

Commentary

The following sections offer the comments of experts outside of the ROLE project consortium about the contents of this book. Each expert was asked to review and comment upon a chapter of this book that is relevant to their expertise, thus offering their feedback about a certain aspect of the ROLE research outcomes.

Personal Learning Environments, Self-Directed Learning and Context

Graham Attwell

Research and development in learning technologies is a fast moving field. Ideas and trends emerge, peak and die away as attention moves to the latest new thing. At the time of writing MOOCs dominate the discourse. Yet the developments around Personal Learning Environments (PLEs) have not gone away. It could be argued that the development and adoption of PLEs is not so much driven the educational technology community but by the way people (and not just students) are using technology for learning in their everyday lives.

Even when Learning Management Systems were in their prime, there was evidence of serious issues in their use. Teachers tended to use such environments as an extended file storage system; forums and discussion spaces were frequently under populated. In other words such systems were used for managing learning, rather than for learning itself. Learners expropriated and adapted consumer and productivity applications for their learning. Such trends became more pronounced with the emergence of Web 2.0 and social software. Social networking applications in particular, allowed the development of personal learning networks. Rather than go to the institutionally sanctioned LMS or VLE, learners communicated through

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Facebook or Whats App. PLNs were not longer limited to class or course cohorts but encompassed wider social and learning networks. Wikipedia has emerged as a major open resource for learning.

As mobile technologies have become increasingly powerful and, at least in some countries, internet access has become increasingly ubiquitous, learners use their own devices for learning and are not confined to institutional facilities. Regardless of trends in educational technology theory and research, learners are developing and using their own PLEs.

At the same time, the ongoing rapid developments in technologies are changing forms of knowledge development and leading to pressures for lifelong learning. Universities and educational institutions can no longer preserve a monopoly on knowledge. Notwithstanding their continuing hold on accreditation, institutions are no longer the only providers of learning, a move seen in the heart-searching by universities as to their mission and role.

Such changes are reflected in the growing movement towards open learning, be it in the form of MOOCs or in the increasing availability of Open Educational Resources. The popularity of MOOCs has revealed a vast pent up demand for learning and at least in the form of the c-MOOCs has speeded the adoption of PLEs. MOOCs are in their infancy and we can expect the rapid emergence of other forms of open learning or open education in the next few years.

Learning is becoming multi-episodic, with people moving in and out of courses and programmes. More importantly the forms and sources of learning are increasingly varied with people combining participation in face-to-face courses, online and blended learning programmes and self-directed and peer supported learning using different Internet technologies.

These changes are reflected in discussion over pedagogy and digital literacies. It is no longer enough to be computer literate. Learners need to be able to direct and manage their own learning, formal and informal, regardless of form and source. In conjunction with More Knowledge Others (Vygotsky 1978) they need to scaffold their own learning and to develop a personal knowledge base. At the same time as the dominance of official accreditation wanes, they need to be able to record and present their learning achievement. PLEs are merely tools to allow this to happen.

All this leads to the issue of the role of educational technology researchers and developers. In research terms we need to understand more not just about how people use technology or learning but how they construct a personal knowledge base, how they access different resources for learning, including people and how knowledge is exchanged and developed.

At a development level, there is little point in trying to develop a new PLE to replace the VLE. Instead we need to provide flexible tools, which can enhance existing technologies and learning provision, be it formal courses and curricula or informal learning in the workplace or in the community. It can be argued that while most educational technology development has focused on supporting learners already engaged in educational programmes and institutions, the major potential of technology and particularly of PLEs is for the majority of people not enrolled on formal educational programmes. Not all workplaces or for that matter communities

offer a rich environment or learning. Yet there is vast untapped potential in such environments, particularly for the development and sharing of the tacit knowledge and work process knowledge required in many tasks and occupations. PLE tools can help people learning in formal and informal contexts, scaffold their learning and develop a personal learning knowledge base or portfolio.

At both pedagogic and technical levels, context provides a major challenge. While mobile technologies recognize the context of place (through GPS), other and perhaps more important aspects of context are less well supported. This includes time—how is what I learned at one time linked to something I learned later? It includes purpose—why am I trying to learn something? It includes the physical environment around me, including people. And of course it includes the social and semantic links between places, environments, people and objects.

The challenge is to develop flexible applications and tools to enhance peoples' PLEs and which can recognize context, can support people in scaffolding their learning and develop their own Personal Learning Networks and enhance their ability to direct their own learning and the learning of their peers.

Two major European funded projects, ROLE and Learning Layers are attempting to develop such applications. They both have the potential to make major inroads into the challenges outlined in this short chapter.

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Supporting Self-Regulated Learning

Margit Pohl

Current educational theories emphasise the importance of autonomous learning. Self-regulated learning is one example for such a theory. In the context of this theory, metacognition and cognitive strategies play a significant role. One of the goals of the ROLE project was to support metacognition and reflection of learners specifically. Chapter 2 on “Supporting Self-Regulated Learning” describes the basic ideas of this approach and its implementation in the project.

