Journal of Workplace Learning

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Received 3 February 2014
Revised 19 August 2014
Accepted 7 October 2014

Abstract

Purpose – This paper aims to explore the role of self-regulatory behaviours in predicting workplace learning. As work practices in knowledge-intensive domains become more complex, individual workers must take greater responsibility for their ongoing learning and development.

Design/methodology/approach – The study was conducted with knowledge workers from the finance industry. In all, 170 participants across a range of work roles completed a questionnaire consisting of three scales derived from validated instruments (measuring learning opportunities, self-regulated learning [SRL] and learning undertaken). The relationship between the variables was tested through linear regression analysis.

Findings – Data analysis confirms a relationship between the learning opportunities provided by a role, and learning undertaken. Regression analysis identifies three key SRL behaviours that appear to mediate this relationship: task interest/value, task strategies and self-evaluation. Together they provide an insight into the learning processes that occur during intentional informal learning.

Research limitations/implications – This quantitative study identifies a relationship between specific SRL behaviours and workplace learning undertaken in one sector. Qualitative studies are needed to understand the precise nature of this relationship. Follow-up studies could explore whether the findings are generalisable to other contexts.

Practical implications – Developing a deeper understanding of how individuals manage their day-to-day learning can help shape the learning and development support provided to individual knowledge workers.

Originality/value – Few studies have explored the role of self-regulation in the workplace. This study adds to our understanding of this critical element of professional learning.

Keywords Knowledge workers, Learning, Intrinsic motivation, Workplace learning, Self-regulated learning, SRL

Paper type Research paper

Introduction

In today's knowledge-intensive workplaces, there is a need for learning to occur continually as workers solve complex and novel work problems (Hager, 2004). In knowledge-intensive workplaces, formal training approaches are no longer effective or appropriate, as each worker's learning needs are bespoke and change continually (Littlejohn and Margaryan, 2013). In these workplaces, learning is primarily achieved through intentional informal learning that is deeply intertwined and mediated through everyday work tasks (Collin, 2004; Eraut, 2004; Tynjälä, 2008) and other people (Eraut, 2007; Collin, 2008). Responsibility for learning shifts from the training department to the

Many thanks to the Chartered Institute of Securities and Investment and the other professional bodies who helped identify participants for this study.

Journal of Workplace Learning
Vol. 27 No. 5, 2015
pp. 387-402

1366-5626
DOI 10.1108/JWL-02-2014-0011

learner, who must manage their own learning for work within the constraints afforded by their work role and organisational context (Fuller and Unwin, 2004). These changes place increasing demands on the worker to self-regulate their learning (Sitzmann and Ely, 2011).

This study examines individual learning at work in the financial services industry, a typical knowledge-intensive sector (Windrum and Tomlinson (1999). Specifically, the study explores the relationship between the work context, and the learning actually undertaken by an individual, hypothesising that the individual's ability to self-regulate their learning mediates this relationship. The paper begins with a review of recent studies of intentional informal learning in the workplace, focusing on those which have explored the role of self-regulation of workplace learning. The next section describes the design of the study, including the instruments used, the research participants and the context for the study. The results of the study are then presented and discussed. The paper concludes with a summary of the main findings of the study and their implications, as well as a reflection on the limitations of the study and prospects for future research.

Intentional informal learning in the workplace

Formal training has in the past proved to be an effective mechanism for transmitting skills and knowledge to prepare workers for job roles that evolve slowly over time. These relatively "static" job roles have transformed as contemporary work contexts become complex, demanding dynamic approaches to working and learning (Tynjälä, 2008). Just as workers have to assume greater responsibility for planning their work and transforming their work practices, so too must they take more responsibility for planning their learning and evolving their learning practices. Individual workers plan and evolve their learning by setting learning goals, monitoring progress and adapting strategies to suit precise learning requirements (Schulz and Stamov Roßnagel, 2010). These processes mirror the sub-processes of self-regulated learning (SRL; Zimmerman, 2002).

