Over the course of the last twenty years or so, use of the World Wide Web (the web) has grown—evolving from a hobbyist’s tool to an indispensable resource for social interaction, education, commerce, and entertainment, among other uses. The web evolved into a tool for self-directed personal development and has become a vast resource that enables one to learn and grow outside the parameters of what is considered formal learning (courses, degrees, and other offerings). Adherents of a constructivist viewpoint on learning might be pleased at the many opportunities for one to construct one’s learning opportunities from web resources (Wilson & Lowry, 2000). But the challenge for learners is to be able to create meaning from the vast amounts of information available for informal learning—learning that occurs outside of an education or training program. This challenge has created a significant need for a better way to organize self-directed personal development.

To meet this need, tools have continued to evolve as well, partly in order to help users organize and contribute to this vast informational resource. The concept of “Web 2.0” has been used to describe the evolution of the web from an information source to a “read/write” medium (O’Reilly, 2005). Individuals use these tools, sometimes known as social software, to interact, organize resources, and contribute new content. Social software can be defined simply as software that supports group interaction (Allen, 2004). Learners can thus organize and
share content along with their own interpretation of the content. Some of this organizing, sharing, and interpreting is being done by persons with particular learning goals. It is in this context that the concept of the personal learning environment (PLE) has emerged.

The PLE qualifies as an emerging technology as defined in the opening chapter of this book. It is a new and evolving construct, not yet fully understood, and its unfulfilled potential means it can be disruptive. The concept of the PLE has emerged in recent years via the work of online theorists, researchers, and developers, as a result of the limitations of learning management systems (LMS), recognition of the importance of informal learning, and the growth of social software.

In this chapter we will describe the history of the PLE, explain why the PLE is useful, present PLE examples, examine the affordances of the PLE as compared to the LMS, describe barriers to the PLE, and present directions for future PLE development. Our work builds on the earlier version of this chapter published in Martindale and Dowdy (2010).

DEFINING THE PLE

Defining the PLE is a challenge, because the term has been used in several contexts to describe tools, processes, and sometimes both. Some define the PLE as a conceptual way of working to accomplish (usually informal) learning goals. In this case, the PLE is a collaborative ad hoc set of procedures learners use to interact and share resources that further the expertise and competence of the individual (and group, in some cases). Conversely, some define the PLE as a specific tool or set of tools (usually software) that a learner employs to interact with and manipulate online learning environments and resources. Buchem (2010) collected some commonly cited definitions for a PLE and we direct the reader to this useful resource for further study of the evolving definition of the concept. To demonstrate the diversity of thought, the following are some definitions of a PLE:

Personal learning environments are systems that help learners take control of and manage their own learning. This includes providing support for learners to: set their own learning goals; manage their learning . . . both content and process; communicate with others in the process of learning; and thereby achieve learning goals. A PLE may be composed of one or more sub-systems: As such it may be a desktop application, or composed of one or more web-based services. (van Harmelen, 2008)
[A] facility for an individual to access, aggregate, configure and manipulate digital artifacts of their ongoing learning experiences. (Lubensky, 2006)

A collection of social software tools that take on a learner-centered approach (Schaffert & Hilzensauer, 2008).

It is tempting to think of it as a content management device or as a file manager. But the heart of the concept of the PLE is that it is a tool that allows a learner (or anyone) to engage in a distributed environment consisting of a network of people, services and resources. It is not just Web 2.0, but it is certainly Web 2.0 in the sense that it is (in the broadest sense possible) a read-write application. (Downes, 2006)

The PLE is not a single piece of software, but instead the collection of tools used by a user to meet their needs as part of their personal working and learning routine. So, the characteristics of the PLE design may be achieved using a combination of existing devices (laptops, mobile phones, portable media devices), applications (newsreaders, instant messaging clients, browsers, calendars) and services (social bookmark services, weblogs, wikis) within what may be thought of as the practice of personal learning using technology. (Wilson et al., 2006, p. 36)

The PLE concept has evolved with the development of social software. Web 2.0 and social software tools have gradually expanded and are now a significant part of the online world. These tools include blogs, wikis, podcasting, social networking, RSS, microblogging, instant messaging, virtual worlds, and others. It is worth noting that some researchers make a distinction between the PLE itself and the personal toolkit that one uses to act upon this environment.

