



A Categorization of Workplace Learning Goals for Multi-Stakeholder Recommender Systems: A Systematic Review

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Abstract

Educational recommender systems offer benefits for workplace learning by tailoring the selection of learning activities to the individual's learning goals. However, existing systems focus on the learner as the primary stakeholder of learning processes and do not consider the organization's perspective. We conducted a systematic review to develop a categorization of workplace learning goals for multi-stakeholder recommender systems. Out of an initial set of 13,198 publications exported from databases, a final sample of 34 key publications was identified, according to predefined inclusion criteria. Content analysis and reflective exchange were deployed to synthesize workplace learning goals investigated in the key publications. We identified five categories of workplace learning goals that can be arranged along a dimension from intrinsic (goals set exclusively by the learner) to external (goals set exclusively by the organization). Our categorization provides a common language for multi-stakeholder recommender systems incorporating both the learner's and the organization's perspectives.

Keywords Learning goals · Recommender systems · Systematic review · Categorization · Workplace learning

When engaging in workplace learning, learners pursue different learning goals, covering a wide range from the satisfaction of personal interests and curiosity, the advancement of one's career, or the solution of position-specific use cases to mandatory job requirements such as safety or compliance training (Decius et al., 2021; Louws et al., 2017; Subramanian & Zimmermann, 2020). The search and choice of those goals and the corresponding relevant learning activities for their pursuit often prove to be a major challenge for learners, mainly due to the general oversupply of options and opportunities (Ilkou & Signer, 2020). Modern platforms for online

learning and their associated recommender systems have the task of tailoring the selection of learning activities to the individual learner (Drachsler et al., 2015), typically in the form of courses, learning paths, or specific skills and materials. With a methodology typically adapted from successful recommender systems for consumer goods (e.g., Manouselis et al., 2012), they hereby focus on the learner as the single stakeholder. Consequently, they mostly interpret the learning goals to be *intrinsic* to the learner: they appeal to the learner's curiosity and the exploration of new topics, are flexible to rapid changes of interests, require self-regulation, and are inherently short-term oriented, aiming at the immediate satisfaction of the learners' needs and interests (Assami et al., 2018; Burke et al., 2011; Laseno & Hendradjaya, 2019).

However, workplace learning in practice requires balancing the interests, strategies, and goals of a second stakeholder: the organization (Kyndt & Baert, 2013; Ifenthaler, 2018). With the expected transformation of more than a billion jobs in the next decade through the advancing digitalization (Zahidi, 2020), workplace learning becomes a strategic component of increasing importance on the corporate side (Bersin, 2022). Organizations need to develop into so-called learning organizations to face the challenge of fast restructuring due to global competition, new knowledge, and technology (Ben-Hur et al., 2015; Ifenthaler, 2018;

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Marquardt, 2011). The organizations' requirements for the associated learning processes are different from the learners' and often rather translate into *external* learning goals for the individual learners. Those goals are not determined by the learners' interests and curiosity but by the organization: Learners should engage in learning activities that directly contribute to the organization's strategy and needs, which should result in a much narrower range of choices than classic recommender systems typically offer (Burke et al., 2011; Kyndt & Baert, 2013; Subramanian & Zimmermann, 2020). Consequently, external learning goals can require a much more specific and less exploratory or even mandatory as well as time-bound behavior of the recommender system.

With the learning and development goals of both learners and organizations being increasingly intertwined and dependent on each other, recommender systems for workplace learning need to develop into multi-stakeholder systems (Abdollahpouri et al., 2020; Burke et al., 2016) balancing the interests, strategies, and goals of both the individual learner and the organization. We suggest that intrinsic goals set by the learner require other learning activities and materials than external goals set by the organization: Whereas learners pursuing intrinsic goals might value an exploratory and flexible recommendation of learning materials, this behavior of recommender systems might not be beneficial for external goals. Therefore, recommender systems for workplace learning need to adapt their behavior depending on the type of goal that is currently pursued by the learner, restricting or enabling exploration, satisfying or disregarding personal interests, being flexible and short-term-focused or long-term-oriented (Buder & Schwind, 2012; Gagné & Deci, 2005; Plass & Pawar, 2020).

This research aims to develop a common language for such systems in the form of a categorization of workplace learning goals incorporating both the learners and the organizations as major stakeholders. To do so, we conducted a systematic review of learners' goals for workplace learning as well as their degree of self-regulation. We demonstrate that all workplace learning goals can be arranged along a dimension from intrinsic (high self-regulation, i.e., goals set exclusively by the learner) to external (low self-regulation, i.e., goals set exclusively by the organization). The types of goals alongside this dimension correspond to an increasing amount of influence of the organization as an additional stakeholder in the learning goal. The categorization can be used to adapt the behavior of recommender systems to the specific type of workplace learning goal.