Although SRL theories have been formulated for use in formal, educational contexts, some have been applied to workplace learning: initially formal, workplace training contexts (see Sitzmann and Ely, 2011 for a comprehensive synthesis of research in this domain) and, more recently, intentional informal learning for work (van Eekelen, Boshuizen and Vermunt, 2005; Margaryan *et al.*, 2013; Schulz and Stamov Roßnagel, 2010). A meta-analysis of SRL in formal training contexts illustrated the extent to which SRL theories have shaped our understanding of how individuals adapt their behaviour during training to attain learning goals (Sitzmann and Ely, 2011), emphasising particularly the goal-oriented nature of work-related learning. Self-regulation is likely to have a greater impact on learning in informal situations, for instance where workers have to identify or create their own learning opportunities (Enos *et al.*, 2003) or when it is critical that workers are able to monitor their own learning effectively. To investigate these hypotheses, SRL theories have been applied in studies of informal learning at work. van Eekelen *et al.* (2005) conducted a qualitative study exploring teachers' SRL occurring during practice. The study used qualitative instruments (interviews and diaries) to gather data about instances of learning termed "learning episodes". The study found evidence of teachers changing their practice, which was assumed to be a sign of learning. When learning is deeply intertwined with work, it is difficult to

distinguish between work and learning (Eraut, 2007). Another qualitative study, conducted by Margaryan *et al.* (2013), explored how knowledge workers in a multinational energy company planned and attained their learning. The authors found evidence of workers self-regulating their learning. However, their SRL practices were not delineated into discrete phases, as described in conventional SRL models. Informal, workplace learning seems more complex, with processes occurring simultaneously, rather than being phased. Taken together, the studies by van Eekelen *et al.* and Margaryan *et al.* indicate that informal learning in the workplace, that is continual, dynamic and deeply intertwined with work goals, may not occur precisely as described by SRL theories originating from formal education. SRL is not a single attribute, but instead a group of sub-processes. By examining these sub-processes in detail, it might be possible to understand which are most important for informal workplace learning.

A number of quantitative instruments designed to measure SRL sub-processes have been developed in formal educational contexts (Pintrich *et al.*, 1991). Schulz and Stamov Roßnagel (2010) adapted a German translation of the Motivated Strategies for Learning Questionnaire devised by Pintrich *et al.* (1991) to fit a workplace context by altering the wording and eliminating items not relevant for workplace learning. The authors then used the adapted items to explore informal workplace learning in a mail order company. This study concluded that an individual's ability to self-regulate his/her learning (described by the authors as "learning competence" drawing on previous work by van den Boom, Paas, van Merrienboer, and van Gog, 2004) was a predictor of (self-identified) success in informal learning. The study identified specific SRL sub-processes that are important attributes of successful learners, including the ability to set learning goals; to plan, monitor and evaluate learning; and possessing a positive learning orientation. Gijbels *et al.* (2012) used the related concept of self-directed learning (SDL) to explore how an individual's self-directed learning orientation (SDLO) influences their participation in work-related learning. SRL and SDL are closely linked concepts (Pilling-Cormick and Garrison, 2011) focused on individual control of the processes of setting goals and priorities for learning. The two concepts have different origins, with SRL emphasising the internal (motivational and cognitive) processes of learning, while SDL focuses on external control. Gijbels *et al.* (2012) found that SDLO is a significant and strong predictor of work-related behaviour. One weakness of the Gijbels study is that SDLO is a single construct, and therefore, while the Gijbels *et al.* study finds that learners who score highly on a SDLO scale take up more learning opportunities over a fixed period, it is difficult to explore this relationship further. The use of instruments derived from SRL research would allow the identification of specific sub-processes highlighting particular behaviours which predict work-related learning.

Workplace learning activity and context

In the post-industrial world, an organisation's key value lies in the knowledge of its workforce (Nonaka and Takeuchi, 1995). This is particularly true of knowledge-intensive industries such as finance, where recent failures and ensuing stricter financial regulations demand the development of novel solutions and process innovation. While it is the organisation's responsibility to create an environment that encourages and supports learning to occur, responsibility for learning itself falls increasingly on the individual who must continually monitor and attend to their own learning needs

balancing structured learning opportunities with on-the-job learning individually and in collaboration with others (Billett *et al.*, 2008; Eraut, 2004).