The phrase “personal learning environment” appears to have first been mentioned at the annual JISC-CETIS conference in 2004 (Schaffert & Hilzensauer, 2008). The history of the PLE concept has been documented in a number of sources (e.g., van Harmelen, 2008) and we refer the reader to this source for more detail on the history of PLEs. A key event in PLE history was Scott Wilson’s presentation of “the VLE of the future” (Wilson, 2005). Soon afterward, the PLE became a theme in the 2005 JISC-CETIS annual conference.

As the PLE concept gained exposure, researcher Scott Leslie solicited and posted a collection of PLE models (Leslie, 2008) that would receive significant attention. Four years after posting the original diagrams, Leslie subsequently posted some observations about the collection, including some commentary on commonalities among the posts (Leslie, 2012). This collection of PLE diagrams
was categorized by entries that were generally tool oriented, action oriented, person oriented, or consisted of a hybrid approach to all these. Figure 8.1 and 8.2 are two examples of such diagrams.

Figure 8.1  David Tosh PLE Diagram (Tosh, 2005).

doi:10.15215/aupress/9781771991490.01
Figure 8.2 Scott Leslie, PLE Diagram (Leslie, n.d.).

doi:10.15215/aupress/9781771991490.01
In the years since the publication of our previous version of this chapter on PLEs (Martindale & Dowdy, 2010), there have been three notable additions to the PLE landscape. First, a series of academic conferences focusing on PLEs have been held, beginning in 2011 (http://pleconf.org). These conferences have facilitated the publication of many articles pertaining to the concept. For example, the conference proceedings from the 2013 PLE Conference (Buchem, Attwell, & Tur, 2013) focused on PLEs and “smart cities.” Second, there have been special issues in academic journals concentrating on PLEs such as the ones in eLearning Papers (http://openeducationeuropa.eu/en/paper/personal-learning-environments) and the Journal of Literacy and Technology (http://www.literacyandtechnology.org/volume-15-number-2-june-2014.html). Third, the International Journal of Virtual and Personal Learning Environments (IJVPLE) was launched in 2010 and has since published over eighty articles (http://www.igi-global.com/journal/international-journal-virtual-personal-learning/1134).

INSTANCES OF PLES

Sclater (2008) identified three perspectives on what PLEs should consist of and how PLEs should function. The first perspective is that the PLE should be client software that mediates between the learner and whatever resources the learner wants or requires. The second perspective is that a web-based portal can be an effective PLE without the need for client software. The third perspective is that PLEs are present in the form of physical and electronic resources learners can manipulate and customize to learn effectively (Sclater, 2008). The following is a brief summary of tools that can function as all or part of a PLE given these three perspectives:

PLEX (http://www.reload.ac.uk/plex/) is an open-source PLE prototype application developed at the University of Bolton. PLEX allows the user to seek out learning opportunities and manage them. PLEX supports standards such as RSS, Atom, and FOAF.

Colloquia (http://www.colloquia.net/) is a software application developed for group work. Once installed on each user’s computer, Colloquia allows a user to create workgroups based on contexts or projects. These contexts allow for sharing of resources, messaging, and project management. Colloquia was released as version 1.3 in September 2001 and transitioned to open source in September of 2002. This platform has been described as a conversation-based PLE (van Harmelen, 2006).
Elgg (http://www.elgg.org/) is an open-source social networking platform and e-portfolio tool. Elgg is server-based, meaning one can download, install, and host an instance of Elgg.

Responsive Open Learning Environments (ROLE) (http://www.role-project.eu) is a European collaborative project with the goal to provide and support open learning environments, and organize a central repository of “widgets” that could be present in a PLE.

EyeOS (http://www.eyeos.org) is a “private-cloud” application platform that resides within one’s web browser. One’s files, applications, and settings are available at any networked computer.

