In general, a literature review is a snapshot of the literature that builds an understanding of the topic at hand as well as summarizes the key ideas [15]. Literature reviews are tools that can be used to connect the past and the future within a research domain [16, 17]. Furthermore, systematic literature reviews, as well as systematic reviews are conducted in a systematic manner. By searching for particular theories or perspective in a specific area of research, what Sandberg and Alvesson [18] refer to as application spotting, we examine how workplace learning is utilized within the field of IS. Our findings conclude with several research implications, discussion about possibilities for the field of IS and end with a research agenda, concerning learning at work as a part of IS.

2. Workplace Learning

The notion of workplace learning originates from research and practice on learning at the workplace. Historically, workplaces have not always been considered arenas for learning but have instead merely been seen as sites where labor takes place. It is only in the past 60 years that research and practice has shown documented interested in workplaces as learning-conductive settings [19]. The concept of workplace learning relates to informal learning practices at the workplace. Learning at work is an extension of the concept brought on by the notion that work is 'what you do', it is an activity, and is not necessarily bound to a physical location. Learning at work is a concept used to illustrate the will to create the motivation for continuous development through work, and more often entails the informal learning instead of more formal learning activities. These theories originate from John Dewey and concepts on "learning by doing" [20]. The epistemological underpinning is that learning can only take place in action, as individuals practice work [21]. However, the notion of *practice* is not only related to physical practice of doing in the real world and is as we argued earlier, does most definitely not have to be bound to a physical workstation. Even processes of thoughts and reflections can be considered as practice, according to scholars such as Schön [22]. In this paper we draw on that notion and extend it to include activities that are of similar character as work settings. Through that line of thinking, we see that IS scholars could benefit from more structured use of workplace learning theories for the purposes of forwarding our field. These theories could be used to shed light on change aspects triggered by existing technology as well as more recent technologies, such as what the introduction of digital platforms, artificial intelligence and social media into work, calls for. Looking towards more recent scholars, Eraut [23] talks about informal learning in the workplace and explains it as the increasing consciousness of the learning that occurs within the work setting. This type of consciousness can be triggered through new types of work, which can be conveyed through new technological advancement brought into the workplace. The work setting is described as a much wider mixture of different situations than can be found in conventional education and the work setting is where much of the professional growth and professional progression happens [21, 23-25]. As such, learning in general and informal learning in particular can be associated with learning through experience as well as to using a new kind of technology in the daily routine [21, 26].

IS as a research field is at the forefront of understanding and explaining digitalization and its effect on humanity. To continue to do so, we cannot understand and explain new practices, processes and new types of trends with old theories [27-29]. In this paper we argue for that workplace learning theories could be embraced to a larger extent in the IS field. Learning at work and theories related to that contribute with an opportunity to understand and explain practices, processes, and trends in their own setting. This brings a valid question: so, why should IS scholars use workplace learning theories? We already have established theories, that we have always cited, do we really need new theories to understand and explain our thoughts? The answer to that question connects to our previous argument and is embedded in the notion that

our field, the IS field, needs to be at the forefront of explaining digitalization and the change it brings with it. As we know, digitalization leads to changes and challenges for learning and leading [8]. In order to adapt to the changes employees and managers need to *learn* about new processes, practices and trends, hence the interest in learning. Some of the newer theoretical angles from workplace learning can help us understand these digitally enabled changes. In the following systematic review, we show why and how workplace learning theories (and theories derived from the learning at work literature) can be used to a lager extent within our field, and show why IS scholars should listen to our colleagues from other fields, and borrow their newer theoretical framings, just like we have borrowed their older theories to explain IS phenomenon since IS became a research field.

3. Method

Inspired by Webster and Watson [15] we used a combination of concept-centric and author-centric approaches to systematic literature reviews. The concept-centric approach aims to identify and follow concepts or patterns in the literature whereas the author-centric presents a summary of relevant papers and key authors within a specific domain [15]. Searches were conducted multiple times by the authors separately and together to attain reliability, and the systematic literature review was further complemented with descriptive statistics.