Workplace Learning

The concept of *workplace learning* refers to a broad range of learning activities through which individuals acquire or improve work-related skills and competencies. These

learning activities can occur in formal, non-formal, and informal settings at the physical workplace or in other locations such as at home or educational institutions (Doyle & Young, 2007; Kyndt & Baert, 2013; Manuti et al., 2015). According to Matthews (1999), workplace learning should promote the development and performance of the individual learner as well as the organization. Therefore, workplace learning is determined by the reciprocal interaction between individual and organizational demands and needs to balance the goals of both the individual learner and the organization (Kyndt & Baert, 2013; Manuti et al., 2015). While the initial approaches to workplace learning were primarily classroom-based training, workplace learning is now becoming increasingly digitalized (Ifenthaler, 2018; Manuti et al., 2015). Digital technologies and artificial intelligence enable the implementation of more flexible, cost-effective, and customized forms of workplace learning (De Laat et al., 2020) as well as new methods to support learning processes such as learning analytics (Giacumo & Breman, 2016; Ifenthaler, 2022), adaptive learning (Plass & Pawar, 2020), or educational recommender systems (Tavakoli et al., 2022).

Educational Recommender Systems

Recommender systems are designed to support users in areas where the amount of information exceeds the individual's abilities to process it and provide them with the individually most relevant, interesting, or useful object (Manouselis et al., 2012). Classic approaches like collaborative filtering or content-based recommender systems (e.g., Koren et al., 2009) assume that similar users prefer the same objects and are successfully employed in commercial applications and information services. The similarities between the tasks of recommender systems in the consumer domain and the challenges of online education have led to many adaptations, especially for the personalization of learning processes (Drachsler et al., 2015). Examples of successful adaptation include finding relevant learning content (Deschênes, 2020), entire courses (Guruge et al., 2021), or the optimal sequence of learning content and activities (Kerres & Buntins, 2020).

At a second glance, however, recommender systems in the educational domain impose a significantly higher complexity than recommender systems employed in the consumer domain (Drachsler et al., 2007; Kerres & Buntins, 2020). In addition to general interests and preferences, systems must address a variety of other dimensions to sufficiently reflect and support learners' learning processes, for example, continuously changing knowledge and skill levels, varying learning goals, and time constraints. Even for learners with the same interests, different learning activities often need to be recommended depending on their prior knowledge and skill levels, learning goals, and time constraints.

Consequently, the use of recommender systems for educational purposes is rather limited so far (Krauss, 2018), especially in the context of workplace learning (Rivera et al., 2018).

We want to address two major drawbacks of existing (educational) recommender systems. Firstly, they are inherently short-term-oriented in the sense that they try to meet the present demands of the user and maximize the current satisfaction (Burke et al., 2011; Manouselis et al., 2012). However, successful learning sometimes demands significant amounts of planning (Margaryan et al., 2013) and requires recommender systems to take a long-term perspective instead. Current advances in the use of reinforcement learning for (commercial) recommender systems put more focus on the maximization of long-term rewards (Afsar et al., 2021). However, they cannot be translated to the workplace learning setting without a proper categorization of workplace learning goals. Educational recommender systems require a proper framework that models learning processes and from which sound recommendations for learning activities and materials can be derived. A categorization of workplace learning goals can help to build such a framework by describing the exact objectives and reasons why learners engage in workplace learning and by enabling transparency and interoperability of recommender systems (Ilkou et al., 2021; Reichow et al., 2022).

Secondly, specifically for workplace learning, current educational recommender systems lack a multi-stakeholder perspective (Abdollahpouri et al., 2020; Burke et al., 2016), that is, they do not put the organization and its corporate strategies into the focus of attention alongside the learner. The strategic and organizational conditions set by the employer (e.g., the selection of content-related learning goals and the learning opportunities, contents, and activities necessary to achieve them) and the setting of the time frame highly influence the learning process and its effectiveness (Doyle & Young, 2007; Kyndt & Baert, 2013; Matthews, 1999). Yet, they are so far widely ignored by educational recommender systems.

Workplace Learning Goals

Workplace learning goals are cognitive representations of states or outcomes an individual strives to achieve in workplace learning (Deci et al., 1996; Locke & Latham, 2002; Seijts et al., 2013). They are key drivers of learning motivation as they direct attention towards goal-relevant activities and enhance effort and persistence (Locke & Latham, 2002). According to self-determination theory (Deci et al., 1996), goal-directed behaviors differ in their degree of self-regulation. Behavior based on intrinsic motivation is considered highly self-regulated, because it is performed out