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One relevant issue in this context is the question how much support learners need and how to give appropriate feedback to them. It is well known that autonomous learning often overwhelms learners and increases drop-out. Still, there are individual differences related to the ability to learn autonomously. Students with high metacognitive skills and self-efficacy are better able to plan their learning processes and learn more efficiently. The ability to structure one's own learning and to reflect on the issues raised in the learning material apparently does not come naturally and has to be communicated to the students. In contrast to some constructivist approaches, self-regulated learning takes these issues into consideration. In the context of the ROLE project, specific assistance is given to the learners to increase metacognition and reflection. There is an adaptive mechanism in the support strategies which adjusts the learning material provided to the students to their specific needs. This mechanism also takes care of the fact that some students need more scaffolding than others.

The support process is based on an extremely sophisticated framework consisting of a process model, a competence model and a learner model. This framework enables the system to give highly differentiated feedback to the learners without having to resort to AI methods. The framework enables the researcher to come up with relevant guidelines for the development and adoption of learning resources. In my opinion, the fact that the framework used as a basis for the development process is strongly related to the guidelines is an indication of the value of the didactic approach used in this project. In many e-learning projects the relationship between the underlying theory and the actual design is only very loose which results in a certain arbitrariness of the design.

One of the strengths of the approach adopted in the ROLE project is that the authors also clarify challenges and limitations of their work. They conducted a survey with teachers, and they collected data at summerschools and conference workshops. These data indicate that the approach has advantages and limitations. Teachers described that advantages might be better learning from the students, more autonomy for the students and peer collaboration. They also see problems as, for example, the fact that many students are not equipped for self-regulated learning and reluctant to accept new methods of teaching. There are also barriers because of the way how universities or other educational institutions are organized. These problems have also been described in the literature (Laurillard 1993). The character of assessments at universities, for example, does not encourage self-regulated learning or reflection or collaboration. In addition, metacognitive skills are often not taught in schools or universities. The development of curricula for schools and universities is usually a highly contested area, and many different stakeholders try to influence this process. The introduction of more autonomous and self-regulated learning is, therefore, quite a challenging process. Projects like ROLE can play an important role in this context to present an exemplary realization of self-regulated learning.

I think there are many interesting areas for future work posed by this project. Although some evaluations have already been conducted, a more detailed study of student's interaction with the system would be very interesting. There is a pronounced emphasis on meta-cognitive activities of the students. Students have to tag widgets or formulate their learning goals. I think it is an interesting research

question how students adopt these activities. Nowadays, students are not rewarded for this kind of meta-cognitive activities at universities. Therefore, they might see it as an obstacle to get a certificate. I assume that meta-cognitive activities have to be integrated into courses and be rewarded in the same sense as other kinds of learning activities, but these are open questions which have to be investigated.

In general, I think it would be interesting to investigate how students interact with this system. Choosing learning widgets and integrating their contents to form a coherent mental model is certainly a demanding task for the students. It would be very interesting to know how students cope with this task and what can be learned for the design of similar systems. I think that the approach using widgets which can be reused and combined flexibly is very promising, but it is also challenging because it is unusual and forces the students to reflect about their learning processes even if there are only few widgets to choose from. There are two aspects which I think would be relevant in this context. On the one hand, there is the investigation of the interactions and learning processes of the students. On the other hand, it would also be interesting to find out what kind of design can support students best in such systems. The first question is more didactic, whereas the second question also addresses usability issues.

Self-regulated learning is an interesting approach because it combines a more active role of the learner with fairly rigorous learning strategies. Such learning strategies can be an advantage if supported appropriately. The ROLE project is an important step to implement a system to encourage a good balance between freedom and guidance in the learning process.

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Multidimensional Evaluation Framework for PLE: Does It Make Sense and Do We Need It?

Carlo Giovannella

PLEs are a typical expression of our time, a time dominated by the *liquidity*, that from one side is a symptom of a profound crisis of values (Bauman 2000) while on the other may represent a great opportunity (Giovannella 2009), provided you are equipped with the skills needed to manage complexity. PLEs are virtual environments in continuous evolution, potentially no-places (Augé 1992) without memory,

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containing the promise for highly customizable environment and learning processes as amply illustrated by this dedicated publication.

PLEs, thus, are not suitable for most of the today's learning processes and their actors. Certainly not for present teachers, who do not "shine" for the mastery of an adequate digital literacy and who, in the vast majority, still consider virtual environments useful as content repository or message boards. Neither for most of the students that, although belonging to the so called *digital native* (Prensky 2001) and showing a considerable ability/independence in managing interpersonal communication, when are asked to take the responsibility of their own training path step back and, actually, prefer to be hetero-directed and evaluated by teachers. PLEs, thus, are not for today, but represent an interesting laboratory within which one can experiment around the *centrality of the person* and her ability to design her own learning trajectory according to *design based learning* approach, her ability to acquire suitable *design literacy* (Giovannella 2010) and other twenty-first century skills (Giovannella and Baraniello 2013).