To support their workforce, organisations must provide an appropriate environment and appropriate structures to enable them to effectively learn and integrate their experience. For the organisation, the emphasis moves from providing training, to creating an "expansive learning environment" (Fuller and Unwin, 2004) where staff can effectively discover knowledge and forge professional relationships. Fuller and Unwin's work highlighted the importance of engaging within and beyond the workplace, coaching and mentoring and opportunities for boundary crossing, while a study by Skule (2004) identified the importance of feedback and reward of performance, managerial responsibilities and task and role variability. The likelihood that learning will take place, therefore, depends not only on the individual, but is influenced by environmental factors such as these and the learning opportunities afforded by the organisation to the individual, and by how the individual perceives these opportunities in the context of their role. The Gijbels study used a measure of *job demand and control* (Karasek, 1979) to explore the contribution of these environmental factors on work-related learning uptake. Other researchers have developed measures focused more closely on the workplace learning context (WLC). In the Schulz and Stamov Roßnagel (2010) study, the authors included a measure of learning opportunities to explore its impact on informal learning success (although in this case they found no impact). Similarly, as part of a study designed to investigate workplace learning among older workers, Schalk and van Woerkom (2009) devised a scale to measure the perceived learning opportunities afforded by a role and showed that greater learning opportunities correlated with higher job satisfaction. The relationship between the WLC and an individual's regulation of their learning is important and provides a control for SRL.

The present study explores the relationship between the WLC (in particular the learning opportunities provided by an individual's role, as perceived by them), SRL (and its sub-processes) and workplace learning actually undertaken as the dependent variable. The study hypothesises a mediating effect of an individual's capacity to self-regulate aspects of their learning in the relationship between WLC and the workplace learning undertaken. Following Schulz and Stamov Roßnagel (2010), we adapted previously validated SRL instruments to develop a measure of SRL behaviour in the workplace context. The use of an instrument focused on SRL (and comprising sub-scales representing different SRL phases and sub-processes) provides us with the opportunity to develop a more nuanced understanding of learning behaviour than would be possible using a measure based on SDLO. Alongside scales to measure SRL and its sub-processes, we adopted the measure of WLC developed by Schalk and van Woerkom (2009), and used this in conjunction with a scale measuring work-related learning derived from the one reported by Gijbels *et al.* (2012).

Research hypotheses

The research hypotheses of this study are articulated as follows:

H1a. Workplace learning context is a predictor of workplace learning activity (WLC → WLA). There is a positive relationship between (perceived) opportunities to learn in the workplace and workplace learning activities undertaken.

H1b. Workplace learning context is a predictor of some or all self-regulated learning sub-processes (WLC → SRL). There is a positive relationship between perceived workplace learning context and SRL behaviour (some or all sub-processes) reported.

H1c. Some or all sub-processes of self-regulated learning are predictors of workplace learning activity (SRL → WLA). There is a positive relationship between SRL behaviour reported (some or all sub-processes) and workplace learning activities undertaken.

H1d. Sub-processes of self-regulated learning mediate the relationship between workplace learning context and workplace learning activity (WLC → SRL → WLA). Some (or all) SRL sub-processes influence levels of workplace learning activity depending on the workplace learning opportunity afforded to employees.

The relationship hypothesised between the factors is represented graphically in Figure 1.

Method

Participants

Participants in the study were knowledge workers drawn from a broad range of organisations within the financial services industry. Associates and Members of the Chartered Institute for Securities and Investment (CISI) were contacted through a gatekeeper who invited volunteers to participate in the study through a message sent to the member mailing list. In all, 240 responses to an online survey were collected over a three-week period in mid-2013. By eliminating incomplete responses, the sample was reduced to 170, comprising 99 male and 71 female respondents with an average age of 38.12 years (SD = 10.97). The participants were engaged across a range of work roles (38 senior managers, 41 supervisors and 91 frontline staff) and had been with their current employer for an average of 9.3 years (SD = 10.73).