of pure interest (Deci & Ryan, 2000; Gagné & Deci, 2005; Vansteenkiste et al., 2006). Goal-directed behaviors that are not intrinsically motivated are based on extrinsic motivation, that is, the behavior is not performed out of pure interest but is related to separable consequences (e.g., rewards or punishments). Extrinsically motivated behavior can be more or less self-regulated depending on the degree to which the individual has internalized the regulation of the behavior and integrated its associated value into the self. If the extrinsically motivated behavior is valuable to the individual, it is considered as (highly) self-regulated. However, if the behavior is controlled exclusively by external demands or contingencies, its self-regulation is very low. For example, if individuals engage in workplace learning because getting a job promotion is important to them, the behavior is extrinsically motivated but self-regulated. However, if individuals engage in workplace learning, because they experience pressure from their supervisors, the degree of self-regulation is very low and the regulation is considered external (Deci & Ryan, 2000; Deci et al., 1996; Gagné & Deci, 2005). Thus, Deci et al. (1996) suggest that self-regulation is a dimension ranging from *intrinsic* motivation (high self-regulation) to *external* regulation (low self-regulation).

Following Deci et al.'s (1996) self-determination theory, we suggest that workplace learning goals can be arranged along a dimension from intrinsic to external goals. Intrinsic goals are related to the individual learner's interests and are highly self-regulated (Vansteenkiste et al., 2006). In contrast, external goals are not set by the individual learner but by external demands or contingencies usually defined by the organization. External goals are based on the least self-regulated form of extrinsic motivation (Deci et al., 1996; Gagné & Deci, 2005). Thus, intrinsic and external goals can be arranged along Deci et al.'s (1996) self-regulation dimension, with intrinsic goals corresponding to the extreme with the highest degree of self-regulation and external goals corresponding to the extreme with the lowest degree of self-regulation.

We suggest that different workplace learning goals and their associated degree of self-regulation affect how individuals engage in learning. For example, educational research has shown that the degree of self-regulation of learning goals is positively associated with learners' persistence (Vansteenkiste et al., 2006), achievement (Grolnick et al., 1991), goal attainment, and satisfaction (Skues et al., 2019). Moreover, individuals engaging in workplace learning because they are generally interested in the topic and want to learn something new (= intrinsic goal) might benefit from other learning materials than individuals who need to solve a specific work-related problem defined by external demands or contingencies (= external goal). Thus, recommender systems for workplace learning should be aware of the different workplace learning goals that learners pursue

and their degree of self-regulation to identify those learning materials necessary to enhance the development of both the individual learner and the organization (Buder & Schwind, 2012; Gagné & Deci, 2005; Plass & Pawar, 2020).

In educational research, several research efforts have attempted to categorize learning goals in the form of taxonomies (e.g., Bloom et al., 1956; Carter, 1985; Krathwohl, 2002). For example, Bloom's taxonomy of learning goals distinguishes between cognitive, affective, and psychomotor goals, each of which is subdivided into different hierarchical levels (Bloom et al., 1956; Harrow, 1972; Krathwohl & Bloom, 1964). Moreover, Carter (1985) developed a taxonomy of learning goals for professional education and distinguishes between learning goals related to knowledge (knowing), skills (doing), and personal qualities (being). However, these taxonomies might not be useful for recommender systems for workplace learning as they either do not focus on the context of work or ignore the varying degrees of self-regulation related to workplace learning goals. Therefore, this paper aims to develop a new categorization of workplace learning goals and their degree of self-regulation. For this purpose, we conducted a systematic review guided by the following two research questions:

1. What categories of learning goals do learners pursue when engaging in workplace learning?
2. What is the degree of self-regulation related to these categories of workplace learning goals?

To present our results, we have chosen the word *categorization* instead of taxonomy, as the categories of workplace learning goals developed in our systematic review are neither organized hierarchically nor orthogonal to each other as usually supposed by taxonomies (e.g., Bloom et al., 1956).

Method

Our systematic review followed the guidelines proposed by Okoli (2015). To identify the body of research investigating workplace learning goals, we conducted an electronic search in the databases ACM Digital Library, Google Scholar, PsycINFO, and Web of Science. Following the methods of other recently published systematic reviews on workplace learning (e.g., Watson et al., 2018), we set the publication period to one decade (2011–2021). We searched for the following search terms: *goal* or *objective* in combination with (and) “*professional training*” or “*professional development*” or “*vocational training*” or “*vocational education*” or “*workplace learning*” or “*further education*” or “*continuing education*”.

A total number of $N = 13,198$ publications were exported from the databases. After removing duplicates, the remaining $N = 11,923$ publications were screened for the following inclusion criteria: The publication (1) presented empirical findings, (2) examined workplace learning goals (we excluded publications that only examined goal attainment without reporting the goal content as well as publications focusing on samples of higher education or K-12 students), (3) was based on a sample with non-disabled adults, (4) was written in English or German, and (5) was published in a peer-reviewed journal. $N = 34$ key publications met all inclusion criteria and were included in the systematic review. Figure 1 provides an overview of the different steps of the screening process. As publication screening progressed, a saturation of workplace learning goals was reached, that is, the consideration of further publications did not produce additional workplace learning goals. Therefore, we assume that a review of publications from the past decade was sufficient to capture different research trends on workplace learning goals.