Thereafter, an initial concept-centric literature review was carried out, aiming to find patterns and to map them by exploring literature reviews specific to workplace learning theories. As a foundation for our understanding of themes and authors relevant for learning at work, we identified three key literature reviews that were central to our research question [12, 30, 31]. These originated from within the workplace learning literature and were not specific to the field of IS. The reviews were compared to each other to derive generic categories. Fenwick [30] proposes five themes: reflection; interference; participation; resistance and co-emergence. Hager [12] describe three themes: observable learning; socio-cultural learning and post-modern theories. Hays [31] describe four themes; adult/andragogy, experiential, transformational and workplace that are sub-categorized into twenty themes. One example of a generic characteristic is participation, which is highlighted in all three reviews. Authors identified as key authors were listed and placed into themes and in some cases, an author was represented in more than one theme, in those cases the author was placed as overlapping between two of the themes. To verify the results from these three reviews, we added

Coll and Zegwaard [32] and Wenger [33] and compared the results of the three reviews to our generic categories.

3.1. Author and concept-centric mapping

The next step was an author-centric mapping where we followed the authors identified as key authors within the workplace learning literature, based on our comparative reading of the systematic reviews (Figure 2). 17 authors or author pairs were identified as key authors within workplace learning: [34, 35], Argyris and Schön [36, 37], Bandura [38-40], Bhaskar [41-43], Billett [44-46], Bourdieu [47], Brown [48, 49], Boud [50-52], Engeström [53-55], Eraut [56, 57], Kolb [58-60], Latour [61, 62], Lave and Wenger [63], Marsick [64, 65], Mezirow [66, 67], Nonaka [68] and Vygotsky [69]. The searches were done in bibliometric databases that indexed the journals such as Scopus and Web of Science (WoS). As the research question specifically examines the field of IS, the AIS Senior Scholars 'basket' of eight IS journals were the first selection, alongside with the London School of Economics and Political Science (LSE) list of top journals from which three journals were added to the selection (see Figure 1).

Journal	Source
European Journal of Information Systems (EJIS, ISSN: 0960-085X);	Basket of 8
Information Systems Journal (ISJ, ISSN: 1365-2575);	Basket of 8
Information Systems Research (ISR, ISSN: 1047-7047);	Basket of 8
Journal of Information Technology (JIT, ISSN: 0268-3962);	Basket of 8
Journal of Management Information Systems (JMIS, ISSN: 2162-9730);	Basket of 8
Journal of Strategic Information Systems (JSIS, ISSN: 0963-8687);	Basket of 8
Journal of the Association of the AIS (JAIS, ISSN: 1536-9323);	Basket of 8
MIS Quarterly (MISQ, ISSN 2162-9730);	Basket of 8
Scandinavian Journal of Information Systems (SJIS, ISSN: 0905-0167);	LSE list
Information Technology and People (IT & People, ISSN: 0959-3845); and	LSE list
Information and Organization (IO, ISSN: 1471-7727).	LSE list

Figure 1. Final list of selected journals

After following the authors and searching for references to these in the reference lists within the selected outlets, we had 2678 articles that met the criteria of the author-centric review. The references were imported into EndNote and sorted by outlet, where each journal was clustered in the same manner, first according to journal, then by authors. This selection included duplicates because when an article referred to more than one of the key authors identified, it appeared several times in the EndNote library. After removing duplicates and limiting the search to the 11 abovementioned publication places, the final selection included 1644 papers. The author-centric review and descriptive statistics enabled us to build a foundation where we got to know the material well and found initial seeds to key findings. This was followed by a second concept-centric review, where we switched from following the authors to following the concepts related to our research question. Aiming to narrow down the