Measures

The instrument used in the study was the Self-Regulated Learning in the Workplace Questionnaire (SRLWQ), developed for this study and validated separately (Fontana *et al.*, 2015). A copy of the SRLWQ instrument is available from: http://db.tt/SeUkol7S. The SRLWQ instrument was composed of five scales. The first scale *Workplace Learning Context* (WLC) was designed to provide a measure of the actual opportunities for learning available to each respondent in their particular workplace context. This

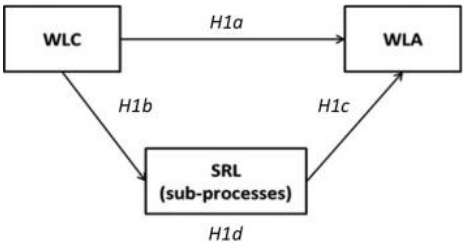

Figure 1.
Research model

six-item scale was developed by Schalk and van Woerkom (2009) as part of a study designed to investigate the relationship between age, workplace context and employability. As the scale was originally developed for a workplace context, no rewording was necessary (example item: WLC-6: "My job requires me to learn new things"). The instrument used a five-point Likert scale from 1 = rarely or never, to 5 = very often or always (Cronbach's alpha: 0.841). The second scale *Workplace Learning Activities* (WLA) was designed to provide a measure of recent informal learning activities undertaken in the workplace by the learner. This scale was an adaptation of different instruments designed to provide a measure of workplace learning behaviour (Gijbels *et al.*, 2012; Schulz and Stamov Roßnagel, 2010; Crouse *et al.*, 2011). It comprised 11 items measured by a five-point Likert scale (example item: WLA-2: "How frequently have you participated in the following learning activities in the last year: Working alone or with others to develop solutions to problems"). The instrument used a five-point Likert scale from 1 = rarely or never, to 5 = very often or always (Cronbach's alpha: 0.855). The final three scales were designed to provide a measure of an individual's ability to self-regulate their learning within their own workplace context, with a separate scale for each of the three phases of self-regulation identified by Zimmerman (2002): forethought, performance and self-reflection. Each scale comprised sub-scales representing a range of sub-processes slightly modified from the model of Zimmerman (2000), replacing sub-processes considered more suitable for formal learning settings (such as "attention focusing" or "imagery") with others identified by Pintrich (2000) and considered more applicable to the workplace context (such as "elaboration", "critical thinking" and "help-seeking"). The typology of sub-processes adopted in this study is given in Table I. The three scales developed were *SRL-F* (17 items; example item: "I set personal standards for performance in my job", Cronbach's alpha: 0.887), *SRL-P* (19 items; example item: "I change strategies when I don't make progress while learning", Cronbach's alpha: 0.877) and *SRL-SR* (6 items; example item: "I think about what I've learned after I finish", Cronbach's alpha: 0.861). The scales were designed by adapting items from a number of validated instruments, designed to assess SRL or its sub-processes: the Online Self-Regulated Learning Questionnaire (OSLQ: Barnard-Brak *et al.*, 2010), the Motivated Strategies of Learning Questionnaire (MSLQ: Pintrich *et al.*, 1991), the Metacognitive Awareness Inventory (MAI: Schraw and Dennison, 1994), the Learning Strategies Questionnaire (LSQ: Warr and Downing, 2000) and an instrument designed to measure Occupational Self-efficacy (OS: Rigotti *et al.*, 2008). All the scales draw on theories of self-regulation developed by Zimmerman (2002) and Pintrich (2000). The first three instruments were originally developed for formal education settings and

Table I.
SRL phases and sub-processes

SRLWQ		
Forethought	Performance	Self-reflection
Task analysis	*Self-control*	*Self-judgement*
Goal setting	Task strategies	Self-evaluation
Strategic planning	Elaboration	*Self-reaction*
Self-motivation belief	Critical thinking	Self-satisfaction/affect
Self-efficacy		
Task interest/value		

items from these were selected and reworded to fit with the workplace context, following the approach adopted by Schulz and Stamov Roßnagel (2010). All three SRL scales used a five-point Likert scale from 1 (= not at all true for me) to 5 (= very true for me).

