Manuscript version: Author's Accepted Manuscript
The version presented in WRAP is the author's accepted manuscript and may differ from the published version or Version of Record.

Persistent WRAP URL:
http://wrap.warwick.ac.uk/136381

How to cite:
Please refer to published version for the most recent bibliographic citation information.
If a published version is known of, the repository item page linked to above, will contain details on accessing it.

Copyright and reuse:
The Warwick Research Archive Portal (WRAP) makes this work by researchers of the University of Warwick available open access under the following conditions.

Copyright © and all moral rights to the version of the paper presented here belong to the individual author(s) and/or other copyright owners. To the extent reasonable and practicable the material made available in WRAP has been checked for eligibility before being made available.

Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge. Provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

Publisher's statement:
Please refer to the repository item page, publisher's statement section, for further information.

For more information, please contact the WRAP Team at: wrap@warwick.ac.uk.

Measuring the impact of learning at the workplace on organisational performance

Purpose

The purpose of this article is to explore the importance of workplace learning in the context of performance measurement on an organisational level. It shows how workplace learning analytics can be grounded on professional identity transformation theory and integrated into performance measurement approaches to understand its organisation-wide impact.

Design/methodology/approach

In a conceptual approach, a framework to measure the organization-wide impact of workplace learning interventions has been developed. As a basis for the description of the framework, related research on relevant concepts in the field of performance measurement approaches, workplace learning, professional identity transformation, workplace and social learning analytics are discussed. A case study in a European Public Employment Service is presented. The framework is validated by qualitative evaluation data from three case studies. Finally, theoretical as well as practical implications are discussed.

Findings

Professional identity transformation theory provides a suitable theoretical framework to gain new insights into various dimensions of workplace learning. Workplace learning analytics can reasonably be combined with classical performance management approaches to demonstrate its organisation-wide impact. A holistic and streamlined framework is perceived as beneficial by practitioners from several European Public Employment Services.

Research limitations/implications

Empirical data originates from three case studies in the non-profit sector only. The presented framework needs to be further evaluated in different organisations and settings.

Practical implications

The presented framework enables non-profit organisations to integrate workplace learning analytics in their organisation-wide performance measurement, which raises awareness for the importance of social learning at the workplace.

Originality/value

The paper enriches the scarce research base about workplace learning analytics and its potential links to organisation-wide performance measurement approaches. In contrast to most previous literature, a thorough conceptualisation of workplace learning as a process of professional identity transformation is used.

Keywords: Performance Measurement, Workplace Learning Analytics, Social Learning, Professional Identity Transformation, Public Employment Services.

1 Introduction

In recent years, interest in workplace learning and organisational development has increased in organisations (Ruiz-Calleja *et al.*, 2016, p. 79; Kyndt *et al.*, 2009; Giacumo and Breman, 2016). In contrast to educational settings, learning at the workplace is often largely informal (Klamma 2013) and happens, for instance, as a by-product of daily working routines (Siadaty et al. 2011). Employees often experience that they learned something when they reflected on their work practices, interacted with peers or exchanged information with them, although they did not plan or intend to learn something (Tynjälä et al. 2014). Interventions that facilitate learning at the workplace by providing an impetus and a space for employees to follow their individual learning journey can trigger such activities (EmployID 2016). Current work contexts need employees to adapt to constantly changing skill requirements at work, driven by new types of working and an ever-growing amount of information available (Tynjälä et al. 2014). It is no longer sufficient to rely on skills acquired in formal education prior to working life (QUELLE des Reviewers). In consequence, the high demand for continuous adaptation of skills to new requirements represent a challenge for organisations, considering the complexity of workplace learning, which is often informal and social. However, workplaces differ in the extent to which they allow or support learning (Tynjälä 2008).

Many organisations try to overcome this challenge by increasing investment in training and development (Miller 2012; Kodwani 2017). However, larger investments have to be justified by proving their impact and return on investment (RoI), for which organisations can use learning analytics (LA), a fast-growing area in technology-enhanced learning (TEL) research (Ferguson 2012; Klamma 2013). LA draws on a growing interdisciplinary community of researchers from fields like business intelligence (BI) or educational data mining (EDM) (Clow 2013). LA aims at producing 'actionable intelligence' to inform tutors and designers of learning interventions to better understand and predict learners' personal needs (Ferguson and Buckingham Shum 2012). Thereby, it is supposed to close the feedback loop (Campbell and Oblinger 2007), enhance the institutional decision-making process (Romero and Ventura 2010; Macfayden and Dawson 2012), and improve learning and education (Buckingham Shum and Ferguson 2012; Brown 2011).

However, LA research has focused predominantly on formal education, and neglected learning processes at the workplace (Attwell et al. 2016; Ruiz-Calleja et al. 2016). Hence, the applicability of LA research findings and approaches to workplace settings is limited (Klamma 2013; Ruiz-Calleja et al. 2016). Furthermore, there is a lack of empirical data on the extent to which LA actually influences decisions about learning and development (L&D) (Giacumo and Breman 2016), notwithstanding its potential to facilitate the implementation of a highly

data-driven decision-making process, which is associated with higher output and productivity levels (Brynjolfsson et al. 2011).

In recent years, the more specialised field of workplace learning analytics (WLA) has emerged. It promises to account for the special nature of workplace learning in contrast to formal learning in educational settings and to provide a means to assess learning materials and interventions at the workplace and to guide the design of learning interventions (Tubb et al. 2013; Attwell et al. 2016). However, an appropriate theoretical conceptualisation of workplace learning, which accounts for its specific characteristics, is lacking in most studies (Martin et al. 2018). Traditional conceptualisations of learning, which mostly originate from formal education contexts, are not easily transferable to workplace learning (Tynjälä 2008). The present article relies on the assumption that professional identity transformation theory can be used to underpin a practical implementation of WLA. This theory puts forward the idea that learning at work can be effectively supported by switching between complementary perspectives such that learning can be represented as a process of identity development, a process of skill development in four inter-related domains, and as taking place in the context of particular opportunity structures (Brown and Bimrose 2018).

(W)LA can help in providing insights into the learning dynamics, but not necessarily demonstrate organisation-wide impact. Providing efficient learning interventions and further developing human resources represents not an end in itself (except for organisations in the education sector) but a vehicle to improve business outcomes in the long term. However, employees often fail to transfer the acquired knowledge and skills to their day-to-day working routines, thereby questioning the success of the learning intervention from an organisational point of view (Mackay 2007). Thus, if WLA is to raise awareness of the importance of workplace learning within an organisation, it has to facilitate the "organisational sense-making of learning activities and their effects" (Bimrose et al. 2014) and contextualise data "in ways that can drive organisational development" (Macfayden and Dawson 2012). Bearing that in mind, combining WLA with performance management (PM) to form a "performance management analytics" (PMA) framework enables organisations to understand relevant business dynamics and organisational learning (e.g. Schläfke et al. 2013; Martin et al. 2018; Nunn 2012). Such a framework would be of great value to profit and non-profit organisations alike, as both are under increasing pressure to prove their effectiveness on the basis of business performance metrics (Clow 2013).

This article provides a framework to measure organisation-wide impact of workplace learning interventions by integrating approaches to WLA and PM. Thereby, it strives to enrich the research base around WLA and extend its scope to an organisational context (Macfayden and Dawson 2012; Silvi et al. 2010) and support data-based decision making to improve organisational performance (Giacumo and Breman 2016). Furthermore, the framework is unique in its grounding on professional identity transformation theory as an appropriate conceptualisation of workplace learning that accounts for the special nature of this type of learning. It is applicable to for-profit and non-profit organisations alike.

2 Related research

The following section describes theoretical concepts and their interrelations, which form the basis for the resulting framework. First, the particularities of workplace learning, its importance in terms of working life skills and corresponding analytical approaches are described. This is followed by the presentation of professional identity transformation theory as the conceptualisation of workplace learning. Afterwards, performance management analytics provides a framework for embedding traditional approaches from the field of LA in an organisation-wide approach to PM. The impact of workplace learning from an organisational viewpoint is based on the assumption that impact spreads along cause-and-effect chains. Finally, the specific circumstances of Public Employment Services (PES), which serves as a practical field of application for this study, are explained.