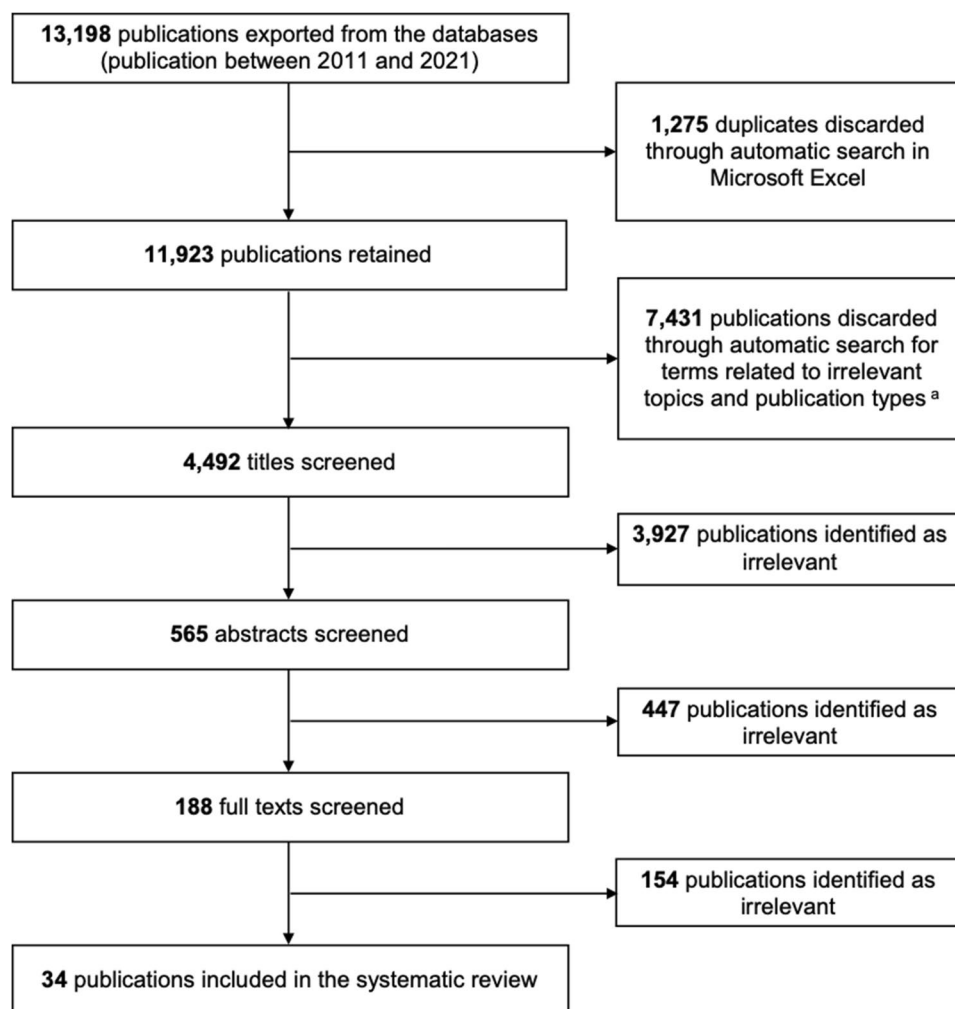
We developed a data extraction sheet to extract workplace learning goals and study characteristics (country, research design, sample size, sample characteristics, workplace learning scenario) from the key publications. Deductive and inductive content analysis (Mayring, 2015) was deployed to synthesize results: Based on Deci et al.'s (1996) self-determination theory, we arranged the extracted workplace learning goals along a dimension from intrinsic to external goals and then inductively clustered them into different categories by grouping similar learning goals and aggregating them at a higher level of abstraction. Data extraction and synthesis were conducted and discussed in iterative processes by two of the authors and two trained student assistants.

Results

Summary of Key Publications

An overview of all key publications included in the systematic review is presented in the Appendix Table 1. The workplace learning scenarios addressed in the publications ranged from specific formal and non-formal training programs ($n = 15$) to informal workplace learning ($n = 2$) and workplace learning in general ($n = 17$). Formal and non-formal training programs refer to organized learning activities (formal training programs usually comprise learning activities leading to a state-approved certificate and non-formal training programs comprise all other forms of organized learning activities; however, this distinction was not always made clear in the key publications). Contrary, informal

Fig. 1 Flow diagram of the publication screening process. The search in databases was conducted between October and December 2021. We adapted the method that Kugler et al. (2018) applied and used conditional formatting and filtering in Microsoft Excel to detect specific terms. Publications with at least one of the following terms in the title or abstract as well as publications not presenting academic journal articles were discarded: *child, infant, pupil, adolescent, primary school, elementary school, secondary school, middle school, high school, disorder, addiction, disease, illness, diabetes, cancer, disability, disabilities, depression, psychosis, schizophrenia, psychotherapy, forensic, diet, patients, drug, medication, wound, motor learning, physical education, sport*



workplace learning refers to unorganized learning activities that take place in the course of everyday work (Manuti et al., 2015; Schumacher, 2018). Although the publications covered a variety of industries (e.g., healthcare, education and research, information technology), most publications focused on samples of health professionals ($n = 12$) or teachers ($n = 10$). The average sample size of all key publications was $M = 4,380.94$ ($SD = 24,902.22$, $Min = 6$, $Max = 149,632$).