Psychometric analysis

An exploratory factor analysis of the instrument revealed a strong factor reliability and structure (Darlington *et al.*, 1973). The WLC scale showed a single factor structure, providing a measure of the opportunities for learning provided by a given workplace context. Similarly, the WLA scale showed a single factor structure providing a measure of the work-related learning behaviour undertaken by an individual. The three scales of the SRL construct correspond to the three phases of SRL hypothesised by Zimmerman (2002): forethought, performance and self-reflection. Each scale comprised items designed to measure individual sub-processes within these phases (Table I) and were therefore expected to show more complex factor structures. For the Forethought scale (SRL-F), four factors were identified. F1: *strategic planning*: referring to the actions an individual undertakes to plan their learning in the workplace such as changing strategies for different learning situations or evaluating different approaches to solve a problem. F2: *occupational self-efficacy* referring to an individual's confidence in their ability to successfully fulfil the tasks involved in his/her job. F3: *goal setting* referring to an individual's ability to set long- or short-term goals for individual learning in the workplace. F4: *task interest/value* referring to the personal interest an individual takes in their learning tasks during their job role, reflecting intrinsic motivation. For the Performance scale (SRL-P), three factors were identified. P1: *elaboration strategies*, referring to an individual's ability to use resources, think about instruments and collect information about a given learning situation. P2: *task strategies*, referring to an individual's ability to the use appropriate resources to accomplish a task. P3: *critical thinking* referring to an individual's ability to make critical connections between new learning and their previous knowledge. Finally, for the Self-Reflection scale (SRL-SR), two factors were identified. SR1: *self-satisfaction* referring to an individual's ability to recognise the value of their recent learning beyond its immediate value (e.g. to longer-term goals or to the organisation rather than the individual). SR2: *self-evaluation* and referring to the ability to think about their recent learning experience and evaluate the actual learning that had occurred. The factor structure for the five scales and factor correlations are summarised in Table II. For more information, see Fontana *et al.* (2015).

The relationship between WLC, WLA undertaken and the nine SRL sub-process factors identified was explored through regression analysis, as described below. Each hypothesis was considered in turn.

Procedures

After an exploratory factor analysis, data were analysed through linear regression analysis (enter method) to test the hypotheses. As the aim of the research is to find causal relationships between variables, a linear regression model was adopted in preference to structural equation modelling (Nachtigall *et al.*, 2003). A Sobel test was run to test the final mediation hypothesis. All analyses were conducted using the SPSS statistics package.

Table II. Principal component exploratory factor analysis on questionnaire's scales

Factor	No. of items	Mean	SD	Example item	Cronbach's alpha	Percentage of explained variance	Total explained variance (%)
Workplace learning activities							
WLA: workplace learning activity	11	3.78	0.57	Observing or replicating colleagues' strategies to complete a task or solve a problem	0.85		41.79
Work learning context							
WLC: work learning context	6	3.44	0.74	I have opportunities to develop my own special abilities	0.84		57.84
SRL: Forethought							
F1: strategic planning	7	3.3	0.8	I use specific strategies for different types of things I need to learn	0.86	35.7	66.15
F2: self-efficacy	4	3.78	0.72	Whatever comes my way in my job, I can usually handle it	0.81	12.88	
F3: goal setting	3	3.91	0.7	I set long-term goals (monthly or yearly) for myself in order to direct my learning activities	0.70	9.53	
F4: task interest/value	3	4.2	0.71	It is important for me to learn new things in this job	0.80	5.83	
SRL: Performance							
P1: elaboration strategies	6	4.11	0.58	During learning I treat the resources I find as a starting point and try to develop my own ideas from them	0.79	37.9	55.08
P2: task strategies	6	3.27	0.74	When learning I make notes (including diagrams etc.) to help organise my thoughts	0.75	9.25	
P3: critical thinking	3	3.5	0.82	I try to play around with ideas of my own related to what I am learning	0.80	7.9	

(*continued*)

Factor	No. of items	Mean	SD	Example item	Cronbach's alpha	Percentage of explained variance	Total explained variance (%)
SRL: Self-reflection							
SR1: self-satisfaction	3	3.66	0.88	I consider how what I've learned relates to my team	0.85	59.35	75.7
SR2: self-evaluation	3	3.44	0.86	I ask myself if there were other ways to do things after I finish a task	0.82	16.24	