Facebook (http://facebook.com) is a proprietary web-based social networking platform, but has enough components and flexibility to be considered as a form of PLE, even though it was not built primarily as a learning tool. Facebook includes a somewhat open API, extensibility, file sharing, forums, microblogging, instant messaging, and RSS feeds.

43 Things (http://www.43things.com) was a web-based service where users post lists of resolutions or life goals they wish to accomplish. Users can find others with shared goals and form an ad hoc community for encouragement and accountability along the way. Many of the posted goals involve learning in some way. The site and service was discontinued in 2014.

Netvibes (http://www.netvibes.com) is a web portal (sometimes referred to as a “weftop”) where users can personalize pages. Individuals can assemble favorite widgets, websites, blogs, email accounts, social networks, search engines, instant messengers, photos, videos, podcasts, and more in one place. Netvibes is primarily an information-gathering service, but one can see in this service the semblance of a PLE.

LePress is an example of a customized plugin for the WordPress blogging platform. This plugin has been used by instructors in an attempt to balance the control issues of conducting a course while allowing students the freedom of using a blogging platform as their PLE (Tomberg, Laanpere, Ley, & Normak, 2013).
Two other examples include a model for an interactive logbook PLE (Chan, Corlett, Sharples, & Ting, 2005) and a “personal learning planner” (Havelock, Gibson, & Sherry, 2006). In addition, there have been attempts to describe a framework of what a PLE could consist of (see Figure 8.3), in terms of components and connections (Chatti, Agustiawan, Jarke, & Specht, 2010). Finally, Labrović and colleagues studied students’ use of learning tools for informal learning to develop a “map” of how these tools coalesce to form a PLE (Labrović, Bijelić, & Milosavljević, 2014).

**Figure 8.3** PLEF Framework (Chatti et al., 2010).
Another development has been the investigation of the “mash-up personal learning environment” (MUPPLE). This consists of collections of tools that users assemble and modify to construct PLEs in unique configurations. There have been a series of MUPPLE conferences (https://sites.google.com/site/muppleworkshop/) and also a code project called MUPPLE II within the Mozilla Developers Network (https://wiki.mozilla.org/Education/Projects/JetpackFor-Learning/Profiles/MUPPLE).

BENEFITS AND AFFORDANCES OF A PLE

In recent years there has been an increasing acceptance of the idea that informal learning will be the primary avenue for a person’s learning experience, while formal learning programs make up a much smaller portion of the time one spends learning over a lifetime (Cross, 2007). The PLE can be seen as a manifestation of how one learns informally from a variety of sources and networks, both online and offline. With the growth of social software and social networking online, the web has become a place for connecting with other persons and communities rather than just a large repository of data and information. Dabbagh and Kitsantas (2012) have described how a PLE augments one’s informal learning opportunities, and have described a pedagogical framework for social media use within a PLE to support student self-regulated learning, as students face a number of challenges with self-regulation when constructing and learning with PLEs (Kravcik & Klamma, 2012).

One of the perceived strengths of the PLE is that, as generally conceived as a learning environment; it is similar to what persons experience in real life—at least those persons who have access to Internet resources. Internet users are becoming accustomed to regularly using web-based resources and also contributing as producers of information for the networked world. The web has evolved to the point that it is unusual for a web resource to not have some opportunity for feedback and comments, if not extension, sharing, and reuse of information.

Another favorable aspect of PLEs is the perceived value of learner-centered instruction. Constructivist proponents contend that PLEs encourage learners to construct their own environments and communities, and create, share, and remix resources (Attwell, 2006).

In a report on PLEs, researchers with the Center for Educational Technology and Interoperability Standards (CETIS) derived these principles when examining current learning technologies (JISC-CETIS, 2007).
Learning opportunities should be accessible to students irrespective of constraints of time and place.

Learning opportunities should be available continually over the period of an individual’s life.

Effective teaching should have as its central concern the individual learning needs and capabilities of a student.

The social component of learning should be prioritized through the provision of effective communication tools.

Barriers to learning, whether they are institutional, technical, or pedagogical should be removed.