2.1 *Workplace learning and analytics*

The rapid changes in the world of work, an increasing amount of available information and the requirements for a broader skill set has led to increased attention for workplace learning. Employers are becoming more aware of the need for life-long learning and professional identity transformation throughout an employee's career to ensure that they possess the necessary working life skills at any time (Tynjälä 2013). Former studies examining university graduates with some years of working experience revealed that skills acquired in formal education are insufficient. Most subjects report that they have learnt necessary skills during their work (Tynjälä 2008). Consequently, an employer might not expect a university graduate to possess all relevant skills to be successful at work, since curricula often neglect necessary working life skills. For instance, in engineering education predominantly technical skills are taught, although it is well-known that engineers also need a broad set of professional, personal and interpersonal skills during their working life. Acquiring these skills was experienced as "transformative" by some engineers, i.e. they triggered personal development (Larsen et al. 2017). This transformative power of such soft skills is especially important in terms of the growing need to react flexibly to changes in work profiles and for individuals to demonstrate adaptability by applying knowledge, skills and understanding in a variety of work contexts across a working career (Brown, 2016). For example, engineers are often expected to take on the role of team leaders or entrepreneurs, in which those soft skills are even more important than technical knowledge acquired at university (Crawley et al. 2011). Even in professions like engineering it is no longer enough to possess technical knowledge and factual skills.

In general, learning is a complex construct, which cannot be directly observed. Whereas learning in educational contexts like schools or universities is traditionally strongly associated with the acquisition of knowledge tested in examinations and assignments, workplace learning is much more complex, and also more effective in many cases (Eraut 2011). First, learning at the workplace often occurs as a side-effect of daily working routines (Siadaty et al. 2011; Eraut 2011) or as a subtle consequence of rather informal social learning interventions instead of being a result of formal courses (EmployID 2017). Second, it is even more difficult to measure the acquired knowledge as it is often tacit and skill-oriented instead of factual. In this case, workplace learning outcomes

are not even accessible via introspection and might take place on different levels: individuals, groups, communities or organisations (Tynjälä 2008). Third, workplace learning often occurs through an individual's interaction and collaboration with others (Marsick and Watkins 2015), driven by "self-directed exploration and social exchange" (EmployID 2017). Hence, it is often accompanied by a strong social component (Ley et al. 2016; Buckingham Shum and Ferguson 2012; Brown and Bimrose 2015).

Learning Analytics (LA) was defined at the 1st International Conference on Learning Analytics and Knowledge 2011 as "the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs" (Siemens et al. 2011, S. 4). In practice, LA normally operates on pre-existing, machine-readable data with techniques that could also be applied to big data (Ferguson 2012). Social Learning Analytics (SLA) focuses on collaborative learning processes enhanced by interpersonal relations in communities (Ferguson and Buckingham Shum 2012; Buckingham Shum and Ferguson 2012).

2.2   *Professional identity transformation theory*

Within their theory on professional identity transformation, Brown and Bimrose (2018) argue that learning at work can be most effectively supported if one switches perspective between three ways of representing workplace learning. First, learning can be seen as contributing to developing a professional identity that takes place within particular communities where socialisation, interaction and learning are key elements, with individuals taking on aspects of existing identities and roles, and actively reshaping other aspects in a dynamic way. The formation, maintenance and change of professional identities are always influenced by the nature of the relationships around which they are constructed. Second, learning can be represented as a process of development in four inter-related domains: relational development, cognitive development, practical development, and emotional development. Learning may involve development in one or more of these domains and development in each domain can be achieved in a number of different ways. Development can be represented thematically, although the extent of development within particular themes can vary greatly between individual cases. The third way of viewing learning at work linked to identity development at work acknowledges that such learning takes place within particular structures, contexts and opportunities within which individuals operate. These structures may also play a key role in access to work which is rich in learning and development opportunities (Brown & Bimrose, 2018).

In the first sense, learning is explicitly linked to the continuous process of developing one's professional identity where the long-lasting, partly subtle and difficult to quantify nature of transformation processes are triggered by workplace learning. Such identity work can be linked to developing personal characteristics, soft skills, a sense of personal agency, resilience or self-efficacy (Brown and Bimrose 2014). Such soft characteristics are complex constructs whose assessment and quantification are often made through self-assessments using validated scales. Nevertheless, they have great potential for substantial developments and improvements.

Furthermore, informal learning is particularly associated with long-lasting identity transformation processes (Brown and Bimrose 2018), which are supposed to lead to longer-term effects from an organisational point of view. The importance of this identity development process provides a strong argument for developing an instrument that enables organisations to identify traces or facets of this process. Learning associated with identity development can be seen as emerging from several developments that are made more visible by analysing a comprehensive set of indicators of identity development.

In the second perspective, workplace learning can be represented as "learning across four domains" (Brown and Bimrose 2018), namely relational, cognitive, practical and emotional development. These four domains represent learning dimensions and areas of work-related skills. Interaction with peers and socialisation at work are factors that influence learning. Evaluating changes in cognitive and practical skills exclusively, as is the case in many organisations does not show the full picture and leaves out crucial aspects of relational and emotional development.

Thirdly, to have a comprehensive perspective on workplace learning, it is necessary to acknowledge that learning takes place "in the context of opportunity structures within which individuals operate" (Brown and Bimrose 2018). These opportunity structures are highly dependent on organisational context, vocational education and training opportunities, affordances for learning and interaction at work, to name a few (Brown and Bimrose 2018).

Identity transformation has primarily been investigated using qualitative methods such as career narratives and interviews. However, the concept can also be used as a basis for a quantitative assessment using a set of indicators.

2.3   Performance Management Analytics (PMA)

In the profit sector, the terms "Performance Management Analytics" (PMA) (e.g. Silvi et al. 2010) or "Business Performance Analytics" (BPA) (e.g. Raffoni et al. 2018) describe an integrated concept that links business analytics (BA) or business intelligence and analytics (BIA) with traditional performance management systems (PMS). BA itself is concerned with organisations' effectiveness and performance (Long and Siemens 2011) and – at least in conjunction with PM - aims at an improved "understanding of relevant business dynamics through the use of data and analytical methods" (Silvi et al. 2010). It thereby relies on the increasingly recognized potential of BA with regard to PM and to organisations' decision-making processes in an increasingly globalised and thus competitive business environment (Raffoni et al. 2018; Abai et al. 2015b; Schläfke et al. 2013; Rikhardsson and Yigitbasioglu 2018). The degree of the potential of BA actually realised by an organisation heavily depends on whether it is implemented consistently and synchronized with PM. Especially misaligned silo implementations, which can be found in many organisations, hinder the realization of benefits of BA (Abai et al. 2015a; Abai et al. 2015b; Rikhardsson and Yigitbasioglu 2018).

Whereas the popularity of BA is driven by the increasing availability of big data and by more advanced analytical methods, the research around its link to PM is still in its infancy (Raffoni et al. 2018). This holds

especially true for the non-profit sector which has received even less attention in past research (Abai et al. 2015b). Consequently, there is currently no framework or approach to link analytical and PM instruments and to facilitate the practical application of BA within PMS (Klatt et al. 2011; Raffoni et al. 2018). Rikhardsson and Yigitbasioglu (2018) identified only a small number of articles concerned with the relationship between BIA and management accounting in their literature review. The number of publications that empirically investigate existing applications is even smaller (Rikhardsson and Yigitbasioglu 2018). Although organisations usually possess a sufficient amount of data, they fail to explicate "the connection between the data and subsequent management actions" (Silvi et al. 2010). Hence, they do not produce actionable intelligence. It is essential to take a holistic view of the organisation, to be able to thoroughly integrate and synchronize BA and PM approaches (Raffoni et al. 2018; Abai et al. 2015b).

Proposed frameworks by Abai et al. (2015a), Appelbaum et al. (2017) and Raffoni et al. (2018) are procedural, that is, they prescribe a process for the establishment of BPA and the integration of different data sources, analysis methods and PM elements (Folan and Browne 2005). Furthermore, Abai et al. (2015a) and Silvi et al. (2010) provide some structural frameworks that specify a typology for PM. However, these frameworks remain on a rather abstract level, defining and grouping requirements, processes and ICT components necessary to implement an integrated BA and PM approach.

