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Fostering informal learning at the workplace through digital platforms and information infrastructures

Paolo Spagnoletti
LUISS "Guido Carli", pspagnoletti@luiss.it

Stefano Za
Luiss "Guido Carli", sza@luiss.it

Andrea North-Samardzic
Monash University, andrea.north-samardzic@monash.edu

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Fostering informal learning in the workplace through digital platforms and information infrastructures

Paolo Spagnoletti
Research Center on Information Systems (CeRSI)
LUISS Guido Carli University
Roma, Italy
pspagnoletti@luiss.it

Stefano Za
Research Center on Information Systems (CeRSI)
LUISS Guido Carli University
Roma, Italy
sza@luiss.it

Andrea North-Samardzic
Department of Management
Monash University
Victoria, Australia
andrea.north-samardzic@monash.edu

Abstract

Increasing attention is paid to organisational learning with the success of contemporary organisations strongly contingent on its ability to learn and grow. Importantly, informal learning is argued to be even more significant than formal learning initiatives. Given the widespread use of digital technologies in the workplace, what requires further attention is how digital technologies enable informal learning processes. Drawing from Complex Adaptive Systems (CAS) theory, in this paper we advance a conceptual model for examining this important topic. The two dimensional matrix presented provides a framework for both further research on digital artefacts used in informal learning, as well as the design of formative contexts for learning to occur.

Keywords

Digital technologies, informal learning, Complex Adaptive Systems

INTRODUCTION

Organisational learning is an area of increasing concern for organisations seeking to achieve sustainable competitive advantage. Informal learning in particular is receiving significant attention for its contribution to organisational learning. With the rise of digital technologies in the workplace, how they can foster informal learning becomes a key question.

Organizations interact with their environment by collecting resources that are transformed into core capabilities. Such development processes are composed of learning loops that routinize work practices, combine work practices and organizational routines to form capabilities and finally, give meaning to capabilities in the context of the firm's competitive environment. Therefore organizations can be seen as formative contexts in which firm's activities, including learning, take place (Andreu and Ciborra 1996). It can thus be argued that learning processes are the basic mechanisms through which organizations evolve. The capability of organizations to continuously adapt to their environment is tightly related to both the individual and group level's ability to learn and the effectiveness of managerial practices in creating the conditions for learning to occur.

Recent approaches to the strategic management of organizations focus on the transformative role of digital technologies in blurring the boundaries of organizations by linking and recombining internal and external resources (Yoo et al. 2010). This positions organizations as platforms able to generate value in new and unplanned ways (Resca et al. 2013). In this context, individual and group learning processes can benefit from the exchange of information and peer production of content within online communities of practice across organizational boundaries (Spagnoletti and Resca 2012).

Digital platforms and information infrastructures have the potential to foster informal learning in the workplace by stimulating knowledge creation processes and promoting the diffusion of knowledge and practices among workers. Different learning strategies such as open and flexible learning (autonomous), distributed learning

(dependent), and learning communities (collaborative) can be enabled by these digital tools and their governance models (North-Samardzic et al. 2014; Za and Braccini 2012). Examples of such digital environments in which learning takes place are commercial software applications (i.e. Blackboard), open source platforms (i.e. Moodle), 3D Virtual Worlds (i.e. Sloodle), and the more recent MOOCs - massive open online courses - (i.e. Coursera). While some studies have emphasized the organizational innovation processes triggered by these artefacts (Martin 2012; Spagnoletti and Federici 2011), their impact on lifelong learning processes and practices is still under-researched.

In this contribution we draw on Complex Adaptive Systems (CAS) theory to conceptually analyse how informal learning processes are entangled with digital artefacts and the subsequent implications for lifelong learning validation policies and practices. A particular focus is given to the shift from intra-organizational to inter-organizational informal learning processes and to the emergence of new relational metrics for assessing lifelong learning outcomes at individual level. The aim of the paper is thus to conceptualise a framework for further research on digital artefacts used in informal learning to help address the emerging challenge of developing global professional competencies.

The paper is structured as follows. A literature review on informal learning, digital technologies for informal learning at the workplace, and informal learning validation methods is presented. This is followed by a discussion of CAS theory as it pertains to informal learning and digital technologies. Then, a two dimensional matrix is introduced as a conceptual tool for identifying four scenarios in which informal learning occurs. An expository instantiation within each scenario provides the ground for discussing possible digitally enabled strategies for informal learning validation. Implications for research and practice are discussed in the conclusion section.