selection and to continue to dig deeper in our pursuit to identify papers that addressed or furthered our research question, we specified inclusion and exclusion criteria. To focus on IS and how learning theories have been applied, the analysis was done on articles with two or more references to workplace learning theories (378) as well as articles with learning in the title, abstract and keywords, regardless of whether they were referring to the authors identified in the previous step or not (113). The descriptive statistics was done in SPSS and r-studio and included data from 1995 to the end of 2020. Thematic analysis was done using qualitative data-analysis software NVivo based on title abstract and keywords, where articles that were clearly not about learning in the workplace or learning at work were excluded. Among those, 11 papers were thematized as workplace learning papers. These steps together, one after the other outline what we hereby forward as a systematic process to a literature review; more specifically a systematic review.
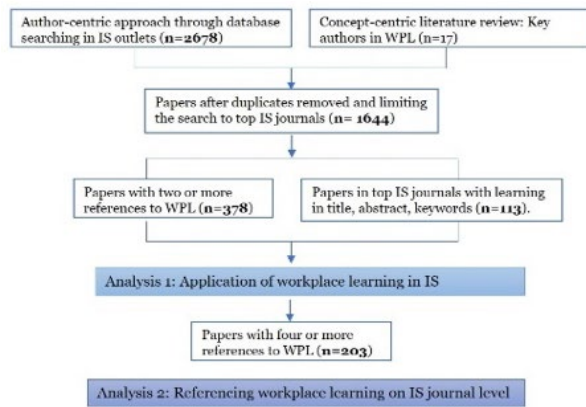

Figure 2. The process of the systematic review

4. Results

4.1. Themes and authors in workplace learning

In the following chapter we outline the results derived from the literature review. First, we present the themes and authors in workplace learning and learning at work (which we shorten to WPL in this particular chapter). Second, application of workplace learning or learning at work in IS. Finally, we outline the references to workplace learning on an IS journal level. After an iterative process of grouping characteristics and authors from the literature reviews, we ended with the following four themes: observable learning, participation-in-practice, reflection-in-action and critical-and-emergent (Figure 3).
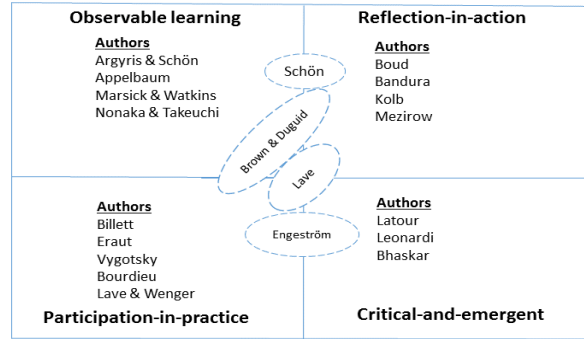

Figure 3. Key authors placed in themes

Observable learning: One of the most important characteristics of this theme is that learning should be observable in for instance in action or doing. Concepts such as understanding and thinking are part of a reflection that leads to an action, the application of knowledge is important. Another characteristic is that knowledge is regarded as a product or a thing which could be observed and hopefully measured empirically. Some authors highlight knowledge creation, but knowledge is still regarded as a product. The focus is on the individual or an individual within an organization. The organizational structure and culture are to a huge extent disregarded as important. The theme observable learning seems to have had their heydays between late 80's and the early days of the new millennium. Important authors or key authors in this theme is: Argyris and Schön [36, 70], Marsick and Watkins [64, 65], Appelbaum [34, 35], Nonaka and Takeuchi [68]. The theme observable learning seems to have had their heydays between late 80's and the early days of the new millennium.

Participation-in-practice: One of the characteristics in this theme is that learning is situated in practice, such as a community or a department at the workplace. The learning has both an individual and a social focus. Learning is also regraded as a process in which the learner is engaging through negotiations using different objects. Through the engagement, the learner develops his or her knowledge. Another characteristic is the influence of the context and how it shapes and affects learning. The theme participation-in-practice is an ongoing theme where Billet, Eraut, Lave; Wenger and Engeström is regularly publishing. Important authors or key authors in this theme is: Billett [45, 46, 71]; Eraut [56, 57]; Vygotsky [69]; Bourdieu [72]; Lave & Wenger [73, 74] and Engeström [53-55, 75].

Reflection-in-action: There are several characteristics of this theme. One of the most important is the empirically grounded reflection in and during action. Another characteristic is a focus on the learner's mental models together with their perception. In many studies, there is a focus on the individual within a group

and their consciousness when they, for instance, are creating artifacts such as reports. In many ways, the theme reflection-in-action uses important theories from socio-constructivist approach together with theories from the more cognitive approaches. The theme reflection-in-action is also an ongoing theme where authors publish on a regular basis. Important authors in this theme are: Boud [50-52]; Bandura [38-40] where one of the articles has 40 000 citations; Kolb [58-60] and Mezirow [66, 67].