2.4   Cause-and-effect chains

Cause-and-effect chains interlink performance indicators with each other by assuming that some indicators lead to changes in other indicators. Such chains are considered a core feature of PMS like balanced scorecard (BSC) for example (Kaplan and Norton 1992; Kaplan and Norton 1996), which is one of the most popular instruments in this area (Yu et al. 2008, S. 1; Hoque et al. 2012, S. 529; Janeš 2014, S. 205; Nørreklit 2000, S. 77). They can reach beyond different time scopes and business perspectives and are also important for PES (Adamecz 2013).

Earlier research found companies with modelled causal linkages between measures to be more successful (Soderberg et al. 2011, S. 694–695). Nevertheless, few organisations – even those that use PMS like BSC - have analytical frameworks in place to achieve a thorough understanding of causal chains (Tayler 2010, S. 1098–1099) and interrelations between certain perspectives like non-financial and financial indicators (Greiling 2005). In practice, the absence of well-established cause-effect-relationships is regarded as a common shortcoming of traditional PMS. This weakness could potentially be overcome by integrating BA in PMS, thereby uncovering the really causally effective performance drivers and facilitating more evidence-based decision making (Silvi et al. 2010; Raffoni et al. 2018).

Regarding the purpose of the present study, effect chains carry the potential to explicate the essential link between LA and its organisation-wide impact. However, even the postulated effect chains within the popular BSC have been subject to fundamental critiques which question their causal nature and see a lack of empirical

support (Hoque 2014; Nørreklit 2000; Malina et al. 2007; Nørreklit 2003; Nørreklit et al. 2012). This illustrates the complexity to define and empirically validate effect chains.

2.5   Public Employment Services (PES)

The critical importance of L&D within almost every organisation is widely acknowledged (e.g. Appelbaum et al. 2017), not least due to the explicit integration in a BSC perspective. Thus, it is quite clear that WLA forms an essential building block of BA to evaluate the progress of L&D, also in non-profit organisations such as European public employment services (PES). The necessity for non-profit organisations to demonstrate the effectiveness of their internal L&D interventions has increased in recent years (Walker et al. 2011; Greiling 2005; Grubb 2004; Scharle 2013; Sheldon 2003). PES are currently facing fundamental challenges due to the changing world of work and new career patterns. Fluctuating unemployment figures, demographic change and more dynamic labour markets force PES employees to apply new ways of working and to become coaches for job seekers. Consequently, PES employees must transform their own professional identities (EmployID 2016), which requires a considerable amount of workplace-oriented learning that reaches beyond the mere transfer of factual knowledge in a sense that it triggers transformation processes and impacts on daily working practice. Since PES are publicly financed, they have to provide detail reports about their spending. In sum, the increased demand for workplace learning on the one hand and the necessity to thoroughly report about the usefulness of spending on the other hand make PES an interesting research object when it comes to assessing organisational impact of workplace learning interventions by means of WLA.

3   Development of the framework

To develop a suitable framework, several PM and workplace learning approaches have been investigated. Furthermore, PES-specific research about appropriate indicator types and current PM approaches (see Nunn,2012; Kanievska, 2012) have explicitly been considered. Additionally, a collection of over 200 currently used indicators in PES were matched against the presented indicator matrix to identify potential gaps or areas for refinement.

Since its introduction, the BSC has been a popular means for conducting PM in the profit sector. Meanwhile, it has also gained relevance in the non-profit sector (Greiling 2010; Zimmermann 2004; Hilgers 2008), including European PES. The majority of them use either the ideal type of balanced scorecards or similar performance dashboards (Nunn 2013; Tubb and Murray 2012; Thijs and Staes 2012; Kanievska 2012). Hence, it seemed reasonable to consider BSC perspectives as the basis for the framework and elaborate on it.

Based on the theoretical considerations in the previous section, the following adaptions proved necessary. Due to its importance in workplace learning the framework should explicitly provide space to capture collaborative L&D, catering for the importance of relational and emotional learning in professional identity transformation. Therefore, it distinguishes traditional L&D perspectives into individual and collaborative parts. Furthermore,

to reflect non-profit organisations' direction to fulfil their mission instead of increasing shareholder value (Niven 2008; Abai et al. 2015b), the financial perspective is removed to make the customer perspective the final perspective (Kaplan 2002). Additionally, the achievement of financial goals cannot be easily linked back to single interventions due to the influence of many uncontrollable internal and external factors, like the growth of the economy (Thijs and Staes 2012). In conclusion, the framework has four different areas of service provision in its horizontal dimension, namely individual L&D, collaborative L&D, internal processes and employee satisfaction, and customer satisfaction.

Regarding the time dimension, the framework focuses on the levels *output*, *intermediate outcome* and *long-term outcome*. The distinction between output and outcome is common in PM research and has been used in various frameworks (e.g. Rouse and Putterill 2003; Brown 2008). Outputs illustrate directly measurable, quantitative results of an intervention, such as the number of participants or the intensity with which they participated and interacted with the course material. However, they do not provide information about how and how much participants profited from a certain intervention or whether the learning took effect. Outcome indicators demonstrate how much an intervention's impact contributes to organisational goals (Boland and Fowler 2000). Intermediate outcomes, for instance, reveal the perceived learning gains of the participants, as well as how much they interacted with peers, which is an important aspect of identity transformation. These outcomes play an important role within this framework because they help organisations to understand how and to what extent they contribute to their long-term societal goals (Nunn 2012). This is in line with PES staff's preference towards streamlined outcome-oriented frameworks (Naldini 2013; Nunn and Devins 2012; Adamecz 2013) and PES current PM approaches, which are often output- or outcome-oriented and incorporate intermediate outcomes (Nunn 2012; Tubb and Murray 2012; Kanievska 2012). Additionally, longer-term outcomes are also crucial to track due to the important and sustainable effects of informal workplace learning and professional identity transformation processes becoming visible only after a certain period. In conclusion, the framework incorporates three indicator types in its vertical dimension, namely outputs, intermediate outcomes, and long-term outcomes.

4 Description of the framework

	Individual Learning & Development	Collaborative Learning & Development	Internal Processes (& employee satisfaction)	Customer satisfaction
Outputs	**Number of participants at different learning activities/ interventions** **Content and design of the intervention**	**Design of the Intervention/ Tool (MOOC, COP, …) for collaborative learning**	**Learning process/ framework conditions**	**Available knowledge and ressources for customer service**
Inter-mediate Outcomes	**Individual learning** **Individual reflection**	**Collaborative reflection** **Facilitation / (Peer) Coaching**	**Improvement of work/ processes**	**Interaction with clients**
Long-term Outcomes	**Professional identity development** *Cognitive development (distance travelled)* *Practical development (distance travelled)* *Emotional development (distance travelled)*	**Professional identity development** *Relational development (distance travelled)*	**Organisational impact**	**Customer satisfaction**

Figure 1 - Indicator framework with key aspects of workplace learning as a process of professional identity transformation

Figure 1 shows the resulting framework, which is holistic in the sense that it incorporates different aspects of service provision (horizontal dimension), different time scopes (vertical dimension) and all four aspects of professional identity transformation as a conceptualisation of workplace learning. The latter are regarded as long-term outcomes on the individual learning & development level when it comes to cognitive, practical and emotional development, and on the collaborative learning & development level when it comes to relational development. Thereby, the framework reaches beyond classical (workplace) LA approaches, which usually focus on a narrow concept of learning and often neglect the organisation-wide impact of social learning interventions with their special characteristics in comparison to formal learning programmes.

The framework as such is structural in nature and thereby complements the rather procedural frameworks proposed by Appelbaum et al. (2017) and Raffoni et al. (2018) by a more fine-grained, application-oriented instrument.

The perspectives and the associated aspects in relation to professional identity transformation theory are described in the following:

4.1 Individual learning & development

Individual learning is a necessary but not sufficient prerequisite for organisational learning (Ellström 2001). The **output** view in this perspective focuses on indicators assessing an **intervention's content and design** addressing individual learning gains. On an **intermediate outcome** level, interventions should aim at fostering **individual learning** as well as **individual reflection**. Individual learning indicators measure how employees engage in certain learning interventions, how much they really learn and how their learning readiness develops (Ellström 2001). Individual reflection, that is, the re-evaluation of on-going or past work experiences, is crucial for employees in modern workplaces to get a better understanding of their work practices

and to gain insights on how to improve them in future (Fessl et al. 2017; Prilla and Blunk 2015). It can be operationalised by the frequency with which PES employees reflect on their daily work, the perceived importance of reflecting, or the perceived benefits of reflection, for instance.