Categories of Workplace Learning Goals

Workplace learning goals were conceptualized with varying specificity across publications. For example, some publications (e.g., Hardré et al., 2013) reported the general development of new skills as a goal, while in other publications (e.g., Pool et al., 2015), these skills were named specifically (e.g., PowerPoint skills). We identified five categories of workplace learning goals which can

be arranged along a dimension from intrinsic goals (high self-regulation) to external goals (low self-regulation). Figure 2 provides an overview of the five categories and the assigned workplace learning goals extracted from the key publications.

Intrinsic learning goals represent the first category of workplace learning goals which is situated at the intrinsic extreme of the self-regulation dimension. Intrinsic learning goals are driven by the individual learner's pure interests. Learners pursuing intrinsic learning goals engage in workplace learning because they like the topic, are curious, or because they want to learn something new (e.g., Choi & Jacobs, 2011; Decius et al., 2021; Pool et al., 2015). We suggest that intrinsic learning goals are usually unspecific and flexible: Learners with intrinsic learning goals might change their learning focus if a topic turns out to be less interesting or if they discover new topics of interest during the learning process (Decius et al., 2021; Pool et al., 2015; Pylväs et al., 2015).

intrinsic (high self-regulation)			external (low self-regulation)	
Intrinsic learning goals	Personal development goals	Career development goals	Task-specific goals	Basic requirements goals
- Satisfy one's desire for studying^[23, 30] - Learning out of interest^[23] - Satisfy curiosity^[8, 12] - Expand knowledge^[23, 26] - Mastery goal orientation^[6, 8, 14, 15, 16, 18, 21, 22, 25, 29, 31]	- Social networking^[2, 3, 9, 13] - Become a team player and share knowledge^[2, 30] - Be a role model for subordinate personnel^[33] - Socialization within the organization^[20] - Personal professional development^[2, 4, 5, 9, 13, 30] - Performance goal orientation^[14, 16, 22, 25, 29, 31] - Personal validation^[13] - Increase self-esteem^[26] - Reach credibility and recognition^[9, 13] - Be prepared for unfamiliar situations^[23] - Develop new skills for the job^[1, 2, 3, 7, 11, 13, 20, 23, 24, 26, 31], e.g.: - Learn additional technical nursing skills - Improve writing skills - Improve coaching skill - Improve PowerPoint skills	- Enhance career opportunities^[4, 9, 28] - Try a different career^[26] - Stand out from others^[23] - Get a job^[26] - Develop or start an own business^[26] - Get into another training of study^[26] - Get a job promotion^[13, 20, 26] - Salary increase^[13] - Obtain a certificate^[7, 23, 27]	- Solve work-task related problems^[19, 20] - Adapt to changing job requirements^[28] - Adapt to technological innovations^[20] - Policy and school development^[2] - Drive innovation in older people care^[9] - Achieve a more positive societal regard for older people and older people care^[9] - Develop and coordinate a behavioral telehealth program^[10] - Improve current behavioral telehealth services^[10] - Provide behavioral telehealth information and education to others^[10] - Improve science instruction in elementary schools^[17] - Write a piece for publication^[1]	- Meet mandatory requirements^[4, 5, 26, 28] - Meet the specifications set by supervisors^[19] - Onboarding^[34] - Eliminate underperformance^[34] - Be up to date / get important information^[17] - Develop skills specified by the organization^[28] - Get continuing education credit^[24]

Fig. 2 Categories of workplace learning goals. Superscript numbers indicate the publications in which the respective workplace learning goals were reported. Publications associated with the numbers are listed in the Appendix

Personal development goals refer to an individual learner's plans to acquire or improve skills to enhance one's performance or credibility in daily work. Personal development goals are set by the learner and are highly self-regulated. However, they are not driven by the learner's pure interests but depend on separable consequences (the enhancement of one's work performance or credibility). Personal development goals can be ego-centered (e.g., increase self-esteem, improve PowerPoint skills) or more social-oriented (e.g., social networking, socialization within the organization) but all personal development goals have in common that they aim at developing skills for enhancing an individual's work performance or credibility (e.g., Brandt et al., 2011; Fitzpatrick et al., 2021; Louws et al., 2017). For example, an individual engaging in workplace learning with the goal of social networking might hope to gain new work-relevant knowledge in social interactions with others (Fitzpatrick et al., 2021).