Critical-and-emergent: One of the most important characteristics of the critical-and-emergent theme is that learning is emergent from its context and unanticipated and unpredictable. One important issue in the critical thinking is that power is in the center. There is also a temporal dimension in this theme that cannot be ignored. The critical-and-emergent theme uses theories such as critical realism, Actor Network Theory (ANT), complexity theory and socio-materiality which is also discussed and applied within IS. Critical realism is to a huge represented by Bhaskar [41, 43, 76] and his underlying philosophy of critical realism. Actor Network Theory (ANT) are relying on the work done by Latour [61, 62].

Authors in-between themes: Some authors and their writings are not that easy to place in a theme (Figure 1). There are two reasons behind this: 1) the articles by the authors has changed over years and 2) in specific articles the authors use theories from different themes. Here we see Brown and Duguid [48, 49], Schön [22] and Engeström [53-55].

4.2. Workplace Learning in Information Systems

The descriptive statistics is presented in accordance with the four themes identified and focus on how articles in different IS-outlets have addressed WPL over the years. Numbers of citations for all authors presented in the text below.

Observable learning: Observable learning has been important in IS over time. The number of citations has decreased somewhat the last years but overall is on a steady level. Some authors are almost missing in the statistics, for instance, Marsick & Watkins nine times in the period of twenty years. Marsick & Watkins have addressed informal and transformative learning in their writings which could be useful in IS where there is a lot of articles addressing implementation of IS. Appelbaum's work on organizational learning has not reached any attraction from IS. Instead, the IS community seems to use Argyris and Schön.

Participation-in-practice: This theme has been increasing over time. Billet and Eraut are important learning theorists in other fields and widely cited in the WPL literature in particular, but not well cited within the selected journals. However, Billett has a couple of citations from last year. The number of citations has also decreased a little bit the last years. Our field's interest in participation-in-practice started around 2000, before that there were only a couple of citations to Lave and Wenger. A surprising finding was that there are rather few citations to Engeström, whereas he is well cited in WPL in general. Worth noticing is that Bourdieu has done a lot of research on the practice-based perspective which could be applied in other settings, for instance, action research, likewise Vygotsky's work that could be applied more in IS.

Reflection-in-action: The theme has to a large extent been ignored within IS. There is one exception, Kolb and his theories on experimental learning and learning styles. It is noteworthy that well-known learning theorists such as Boud, Bandura, and Mezirow are completely missing, which indicate that these authors are not of such high importance for the IS field although the theme reflection-in-action is often used in the surrounding communities of IS (c.f. CSCW and HCI).

Critical-and-emergent: Our findings show that the theme has had an increased interest in theories used in this theme. The authors and their work are closely related to a specific theoretical concept: such as Bhaskar – Critical realism and Latour – ANT. The authors have been widely published and cited within IS with a focus on related topics, not only for learning suggesting that they are both relevant to the field in general as well as for WPL in IS.

Authors in-between themes: The work by Brown and Duguid wanders between three of our themes, observable learning, participation-in-practice, and reflection-in-action. Their work is important and its contribution to WPL should not be underestimated. Another example is Schön, where the work done with Argyris, is placed in observable learning but the work done by himself is placed in reflection-in-action. The last author placed in-between is Engeström, which work on activity theory is placed in participation-in-practice, whereas the later work on expansive learning which has taken a cultural-historical perspective, is placed in critical-and-emergent.