In the **long-term**, interventions should be able to trigger the desired **professional identity transformation** process leading to changes in employees' work-related skills or attitudes. These changes can be conceptualised as the distance travelled at a current time point compared to a baseline. Cognitive, practical and emotional development as core domains in which learning takes place (Brown and Bimrose 2018) should be covered by appropriate indicators. They should be capable of showing changes in self-efficacy perception, an improved resilience or a greater ability to reflect as well as changes in technical skills or increased emotional awareness. Empirical data shows that especially emotional aspects should be considered (EmployID 2018).

4.2   Collaborative learning & development

Analogue to the individual learning and development section, **output** indicators cover the **design of an intervention/tool for collaborative learning**. On an **intermediate outcome** level, interventions are supposed to enhance **collaborative reflection** as well as **facilitation and (peer) coaching** processes (Bimrose et al. 2014). Collaborative reflection plays an important role at workplaces whenever teams have to reflect about their work practice or when colleagues share and discuss experiences with each other in order to change their future work practices. Indicators incorporate the occurrence of collaborative reflection as well as the perceived importance of such reflective processes for social learning and work development (Prilla 2015). To enhance facilitation and coaching amongst peers, employees' willingness and confidence in supporting colleagues, for instance by sharing relevant knowledge or helping colleagues to find solutions to problems, are important prerequisites that can be measured (EmployID 2016). In the **long term**, collaborative learning interventions should trigger **professional identity transformations** regarding **relational development**. It covers employees' socialisation at work, their abilities to effectively interact with colleagues or their participation in communities of practice (Brown and Bimrose 2018).

4.3   Internal Processes (& employee satisfaction)

The internal process perspective tracks the positive impact of interventions from an organisational and business process-oriented viewpoint. At **output**-level, indicators assess the circumstances or **framework conditions** under which **learning processes** take place. Analogue to other perspectives, these output indicators do not measure goal achievement as such but rather assess the conditions that build the basis for changes and improvements in the longer term. For instance, the amount of time during daily work that employees dedicate to learning is considered as a process-related prerequisite for improvements at outcome level (Ellström 2001). Indicators in this cell refer to what is called "opportunity structures" (Brown and Bimrose 2018) in the concept of professional identity development. The **improvement of work-related processes** represents an **intermediate outcome** that could be achieved by means of continuous reflection about current work processes and improvement potential (Prilla 2015) and is often a result of practical development at the

workplace. In the **long term**, the changes described should lead to general **organisational impact** and increased employee satisfaction (e.g. Rowden and Conine 2005).

4.4 Customer satisfaction

Employees' job satisfaction as well as the organisation's learning culture can positively impact **customer satisfaction** (Pantouvakis and Bouranta 2013). **Output** indicators in this perspective assess quantitative measures like the time employees dedicate to work with clients. Although these indicators do not provide insights to the quality of customer service, they build the basis for good service delivery. The way in which PES employees **interact with clients** and their customer orientation are important **intermediate outcomes** towards customer satisfaction (Hennig-Thurau 2004). Employees' ability to actively listen to their clients or the frequency of supporting them to find their own solutions are possible measurable operationalisations. These competences could be reflected by customer satisfaction with the expertise of PES staff, which can be influenced by targeted PES training. **Customer satisfaction** is the **long-term** goal in this perspective. Previous research suggests that the organisation's learning culture and the commitment of its employees influence customer satisfaction directly and indirectly in the long-term (Islam et al. 2014).

5 Appropriate indicators

To apply the scorecard to a particular intervention, it is necessary to identify appropriate indicators carefully, taking into account the inherent characteristics of different interventions as well as the contexts and framework conditions in which they are applied. Thereby, it is crucial to use a well-balanced indicator set in terms of quantitative and qualitative (Nunn 2012; Tubb and Murray 2012), soft and hard (Tubb and Murray 2012), short-term and long-term (Nunn 2012; Grubb 2004) as well as output and outcome indicators (Nunn 2012; Kanievska 2012), respectively. Additionally, the indicator set should be reasonably small to avoid overwhelming employees with too many indicators to be handled appropriately (Greiling 2005; Adamecz 2013). Based on practical experiences, 2-3 indicators in each framework cell seem appropriate for most interventions, resulting in 24-36 indicators in total, which are enough to capture relevant outcomes while avoiding losing sight of organisational strategy due to too many indicators (Paulson Gjerde et al. 2007). The number of indicators in the cells do not necessarily have to be equal. On the contrary, the number of indicators is likely to decrease the further you move towards customer satisfaction, at least if the impact assessment takes place in close temporal proximity to the intervention. This is because the impact of those perspectives is often indirectly caused by the effects in the L&D-oriented perspectives, which are separated in time (e.g. Akkermans and van Oorschot 2005). Either way, it is essential that all indicators are well accepted and easily understandable (Adamecz 2013) so that they are not neglected by key personnel and generate practical impact when fed back to employees. This also implies the need to select indicators that measure aspects of organisational strategy instead of assessing performance in areas that are hardly relevant to an organisation's strategy (Niven 2008).

Folan and Browne (2005) provide an overview of recommendations for indicator selection by different researchers which are adaptable to the presented PM framework. However, even the most appropriate

indicators should be interpreted with care (Tubb et al. 2013) and only in relation to the context. More specifically, a given indicator value can be considered as a huge achievement in some contexts but might represent a mediocre outcome in another context.

Analogous to BSC, it is reasonable to expect impact to spread with some delay, a) from the output to the long-term outcome time scope, and b) from L&D to customer satisfaction perspectives. However, since some researchers argue for a more differentiated view of the linkages (e.g. Wallenburg and Weber 2006), this only serves as a rough estimation that must be based on more robust evidence in any particular application scenario.

6 Exemplary application

This section describes the application of the presented indicator framework on a social learning programme, which was introduced in 2016 to practitioners of a European PES. The detailed framework is available as supplemental material to this publication.

The programme was designed for work coaches and consisted of a face-to-face preparation event prior to a six-week online course on the FutureLearn[1] platform. Seventy-four work coaches took part in the programme. Eleven moderators guided participants through the course content, gave advice, and posed introductory questions. The online course addressed the challenges work coaches are facing due to their changing role. Each week was divided into learning steps (70 in total) and provided a unique focus: 1) cultural changes within the public employment service, 2) impact of going digital, 3&4) enhanced coaching (two weeks), 5) labour market information (LMI) for work coaches, 6) reflection on experience and learning. The course content consisted of a multimedia mix of videos, images, and text material. Participants were encouraged to use the platform to discuss ideas, ask questions and give feedback to others. Learners were invited to reflect on the practical consequences of changes in organisational culture and work processes. Despite the formal structure of the course, the pedagogy followed a constructivist approach. The delivered learning content aimed at stimulating discussions amongst participants, which should be the basis for social and interactive learning processes. Hence, it is reasonable to apply WLA as well as SLA approaches.