LITERATURE REVIEW

Informal learning

When learning processes are neither determined nor designed by an organization, learning is often referred as informal, experiential, or accidental learning. While formal learning may vary from extremely relevant to completely irrelevant to workers' needs, informal learning generally emerges from specific worker needs without explicit learning objectives, learning time and/or learning support (Marsick and Volpe 1999). The term 'informal learning' is increasingly used to not only contrast with formal learning but to suggest a greater freedom and flexibility for learners (Eraut 2004).

Informal learning is defined as learning resulting from daily life activities related to work, family, or leisure (Colardyn and Bjornavold 2004). It is not structured in terms of learning objectives, learning time and/or learning support and typically does not lead to certification. When people learn incidentally, their learning may be taken for granted, tacit, or unconscious; however, a passing insight can then be probed and intentionally explored (Marsick and Watkins 2001). For example, the hidden agenda of an organization's culture or a teacher's class, learning from mistakes, or the unsystematic process of trial and error.

There is some disagreement about the definition of informal learning. While Colardyn and Bjornavold (2004) posit informal learning as largely unintentional (or 'incidental'/random), other scholars (Bell and Kozlowski 2008; Marsick and Watkins 2001) contend that informal learning is usually intentional but not classroom-based, highly structured and the control of learning rests primarily in the hands of the learner. Examples include self-directed learning, networking, coaching, mentoring, and performance planning activities that include opportunities to review learning needs. This is contrasted with formal learning which is typically institutionally sponsored, classroom-based, and highly structured (Boud et al. 2009; Marsick and Watkins 2001). However Bednall et al. (2013) argue that informal learning can be stimulated by formal mechanisms.

Scholarship on informal learning provides a number of typologies to distinguish between types of learning. For example, Eraut (2004) conceptualises informal learning comprised of implicit learning, reactive learning and deliberative learning. These categories are further segmented into temporal categories reflecting past episodes, current experiences and future behaviour. Vavoula et al. (2005) take a slightly different approach to their typology by categorizing learning according to whether the goals and processes of learning were defined and by whom. Learning is further broken down into three categories: intentional formal, intentional informal and unintentional informal.

Vavoula and colleagues' (2005) typology is particularly useful as it not only highlights the areas of control but provides the distinction between formal and informal learning and includes a category for unintentional or tacit informal learning. However it does not distinguish between different types of learning process choices a learner or teacher may make. These choices include not only whether and how to deploy the various learning tools available, but also how to engage with both the social and the physical contexts of the learning they are

undertaking (Clough et al. 2008). Additionally, learners decide whether and how to collaborate with other learners, to pool and share resources, or simply engage in individual reflection. Thus, tools to facilitate open communication become critical for informal learning (Jeon and Kim 2012).

How adults learn from each other at work is particularly important for several reasons. Both Skule (2004) and Eraut (2004) agree that informal learning constitutes the most important way of acquiring and developing the skills and competencies required at work. Indeed, learning at work constitutes a large part of the learning undertaken by adults during their lives. Most importantly, it has been argued that the person who is nominally expected by organisations to foster learning in the workplace - the workplace supervisor - may be unable to do so effectively because of the structural constraints of their role (Boud and Middleton 2003).This presents significant opportunities for the use of digital technologies to support informal learning in the workplace.

Digital technologies for informal learning in the workplace

Recent advancements in information infrastructures, digital platforms, and applications are blurring the boundaries between the physical and digital worlds by providing individual and organizations with ubiquitous communication, sensing, and computing capabilities (Hanseth and Lyytinen 2010; Yoo et al. 2010). Digital technologies, through their layered modular architecture, have demonstrated their unique capability to be recombined in multiple forms and generate unforeseeable services (Yoo 2013).

The digital transformation of work environments and work practices is inevitably affecting informal learning processes. Workers are not only embedded in their traditional organizational settings but can easily connect to external networks of resources for exchanging information in digital form. Ubiquitous and personalized access to multimedia content is possible almost in every context in which a smart device and an internet connection is available. Therefore also informal learning processes are changing given the affordances of digital artefacts. For instance through Massive Open Online Courses (MOOCs) platforms and video streaming capabilities, workers can have on demand access to a potentially unlimited amount of knowledge and at the same time they can produce content and share it with their peers.