Career development goals refer to acquiring or improving skills needed to climb the career ladder or to take on a new job position. These goals can either be set by the individual learner or by the organization and are, therefore, situated in the middle of the self-regulation dimension. Career

development goals are usually more future-oriented than intrinsic learning and personal development goals, and the set of skills to be learned is fixed and defined by the respective job profile being targeted (e.g., Brekelmans et al., 2015; Fitzpatrick et al., 2021; Hildebrandt & Eom, 2011).

Task-specific goals are related to a specific problem or challenge arising from daily work. Learners pursuing task-specific goals need to acquire specific skills to solve this problem or challenge. Thus, task-specific goals are reflected by the work tasks and projects the learner is currently working on. Their degree of self-regulation is rather low, as these work tasks and projects are defined by the organization (e.g., Lemmetty, 2021; Louws et al., 2017; Subramanian & Zimmermann, 2020).

Basic requirements goals refer to the acquisition of basic skills required for the current job position. They can be part of the onboarding process to provide new employees with the information and skills needed to work for the organization (Yen et al., 2016). Moreover, they can also be pursued by long-time employees if specific skills need to be updated regularly (e.g., safety or compliance training) or if a supervisor recognizes the need to manage underperformance (Subramanian & Zimmermann, 2020; Yen et al., 2016).

Particularly with the latter, basic requirements goals are sometimes difficult to distinguish from task-specific goals and the transition is blurred. Generally, basic requirements goals refer to basic skills defined in the job profile, while task-specific goals tend to emerge from daily work (e.g., Jones et al., 2013; Lemmetty, 2021; Subramanian & Zimmermann, 2020).

Discussion

Educational recommender systems offer benefits for workplace learning by tailoring the selection of learning activities and materials to the individual learner (Drachsler et al., 2015). However, existing educational recommender systems are short-term oriented and focus on the learner as the primary stakeholder of learning processes (Assami et al., 2018; Burke et al., 2011; Laseno & Hendradjaya, 2019). As workplace learning needs to balance the demands and goals of both the individual learner and the organization (Kyndt & Baert, 2013; Matthews, 1999), recommender systems for workplace learning should become more long-term oriented and incorporate the organizational perspective as well (Abdollahpouri et al., 2020; Burke et al., 2016).

This systematic review aimed to develop a categorization of workplace learning goals for multi-stakeholder recommender systems incorporating both the individual learner's and the organization's perspectives. We reviewed current publications that investigated workplace learning goals and identified five categories of workplace learning goals. These categories vary in their degree of self-regulation and can be arranged along a dimension from intrinsic goals (high self-regulation, i.e., set exclusively by the learner) to external goals (low self-regulation, i.e., set exclusively by the organization).

Theoretical Implications

From a theoretical point of view, our categorization of workplace learning goals complements existing learning goal taxonomies (e.g., Bloom et al., 1956; Carter, 1985) by focusing on workplace learning and the degree of self-regulation associated with different learning goals. Our categorization is the first to take a multi-stakeholder perspective on workplace learning goals, ranking learning goals according to whether they are more driven by the interests and strategies of the individual learner or the organization. Therefore, our taxonomy provides a more realistic framework for developing recommender systems for workplace learning than previously developed learning goal taxonomies

(Kyndt & Baert, 2013; Reichow et al., 2022). In this regard, our categorization also provides evidence for Deci et al.'s (1996) self-determination theory by suggesting that workplace learning goals vary in their degree of self-regulation. Workplace learning goals are considered highly self-regulated if they primarily reflect the interests and strategies of the individual learner (=intrinsic goal), while they are considered low self-regulated if they primarily reflect the interests and strategies of the organization (=external goal). These different degrees of self-regulation might determine how individuals engage in learning and influence learning outcomes such as goal attainment or learning satisfaction (Skues et al., 2019).

Moreover, the results of our systematic review suggest that workplace learning goals differ in their specificity. Regardless of the degree of self-regulation, workplace learning goals can be formulated more or less specifically (e.g., *improve PowerPoint skills* vs. *personal professional development*). Goal-setting theory suggests that specific goals lead to better performance than unspecific goals (Locke & Latham, 2002). When trying to translate the unspecific goals in our categorization into specific goals, it becomes clear that the majority of workplace learning goals are related to the development of skills. Skills are learned abilities needed to perform a specific task and involve knowledge as well as the understanding and application of this knowledge in specific situations (Attewell, 1990; Bloom et al., 1956; Hasa, 2021). For example, intrinsic learning goals aim at developing skills the individual learner is interested in (Choi & Jacobs, 2011; Pool et al., 2015), while career development goals aim at developing skills needed to fill the gap between the actual skill levels of the individual learner and the requirements of the targeted job position (Brekemans et al., 2016; Hildebrandt & Eom, 2011).