The intervention's evaluation followed a mixed-method approach and focused on investigating whether and to what extent professional identity transformation processes were facilitated. A set of instruments including quantitative methods like structured questionnaires and usage statistics as well as qualitative approaches like semi-structured interviews were applied (further information can be found in EmployID, 2017).[2] The quantitative indicators in the framework convey concrete values on evaluation scales whilst participants' qualitative statements inform about specific problems or perceived benefits. Thus, the latter also allow for the identification of recommendations and challenges for future interventions. *Output* indicators in the *individual learning and development* perspective proved participants' deep involvement, understanding of covered

---

[1] FutureLearn online platform: https://www.futurelearn.com/

[2] Symbols within the indicator framework indicate the evaluation instrument from which the indicator originated.

subjects, and appreciation of the learning setting compared to traditional e-learning. *Output* indicators in the *collaborative learning and development* section, like the number of replies to comments, reveal the high degree of interaction between participants, which is crucial as part of a programme explicitly focusing on social learning. Participants explicitly expressed their motivation to take part and stressed the benefits of sharing their individual experiences within the course resulting in beneficial long-term effects when it comes to the application of new knowledge in a practical context. The *internal processes* perspective includes information about the time participants could dedicate to the social learning programme or the extent of support they felt from their management. It highlighted the important aspect of timing the learning intervention. Given the constructivist pedagogical approach, interaction amongst participants is crucial to achieve learning outcomes. To facilitate interaction, it should be ensured in advance that participants are allowed to regularly dedicate time slots during their daily work to access the learning platform. An even better alternative would be to define fixed hours at which participants can meet and discuss online. This aspect is particularly crucial in workplace settings, where participants are often interrupted by their regular work or contact with their clients and should be considered in future constructivism-based workplace learning initiatives. Indicators in the *intermediate outcome* perspective, which result from evaluation activities at the end of the course and four weeks later, showed important mid-term effects of the social learning intervention. Participants reported that they had gained relevant knowledge, which they had shared with colleagues. Furthermore, they became more confident in their use of peer coaching and intensified their interaction amongst colleagues by more often helping each other or asking each other for help. These are clear signs of intensified individual learning and changing interaction habits that might facilitate collaborative learning and development. Work coaches became increasingly more resourceful learners.

Moreover, learning outcomes also led to improvements regarding *internal processes*. Participants increased their digital skills and knowledge on labour market information (LMI) systems and became more confident in applying these skills and knowledge, which had a direct impact on internal processes. Additionally, learning outcomes affected the behaviour of work coaches towards their clients. For example, participants reported that they had gained knowledge on how to meet claimants' needs and had increased their confidence in using coaching methods with claimants. In general, the intermediate outcomes demonstrate how interventions' outcomes spread along different perspectives in a horizontal effect chain.

Most indicators in the *customer perspective* show *intermediate* or *long-term outcomes*. At an *output* level, the social learning programme offered material for one course week about LMI that is very useful for serving clients' needs. After the course, work coaches reported that they had gained highly relevant knowledge for their interaction with clients. From a longer-term perspective, evaluation data suggests that the increased knowledge also led to a higher level of confidence in working with clients and to the adoption of new tools and information sources that support better service for customers. As the learning programme was designed for PES staff, the link to customer satisfaction is indirect, and thus requires more time to show temporally delayed effects.

Indicators in the *long-term perspective* were assessed six months after the end of the course. They are expected to persist and have a long-lasting and possibly even increasing impact. These indicators reveal that the social learning programme seems to have supported professional identity transformation processes. This is reflected on the individual level by work coaches being more aware of the bigger picture, having greater confidence (e.g., in using digital services) and reporting a higher level of identification with their job role. The collaborative perspective provides even richer evidence by showing intensified interaction and collaboration amongst work coaches in many respects, such as information exchange. Due to the constructivist pedagogical approach focusing on interaction amongst peers and social learning, positive outcomes at this level could be expected. Other approaches which put a stronger focus on one-directional knowledge transfer from course instructor to participants and operate without or with less active tutors and facilitators would possibly fail to achieve an equally high extent of collaborative activities and deep learning that impacts on one's professional identity and becomes visible in daily work routines.

Since the attitude towards sharing knowledge has changed, work coaches now serve as multipliers by providing colleagues with learning outcomes from interventions. In this way, the social learning programme has also had an organisational impact. Work coaches have increased their understanding of organisational goals and become more self-managed and resourceful learners. This can be characterized as a cultural change and is an important indication for an identity transformation process having taken place (EmployID 2017, p. 97).

7 Qualitative evaluation

The exemplary application of the presented indicator framework demonstrated the impact of a social learning programme on *individual learning and development, collaborative learning and development* as well as *internal processes* and even aspects of *customer satisfaction*. This suggests that effects on an individual level can lead to widespread changes on an organisational level. Conceptualising learning as a continuous process of professional identity transformation which takes place in particular contexts (Brown and Bimrose 2018) serves to analyse dimensions of workplace learning and visualise the interdependence between individual and organisational learning (Ellström 2001).

Overall, the framework has been applied to three different workplace-learning settings in European PES: 1) the social learning programme as presented in this article, 2) a peer-coaching course in a second European PES, 3) a reflective community in a third European PES. To ensure and to increase the framework's suitability for its users, L&D staff of these three PES were asked to give their opinion about the framework filled with concrete indicators within a focus group setting. They expressed appreciation of the condensed and simplified graphical demonstration of outcomes, which conveys a lot of information with little text. PES staff involved in the pilots especially stressed the framework's eligibility as a medium to communicate results to management, which could help overcome the typical challenge of presenting analytical data adequately to managers (Abai et al. 2015b) who prefer the presentation in easily understandable, visual formats (Kohavi et al. 2004). Although not every indicator might be relevant to managers, the framework revealed a remarkable organisational impact and

impact on service delivery to clients, which especially attracts management's attention. Furthermore, PES members stressed the usefulness of the framework from a sustainability perspective. The framework conditions in the internal processes perspective make it easy to identify circumstances and constraints that practitioners should take into consideration when designing further interventions.

In this sense, the benefit of the framework is twofold. On the one hand, it serves to demonstrate organisation-wide impact and therefore provide a means to justify the investment in the programme. On the other hand, it supports designers of learning programmes by raising awareness for important aspects of learning that should be addressed. Additionally, they can use outcomes of former evaluations to improve the programme afterwards.

8 Discussion

In the future, many profit as well as non-profit organisations will need to strengthen their PM and integrate WLA approaches, especially since life-long learning at the workplace is becoming more important (Becker 2015). This might extend the scope of the structural framework presented, which also provides guidance on how to coordinate LA beforehand to be able to track impact across all perspectives and time frames. Professional identity transformation theory provided an appropriate viewpoint on workplace learning that integrates important facets of such, usually informal, learning activities. Professional identity transformation theory relies heavily on qualitative data and the narratives of individuals. The presented framework is more oriented towards impact assessment, thus a more quantitative dimension and organisational view has been added.

However, even a good PM framework does not necessarily guarantee effective PM taking place in an organisation. Management support and treating PM outcomes appropriately without establishing a blame-and-shame culture (Tubb et al. 2013; Tubb and Murray 2012; Thijs and Staes 2012) are crucial for realising the possible benefits of such a framework in practice.

A typical limitation of LA is the lack of quantitative, rigorous research (Ferguson and Clow 2017). The positive evaluation results regarding the presented framework are also limited in a sense that they are based on qualitative self-assessments of relatively few people in a small number of case studies due to the exploratory nature of the study. It could be that subjects perceived the framework as beneficial, although it might not be objectively superior to other impact assessment or presentation methods.

In future research, the framework could be extended by an additional perspective, representing a wider social impact for non-profit organisations, including for instance the average duration of unemployment in the case of PES. This would make the way identity transformation processes finally change the fulfilment of organisations' missions more transparent. This would clearly put a greater emphasis on PM compared to LA. The link between learning and social impact is so indirect that it is hardly possible to quantify and provide evidence for such effects.

Furthermore, the structural framework could be complemented by a procedural element, providing concrete recommendations about the steps to apply the framework in an organisation (Folan and Browne 2005). In addition, an analytical framework could be built upon to explicate useful possible effect chains. Technical implementations reaching beyond the static presentation of indicators could visualise effect chains and allow for dynamic and interactive time-line evaluation, which shows the evolution of indicators at different time points. Such a framework would definitely add value but has to be based on thorough investigations and evidence-based effect chains. Additionally, appropriate data visualisations should be selected to best support evidence-based decision-making. Despite some specific publications and a huge amount of publications in the more general field of information visualisation research that already address this topic, it remains a key challenge in analytics to keep the cognitive load for viewers low and avoid biases due to the chosen visualisation format (Abai et al. 2015b; Rikhardsson and Yigitbasioglu 2018).

9 Conclusion

To conclude, this paper presented a two-dimensional framework in the format of a 3x4 matrix to demonstrate the organisation-wide impact of social workplace learning in non-profit organisations, conceptualising workplace learning as a process of professional identity transformation and explicitly taking different business perspectives, periods and facets of workplace learning into account. Thereby, the approach addresses a rising demand to embed classical WLA approaches into PM. This approach stresses the organisation-wide relevance of such learning programmes by conceptualising and increasing the visibility of subtle personal developments triggered by such interventions. In this regard, the concept of effect chains provides a rationale for the diffusion of positive effects along business perspectives.