In a similar report (Johnson, Liber, Wilson, Sharples, Milligan, & Beauvoir, 2006), five major themes were identified as a critique of current learning environments. These can be contrasted with how the PLE is typically described conceptually in terms of its affordances.

Desire for great personal ownership of technology.

Desire for more effective ways to manage technological services.

Desire for the integration of technological activity across all aspects of life.

Removal of barriers to the use of tools and services.

Desire to facilitate peer-based working.

In a frequently referenced post about the “anatomy of a PLE” Wheeler (2010) describes how proposed components of a PLE interact, and how they might interface with a university or workplace learning environment. Figure 8.4 represents the components he discusses.

Tu and colleagues have written about PLEs as part of open-network learning environments (ONLE). These authors described the advantages of such environments, including opportunities for student-generated and student-structured communities, multiple modes and dimensions for discourse, and cloud-based collaboration (Tu, Sujo-Montes, Yen, Chan, & Blocher, 2012).

Anderson (2006) summarizes the advantages of the PLE over the traditional LMS. With PLEs, the learner has a sense of self or identity beyond the classroom. As they direct their own learning, learners control the environment in which
they work. The learner personally organizes the environment instead of operating within an environment that makes sense to the instructor or institution. The learner has responsibility for his or her own content. No longer a passive consumer, the learner is in an ownership role. The learner’s reach extends much farther than the traditional classroom and LMS. While taking part in various online communities of practice, the learner develops an online personality.

![Figure 8.4 Anatomy of a Personal Learning Environment (Wheeler, 2010).](image)

It is apparent from the conceptual definitions and the examples cited that the PLE is a response to the limitations of current learning environments. Consider the following scenario of a hypothetical university student’s use of a PLE:

Liam is a “traditional learner,” equipped with his own laptop computer, who makes the most of Web2.0 services . . . coordinated via his PLE. . . . As a student at University his course information, including resources, assignments, tutor feedback, etc. is made available to him via services provided by the institution, which interoperate with his PLE. In addition, he has access to further services, which support reflective activity and provide a repository for interesting items. Many of these services are provided outside the institution. All of these elements can be integrated and organized in whichever way Liam finds useful. Finally, his environment allows him to set up collaborative social groups, and to coordinate activity within these groups with other groups of which he is a member. . . . He is mindful of the fact that the performance of such a range of tasks without his PLE would present considerable obstacles for him—not least in simply remembering how to
use all the different tools he would have to negotiate. In fact, Liam might go so far to say that his PLE is very much his “tool for dealing with life.” (JISC-CETIS, 2007)

The following is a second scenario of a student using a PLE.

John is a twenty-year-old college student studying European history. He is enrolled in three courses at three different universities. Each university has its own LMS, but every part of each LMS can be accessed by his own web-based application (part of his PLE). He does not have to “go” to each university’s system—rather the information comes to him. He is a frequent user of social networking software, and by his decision he regularly receives “learning opportunity notices” from trusted people and organizations based on his interests and career goals. These learning opportunities are structured around a standard set of fields or metadata that his PLE can interpret. For instance, he wants to learn to play the acoustic guitar, and his PLE interacts with his social network to find opportunities and resources to help him learn along with others who also want to learn to play. His PLE also connects with various open courseware sites to access open educational content, and can manage his interaction with others using the same content. John’s PLE helps him maintain an online portfolio of his products and competencies. He can easily configure this portfolio for the appropriate audience(s) when he needs to demonstrate what he knows and what he can do. From informal interests to formal degree programs, John’s PLE can interact with the various systems via one familiar and personally configurable interface.

THE PLE COMPARED AND CONTRASTED WITH THE LMS

Researchers and theorists investigating PLEs sometimes frame a philosophical debate in which the PLE is positioned against the learning management system (LMS). The LMS in some ways is an easy target in that it is frequently a large, somewhat inflexible environment that is chosen and implemented by formal educational organizations rather than by the learners (see chapter 7). An LMS offers control, tracking, and management by the institution and by the instructor in a particular course, and therefore is quite different in nature and purpose from the PLE as described in this chapter.