Practical Implications

The specific nature of the workplace learning setting and the entangled interests of both learners and organizations have a great influence on the outcome of learning activities (Ifenthaler, 2018; De Laat et al., 2020; Skues et al., 2019; Vansteenkiste et al., 2006). To achieve sustained results, the related learning processes need to be supported in different ways depending on the category of workplace learning goals a learner pursues (Buder & Schwind, 2012; Plass & Pawar, 2020). In practice, our categorization represents a means for learning platforms and their associated recommender systems to decide to which extent they need to adapt to the learners' or the organizations' share of the workplace learning goal. This implies that, alongside the learners'

intrinsic goals, they need to support organizations in translating their strategic considerations into skills and transforming these into (external) learning goals for their employees (Kovacs-Ondrejko et al., 2019). Depending on the category of workplace learning goal (from exclusively intrinsic to exclusively external), platforms can then restrict or enable exploration for the learners, satisfy or disregard personal interests, or switch from being flexible to very specific. Furthermore, the organizations' possibility of formulating workplace learning goals related to company strategy can help remove the short-term focus of recommender systems (recommendation of single topics and activities related to the current learner interests and skills) and strive toward a sustainable long-term-orientation of learning activities which are sensible in the context of the whole organization.

Limitations and Implications for Future Research

Our systematic review is subject to limitations that provide implications for future research. First, although we did not limit our search to specific industries, most of the key publications included in the systematic review focused on samples of healthcare professionals or teachers. Therefore, results might be biased and generalizability might be limited. Moreover, workplace learning goals have not been the primary focus of most of the key publications and have only been examined superficially. Thus, further primary studies focusing on an in-depth analysis of workplace learning goals across different industries are needed.

Second, as work requirements change continuously in today's working world, workplace learning goals might change during the learning process. For example, specific skills might become outdated if contexts or conditions within the organization change (Manuti et al., 2015). Further, the degree of self-regulation is not fixed and might change as well (Ifenthaler, 2012). For example, external goals might be transformed into more self-regulated goals by the individual learners if they begin to identify with the importance of the goal or if they recognize specific topics of interest during the learning process (Deci et al., 1996; Gagné & Deci, 2005). Our systematic review does not cover

these dynamics of workplace learning goals because none of the included key publications did. However, successful recommender systems for workplace learning should capture these dynamics to effectively support learning processes and recommend appropriate learning activities. Thus, future research should examine the dynamics of workplace learning goals in more detail.

Third, most of the key publications surveyed individual learners about their workplace learning goals. Although several learners mentioned external goals set by the organization, the surveys primarily reflect the learners' perspectives. Primary studies focusing on workplace learning from the organizations' perspectives are scarce. Therefore, future research should focus more on the organizations' perspectives by examining samples of learners and their supervisors and managers.

Fourth, although our categorization of workplace learning goals was derived from empirical studies, this does not necessarily mean that educational recommender systems based on our categorization are effective in supporting learning processes in workplace learning. Thus, future research should implement and evaluate educational recommender systems based on our categorization of workplace learning goals.

Conclusion

When engaging in workplace learning, learners pursue different learning goals such as advancing one's career or fulfilling mandatory job requirements. This systematic review provides a categorization of workplace learning goals and shows that workplace learning goals range from intrinsic goals (set exclusively by the learner) to external goals (set exclusively by the organization). The categorization of workplace learning goals offers a common language for educational recommender systems incorporating both the individual learner and the organization as major stakeholders. Future research should build on our categorization to develop recommender systems for workplace learning to adapt the behavior of educational recommender systems to the specific types of workplace learning goals.