The indicator framework presented here has been successfully applied to three social learning programmes in different European PES and received positive feedback. It was considered as a useful vehicle to guide a structured and holistic evaluation and as a suitable presentation format to communicate learning outcomes to managers in a condensed and streamlined way. In future, the framework needs to be validated in other organisations and learning contexts to prove its general benefits compared to former approaches. Relevant research questions to be answered could be for example: To what extent does the framework improve performance measurement of workplace learning interventions? Does it address additional facets of learning and business areas in comparison to formerly used performance management approaches? Is the framework superior in achieving a more profound and streamlined impression of the intervention's impact? Does it allow for deriving additional implications to improve the intervention itself?

The presented article enriches the limited research base around workplace learning analytics and extends its scope to an organisational context. It presents a new framework enabling organisations to demonstrate the impact of workplace learning, conceptualised as a process of continuous professional identity transformation. Thereby, it extends research on professional identity transformation with a practical evaluation tool combining a qualitative and quantitative view.

Literaturverzeichnis

Abai, Nur Hani Zulkifli; Yahaya, Jamaiah H.; Deraman, Aziz (2015a): An integrated framework of business intelligence and analytic with performance management system: A conceptual framework. In: 2015 Science and Information Conference (SAI). 28 - 30 July 2015, London, United Kingdom. 2015 Science and Information Conference (SAI). London, United Kingdom, 28.07.2015 - 30.07.2015. Institute of Electrical and Electronics Engineers; Science and Information Conference; SAI. Piscataway, NJ: IEEE, S. 452–456, zuletzt geprüft am 23.06.2018.

Abai, Nur Hani Zulkifli; Yahaya, Jamiah Hj.; Deraman, Aziz (2015b): Incorporating Business Intelligence and Analytics into Performance Management for the Public Sector. Issues and Challenges. In: The 5th International Conference on Electrical Engineering and Informatics. Bali, Indonesia, August 10-11, 2015, S. 539–544.

Adamecz, Anna (2013): Performance management in PES: clustering and individual performance management - follow up study visit report. Ed. Susanne Kraatz. European Commission. Brussels.

Akkermans, Henk; van Oorschot, Kim E. (2005): Developing a balanced scorecard with system dynamics. In: *Journal of Operational Research Society.* 40(56), 931–941.

Appelbaum, Deniz; Kogan, Alexander; Vasarhelyi, Miklos; Yan, Zhaokai (2017): Impact of business analytics and enterprise systems on managerial accounting. In: *International Journal of Accounting Information Systems* 25, S. 29–44. DOI: 10.1016/j.accinf.2017.03.003.

Attwell, Graham; Kieslinger, Barbara; Blunk, Oliver; Schmidt, Andreas; Schaefer, Teresa; Jelonek, Markus et al. (2016): Workplace Learning Analytics for Facilitation in European Public Employment Services. Available online at http://ceur-ws.org/Vol-1601/CrossLAK16Paper17.pdf, accesseed on 29.03.2017.

Becker, Klaus-Detlev (2015): Arbeit in der Industrie 4.0 – Erwartungen des Instituts für angewandte Arbeitswissenschaft e.V. In: Zukunft der Arbeit in Industrie 4.0. In: Alfons Botthof und Ernst Andreas Hartmann (Eds.): Zukunft der Arbeit in Industrie 4.0. Berlin: Springer Vieweg, S. 23–30.

Bimrose, Jenny; Brown, Alan; Holocher-Ertl, Teresa; Kieslinger, Barbara; Kunzmann, Christine; Prilla, Michael et al. (2014): The Role of Facilitation in Technology-Enhanced Learning for Public Employment Services. In: *Int. J. Adv. Corp. Learn.* 7 (3), S. 56. DOI: 10.3991/ijac.v7i3.4050.

Boland, Tony; Fowler, Alan (2000): A systems perspective of performance management in public sector organisations. In: *Intl Jnl Public Sec Management* 13 (5), S. 417–446. DOI: 10.1108/09513550010350832.

Brown, A. (2016). The Role Of Career Adaptability And Flexible Expertise In Developing Individual Innovative Behaviour. In H. Shipton, P. Budhwar, P. Sparrow & A. Brown (Eds). *Human Resource Management, Innovation and Performance*, pp. 249-265, London: Palgrave Macmillan.

Brown, Alan; Bimrose, Jenny (2014): Model of Learning for Career and Labour Market Transitions. In: *Research in Comparative and International Education* 9 (3), S. 270–286. DOI: 10.2304/rcie.2014.9.3.270.

Brown, Alan; Bimrose, Jenny (2015): Identity Development. In: Paul J. Hartung, Mark L. Savickas and W. Bruce Walsh (Eds.): APA handbook of career intervention, Volume 2: Applications. Washington: American Psychological Association.

Brown, Alan; Bimrose, Jenny (2018): Learning and Identity Development at Work. In: M. Milana, S. Webb, J. Holford, R. Waller and P. Jarvis (Eds.): The Palgrave International Handbook on Adult and Lifelong Education and Learning. London: Palgrave Macmillan.

Brown, Malcolm (2011): Learning Analytics: The Coming Third Wave. EDUCAUSE Learning Initiative, accessed on 17.07.2017.

Brown, Mark Graham (2008): Keeping score. Using the right metrics to drive world-class performance. New York: Productivity Press.

Brynjolfsson, Erik; Hitt, Lorin M.; Kim, Heekyung Hellen (2011): Strength in Numbers: How Does Data-Driven Decisionmaking Affect Firm Performance? In: *SSRN eLibrary,* accessed on 17.07.2017.

Buckingham Shum, Simon; Ferguson, Rebecca (2012): Social Learning Analytics. In: *Educational Technology & Society* 15 (3), S. 3–26. Available online at http://www.ifets.info/journals/15_3/2.pdf, accessed on 29.05.2017.

Campbell, John P.; Oblinger, Diana G. (2007): Academic Analytics. Available online at http://www.educause.edu/ir/library/pdf/EDU07286B.pdf, accessed on 04.07.2017.

Clow, Doug (2013): An overview of learning analytics. In: *Teaching in Higher Education* 18 (6), S. 683–695. DOI: 10.1080/13562517.2013.827653.

Ellström, Per-Erik (2001): Integrating learning and work: Problems and prospects. In: *Human Resource Development Quarterly* 12 (4), 421 - 435.

EmployID (2016): Empowering Change in Public Employment Services: The EmployID Approach, accessed on 25.10.2017.

EmployID (2017): Empowering Change in Public Employment Services. The EmployID Approach. Part II., accessed on 05.02.2018.

EmployID (2018): Empowering Change in Public Employment Services. The EmployID Approach. Part III., accessed on 05.07.2018.

Eraut, Michael (2011): Informal learning in the workplace: evidence on the real value of work-based learning (WBL). In: *Dev and Learning in Org* 25 (5), 8–12. DOI: 10.1108/14777281111159375.

Ferguson, Rebecca (2012): Learning analytics. Drivers, developments and challenges. In: *IJTEL* 4 (5/6), S. 304. DOI: 10.1504/IJTEL.2012.051816.

Ferguson, Rebecca; Buckingham Shum, Simon (2012): Social learning analytics. In: Simon J. Buckingham Shum, Dragan Gašević and Rebecca Ferguson (Eds.): LAK 2012. Proceedings of the 2nd International Conference on Learning Analytics and Knowledge, April 29 - May 2, 2012, Vancouver, British Columbia, Canada. the 2nd International Conference. Vancouver, British Columbia, Canada. New York, New York: ACM (ICPS: ACM International Conference Proceeding Series), S. 23. Available online at http://oro.open.ac.uk/32910/1/LAK2012-RF-SBS.pdf, accessed on 28.06.2017.