A smooth introduction of widgets usage into more "traditional" learning environments would be, thus, largely advisable to foster the transition toward more self-regulated learning paths.

Considering the present conditions the *organizational level* of the evaluation, although should be considered to design a general framework, is too far away with respect to the nowadays urgencies. Since in PLEs the *PERSON* and her learning *EXPERIENCE* is expected to be at the centre of learning process, the evaluation should focus mainly on interplay and co-evolution of the "characteristics" of both people and techno-ecosystem.

As well explained by the authors of Chap. 3 one should go well beyond the standard HCI prescriptions to embrace the whole multidimensional spectrum of the human experience mediated by the machine. Of course one needs to develop a better understanding of the learning experience, develop meaningful models (Giovannella et al. 2011) and try to make these latter as robust as possible. New evaluation methods, thus, should be developed and integrated within (or made more easily accessible from) PLEs, and more in general all kinds of learning environments.

The goal should be the multidimensional evaluation of the *EXPERIENCE* and, of course, of:

The learner ability to design her learning process (not just to follow the proposed one).

The acquisition of the relevant competences and literacies and among them the ability to interpret the analytics and self-evaluate her own evolution and needs. Accordingly the evaluation and redefinition of PLEs usage has to capitalize on the large and well established methodological corpus that have been developed in the past 20–25 years within many disciplinary domains: anthropology, psychology, sociology, computer science, interaction design, design for the experience, design, etc., and that has been well synthesized in Chap. 3 of this book. A corpus that can be even enlarged to consider many other methods (the description of which can be easily found on the web) and that should also be integrated by new approaches and methodologies suitable for the multidimensional

monitor of the learning experience (Giovannella et al. 2011, 2013). A task, this latter, that has been accomplished also by some partners of the ROLE project. The debate on *qualitative vs. quantitative* methods and *subjective vs. objective* data detection can be considered an ill posed one. No one would renounce to more objective data, collected in an unobtrusive and respectful of privacy manner, no one would renounce to push the border from qualitative toward quantitative data detection, when possible. The debate, thus, has better to concentrate on the quality of data (i.e. “smart data” instead of “big data”) and on the ability to interpret them.

As an example, an apparently highly objective detection method like the eye-tracking when not well controlled may produce unreliable results if individual visualization styles are not dutifully taken into account.

As additional example, emotions and sentiment, apart the need of well-grounded and interoperable models, could be both objectively and subjectively detected, but the choice of the approach strongly depends on the time-window of interest and cannot avoid to consider both emitters and detectors, whatever communication modality (voice, text, images, etc.) and medium are involved.

In conclusion, PLEs are *learning labs* challenging all actors of learning processes and researchers in many respects, including a *person/people in place multidimensional monitoring* to detect the acquisition of meta-design literacy, self-direction and self-evaluation skills.

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PLE in Formal Education: Challenges for Openness and Control

Marco Kalz

Abstract This short comment reflects on a critical account of educational technology and makes reference to the chapter by Vieritz et al. about the use of widget bundles for formal learning in higher education.

Introduction

Personal Learning Environments (PLEs) have been intensively discussed since the introduction of the concept without an agreement about their definition and concrete focus. In its early development phase PLE has been introduced as learning technologies under the control of the learner (van Harmelen 2006). Later we have described the PLE as a learning environment in which learners on the one hand actively integrate distributed digital information, resources and contacts, on the other hand document learning progress and learning outcomes based on standards (Schaffert and Kalz 2008). While the original concept of the PLE has been introduced as a counter-concept for teacher/instructor-prepared learning environments like Learning Management Systems (LMS) nowadays this perception of a PLE seems to have moved into a direction in which all technology that enlarges the landscape of standard learning technology can be regarded as a PLE.

The authors of the chapter have presented three case studies of widget bundles that function as an enrichment of the traditional technology-supported learning environments at these three institutions. These implementations provide interesting directions for a transition between learning technologies that are designed according to fixed curricula and prepared content towards more flexible environments. Especially the activity recommender might offer an interesting direction to support self-organized learning. But flexibility alone is not the core of a PLE.

Selwyn calls for a critical account of educational technology that takes into account the societal intertwining of educational technology on the micro-and macro-level and the study of learning technology in dimensions of “power, control, conflict and resistance” (Selwyn 2010). We cannot disconnect this wider discussion and reflection from the implementation level. In this sense, learners need to be able to actively (co-)design their learning environment to make it a personal one. This is the important difference between adaptivity and adaptability of a learning environment (Oppermann and Rasher 1997). While adaptivity can be designed completely according to rules of teachers or the designer of a piece of learning technology, the

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adaptability enables a learner to design the learning environment according to individual needs. In the context of educational institutions and formal learning this leads to a number of challenges.