Appendix

Table 1 Summary of Key Publications Included in the Systematic Review

Number	Reference	Country	Study design	Sample size	Sample	Workplace learning scenario
[1]	Al-Imari et al. (2016)	Canada	Quantitative (questionnaire survey) + qualitative (focus group)	8	Healthcare professionals	Peer-support writing group program for health professionals interested in writing
[2]	Boei et al. (2015)	Netherlands	Qualitative (analysis of portfolios)	13	Teacher educators	Professional development program for teacher educators
[3]	Brandt et al. (2011)	United States	Quantitative + qualitative (questionnaire survey)	140	Research professionals	Educational series and mentoring for research professionals
[4]	Brekelmans et al. (2015)	Netherlands	Quantitative (questionnaire survey)	1,326	Nurses	Workplace learning in general
[5]	Brekelmans et al. (2016)	Netherlands	Quantitative (questionnaire survey)	1,226	Nurses	Workplace learning in general
[6]	Choi and Jacobs (2011)	Korea	Quantitative (questionnaire survey)	203	Middle managers in the banking sector	Workplace learning in general
[7]	Cleary et al. (2011)	Australia	Qualitative (interviews)	50	Mental health nurses	Workplace learning in general
[8]	Decius et al. (2021)	Germany	Quantitative (questionnaire survey)	702	Blue-collar workers from small- and medium-sized businesses	Informal workplace learning
[9]	Fitzpatrick et al. (2021)	England	Qualitative (focus groups + telephone interviews)	63	Healthcare professionals employed in older people care	National specialist gerontological program
[10]	Gifford et al. (2012)	United States	Quantitative (questionnaire survey)	9	Behavioral health providers	Professional development program on behavioral telehealth
[11]	Hardré et al. (2013)	United States	Quantitative (questionnaire survey) + qualitative (focus groups and interviews)	17	Secondary school math and science teachers + their mentors	Teacher professional development program in engineering
[12]	Hassan et al. (2015)	Pakistan	Quantitative (questionnaire survey)	150	Medical physicians	Training programs on advanced general surgery
[13]	Hildebrandt and Eom (2011)	United States	Quantitative (questionnaire survey)	433	Foreign language teachers	National board certification program to professionalize teaching
[14]	Hoffman et al. (2014)	United States	Quantitative (questionnaire survey)	64	Surgical residents	University-based surgical residency program
[15]	Janke et al. (2015)	Germany	Quantitative (questionnaire survey)	334	Teachers	Workplace learning in general
[16]	Johnson and Beehr (2014)	United States	Quantitative (questionnaire survey)	183	Healthcare professionals	Workplace learning in general
[17]	Jones et al. (2013)	United States	Quantitative (questionnaire survey) + qualitative (interviews)	Questionnaire survey: 65 Interviews: 16	Elementary school science teachers	Professional learning communities
[18]	Kittel et al. (2021)	Germany + Austria	Quantitative (questionnaire survey)	170	Employees from various industries and organizations	Informal workplace learning

Table 1 (continued)

Number	Reference	Country	Study design	Sample size	Sample	Workplace learning scenario
[19]	Lemmetty (2021)	Finland	Qualitative (interviews + observations, field notes, and field records)	40	Employees from two organizations operating in the technology sector	Self-directed learning projects
[20]	Louws et al. (2017)	Netherlands	Qualitative (interviews)	16	Secondary school teachers	Workplace learning in general
[21]	Matsuo et al. (2020)	Japan	Quantitative (questionnaire survey)	334	Consultants from an accounting and consulting firm	Managerial coaching
[22]	Nitsche et al. (2013)	Germany	Quantitative (questionnaire survey)	667	Teachers	Workplace learning in general
[23]	Pool et al. (2015)	Netherlands	Qualitative (interviews)	21	Nurses	Workplace learning in general
[24]	Powell et al. (2013)	United States	Quantitative (questionnaire survey)	318	Clinicians	Workplace learning in general
[25]	Pylväs et al. (2015)	Finland	Qualitative (interviews)	28	Air traffic controllers	Workplace learning in general
[26]	Skues et al. (2019)	Australia	Quantitative (questionnaire survey)	149,632	Learners who completed their vocational education and training studies in 2016	Vocational education and training courses of different levels and subjects
[27]	Speering (2016)	Australia	Qualitative (interviews + document analysis)	18	Teachers, their supervisors, and responsables from the organization delivering the program	Leadership training programs for teachers
[28]	Subramanian and Zimmermann (2020)	France	Qualitative (interviews)	79	Employees from three companies (pharmaceutical industry, software engineering, automotive industry)	Workplace learning in general
[29]	van Dam (2015)	Netherlands	Quantitative (questionnaire survey)	Study 1: 415 Study 2: 511 Study 3: 292	Study 1: employees working in education Study 2: employees working for a supplier of electronics Study 3: employees working from different organizations	Workplace learning in general
[30]	Van der Klink et al. (2017)	multiple	Qualitative (interviews)	25	Teacher educators	Workplace learning in general
[31]	Verberg et al. (2016)	Netherlands	Qualitative (analysis of dialogues between teachers and their assessors)	6	Teachers of nursing and their assessors	Workplace learning in general
[32]	Wang et al. (2018)	Australia	Quantitative (questionnaire survey)	132	Full-time managers and professionals	Part-time Master of Business Administration (MBA) program
[33]	Warhurst (2013)	England	Qualitative (case study)	29	Managers holding a Master of Business Administration (MBA) within local authorities	Workplace learning in general
[34]	Yen et al. (2016)	Australia	Qualitative (interviews + field observation + focus group)	7	Nurse managers	Workplace learning in general

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Data Availability The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Declarations

Conflict of Interest The authors declare no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. Yvonne M. Hemmler declares no conflict of interest. Julian Rasch declares no conflict of interest. Dirk Ifenthaler declares no conflict of interest.

Informed Consent No informed consent was needed, as the study included literature research only.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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