Correlations

	1	2	3	4	5	6	7	8	9	10	11
1. WLA	1	0.48[38]**	0.50**	0.20**	0.28**	0.46**	0.48**	0.52**	0.45**	0.42**	0.40**
2. WLC		1	0.32**	0.25**	0.32**	0.36**	0.39**	0.31**	0.38**	0.31**	0.26**
3. F1			1	0.38**	0.53**	0.39**	0.57**	0.73**	0.51**	0.51**	0.43**
4. F2				1	0.61**	0.23**	0.37**	0.30**	0.29**	0.31**	0.24**
5. F3					1	0.30**	0.49**	0.45**	0.35**	0.39**	0.32**
6. F4						1	0.47**	0.40**	0.30**	0.42**	0.20**
7. P1							1	0.57**	0.62**	0.49**	0.40**
8. P2								1	0.53**	0.51**	0.41**
9. P3									1	0.49**	0.43**
10. SR1										1	0.58**
11. SR2											1

Table II.

Results

Mediation analysis

A linear regression analysis (with Enter) method was conducted to verify the first research hypothesis *H1a: Workplace learning context is a predictor of workplace learning activity (WLC → WLA)*. For WLC, this analysis indicated that a higher score for WLC (indicating greater perceived opportunities provided by workplace role) is on its own a strong predictor of learning activities undertaken (*beta* = 0.49, $t(137) = 6.55$, $p = 0.000$, $F(1,139) = 42.86$, $p = 0.000$, $R^2 = 0.24$, adjusted $R^2 = 0.23$). Having established the link between WLC and WLA undertaken, the remaining hypotheses allowed the authors to explore whether an individual's capacity to self-regulate their learning can affect the relationship between WLC and workplace activities undertaken.

First, the relationship between WLC and the individual SRL sub-process factors was explored as described in hypothesis *H1b*: *Workplace learning context is a predictor of all self-regulated learning sub processes (WLC → SRL)*. Multiple linear regression analysis was used to explore the relationship between WLC and each SRL sub-process identified by the factor analysis. Results showed that WLC was a predictor of all SRL sub-processes, with the strongest effect on factors P1 (*elaboration*) and P3 (*critical thinking*), as summarised in Table III. WLC therefore, has an impact on an individual's ability to self-regulate their learning, with greatest effect on the Performance phase.

Next, the nature of the relationship between an individual's capacity to self-regulate their learning, and the WLA they undertake was explored through hypothesis *H1c: Some or all sub-processes of self-regulated learning are predictors of workplace learning activity (SRL → WLA)*. By including the nine identified SRL sub-process factors in the regression equation alongside WLC (see *H1a*), and retaining WLA as the dependent variable, the analysis indicated that only a subset of the SRL sub-process factors predict learning activities undertaken in the workplace for a given WLC. Alongside WLC, only three SRL sub-process factors were significant: F4: *task interest/value*, P2: *task strategies* and S2: *self-evaluation*. Together, these factors explained 44 per cent of the variance, with factor P2 (task strategies) having the strongest individual effect. This analysis is summarised in Table IV.

Although all sub-processes of SRL are influenced by WLC, only three sub-processes had a significant effect on WLA undertaken. As a third step in this analysis, we explored

Predictor	*Dependent variable*	*Beta*	*t*(df)	*F*(df)	R^2	*Adjusted* R^2
WLC	F1	0.32	3.92*** (138)	15.38*** (1,139)	0.10	0.09
	F2	0.25	3** (138)	9** (1,139)	0.06	0.05
	F3	0.33	4.05*** (138)	16.44*** (1,139)	0.11	0.10
	F4	0.36	4.6*** (138)	21.14*** (1,139)	0.13	0.12
	P1	0.39	4.9*** (138)	24.44*** (1,139)	0.15	0.14
	P2	0.3	3.83*** (138)	14.72*** (1,139)	0.10	0.09
	P3	0.38	4.88*** (138)	23.8*** (1,139)	0.15	0.14
	S1	0.31	3.84*** (138)	14.73*** (1,139)	0.10	0.09
	S2	0.26	3.2** (138)	10.28** (1,139)	0.07	0.06