Given the hierarchical and modular nature of digital artefacts, it is worth to mention some of the elementary capabilities that have been applied to workplace learning. Shi et al. (2013) draw attention to Adaptive Educational Hypermedia (AEH), one of the most popular research areas of Adaptive Hypermedia System (AHS) (Brusilovsky 1996). It combines AHS and Intelligent Tutoring Systems (ITS), with the aim of breaking away from the "one- size-fits-all" mentality (Brusilovsky 2012), engaging learner interaction as well as enabling e-learning systems to adapt to different learners' specific needs in a given context, and thereby provide a personalized learning experience for each learner. This example illustrates that with such social software systems, new heterogeneous kinds of technology enhanced informal learning are now available to the life-long learner (Klamma et al. 2007). Learners outside of learning institutions now have access to powerful social communities of experts and peers who are together forging a new web 2.0

Such social communities are a key example of digital technologies supporting informal learning as over the past five years social networking sites (SNSs) have become one of the most prominent genres of social software. Given their broad range of features, SNSs function in different ways depending on the preference of the user. Individuals can use SNSs to construct their profile, or/and to maintain contact with friends or colleagues, and/or to share contents, and/or to view and traverse their list of connections (Boyd and Ellison 2007). Furthermore these features allow people to recombine the shared content building new concepts, ideas, and knowledge (McLoughlin and Lee 2007). Whilst education professionals hope that social networking promotes exchanges between learners that are related to formal educational objectives, SNSs are also celebrated for providing channels for informal and unstructured learning (García-Peñalvo, Colomo-Palacios, and Lytras 2012; Ravenscroft, Schmidt, Cook and Bradley 2012; Selwyn 2009).

The increasing use of handheld devices further supports SNSs. Handheld devices have been deployed as learning tools in both formal and informal learning contexts, with learners of all age groups. Given the evidence that mobile devices have a role to play in formal learning scenarios, it seemed reasonable to expect that experienced mobile device users would include their mobile devices among the learning tools used to support their informal learning (Clough et al. 2008). Overall, scholarship suggests that mobile devices are used extensively in an informal learning context by enthusiasts, and that they use them in ways that correspond to the collaborative, contextual and constructivist mobile learning philosophies identified by Patten et al. (2006).

Informal learning validation methods

Assessing the outcomes of informal learning is an important issue with many practical implications. Gradually, validation of non-formal and informal learning is becoming a key aspect of lifelong learning policies. For instance, an objective of the European Lifelong Learning Programme is that learning outcomes from different

settings and contexts are linked together. In fact, a precondition for achieving the ambition of lifelong learning is that learning, skills and competences acquired outside formal education and training are visible and properly valued.

Validation of informal learning is defined as the process of identifying, assessing and recognising a wider range of skills and competences which people develop through their lives and in different contexts, e.g. through education, work and leisure activities (Colardyn and Bjornavold 2004). In lifelong and life-wide learning, 'validation' is a crucial element to ensure the visibility and to indicate the appropriate value of the learning that took place anywhere and at any time in the life of the individual.

Although difficult to achieve, validation of informal learning can be performed combining a variety of methods. Previous studies have discussed these issues by comparatively analysing the policies and practices in place in EU Member States (Colardyn and Bjornavold 2004). A European Inventory of approaches to validation of non-formal and informal learning has been envisaged as a possible solution for defining some common principles that should drive towards a EU lifelong learning strategy. The assumption in this case is that a common set of methodologies, validation procedures and coordination mechanisms can ensure the coherence and transparency of a system. Starting from these experiences, some assessment methodologies have been identified as a part of the European inventory. These methodologies have been also applied in other EU projects[1] and have informed some work on the design of learning environments (Casalino 2013).

Table 1. Informal learning validation methodologies

Methodology	Description
Collecting Evidence	Drawing evidence on outcomes of learning and secondly with 'documenting evidence' which is a technical step to assemble evidence and relevant information
Examination	Candidates answer questions (oral or written) on a domain of study. They can focus on a domain or be interdisciplinary in nature. Questions can be open or closed (essay, multiple-choice).
Declarative	Candidates declare and justify (orally and in writing) that what they can do corresponds to certain parts of the curriculum taught in the education or training programme for which they would like to obtain credit. A panel (third party) gives the final judgement
Observation	Following certain rules and strict methods, an assessor (third party) observes candidates in situ and judges whether they have the competence described in a standard. Observation is a more demanding exercise than one can imagine
Simulations	Some examples are well-known, since aircraft pilots are partly trained that way. Candidates are placed in a context that present all the characteristics of the real work (or other) situation and are then able to demonstrate their competences
Evidence Extracted from Work (or other) Situations	Based on the descriptions in the occupational and assessment standards, candidates collect evidence of skills and competences in the real work situation (or social, family or cultural setting).