The authors have argued that pre-designed widget bundles have been used to not confuse users and provide them with too many choices. But this leads to the contradiction that widget bundles are a result of a design process of teachers without giving learners any influence on their technology-enhanced learning environment. We have described this contradiction as a “competence continuum” consisting of a number of core skills to be able to use a PLE effectively for self-directed learning (Wild et al. 2009). The biggest challenge is to come to a setup that also enables learners without a high level of self-directedness and IT skills to slowly get used to a more open and flexible learning environment. Pre-defined spaces that can slowly be extended are one option for this issue, the other option would be to make available a limited number of widgets that users try first and then decide about their use and usefulness.

And this leads to a related challenge: Since PLE are dynamic environments that grow according to the context and needs of the learner their evaluation needs to take into account a temporal perspective consisting of a number of snapshots of the environment and their impact on enabling self-directed learning processes. It is essential for the further development of PLE and their impact in education that the community develops evaluation frameworks that can systematically handle the complexity of evaluating a personal environment that changes its status dynamically over time and can thus fulfill different purposes.

One possible theoretical framework for developing such an evaluation approach is the adaptive structuration theory: „The act of bringing the rules and resources from an advanced information technology or other structural source into action is termed structuration. Structuration is the process by which social structures (whatever their sources) are produced and reproduced in social life” (DeSanctis and Poole 1994). Thus can this theory build a good foundation to analyse the interrelation between social structures and technological structures developed in a PLE and the dimensions pinpointed by Selwyn.

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The Future of PLEs: How Can Higher Education Be Passed?

Martin Ebner

Woolly Thoughts on PLEs for Higher Education

I just read Chap. 5 on “Case study 2: Designing PLE for Higher Education” and would like to sort my thoughts. On the one side the ROLE (Gillet et al. 2010) as well as the Go-Lab project (Gillet et al. 2010) took us a step forward to see how the future of teaching and learning might look like, on the other side we ourselves at Graz University of Technology also gathered experiences how a PLE is used in Higher Education (Ebner et al. 2011; Taraghi et al. 2010). From this personal perspective I would like to enhance the chapter bringing three dimensions in mind. Three factors have to be considered when introducing a PLE to Higher Education institution, at least in middle-Europe:

1. *Technological perspective*: First of all as already written in the chapter a Personal Learning Environment offers more or less both—freedom and restriction. Learners must be able to choose their personal applications, contents, tools for their individual learning process, but should be also able to do this in a secure and private way. In contrast to a teacher-centred Learning Management System we are talking now about a user-centred, flexible, expandable system. From a

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technological point of view it is a kind of a multi-application monitoring environment according to the special needs of a specific learner.

To achieve this goal those platforms are following a widget-based MashUp concept (Taraghi et al. 2011) where different small applications (widgets) can be arranged by users themselves. The web-based software consists mainly of two parts—a framework (the widget container) and the widgets themselves. So the weakness of the concept is maybe also its strength—to run such an environment a high number of widgets for different purposes or learning goals are needed. Graz University of Technology follows the concept of users' programmed widgets, which means that students of informatics are doing this small applications during their projects or exercises (Taraghi and Ebner 2010).

2. *Organizational perspective*: The second major factor of a PLE in Higher Education is the question who is running such an environment and what does that mean to our lecturers? On the one side it seems rather obvious that the system has to be provided university-wide on the other side it must be brought into the mind of each single user—lecturers as well as students. First experiences pointed out that in general such an environment is intuitive and can be well explained with the “App-store metaphor”. Due to the fact that nearly everyone owns a smartphone today it is easily imaginable if a Widget is called App and the Widgetstore is compared with the App-store. First gathered statistics pointed out that the PLE in general is used if it is provided university-wide, but still more or less for getting-information issues than teaching and learning purposes (Selver et al. 2013; Taraghi et al. 2013).
3. *Teaching and learning perspective*: Finally it must be taken into account that any system for supporting learning and teaching needs a certain context where it is used and an embedded didactical scenario (Ebner et al. 2011). As described well in the chapter using a PLE for teaching and learning will be a switch from behaviourism to cognitivism. Most of our daily lectures in typical bachelor programmes are based on a face-to-face education where lectures present their contents. It is obvious that this kind of teaching is not appropriate for such an environment where students should aggregate, share, search, recommend etc. It can be summarized that an arbitrarily effort will be necessary on this issue.

Future of Higher Education will need therefore new concepts, lecturers who revise their lectures and learners who will adapt their learning styles. The concept of a Personal Learning Environment and its technical realization is just a first step and the chapter as well as the whole book a first great tribute to it.