Summary: To sum up, the main findings from the descriptive statistics show that that citations and references to well-cited authors within WPL are minimal within the IS field. Another finding was that the references addressing the observable knowledge have been rather stable but are however not increasing. What is also interesting is that the peaks in citations are mostly related to special issues where specific topics are the main theme, even so, the interest does not last longer than the special issue itself, explaining some of the

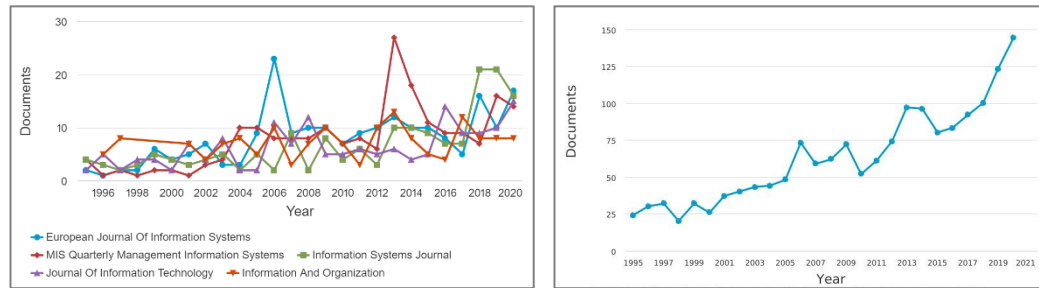| Source	Documents
EJIS	210
MISQ	206
IT&P	206
ISJ	175
JIT	165
IO	160
JAIS	135
ISR	130
JMIS	119
JSIS	110
CAIS	104
SJIS	28

Figure 4. Number of citations in each journal and the rise in citations

peaks in the statistics. The special issues do therefore not raise the citations for years but rather increase them for a shorter period.

4.3. Citations to WPL in IS journals

In addition to the descriptive statistics of articles citing learning theory authors within WPL we also analyzed how the material was distributed between the selected journals. A starting point for this analysis was to search for references that had cited several of our learning theory authors (on the bottom in Figure 4). As shown to the top in Figure 4, the number of references within an article drops rather quickly. It is more than half when moving from two to three citations. The decrease in citations continuous when moving from three to four and four to five citations. There are three journals from IS where the frequency of articles citing WPL is high: European Journal of Information Systems (EJIS) Management Information Systems Quarterly (MISQ) and Information technology & People (IT&P).

From the table we chose twelve articles that had six or more citations to WPL-authors and made an analysis of the reference list in each article. Two of the articles are addressing education or teaching IS, the rest of them are more traditional IS articles. The two articles about education and teaching are the only articles that has references to WPL authors in the theme reflection-in-action. Both articles cite Kolb and one of them Bandura. The authors in reflection-in-action are completely missing in the other ten articles. The only author that is cited is Schön, which is in-between observable learning and reflection-in-action. Another interesting finding is that pair of authors in WPL are following each other. Brown and Duguid are referenced from ten articles. In each and every one of these reference lists there is also a reference to Lave and Wenger, but not only that, there is also a reference to Boland and Tenkasi. Boland and Tenkasi are well-known authors in IS, but was missing in the three literature reviews from WPL. Another related finding was that articles that referenced Lave and Wenger also referenced Lave (Cognition) and Wenger (Communities of Practice) separately. One difference is

that Wenger has become an author in-between participation-in-practice and observable learning. The twelve selected articles are from the period 1995 to 2020, and seven of the articles had knowledge in the title. All of these articles cited Argyris & Schön and Nonaka & Takeuchi, which is another example of author-pairs following each other. The result indicates that IS researchers are behind in applying authors in the theme observable learning since the theme is not addressed anymore in WPL. We also note that the authors cited here, do not mean that WPL learning theories are cited, it means that the authors are cited. We also need to mention in our findings about Latour since WPL applies Latour's Actor Network Theory, and we suspected the same in IS. However, the articles from Latour that is cited among our selected articles are "Science in action" and "Technology is society made durable", not ANT.

Explicit Learning in IS: In addition to the analysis on articles with two or more references to WPL (figure 2), we also conducted a thematic analysis of articles with learning in title, abstract and keywords, regardless whether they were referring to WPL authors or not (113). Among those, 11 articles were classified as WPL, while clearly there was also an overlap with many articles on knowledge management and knowledge management systems. This indicates that explicitly articulating learning, is not done a lot within our field. A content analysis was also conducted on the same material, based on word frequency, suggesting that views of learning in IS may be related to a tradition of technocentric views on information systems rooted in the positivist paradigm and the use of quantitative methods. Something that was further illustrated by concepts as computer-supported learning, technology enhanced learning, computer-mediated learning, etc. E-learning, online learning and learning systems was also common keywords but was not articles on learning per se, but rather other aspects of the system (that happen to be a learning system). Some concluding results are regarding methods used in the selected papers; it was more common with qualitative methods in general and case studies in particular.