However one major problem that policy makers and enterprises encounter in their endeavours to assess and promote informal learning in the workplace is that methods for measuring the conditions that are conducive to this kind of learning are seriously underdeveloped (Skule 2004). Scrutinising the tools most commonly employed by policy makers and companies to measure, assess and benchmark learning however, reveals a striking gap between this broad view of informal learning, and the types of learning actually measured.

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[1] EARNFILE project results (2009–2011). In Final report Evaluation And Recognition of Non- formal and Informal Learning, project number LLP-LDV-PA-09-IT-0276, Leonardo Da Vinci Partnership project, financed by EU Lifelong Learning Programme.

Complex Adaptive Systems (CAS)

Several scholars have pointed to the science of complexity as a potentially fruitful link to further research on organizational learning (Cohen and Sproull 1996; Miner and Mezias 1996) as it has been argued that one of the most important characteristics of Complex Adaptive Systems is their capacity to learn (Stacey 1995, 1996). One of the contributions of this paper is to argue that it is particularly relevant to informal learning specifically rather than just organizational learning in general.

The notion of Complex Adaptive Systems (CAS) resides within the broader Complexity Theory and is a subset of the research on non-linear dynamic systems. CAS theory is grounded in ecology and used to illustrate ecological resilience and evolution (Miller and Page 2007). In the context of organisations, CAS refers to the dynamic semi-autonomous networks of agents within organisations acting in coordination as well as responding to other agents and the environment in an effort to maximize fitness and survival (Dooley et al. 2003; Holland 1998). As such, systemic behavior is the result of a multiplicity of decisions made constantly by agents who simultaneously cooperate, collaborate and compete as part of the systems evolutionary cycle (Waldrop 1992).

There are four characteristics of complex adaptive social systems that also complement the typologies of informal learning discussed in the previous sections:

1. They have a propensity for self-organisation

2. They build hierarchies and structures to conserve resources

3. Innovations emerge to solve problems

4. Learning occurs in the face of environmental constraints

(Gunderson and Holling 2002)

According to Mitchell (2009:13), 'systems in which organized behavior arises without an internal or external controller or leader are sometimes called self-organizing.' Self-organization is viewed as a natural ecological process rather than deliberate and purpose-driven (Allen et al. 2003). This fits neatly with the definition of informal learning as unintentional.

As part of this evolutionary process, the system seeks also structural form as a means to create order and reduce uncertainty (Ahl and Allen 1996). With the emergence of new phenomena, ideas, and concepts derived through the creative process, we see the development of innovative solutions to propel the system forward (Allen et al. 2001). Within this system, learning is what provides the fuel for the process of adaptation. Thus, digital platforms and information infrastructures, which connect workers with peers and learning objects, can provide the necessary artefacts for organizational evolution. Systems that afford learning by facilitating communication, monitoring and feedback become key to rendering the iterative learning that enhances organizational adaptation (Mintzberg and Westley 1992); Ackoff's (1981) knowledge management system is a strong example.

This reflects one of the key assumptions of CAS, that is, some events are unknowable until they occur (Eve et al. 1997). It can therefore be argued that according to CAS, informal, iterative learning facilitated by knowledge systems is at the heart of organizational adaptation, survival and success. Technological systems are at the heart of this process. As Nevo and Wade (2010: 164) argue 'enabling strategy execution relates not to the individual capabilities of organizational resources or IT assets in isolation, but rather to the emergent capabilities that arise from their combination.' Indeed, Nevo and Wade (2010) suggest using CAS theory to examine how organizations evolve alongside IT assets.

Since the emergence of innovative solutions to novel environmental constraints is a key feature of CAS, a further reflection on the mechanisms through which such emergence occurs in workplace settings can provide a powerful lens for understanding how to achieve sustainable competitive advantage by leveraging organisational learning. By looking at digitally enabled informal learning processes as constrained generating procedures (Holland 1998b: 125) can provide insights in identifying elements, rules, and interactions underpinning organisational innovation. Based on such building blocks, more sophisticated models of organisational learning can be defined for investigating patterns of behaviour and points of control through computer based simulation (Spagnoletti et al. 2013).