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Exploring Open Educational Resources for Informal Learning

Jon Dron

I have been following the ROLE project since its early days and I am delighted to read this report of some of the resulting insights and ideas about how lifelong learning may be supported with its tools. I would like to take this opportunity to interpret some of the findings in this chapter, drawing on both the chapter and my own experiences with the development of widget-based PLE tools.

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One of the most interesting findings related in this chapter is the mixture of feelings expressed by participants as to whether the PLE would be useful. For instance, one of the responses from workshop 2 suggests that the effort needed might not be worth the trouble and, more explicitly, one participant in the Dev8eD workshop comments on the potential difficulties of integrating the ROLE widgets with their existing PLE that included EverNote, Twitter and Google calendar. PLEs are not filling an empty niche: we all assemble our own PLEs, whether we call them that or not. At a broad level, there are PLEs that seek a high level of integration and management of disparate learning tools (that I will refer to as iPLEs), and others that are mostly an aggregation of tools (that I will call aPLEs). The ROLE tools fall mainly into the iPLE category: their purpose is largely to make it easier to aggregate and integrate learning spaces and resources. If this is to work, then it must have extra value not found in other parts of an aPLE. It must be worth the effort to learn to use them. My own aPLE includes a range of personal and shared aggregation tools like browser bookmarks, Pocket, RSS readers and EverNote; productivity tools like calendars, email, Google Search and Apple Widgets; learning objects everywhere, from Wikipedia pages to StackOverflow answers; telephone, Skype, Adobe Connect, social networks, Google Hangouts for dialogue; shelves of physical books as well as virtual collections; a desk, a range of computers and mobile devices; and, most significantly, a set of methods, procedures and pedagogies from which I choose to assist my learning process. Altogether, it is a flexible, highly customized personal learning environment that I use to assemble the things I need for my own learning. There would need to be a good reason to add more tools to this mix. This leads to another quite closely related major issue raised in the chapter: that of usability.

The chapter highlights issues of usability and technical complexity. This is a wicked problem because PLEs tread a tightrope. They must provide a lot of flexibility in order to support an indefinitely large number of potential self-guided learning strategies but they must also make learning easier. For flexibility, they must be fairly soft technologies, in which orchestration of processes and methods is performed by their users. Unfortunately, the softer we make our technologies the harder they are to use, because we must put in the effort to perform the orchestration. If we harden our toolset then some parts of the orchestration must be handled by the tools but, the more orchestration that is built into a technology, the less flexible it becomes. Efficient, demanding less thought, fast: but rigid. Widgets offer a potential solution, by allowing small hard pieces to be assembled into a vast range of learning environments. Using any single widget is mostly pretty simple but knowing which widgets to choose, how they can be configured, how they can be arranged and what they can be used for is much more complex. Thus, though the pieces may be relatively hard, the overall assembly remains soft and therefore difficult to use effectively, requiring an investment in learning and configuring that, unless proven worthwhile, is unlikely to be attempted.

When we talk of self-guided learning we normally mean it only at a coarse granularity: essentially, the absence of an overarching course structure. At a smaller scale, structured learning objects, book chapters, websites, videos and many other

teacher-created artefacts are the norm (using “teacher” to mean anyone, including a team of designers or fellow learners, that intentionally or otherwise helps another to learn). So it is with interest that I read this chapter reporting on personal learning environments, but talking about them in the context of intentional teaching, courses, workshops and other planned processes. Self-regulation can occur at many scales. We may choose to control different aspects of the learning process but almost always delegate control to others at many stages, whether to the author of a chapter or learning object, the leader of a workshop, our PLE or the widgets within it.

Some tools described in this chapter such as Etherpad and Flashmeeting hinge on social engagement, which entails a need to be at the very least mindful of the schedules, needs and goals of others. This highlights a tension that exists in nearly all PLE implementations, that they support our social learning activities, but that those social learning activities themselves, with our fellow learners and teachers, provide shape and form to our learning. For instance, I was not surprised to read that relatively little use was made of Etherpad and Chat in the events described: given that participants were collocated it would not normally be very useful to provide alternative real-time collaboration tools, especially as the tasks did not appear to focus on production of a permanent artefact but were simple part of some active experimentation to use the toolset.

At the heart of all my reflections on this chapter is the fact that PLEs are more than just a way to keep things organized in our learning lives. Done well, they are generative toolsets that can act in some ways like a teacher, offering guidance, inspiration, motivational support and structure to the learning experience. But, at the same time, they seek to provide freedom from such a teacher role, to be soft tools to support self-regulated learning. They are thus both teachers and not teachers at the same time. Their innate softness is perhaps the reason that the evaluations performed in this chapter focused on helping people to use the tools in a manner that is anything but self-regulated and explains why it is so hard to pin them down. A PLE is personal: every individual builds processes and methods around them, configures his or her own space but, at the same time, that space is shaped and influenced by the people, resources, learning objects, tools and expertise that are available. This tension lies at the heart of education. When we educate ourselves we choose the parts that we delegate to others more than those who follow a more guided path but, through the shape of our tools, the people around us and simple path dependencies, we have many of our decisions made for us and, at a finer granularity, always delegate at least some of the teaching process to others. Getting the right balance is a tough task to perform well and partly explains why case studies like the one presented here have a vital role to perform in helping us to understand that better.