In terms of “market reach” and scope of adaptation, the LMS has been very successful in higher education. The LMS meets certain needs of the institution, such as tracking student enrollment, participation, assessment (grading), and completion. It allows for discussion and other types of interaction, and is a relatively quick and easy way for an instructor or entire program to “put courses
online.” The LMS has been popular in business and industry as a way to quickly deliver and track employee training, particularly in terms of compliance training and meeting regulatory requirements (Avgerinou, Papasalouros, Retalis, & Skordalakis, 2003). Having achieved success in business and in higher education, the LMS vendors are rapidly moving into secondary and primary education, for both in-person and online education.

Wilson et al. (2006) examined the design of LMSs and the alternative design presented by PLEs. The researchers compared LMSs to standards such as the VHS videotape and the QWERTY keyboard, and proposed that the LMS had become the de facto standard in online learning. Here is a summary of LMS characteristics.

LMSs concentrate on the course context.

All resources are loaded and linked within the overall structure of a course.

LMSs have an inherent asymmetric relationship between instructor and learner in terms of control of the learning experience.

The learner’s role is one of passive acceptance of content and limited permissions set by the LMS.

Every learner experiences content exactly the same way. Each learner interacts with content in identical fashion.

Most LMS implementations are focused on managing rights and permissions in terms of access, which further restricts the learner’s experience. And generally these rights and permissions do not extend beyond the hosting institution. An LMS by nature is concerned with managing learning and learners, and learners may prefer not to be managed; they may prefer to be encouraged, challenged, motivated, and inspired. Attwell (2006) posits that the predominant focus on managing via the institutional LMS has not resonated with modern learners, and that the educational system is in danger of being perceived as irrelevant or as an imposition. Outside the LMS, the modern learner has access to a wide variety of online information, experiences, and communities, the combination of which may make the LMS appear quite limited or impoverished as a learning environment (Sclater, 2008).

LMSs have been criticized for being so large and standardized that they become inflexible, and in fact prescribe a certain kind of learning environment.
From the learner’s point of view, the limitations of an LMS have become more pronounced as social networking and related software has risen in prominence. The ease and flexibility afforded by a combination of tools mostly under the learner’s control can make the university LMS seem too rigid and out of touch.

Researchers have identified the following perceived failures of the state of online learning environments in higher education:

Accessibility has only partially been achieved by moving the medium of dissemination onto the web. However, barriers to accessibility remain in the form of institutional procedures and usability.

The institutionalization of learning technology presents a further barrier, because with institutional ownership of technology comes the requirement for students to re-learn the technologies of access to learning at each education provider.

Current pedagogical practice is still teacher-centric. The promise of e-learning in enabling effective management of a diverse student population has only seldom been realized. At its worst, the VLE [virtual learning environment] can be characterized as a giant photocopier!

The process of education is primarily institution-centric, rather than learner-centric. (JISC-CETIS, 2007)

A PLE brings with it many changes for the learner, the institution, and the content. The following table (Schaffert & Hilzensauer, 2008) identifies how seven facets of online learning differ in an LMS compared to a PLE. The table specifies these differences as well as the challenges and changes that PLEs represent.

<table>
<thead>
<tr>
<th></th>
<th>LMS</th>
<th>PLE</th>
<th>Challenges and Shifts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Role of the learner</td>
<td>learner as consumer of pre-defined learning materials, dependent on the “creativity” of the teacher</td>
<td>active, self-directed, creator of content</td>
</tr>
</tbody>
</table>