DISCUSSION

The above mentioned streams of research suggest further attention by directed to the phenomenon of digitally enabled informal learning processes, through the lens of Complex Adaptive Systems (CAS) theory (Amaral and Uzzi 2007; Anderson 2008; Holland 1998; Lewin 1999). Here, the phenomenon is informal learning which emerges from the interaction between heterogeneous learning agents (workers) and their environment. The

environment itself is characterized by networks of digital capabilities, applications, platforms and infrastructures through which learning objects and information are collected, created, mixed and exchanged.

In this context, learning occurs without predefined plans and according with search processes that are locally implemented by workers that interact with peers and learning objects within and across the boundaries of their organizations. The locus in which informal learning takes place can be either the traditional work environment in which institutional processes translate resources in routines and then in core organisational capabilities, or within wider communities of practice that characterize the enlarged formative context. Organisational learning processes are therefore characterized by learning loops that reflect the behaviour of lower level learning loops in which workers build their capabilities by accessing sources of knowledge that are both internal and external to the organisation.

Among the key mechanisms allowing individual learning processes to occur there are the interactions among system elements that provide memory capabilities through cycles based on feedback and feedforward cycles. When applied to the context of informal learning in the workplace, this theoretical framework suggest to consider validation of informal learning as an important phase of the overall process in which information on the learning outcome are generated and exchange in the network. In the remainder of the paper we focus on methods for validating informal learning in the workplace by providing a classification based on CAS concepts. The range of methodologies for the validation of informal learning spans from a more traditional set of metrics that refer to the level of competences acquired by the individual to an enlarged set of metrics that assess the impact of the worker in the communities to which he belongs.

Different industries, firms, and professions can be analysed through the lenses of CAS theory in order to identify patterns of behaviours and points of controls. As a first step in this direction we introduce a simple matrix that characterizes the informal learning space. In particular, the matrix is based on two dimensions. The horizontal dimension represents the locus in which informal learning occurs, which can be either within or across the organizational boundaries; for example like in the case in which skills and competences are acquired through the experiences done during every working day, or through the interaction with several actors in own on-line communities, or through open contents available in the network. The vertical dimension is related to how the information on the individual's skills and competences learned informally are generated and exchanged in the workplace. These information can be based on predetermined assessment frameworks or on the value perceived by own community taking into account the relational capital. Therefore the vertical dimension has to do with the feedback mechanism that allows workers to move in the informal learning space. Such feedback mechanism must measure the outcome of informal learning and can focus either on the effects of learning on the individual worker or on the network of agents with whom the worker interacts.
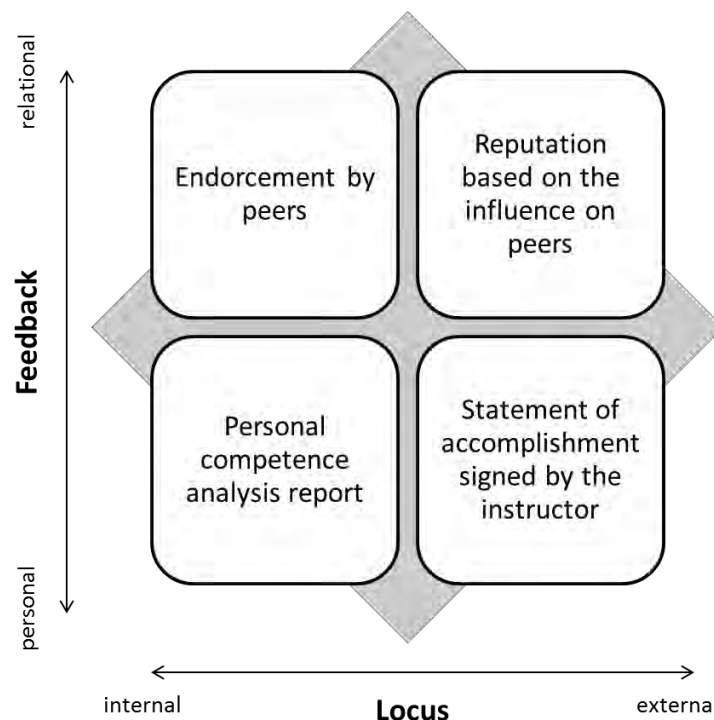