Notes: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Table III.
Regression model workplace learning context and SRL sub-processes, Enter method

whether these three sub-processes act as mediators in the relationship between WLC and WLA undertaken by combining the two models together, including the SRL sub-processes significant for both WLC and WLA with Sobel's test to explore the hypothesis *H1d: An individual's capacity to self-regulate their learning is a mediator in the relationship between workplace learning context and workplace learning activity undertaken (WLC → SRL → WLA)*. This analysis showed that all three factors F4: *task interest*, P2: *task strategies* and S2: *self-evaluation* act as mediators in the relationship between workplace learning opportunities and WLA undertaken. This analysis is summarised in shown in Table V and Figure 2. SRL is a complex activity comprising many sub-processes. This final hypothesis, therefore, focuses our study on just those sub-processes which appear to play a mediating role.

It is noteworthy that not all the SRL sub-processes are predictors of WLA undertaken, the only variables involved are: task/*interest value* (F4), *task strategies* (P2) and *self-evaluation* (S2). All the factors showed similar predictor effects on the dependent variable. Indeed, the most influential dimension in the model is *task strategies* (P2). The model's fit for these SRL sub-processes and WLA undertaken explained 39 per cent of the WLA variance.

Predictor	*Dependent variable*	*Beta*	*t(df)*	*F(df)*	R^2	*Adjusted* R^2
WLC	WLA	0.28	3.92*** (129)	11.42*** (10,130)	0.44	0.43
F4		0.22	2.98** (129)			
P2		0.27	3.61*** (129)			
S2		0.17	2.39* (129)			

Notes: $*p < 0.05$; $**p < 0.01$; $***p < 0.001$

Table IV. Regression model WLC and SRL's factors as predictors of WLA; backward method

Variables	*Sobel test*
Forethought F4: *task/interest value*	2.83**
Performance P2: *task strategies*	3.12***
Self-reflection S2: *self-evaluation*	2.39**

Notes: One-tailed $*p < 0.05$; $**p < 0.01$; $***p < 0.001$

Table V. Sobel test of hypothesised mediator variables

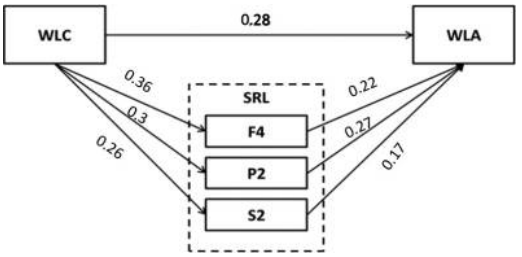

Figure 2. Regression model with SRL sub-processes as mediators between workplace learning context and workplace learning activities, Enter method

Conclusions and discussion

The aim of this study was to examine the relationship between WLC, SRL (and its sub-processes) and workplace learning undertaken. Analysis confirmed the overall hypothesis that WLC influences our measure of WLA undertaken and that individual characteristics (SRL behaviour) influence this relationship. Exploring the relationship between WLC and an individual's ability to self-regulate his/her learning, WLC was found to impact all sub-processes with greatest effect on sub-processes in the Performance phase of SRL. When learning is deeply embedded within work practice, it is unsurprising that the performance phase sub-processes are most affected by the wider context.

Regression analysis further confirmed that particular sub-processes of SRL significantly predicted the WLA undertaken by an individual. Indeed, three variables in particular mediated the relationship between workplace learning opportunities and WLA undertaken: *task interest or perceived value* (F4), *task strategies* (P2) and *self-evaluation* (S2). Considering each in turn, the factor F4: *task interest or perceived value* refers to elements of individual intrinsic motivation. How do these workers approach a new learning challenge? Do they see it as solely a work problem to solve, or an opportunity to learn something new that they may be able to apply elsewhere within their current role or in their future career? Perhaps learners who score highly for factor F4 think about their learning in a broader sense and are, therefore, more proactive in undertaking learning activities. Factor P2: *task strategies* refers to the range and quality of learning strategies available to the individual, and to how they choose to use them. Effective learners will have a range of strategies, and will know when to use them, and when to change strategies if they prove ineffective in a given situation. Again, perhaps these learners are more primed to recognise the informal learning they undertake. Interestingly, Schulz and Stamov Roßnagel (2010) did not find evidence that an individual's "repertoire of learning strategies" was an important predictor of informal learning success. Factor S2: *self-evaluation* relates to an individual's ability or readiness to monitor their learning against external criteria to determine the value and effectiveness of their learning. As with the other two factors, perhaps these learners are more aware of their learning than other learners, and are more likely to engage in informal learning opportunities.