A PLE brings with it many changes for the learner, the institution, and the content. The following table (Schaffert & Hilzensauer, 2008) identifies how seven facets of online learning differ in an LMS compared to a PLE. The table specifies these differences as well as the challenges and changes that PLEs represent.
<table>
<thead>
<tr>
<th></th>
<th>LMS</th>
<th>PLE</th>
<th>Challenges and Shifts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Personalization</td>
<td>. . . is an arrangement of learning assignments and materials according to a (proposed or pre-defined) learner’s model, based on an underlying expert system</td>
<td>competence for usage of several tools and self-organization is needed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>. . . means to get information about learning opportunities and content from community members and learning services fitting to the learner’s interests (via tags/RSS)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Content</td>
<td>the infinite “bazaar” of learning content in the Web, exploring learning opportunities and services</td>
<td>necessary competences to search, find and use appropriate sources (e.g., weblogs [blogs])</td>
</tr>
<tr>
<td></td>
<td>developed by domain experts, special authors, tutor and/or teachers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Social involvement</td>
<td>limited use of group work, focus on the closed learner group (e.g. in the LMS), collaboration and exchange not primarily in the focus</td>
<td>community and collaboration as the central learning opportunities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the community and the social involvement (even in multiple communities) is the key for the learning process and the recommendations for learning opportunities</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ownership</td>
<td>content is generally owned by the educational institutions or the students, due to technological reasons, this ownership cannot always be realized</td>
<td>awareness of personal data is needed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>content is organized in multiple web-based tools, ownership is controlled by the learners themselves and/or (commercial) service providers</td>
<td></td>
</tr>
<tr>
<td>LMS</td>
<td>PLE</td>
<td>Challenges and Shifts</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>6 Educational &amp; organizational culture</td>
<td>imitation of classroom learning, course-oriented, teacher-oriented features</td>
<td>self-organized learner is the focus</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>change of learning culture and perspective—move toward self-organization and self-determination</td>
<td></td>
</tr>
<tr>
<td>7 Technical aspects</td>
<td>classical learning content needs interoperability between LMS and data repositories</td>
<td>Social software tools and aggregation of multiple sources</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>required interoperability between LMS and the social software</td>
<td></td>
</tr>
</tbody>
</table>

The PLE’s accommodation of new tools and services makes it difficult for LMS developers and vendors to keep pace. There are instances of LMSs employing social media. Tensions arise, however, because social media are outward manifestations of an underlying ethos—of social learning, communities of practice, and open resources (Downes, 2005). For example, some LMSs offer student blogs, but the blogs may not be accessible to readers outside the LMS. While an LMS can include Web 2.0 elements in its systems, it is rooted in the traditional instructor-centric model of instruction. Curricula are determined, courses are designed, networks extend only to the boundaries of the institution, and participation is limited to students paying tuition, and often only the students in a particular course. In a PLE, the learner is not restricted to only institutionally approved groups and resources. The PLE becomes the gateway to the web where learners evaluate resources and make meaning of content. This type of activity aligns with the concept of communities of practice (Wenger, 1998). We contend that communities of practice have more potential to be realized with the PLE than the LMS.

LIMITATIONS AND FUTURE ISSUES

PLEs are attractive for a number of reasons, and yet currently face significant issues that would need to be overcome to see broad implementation of the environment as described in this chapter. As we mentioned, the LMS has become a dominant feature of formal learning environments, and it is a large and lucrative
market. Despite the criticisms, we predict that LMS use will continue long into the future. One of the key issues will be determining where PLEs fit in terms of relationship with the LMS. Is it an augmentation, a competitor, a replacement, or something else?

There are three scenarios in which PLEs could coexist with LMSs. The first scenario would be the PLE existing in a “parallel life,” dominating the informal learning space while the LMS continues to dominate formal education. The second scenario would see LMSs gradually open their structures to include interoperability with PLEs. The third scenario would be the LMS attempting to co-opt elements of the PLE. One study was conducted to bring the PLE into the LMS through the use of widgets (OpenSocial applications), which could be integrated into Moodle. The researchers found that these widgets were perceived to be useful by the students. However, students not being able to fully or extensively personalize the environment detracted from the acceptance and utility of this blending of the PLE and the LMS (Bogdanov, Ullrich, Isaksson, Palmer, & Gillet, 2012). This can be compared to a related project in which the researchers eschewed the LMS completely and constructed their own cloud-based environment using OpenSocial applications (Gillet & Bogdanov, 2012).