Workplace Learning at Festo: Content Creation by Workers for Workers

Content Creation by Workers for Workers

Juergen Mangler

Abstract As a follow-up to Chap. 7—an interview with Manuel Schmidt and Michael Werkle was conducted, to delve into how it is possible for Festo to embrace PLE concepts in their organization, about the motivation of workers to create and share content, and about future projects.

Keywords Interview • PLE • Content creation

Introduction

From Chap. 7 we learned that FESTO is to promote informal learning—learning that happens e.g. through interaction of the learners in social media environments. Rather than employing a top down approach, where learners are fed learning material prepared by dedicated content creators, an individualization of learning is aspired for that covers the learning process (i.e. the what, when and the pace), as well as the content creation process. For the content creation process FESTO is focusing on the experts in the fields (i.e. the workers who do something day to day).

In order to find out more about how typically strict learning related policies in a company fit in with the goals of PLEs, the interview was conducted with a focus on the philosophy and benefits related to letting workers create their own learning material during their work-time, and how this fosters learning and collaboration in the workplace.

Both interviewees are members of Festo Lernzentrum, a separate entity inside Festo that maintains the companies' Learning Management System (LMS), oversees content creation, as well as the creation of didactic designs for the training of workers.

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Interview

Interviewer: What is the relationship between traditional e-Learning and PLE's in your Organization, and how was it shaped by the ROLE project?

Manuel Schmidt: The ROLE project served as an incubator for complementing the existing LMS with properties of a Personal Learning Environment (PLE). From the start of the project there was a strong consensus inside Festo, that a pure PLE was *not suitable for the business context*. As motivating workers to maintain and extend their job related skills and knowledge is a primary focus of businesses in general, they also want to control the goals and granularity (i.e. the when and what) of learning. Furthermore businesses want to speed up the process of *getting started*, which they see as conflicting with the nature of PLE's, where the user starts from scratch, e.g. spending lots of time building one's own learning environment through widgets.

Interviewer: Can you describe the typical learning scenarios for Festo workers?

Manuel Schmidt: Festo is, like possibly most businesses, very much focused on individual workers' career paths and individual competence development plans. This formal training of workers is accompanied by e-learning. We focused on allowing workers that have to tutor other workers to create and distribute their own content, e.g. videos. (. . .) 90% of our users are knowledge workers.

While all workers of course are actively encouraged to participate in seminars, which are rigidly structured, we provide complementary e-learning content in our LMS. For this content, workers can decide for themselves if and which parts they want to consume. So even if a learner does not participate in seminars, he/she can select from a wide array of on-line learning material.

Interviewer: Do you have an estimation which percentage of users use your LMS to consume content because of—or complementary to—seminars, and which percentage of users are purely self-motivated learners?

Manuel Schmidt: During 2013, about 50 blended learning seminars with obligatory material provided through the LMS took place, but about 600 courses in total have consumed during the same year.

Michael Werkle: Staff development in Festo relies on two pillars—quantitative and qualitative goal-setting between workers and their supervisors, and self-motivation. The facts are: the 600 courses had a total of about 8,000 users consuming them, and learning videos have been consumed over 13,000 times in the last year.

Interviewer: In Chap. 7, section 'Implementation of the Personal Learning Management System' it is stated that one organizational requirement is to ensure the transparency of the learning process and the yielded achievements. For sure the employer is interested in, and encourages its workers, to improve their skills and competencies. Does Festo have any formal instruments in place for motivating workers, for example awards?

Manuel Schmidt: There are no awards for learners or content creators. We were toying with the thought, but so far nothing has been realized. One important aspect

in our organization is the very open culture regarding learning: we allow and encourage the learners to use our on-line resources during normal work-time. This trust vis-a-vis the workers alone translates into motivation.

Michael Werkle: Rewards for content creation can of course also have negative effects. For example the use of Wiki's in companies is often very successful when coupled with reward systems . . . but they immediately die as soon as the rewards are taken away. The learning-tube philosophy is successful without any extrinsic rewards.

Manuel Schmidt: We think that systems are successful when the intrinsic reward is obvious for the workers. For example, knowledge workers that have to train other workers are much more flexible when they create videos. They can reuse them in seminars or even refer to them during normal meetings.

Interviewer: Do you track individual learners, their learning progress, . . . ?

Michael Werkle: This is not possible due to German privacy protection laws, and company level agreements.

Interviewer: Currently the whole approach seems much centred on knowledge workers—workers who do all their work in front of the computer screen—or at least on the knowledge working part of the job. Is there a planned integration of the factory floor learning processes into the system? For example when a worker explains to other workers how certain systems on the factory floor work, or how to make them work better, it cannot be captured by screen-casts.