Ferguson, Rebecca; Clow, Doug (2017): Where is the evidence? In: Alyssa Wise, Phil Winne, Grace Lynch, Xavier Ochoa, Inge Molenaar, Shane Dawson et al. Eds.): LAK '17 conference proceedings. The Seventh International Learning Analytics & Knowledge Conference : March 13-17, 2017, Simon Fraser University, Vancouver, British Columbia, Canada. the Seventh International Learning Analytics & Knowledge Conference. Vancouver, British Columbia, Canada. New York, New York: The Association for Computing Machinery (ICPS), S. 56–65, accessed on 20.06.2018.

Fessl, Angela; Blunk, Oliver; Prilla, Michael; Pammer, Viktoria (2017): The known universe of reflection guidance: a literature review. In: *International Journal of Technology Enhanced Learning (IJTEL)* 9 (2/3), S. 103–125, accessed on 11.02.2018.

Folan, Paul; Browne, Jim (2005): A review of performance measurement. Towards performance management. In: *Computers in Industry* 56 (7), S. 663–680. DOI: 10.1016/j.compind.2005.03.001.

Giacumo, Lisa A.; Breman, Jeroen (2016): Emerging Evidence on the Use of Big Data and Analytivs in Workplace Learning. A Systematic Literature Review. In: *The Quarterly Review of Distance Education* 17 (4), 21–38, accessed on 29.05.2017.

Greiling, Dorothea (2005): Performance measurement in the public sector: the German experience. In: *International Journal of Productivity and Performance Management* 54 (7), 551–567. DOI: 10.1108/17410400510622223.

Greiling, Dorothea (2010): Balanced scorecard implementation in German non-profit organisations. In: *International Journal of Productivity and Performance Management* 59 (6), 534–554. DOI: 10.1108/17410401011063939.

Grubb, David (2004): Principles for the Performance Management of Public Employment Services. In: *Public finance and management* 2004 (4(3)), 352–398.

Hennig-Thurau, Thorsten (2004): Customer orientation of service employees. In: *Int J of Service Industry Mgmt* 15 (5), 460–478. DOI: 10.1108/09564230410564939.

Hilgers, Dennis (2008): Performance Management. Leistungserfassung und Leistungssteuerung in Unternehmen und öffentlichen Verwaltungen. 1. Aufl.: Gabler Edition Wissenschaft.

Hoque, Zahirul (2014): 20 years of studies on the balanced scorecard. Trends, accomplishments, gaps and opportunities for future research. In: *The British Accounting Review* 46 (1), 33–59. DOI: 10.1016/j.bar.2013.10.003.

Hoque, Zahirul; Barnabè, Federico; Busco, Cristiano (2012): The causal relationships between performance drivers and outcomes. Reinforcing balanced scorecards' implementation through system dynamics models. In: *J Acc & Organizational Change* 8 (4), 528–538. DOI: 10.1108/18325911211273518.

Islam, Talat; Ahmad Kassim, Norliya; Ali, Ghulam; Sadiq, Misbah (2014): Organizational learning culture and customer satisfaction. In: *The Learning Organization* 21 (6), S. 392–404. DOI: 10.1108/TLO-07-2014-0040.

Janeš, Aleksander (2014): Empirical verification of the balanced scorecard. In: *Industr Mngmnt & Data Systems* 114 (2), 203–219. DOI: 10.1108/IMDS-04-2013-0195.

Kanievska, Katia (2012): PES performance measurement systems and geographical labour mobility. Final Report. Ed. by ECORYS, latest update 11.06.2014.

Kaplan, R. S.; Norton, D. P. (1992): The balanced scorecard - measures that drive performance. In: *Harvard business review* 70 (1), 71–79.

Kaplan, Robert S. (2002): The Balanced Scorecard and Nonprofit Organizations. In: *ON Balance* 2002, 231–234.

Kaplan, Robert S.; Norton, David P. (1996): The balanced scorecard. Translating strategy into action. Boston, Mass.: Harvard Business School Press. Available online at http://www.gbv.de/dms/faz-rez/F19980615INGEN--100.pdf.

Klamma, Ralf (2013): Community Learning Analytics – Challenges and Opportunities. In: Jhing-Fa Wang (Ed.): Advances in web-based learning - ICWL 2013. 12th International Conference, Kenting, Taiwan, October 6 - 9, 2013 ; proceedings, Bd. 8167. Heidelberg [u.a.]: Springer (Lecture Notes in Computer Science, 8167), 284–293. Available online at http://s3.amazonaws.com/academia.edu.documents/40792531/icwl2013_submission_59.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1496052330&Signature=f%2Bq7UEjOHGJv5T40lliv%2B3LM6ko%3D&response-content-disposition=inline%3B%20filename%3DCommunity_Learning_Analytics_Challenges.pdf, accessed on 29.05.2017.

Klatt, Tobias; Schlaefke, Marten; Moeller, Klaus (2011): Integrating business analytics into strategic planning for better performance. In: *Journal of Business Strategy* 32 (6), 30–39. DOI: 10.1108/02756661111180113.

Kodwani, Amitabh Deo (2017): Decoding training effectiveness: the role of organisational factors. In: *Journal of Workplace Learning* 29 (3), 200–216. Available aonline at http://www.emeraldinsight.com/doi/pdfplus/10.1108/JWL-05-2016-0038, accessed on 17.07.2017.

Kohavi, Ron; Mason, Llew; Parekh, Rajesh; Zheng, Zijian (2004): Lessons and Challenges from Mining Retail E-Commerce Data. In: *Machine Learning* 57 (1/2), 83–113. DOI: 10.1023/B:MACH.0000035473.11134.83.

Ley, Tobias; Klamma, Ralf; Lindstaedt, Stefanie; Wild, Fridolin (2016): Learning analytics for workplace and professional learning. In: Dragan Gašević, Grace Lynch, Shane Dawson, Hendrik Drachsler and Carolyn Penstein Rosé (Eds.): LAK '16 conference proceedings. The Sixth International Learning Analytics & Knowledge Conference : April 25-29, 2016, The University of Edinburgh, Edinburgh, United Kingdom. the Sixth International Conference. Edinburgh, United Kingdom, 25.04.2016 - 29.04.2016. ACM Conference on Learning @ Scale. New York, New York: The Association for Computing Machinery (ICPS), 484–485.

Long, Phil; Siemens, George (2011): Penetrating the Fog: Analytics in Learning and Education. In: *EDUCAUSE Review*.

Macfayden, L. P.; Dawson, Shane (2012): Numbers Are Not Enough. Why e-Learning Analytics Failed to Inform an Institutional Strategic Plan. In: *Educational Technology & Society* 15 (3), 149–163. Available online at http://www.ifets.info/journals/15_3/11.pdf, accessed on 29.06.2017.

Mackay, R. (2007): Fit for which purpose. In: *Training and Management Methods* 21 (4), 333–338.

Malina, M.; Nørreklit, H.; Selto, F. (2007): Measures, climate of control and performance measurement models. In: *Contemporary Accounting Research* 24 (3), 935–982.

Marsick, Victoria J.; Watkins, Karen (2015): Informal and incidental learning in the workplace. Abingdon, Oxon, New York, NY: Routledge (Routledge revivals).

Martin, Jason; Elg, Mattias; Wallo, Andreas; Kock, Henrik (2018): Four facets of learning in performance measurement. In: *Int J Productivity & Perf Mgmt* 67, 9, 1608-1624. DOI: 10.1108/IJPPM-11-2017-0320.

Miller, Laurie (2012): ASTD 2012 State of the Industry Report: Organizations Continue to Invest in Workplace Learning. Available at https://www.td.org/Publications/Magazines/TD/TD-Archive/2012/11/ASTD-2012-State-of-the-Industry-Report, accessed on 17.07.2017.

Naldini, Andrea (2013): HoPES - Working Group &PES Efficiency Working Group. Final Report. Eds. HoPES - Working Group and PES Efficiency Working Group. Online access at http://ec.europa.eu/social/BlobServlet?docId=11320&langId=en, accessed on 11.06.2014.

Niven, Paul R. (2008): Balanced Scorecard Step-by-step for Government and Nonprofit Agencies. 2. Aufl. Hoboken, New Jersey: John Wiley & Sons Inc.

Nørreklit, Hanne (2000): The balance on the balanced scorecard a critical analysis of some of its assumptions. In: *Management Accounting Research* 11 (1), 65–88. DOI: 10.1006/mare.1999.0121.