4.4. Methodological considerations and limitations

This literature review has similarities with application gap-spotting [18] where we tried to spot new ways to apply existing literature from other fields, in our case WPL, and incorporate that into the field of IS. What needs to be considered in regards to the literature review and selection of the 2678 articles, is that some articles in the EndNote results were missing abstract and others were missing keywords. We did a random check in the material, and it was apparent that the articles missing either keywords or abstracts, were only a handful. However, as we approached the material in different ways the methods complemented each other and only one of the approaches relied on keywords and abstract whereas the other approaches relied on the reference list, this should not affect the outcome. To complement our study, we conducted a search on learning explicitly among the 2678 IS articles. If we had made the selection of first the citation count and then, explicitly using learning, the results would have been too narrow. The articles we thought were clearly about learning, e.g. using communities of practices or boundaries as an analytical lens, did not explicitly talk about learning. This also implies that the comprehensiveness and the two different parallel approaches of the concept-centric and author-centric review were necessary to gain an in-depth understanding of the material. This resulted in them not showing up in this final search. Overall, this suggests that there is great potential for explicitly talking about learning within the IS field and maybe we should be the agenda-setters that open up the discussion about learning.

Our thematic mapping of the authors (Figure 1) can be discussed as the authors within each theme might not agree with where they have been placed. What could be developed is to visualize somehow how the authors have moved between themes over time. The time dimension of the authors in each corner could also be illustrated to consider how paradigm changes have influenced the authors, since authors, as well as the IS field in general, have developed and grown over time as well. What needs to be added here is the critical point of the general growing amount of published papers and references during the period of the search (since the journals started). There is a general trend of using reference management systems and increased referencing in general, this has however not been extravagantly increasing, but we do see, from our material an increase in references after 2000 compared to before the year 2000. However, as this trend is from within all research, it should not affect our results more than any other literature review results.

7. Research Agenda

This literature review brings together the field of IS and workplace learning or learning at work that have previously been disparate streams of research. Looking at similar cross-fertilization efforts, or similar intersections to what we are forwarding, we have for example marketing and IS (service innovation) [e.g., 28] and healthcare and IS (e-health) [e.g., 77, 78]. We argue that if scholars address change and learning within IS, using what has happened in the other fields is fruitful both for that specific paper, and for the field of IS in general. Following this line of argument, and based on the findings from this study, we would like to forward a research agenda for learning at work within the field of IS which discuss as emerging implications and three specific research directions, illustrated in Figure 5 and further elaborated/presented here below.
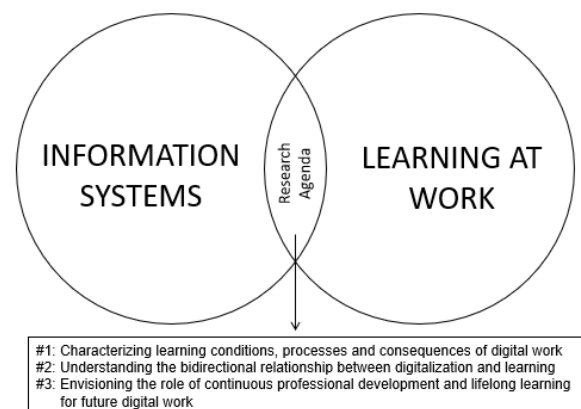

Figure 5. Research agenda for learning at work within the field of IS

Research direction #1: Characterizing learning conditions, processes and consequences of digital work Our findings show how workplace learning theories have been applied within IS and through that overview, there is clearly potential for using workplace learning theories more explicitly as an analytical lens within the field of IS. The research in IS has been focusing on aspects related to learning, such as knowledge management and knowledge sharing in organizations without explicitly articulating learning. Our findings from the descriptive statistics show that we tend to cite authors that we are familiar with, such as Nonaka & Takeushi or Argyris & Schön instead of exploring other authors such as Bandura, Kolb, Boud and Mezirow. What we have also done in this literature review (even though this is not emphasized in this particular article), is the same review on surrounding communities of IS (HCI, CSCW, CSCL etc.) where the growth in citations to the authors included herein was apparent; the interest

in the related communities is growing faster than the interest within IS. Based on that, future research could target: How is learning in digital work actualized?