Figure 1: Validation methods in the logical space of informal learning

In order to better clarify the model, we illustrate four examples that instantiate the ideal typical scenarios positioned in the above-mentioned two-dimensional matrix (figure 1). The first scenario is characterized by informal learning processes taking place within organizational boundaries and by feedback mechanisms that operate at individual level. In this case validation is based on personal competence analysis reports drawn upon the results of declarative methods in which workers declare and justify their skills and a third party gives a final judgement. This informal learning validation can be supported by digital tools such as the CEPIS e-Competence Benchmark[2] based on the e-Competence Framework[3]. It is a free and online interactive tool that enables individuals to identify the competences needed for covering various ICT roles: filling out a questionnaire, a personal report will be generated based on the given responses, providing a detailed analysis of owned competences and how they rate against those required for a specific ICT job profile.

The second scenario is still characterized by informal learning processes taking place within organizational boundaries (e.g. projects) but by feedback mechanisms that are based on the validation of the strengths of a professional profile made by peers. A clear example is the case of professional social networks such as Linkedin[4], in which workers are able to share their experiences and achievements with members of their professional network that can endorse them as holder of some specific skills and experiences. An algorithm implements this mechanism by generating some simple questions that allow to both get in touch with peers by endorsing them on some specific skill and to accumulate ratings for each skill. In this case validation of informal learning is based on endorsement by peers. A mix of validation methods such as declaration, observation, and evidence extracted from work, is embedded in a digital platform that provides metrics for measuring the relational capital.

A third scenario is characterized by informal learning processes that cross organisational boundaries, and feedback mechanisms that provide a personal validation of the acquired skills. This is the case of MOOCs in which learners have access to open online courses and assess their knowledge through a set of validation methods defined by the instructor. These methods can be based on collecting evidence, examination, observation, and simulations, allowing them to achieve a statement of accomplishment signed by the instructor. A digital platform in this case provide the mechanism for connecting producers of course contents (i.e. Universities, instructors) and learners (i.e. students, workers) by supporting different learning models which can be also adopted within informal learning processes. The Coursera[5] platform provides an example of this scenario.

Finally the fourth scenario is characterized by inter-organizational informal learning processes based on relational feedback mechanisms. In this case the digital tools are involved for fostering informal learning and also the validation processes, where the latter takes into account the impact that the knowledge created and shared by the worker has on its network. A typical example is represented by the ResarchGate[6] platform which is used by scholars to share their research publications, to stay connected and collaborate with their colleges, to ask and answer questions, etc. All of these features support informal learning processes of each member acting on this platform. Furthermore ResearchGate provides also for each member a Score rate based on several parameters, such as: the number of own content views, publication downloads, answers to some questions, questions, followers, etc. This score represents a metric related to the impact of the individual's contributions (research products and actions) on the community composed by all the platform members.

The proposed model for looking at digitally enabled informal learning processes has both practical and theoretical implications. From a practical standpoint it allows to identify the locus of intervention for fostering informal learning and assessing outcomes. Furthermore it provides hints on the design of formative contexts in which managerial practices combined with digital capabilities can provide feedback and feedforward learning loops for enhancing knowledge, creativity and innovation.

From a theoretical point of view, the proposed matrix can serve as a basis for further investigations on the generative materiality of digital artefacts (Yoo 2013). In particular it can contribute to the debate on the individualist foundations of collective heterogeneity in new value and knowledge creation (Felin and Hesterly 2007). By drawing on CAS theory, the matrix above also highlights mechanisms by which individuals informally learn and absorb knowledge from their environment as well as connecting with new members to share knowledge and enhance the organizations capabilities.

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[2] http://cepisecompetencebenchmark.org/

[3] http://www.ecompetences.eu/

[4] http://help.linkedin.com/app/answers/detail/a_id/31888

[5] https://www.coursera.org/

[6] http://www.researchgate.net/

CONCLUSION

The aim of this paper is to advance a conceptual model that accounts for digitally enabled informal learning in the workplace. The notion of informal learning is increasingly important for organisations as scholarship argues that it is the most effective way to enhance knowledge, skills and abilities in the workplace. Complex Adaptive Systems (CAS) theory supports informal learning as one of the chief ways organisations not only grow but survive. As informal learning is often not intended or directive, there is the opportunity for digital technologies to not only support the knowledge acquisition and sharing process but to be used as tools for measuring workplace learning. The two-by-two matrix proposed in this paper contributes to furthering this agenda by presenting a tool for reporting and measuring digitally enabled informal workplace learning, a topic meriting much needed attention.

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