Nørreklit, Hanne (2003): The Balanced Scorecard: what is the score? A rhetorical analysis of the Balanced Scorecard. In: *Accounting, Organizations and Society* 28 (6), 591–619. DOI: 10.1016/S0361-3682(02)00097-1.

Nørreklit, Hanne; Nørreklit, Lennart; Mitchell, Falconer; Bjørnenak, Trond (2012): The rise of the balanced scorecard! Relevance regained? In: *J Acc & Organizational Change* 8 (4), 490–510. DOI: 10.1108/18325911211273491.

Nunn, Alex (2012): Performance Management in Public Employment Services. Analytical paper. European Commission. Brussels.

Nunn, Alex (2013): Review of Performance Management in PES. Peer Review Comparative Paper. European Commission. Brussels.

Nunn, Alex; Devins, Dave (2012): Process evaluation of the Jobcentre Plus Performance Management Framework. Research Report No 801. DWP.

Pantouvakis, Angelos; Bouranta, Nancy (2013): The link between organizational learning culture and customer satisfaction. In: *The Learning Organization* 20 (1), 48–64. DOI: 10.1108/09696471311288528.

Paulson Gjerde; Kathy A; Hughes, Susan B. (2007): Tracking Performance: When Less is More. In: *Management Accounting Quarterly* 9 (1), Fall 2007.

Prilla, Michael (2015): Supporting Collaborative Reflection at Work: A Socio-Technical Analysis. In: *AIS Transactions on Human-Computer Interaction* 7 (1), 1–16,.

Prilla, Michael; Blunk, Oliver (2015): Reflective TEL: Augmenting Learning Tools with Reflection Support. In: Gráinne Conole, Tomaž Klobučar, Christoph Rensing, Johannes Konert and Élise Lavoué (Eds.): Design for teaching and learning in a networked world. 10th European Conference on Technology Enhanced Learning, EC-TEL 2015, Toledo, Spain, September 15-18, 2015, Proceedings. Cham: Springer (LNCS sublibrary. SL 3, Information systems and applications, incl. Internet/Web, and HCI, 9307), 626–629, accessed on 11.02.2018.

Raffoni, Anna; Visani, Franco; Bartolini, Monica; Silvi, Riccardo (2018): Business Performance Analytics: exploring the potential for Performance Management Systems. In: *Production Planning & Control* 29 (1), 51–67. DOI: 10.1080/09537287.2017.1381887.

Rikhardsson, Pall; Yigitbasioglu, Ogan (2018): Business intelligence & analytics in management accounting research: Status and future focus. In: *International Journal of Accounting Information Systems* 29, 37–58. DOI: 10.1016/j.accinf.2018.03.001.

Romero, Cristóbal; Ventura, Sebastián (2010): Educational Data Mining. A Review of the State of the Art. In: *IEEE Trans. Syst., Man, Cybern. C* 40 (6), 601–618. DOI: 10.1109/TSMCC.2010.2053532.

Rouse, Paul; Putterill, Martin (2003): An integral framework for performance measurement. In: *Management Decision* 41 (8), 791–805. DOI: 10.1108/00251740310496305.

Rowden, Robert W.; Conine, Clyde T. (2005): The impact of workplace learning on job satisfaction in small US commercial banks. In: *Journal of Workplace Learning* 17 (4), 215–230. DOI: 10.1108/13665620510597176.

Ruiz-Calleja, Adolfo; Dennerlein, Sebastian; Ley, Tobias; Lex, Elisabeth (2016): Visualizing workplace learning data with the SSS Dashboard. In: *CrossLAK*, S. 79–86. Available online at http://ceur-ws.org/Vol-1601/CrossLAK16Paper15.pdf, accessed on 29.03.2017.

Scharle, Ágota (2013): Performance Management in PES. Toolkit for PES. European Commission. Brussels.

Schläfke, Marten; Silvi, Riccardo; Möller, Klaus (2013): A framework for business analytics in performance management. In: *Int J Productivity & Perf Mgmt* 62 (1), 110–122. DOI: 10.1108/17410401311285327.

Sheldon, George M. (2003): The Efficiency of Public Employment Services: A Nonparametric Matching Function Analysis for Switzerland. In: *Journal of Productivity Analysis* 20 (1), 49–70. DOI: 10.1023/A:1024870108435.

Siadaty, Melody; Gasevic, Dragan; Jovanovic, Jelena; Milikic, Nikola; Jeremic, Zoran; Ali, Liaqat et al. (2011): Learn-B: A Social Analytics-enabled Tool for Self-regulated Workplace Learning. In: *LAK '12 Proceedings of the 2nd International Conference on Learning Analytics and Knowledge*, 115–119. Available online at https://pdfs.semanticscholar.org/0b16/b099594b782918617e7e352c9d2b99d9089c.pdf, accessed on 04.07.2017.

Siemens, George; Gasevic, Dragan; Haythornthwaite, Caroline; Dawson, Shane; Buckingham Shum, Simon; Ferguson, Rebecca et al. (2011): Open Learning Analytics: an integrated & modularized platform. Proposal to design, implement and evaluate an open platform to integrate heterogeneous learning analytics techniques. SOLAR - Society for Learning Analytics Research, accessed on 29.10.2017.

Silvi, Riccardo; Moeller, Klaus; Schlaefke, Marten (2010): Performance Management Analytics - The Next Extension in Managerial Accounting. In: *SSRN Journal*. DOI: 10.2139/ssrn.1656486.

Soderberg, Marvin; Kalagnanam, Suresh; Sheehan, Norman T.; Vaidyanathan, Ganesh (2011): When is a balanced scorecard a balanced scorecard? In: *Int J Productivity & Perf Mgmt* 60 (7), 688–708. DOI: 10.1108/17410401111167780.

Tayler, Wiliam (2010): The Balanced Scorecard as a Strategy-Evaluation Tool: The Effect of Implementation Involvement and a Causal-Chain Focus. In: *The Accounting Review* 85 (3), 1095–1117.

Thijs, Nick; Staes, Patrick (2012): Organisational development, improvement and innovation management in PES. Analytical paper. European Commission. Available online at http://ec.europa.eu/social/BlobServlet?docId=8937&langId=en, accessed on 26.08.2014.

Tubb, Helen; Murray, Ellen (2012): PES to PES Dialogue Report 2012. Dissemination Conference: Results from the second year of the PES to PES Dialogue Programme. European Commission. Brussels.

Tubb, Helen; Murray, Ellen; Weber, Tina; Puchwein, Isabelle; Breen, Eleanor (2013): PES to PES Dialogue Report 2013. European Commission. Brussels. Available online at http://ec.europa.eu/social/BlobServlet?docId=11267&langId=en, accessed on 18.09.2014.

Tynjälä, Päivi (2008): Perspectives into learning at the workplace. In: *Educational Research Review* 3 (2), 130–154. DOI: 10.1016/j.edurev.2007.12.001.

Tynjälä, Päivi; Häkkinen, Päivi; Hämäläinen, Raija (2014): TEL@work: Toward integration of theory and practice. In: *Br J Educ Technol* 45 (6), 990–1000. DOI: 10.1111/bjet.12164.

Walker, R. M.; Damanpour, F.; Devece, C. A. (2011): Management Innovation and Organizational Performance. The Mediating Effect of Performance Management. In: *Journal of Public Administration Research and Theory* 21 (2), 367–386. DOI: 10.1093/jopart/muq043.

Wallenburg, C. M.; Weber, J. (2006): Ursache-Wirkungsbeziehungen der Balanced Scorecard - Empirische Erkenntnisse zu ihrer Existenz. In: *Controlling & Management,* 50 (4), 245–256.

Yu, Lichen; Perera, Sujatha; Crowe, Susan (2008): Effectiveness of the Balanced Scorecard: The Impact of Strategy and Causal Links. In: *Journal of Applied Management Accounting Research* 6 (2), 37–55. Available online at http://www.cmawebline.org/joomla4/images/stories/JAMAR%202008%20Summer/JAMARv6.2-BSC%20and%20Strategy.pdf, accessed on 04.03.2015.

Zimmermann, Joel (2004): Using a Balanced Scorecard in a Nonprofit Organization. In: *CDR White Paper Collection* 2004, 1–7.