Research direction #2 - Understanding the bidirectional relationship between digitalization and learning

Within the field of IS observable learning is stable over time, meaning that the field of IS might be stuck in comfortable theories. Information Systems is the field that should be most concerned with the digitalization of society and should not be stuck dealing with the mainframe in the basement [1], using old and comfortable theories. In order to be the leading field addressing digitalization, we need to broaden our perspectives and seriously consider the use of strong theories from other fields to a larger extent. Another benefit could be the cross-fertilization between research fields, where IS could contribute to workplace learning and learning at work. Our findings suggest that learning needs to be taken seriously in the field of IS, particularly focusing on learning in a digitalized working life where work is not necessarily bound to a place, instead it is an activity. However, this does not mean that we only have the option of borrowing learning theories, that is not our agenda, we might borrow some, but we also need a grounded way of working with learning within our sub-field in order to further the theoretical underpinning within the field of IS. Future research could target: How can digital artifacts be designed and used to support and develop learning at work activities? And: What type of learning is needed when using digital artifacts as a part of digital work, as digital work is becoming increasingly important?

Research direction #3: Envisioning the role of continuous professional development and lifelong learning for future digital work

Working life is also changing so that it is not merely within the workplace, instead work is 'what you do', and not 'where you go'; it is an activity that can be performed often independent of place. Learning theories might help advance the field of IS in understanding that. The digitalization of society and of work demands new competencies from the professionals [3]. With the digitalization of society comes the demand to adjust to constant change, by keeping skills up to date and by learning how to learn in an ever-changing digital environment [79]. The digitalization of work allows for new forms of collaboration within and across organizational borders [4]. Workplace learning theories could therefore be one way of understanding the new challenges that digitalization brings for the field of IS that [1, 2] and [80] bring forward. Based on that, future research could target: What strategies could organizations on the one hand and individuals on the other hand enact to meet the demands of workplace learning and lifelong learning?

8. Conclusion

In conclusion, we call for a more explicit discussion on learning in relation to information systems and digitalization within the field. The lack of referring to acknowledged workplace learning and learning at work theorists identified in this study (e.g. Engeström, Billet and others) within the IS field, points towards the notion that the field of IS, is lagging behind when it comes to known, established theorists from other fields; our field could learn from learning. The paper has shed light on the intention to address the intersection and cross-fertilization between workplace learning and learning at work and IS. In the first phase of our study, three literature reviews from workplace learning were analyzed. The result was 17 key authors and five themes: i) observable learning, ii) participation-in-practice, iii) reflection-in-action, iv) critical and emergent and v) in-between themes. The identified workplace learning authors were traced in eleven high ranked journals (Basket of eight plus three additional journals) and analyzed based on descriptive statistics. The results clearly show that the interest in learning is stable over time within the field of IS and in addition to that, the analysis shows how learning theories have been applied to the field of IS up until this point. Even though the interest in learning is stable, the key learning theorists and themes are underrepresented within the field of IS.

The result also indicates that the progress in workplace learning and learning at work made by the key learning theorists has not been applied in IS and that there is a great potential to apply the newer theories in the future, to explain the recent IS phenomena that we stand in front of today, through increased digitalization of work, where the digital infrastructure is becoming increasingly complex and the way the workforce is learning through work can be explained with more complex, newer theories instead of explaining it with older theories. Based on our findings we propose an intersection between workplace learning and IS where we to a larger extend embrace the newer theoretical development from the workplace learning side, and incorporate into IS. Such an intersection might enrich and further new theories that more currently accommodates contemporary phenomena of digitalization and lifelong learning. Moreover, we forward three specific research directions as areas for future research on this topic though a research agenda for addressing learning through work in everyday routines and work-related activities facilitated by digital artifacts.

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