Michael Werkle: There are several research projects underway for human-machine interaction. We are not sure yet which direction these projects will take.

Manuel Schmidt: For me the question is—how to integrate the LMS into the work environment—or maybe not integrate it at all. For example, content could be attached to machines, and a learner equipped with technology like 'google glass' could access this content directly in front of the machine, in an augmented reality setting. The goal will be 'integration into the normal work environment'.

Interviewer: A very simple step, long before producing content for others is: taking notes for yourself in order to not forget. Learning material is produced for self-consumption. Are there any signs that the learning facilities inside Festo are used like this? To what extent?

Manuel Schmidt: Our content creation process (for learning-tube, Ed.) is two-tiered. First the created content is saved locally, and only in a second step it is published. I know that some colleagues are using the system for personal notes.

My personal estimation is that the ratio between published videos and local videos—consisting of videos that the users are not happy with, and videos that the users created for self-consumption—is about 1:10.

Interviewer: In the conclusion of Chap. 7, it is mentioned that the search mechanisms inside videos are not yet there—specifically full text search is not working because not automatic translation of the spoken word to text is possible. Are there any new developments in this area?

Manuel Schmidt: We tried to set up a project that tackles full-text search for videos with a semi-automatic approach: machine-translation and human lectors.

We furthermore wanted to create tag-clouds for each video. Currently our search only uses tags that have been added by the creator of the video. . .

Interviewer: . . . but are the learners allowed to add own subtitles, tags, and notes to learning videos—basically crowd sourcing the creation of data for full-text search? Semantically conceptualized information is after all much more valuable than just the plain full-text, as it allows to find something according to its meaning, instead of the words that are used by the creator.

Manuel Schmidt: This is currently not possible, but will be added in the future. For now we focused version of the platform that supports a recommender system for videos, including comments.

Michael Werkle: Especially interesting—and related to this topic—is internationalization. As we are a multi-national organization, we observe the workers—e.g. colleagues from US and Germany collaborate for bi-lingual videos. It is especially important that the tools not only support such collaboration, but make it easy.

Interviewer: As mentioned in the introduction, media-didactic conception and design is key to the success of learning material. How does Festo tackle the fact that when the content is produced by experts in the field (i.e. with no extra media-didactic education)? Is there a support team that helps the workers who are willing to produce content, without putting an additional post-production burden on him? Or is the content left unaltered and filtered purely by how well is received by other learners?

Michael Werkle: Our observation is: the quality is very high. The content creators are aware that about 15,000 colleagues—including the upper management—can watch created content. Thus they put lots of efforts into the created material. Usually we only have to provide technical support regarding the tool—and more generic tips, like *how to best present my desktop*. The users definitely put lots of effort regarding message and scenario into the content creation process. The users even come up with lots of ideas for the presentation of topics that we would have not thought about.

Interviewer: This raises the question about granularity? How is ensured that one video does not contain too much information (that could be split up into smaller pieces—micro-learning)?

Manuel Schmidt: Videos typically have a duration of 2–10 min, so the content creators intuitively go for the right granularity. As most created content deals with solving a specific problem, a storyline is natural: explain the problem, solve the problem, happy end.

Also one big group of content creators is definitely key (region, E.d.) managers and product managers—they know how to sell products and thus are also qualified to create learning material.

On the other hand, also people with no special skill-set, which even could be described as introverted, created content. In some cases these people work together on videos, i.e. interact regarding the topic of the video in the form of a question-response game. In this case I suspect one person alone would not have created a video.

Interviewer: Evaluation is always a time-consuming process that is easily criticisable because of e.g. sample size, or certain questions used. Additionally, the quality of the properties of a tool is distorted by the very content it provides—in the case of Festo, the videos produced by workers. But they also only produce a snapshot—a glimpse into what a limited group of people thought at a certain time. Is there a permanent evaluation mechanism, that continuously and preferable without placing additional burden on the users (a passive mechanism)? Quantity is important, but what about quality?

Manuel Schmidt: We differentiate between LMS and content. We have a continuous evaluation regarding learning-content, the platform—its functionality—is evaluated with each new release. Currently questionnaires are created in conjunction with courses; the functionality for evaluating single learning objects like videos is included in our next internal release.

Interviewer: Thank you for the interview.

Conclusion

As a conclusion from the interview, it becomes apparent, under the premise that a learning-friendly culture has been established, that businesses have no problems finding motivated workers that create high-quality content, and cooperate with colleagues in content creation. Finding a balance between pure PLE's and traditional LMS seems to be a bit of struggle. Due to already existing formal educational instruments like seminars, and time-restrictions, properties of PLE's seem to be hard to integrate into a company strategy. At Festo the idea of PLE's is manifested as a comprehensive library of learning objects—videos, courses, material—that the learners can select from. It will be very interesting to observe if other companies will move into the direction of allowing learners to create and share own material and courses at an even more fine-grained level.