The overall relation of WLC, SRL behaviour and WLA is similar to that uncovered by Gijbels *et al.* (2012). Their study demonstrated that learning activity is dependent not just on the presence of a work context which is conducive to learning (Taris and Kompier, 2004), but that individual characteristics play an important role in determining whether the individual will or will not take advantage of the learning possibilities offered by the working environment. In this study, the specific SRL sub-processes articulated in the models proposed by Zimmerman (2000) and Pintrich (2000) provide a more nuanced view of learning in the workplace than the SDLO construct used by Gijbels *et al.* (2012). Developing a fine-grained understanding of how individuals manage their day-to-day learning can help shape the learning and development support provided to individual knowledge workers and can empower the workers themselves. Identifying specific sub-processes (or groups of sub-processes) that predict WLA provides pointers to behaviours that may be targeted through workplace interventions.

This study used a quantitative approach to identify the relationship between a series of variables within a single context (the finance industry). The study is, therefore, somewhat limited in scope, and it would be unwise to claim generalisability of the

findings. Parallel studies could be conducted in different knowledge work contexts to see whether the mediation relationship is still present, and whether the same SRL sub-processes are identified as significant. As well as further quantitative studies, qualitative studies are also needed to explore the precise nature of this relationship. Semi-structured interviews, for example, could be used to collect rich descriptions of learning practice illustrating how the SRL behaviours identified are enacted in individual learning situations. Such approaches would also uncover context-specific characteristics which influence the relationship. Qualitative approaches are also able to capture something of the dynamic nature of SRL (Sitzmann and Ely, 2011), while longitudinal studies (preferably measuring across cycles of self-regulation) would present an ideal approach. This study, like much research studying SRL behaviours, has utilised self-report measures. The limitations of self-report are acknowledged, particularly in relation to over-estimation of ability; however, this bias can be considered a measurement error (Barnard-Brak *et al.*, 2011) and should be independent of the factor relationship described here. Approaches which do not rely solely on self-report could be considered. For example, trace methods have been proposed as a potential approach to measuring SRL in formal contexts (Zimmerman, 2008). It is difficult to design trace studies to measure SRL when the nature of learning is informal, and in workplaces where there may be concerns over confidentiality of commercially sensitive data, which forms the focus of learning. However, research designs which collect learning artefacts or include peer viewpoints could provide opportunities to corroborate self-report data. While this study did not find any causal relationships between role, tenure, age and SRL scores (data not presented here), studies focusing on a single organisation would provide an opportunity to focus on specific role types or organisational contexts. With regard to the specific SRL sub-processes identified in this study, knowledge workers should be encouraged to see the broader value of their learning and could be encouraged to take time out to reflect on their learning and development. This might present a challenge in a highly competitive industry such as finance, but the long-term benefit of creating an expansive learning environment (Fuller and Unwin, 2004) where workers feel that their learning needs are recognised is clear. In the workplace, each individual must be able to plan and structure their own learning, in the short term to address problems encountered in everyday work, and in the longer term to develop a balanced range of skills to allow them to operate effectively and autonomously throughout their career. Recognising those individuals who are more and less capable of self-regulating their learning, and supporting them through the provision of support structures tailored to their specific needs becomes a means by which organisations can support their knowledge workers to become and remain effective employees when the nature of work makes it impossible to provide specific training and support. Similarly, by gaining a better understanding of their own capacity to self-regulate their learning, knowledge workers can assume full control of their own learning and development.

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