Sclater (2008) raised a number of PLE implementation issues. Why would a LMS vendor allow a PLE client to access the LMS functions without the user directly using the LMS? How would the PLE reconcile with the traditional elements of formal education such as syllabi, assignments, grades, and schedules? Finally, the PLE “movement” lacks a recognized charismatic leader or champion to push the development of PLE standards.

LMSs provide boundaries between approved institutional users and the outside community. However, online communities can contain many thousands of participants and resources. Wilson et al. (2006) contended that emerging PLE technology might solve the issue of limitless resources by facilitating local filtering within a learner’s PLE. In effect, trusted persons and processes become the “personal librarians” for the learner, mining through mountains of information and directing the learner to valuable resources (Martindale, 2007). We see instances of this with blogrolls and RSS feed collections, in which users can show “who” and “what” they are reading. Tools such as Twitter show whom a user is following and who is following the user.

Beyond the clearly marked boundaries of the institutional LMS (with its clear delineation between the expert instructor and the novice learner), the PLE learner must master skills beyond self-regulation. These skills also include
evaluation of online resources (Bouchard & Qc, 2013). Schaffert and Hilzensauer (2008) described the need for media-literate learners:

The change from content that was developed by expert and/or teachers towards possibilities and challenges to make use of the bazaar of learning opportunities and content leads to the necessity of advanced self-organizing and searching in the Web—in other words: media competent learners (Schaffert & Hilzensauer, 2008).

PLEs generally comprise several social software applications. The rate at which these applications arrive, expand, and sometimes disappear creates a challenge to learners looking for new components for their PLEs. Successful PLE learners must be able to navigate multiple systems, passwords, and content formats to benefit from the myriad offerings on the Web. PLE users must spend higher proportions of their time learning and relearning user interfaces of emerging Web 2.0 personal technologies (JISC-CETIS, 2007; Johnson et al., 2006).

There are several technologies and initiatives that could affect the prominence of the PLE. For instance,

The Open Courseware Consortium (http://ocwconsortium.org/) is a collaboration of over 200 institutions to share open learning resources.

The e-Framework for Education and Research (http://e-framework.org) is an attempt to create standards of interoperability for LMSs and related tools.

Moodle (http://moodle.org/) is a free and widely used open-source LMS that has the potential to be more learner-centered than the typical LMS.

Mahara (https://mahara.org) is an open-source e-portfolio application that allows a person to construct an electronic portfolio, and interact with others. Mahara interacts well with Moodle.

Google Open Social (http://code.google.com/apis/opensocial/) is a set of common APIs (application program interfaces) for building social applications across many websites.

Google Classroom (https://www.google.com/edu/classroom/) appears to be aimed at K-12 teachers, and might be characterized as a very lightweight LMS for document sharing, grading, assessments, etc.
The Open ID project (http://openid.net/) is a shared identity project that allows Internet users to log on to many different web sites using a single username and password (an identity).

Attwell (2006) specified that PLEs should operate online and offline, work on multiple devices, allow granular permissions control, and support multiple learning contexts. PLEs need to be open to multiple sources, provide powerful searches, be easily updated, be easily installed and maintained, be extensible, provide multiple presentation options, have built-in interoperability, be based on standards, and help learners sequence their own content (Attwell, 2006; Attwell & Costa, 2008). With this as a checklist, clearly there is much work to be done for the PLE to be realized. As a good example of the type of work needed, Fournier and Kop (2010) described a study in which participants ranked experiences with tools they used, and the desired features in a proposed PLE.

There are many opportunities for future research and development in terms of investigating PLEs for learning. Buchem (n.d.) has collected a number of research and conceptual articles, and Cosgrave (2014) has curated a list for further reading on the subject of PLEs. In summary, the scholarly community needs a greater understanding of:

Identity management and privacy issues across multiple sites and services;

Selecting social software applications for effective learning;

The practical, legal, and financial implications of decentralized learning environments for institutions such as universities; and

The implications of learners being responsible for their own environments, and in many instances, regulating their own learning.

This is an exciting time for research and exploration of personal learning environments, as researchers and educators are investigating the emergence of the PLE and its relationships to and impacts on education and learning.

REFERENCES