Finally, the topic of integration the factory floor—non white-collar workers—into these systems will be a challenge, with lots of innovative concepts to be tried out. For example the idea to attach learning material to physical objects including the consumption in an augmented reality setting seems very intriguing.

Lessons Learned from the Development of the ROLE PLE Framework

Sheila MacNeill

Extending the flexibility of learning environments continues to be a challenge for both users and developers. Over the past decade there has been increased demand to ensure that institutionally provided learning spaces are easily adaptable and personalized. Many teachers, learners and VLE administrators have been frustrated by the lack of flexibility and opportunities for customization and personalization in VLEs. Recently, there have been a number of developments that are allowing far more flexible and open approaches to be taken.

In 2010, in response to the increased demands both pedagogically and technically to integrate more social applications into VLEs, Cetus produced the Distributed Learning Environments Briefing Paper. The paper outlined the tensions at that time as:

the requirement for deeper integration with other (administrative) systems gave rise to the MLE (managed learning environment) concept. Later, the demand for greater personalisation and the availability of new web tools gave birth to the PLE (personal learning environment) debate, in which people radically re-conceptualised the notion of a learning environment. During these phases, however, the VLE still remained a dominant force within institutions. This has resulted in a tension between the role of the VLE as a common tool for the institutional community, the desire to make it permeable to the institutional network and the wider web and to allow greater levels of personalization/customization for individuals and institutions.

The chapter outlined five potential models for the opening up and integration of VLEs with a number of other administrative systems and the wider social web and allowing increasingly flexible access to VLEs from mobile devices

Following the publication of the paper, Jisc funded a small development programme, Distributed Virtual Learning Environments¹ that allowed several relatively small-scale projects to develop solutions based on the models.

Interoperability and flexibility have, and continue to be, central to the work of Cetus, so as this programme developed we actively engaged with a number of other communities working in this space including the Apache Foundation and the ROLE project.

The work of the ROLE project was of particular interest as it provided a useful intersection and more potential technical solution to some of the outstanding challenges from the programme. In particular by providing an underlying open architecture for the creation, deployment and storage of widgets. The areas of

¹ www.jisc.ac.uk/publications/briefingpapers/2012/extending-the-learning-environment.aspx

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development discussed in this chapter were of particular interest in terms of providing potential solutions to HEIs in moving forward the development of more flexible learning spaces.

Interoperability Framework, Architecture

The open framework and architecture developed through ROLE demonstrates the key functionality and communication mechanisms for the deployment and integration of widgets. A significant challenge highlighted by the Jisc DVLE programme was that institutions do not have the capacity to host and manage institutional widget spaces/stores. However the concept of a central, educational specific “app store” did have traction. The concept of an educational specific app store had traction; it just needed a mechanism to make it a reality. Following the Cetus 2012 App Store Conference Session,² Jisc funded a pilot project for the Role project to produce a proof of concept store utilizing their developing infrastructure and architecture.

Inter-widget Communication

For widgets to be integrated within a successful PLE, it is necessary for them to be able to integrate with other elements of that environment. Collaboration is an increasing part of many learning experiences. Widgets offer an array of customized collaborative activities. One of their inherent appeals is the fact that learners/teachers can utilize a variety of widget combinations. In an educational setting such as a course delivered primarily via a VLE, widgets need to be able to access key user information and recognize individuals and groups.

Contextualized Meta-data

As the chapter highlights tracking widget interactions is central to developing responsive learning environments. The growing interest in learning analytics in the sector also points to the desire for more detailed information on user activities. The exploration and instantiation of the CAM schema as described highlight the affordances (and challenges) both for end users and developers that this method of data collection can provide.

² <http://blogs.cetus.ac.uk/sheilamacneill/2012/02/26/app-stores-galore-at-cetus12/>

Spaces

Learning spaces are notoriously difficult to comprehensively define. The boundaries are constantly evolving and being permeated. The concept of space(s) defined by the ROLE framework allows the aggregation of people, resources, applications and spaces. Two approaches—linked data and Open Social are discussed. Both have their strengths and weaknesses, which have been explored and expanded through the work of the project.

Authentication and Authorization

Authentication and authorization of users and data is a vital element of widget deployment in a PLE context. The chapter highlights the two levels of data communication methods needed for authentication and authorization—service-to-service and widget-to-widget. More work has been done on the later, in particular with recognized authorization services such as OAuth, which provides a level of user control over sharing of data in specific spaces.

The chapter provides a comprehensive overview of the potential of the ROLE framework in the development of increasingly adaptable and sophisticated personal learning environments. From a personal point of view, it was very rewarding to play a small part in joining up developments within the UK HE sector with the wider European context provided through the ROLE project.

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