Learning and performance support systems: personal learning record: user studies white paper

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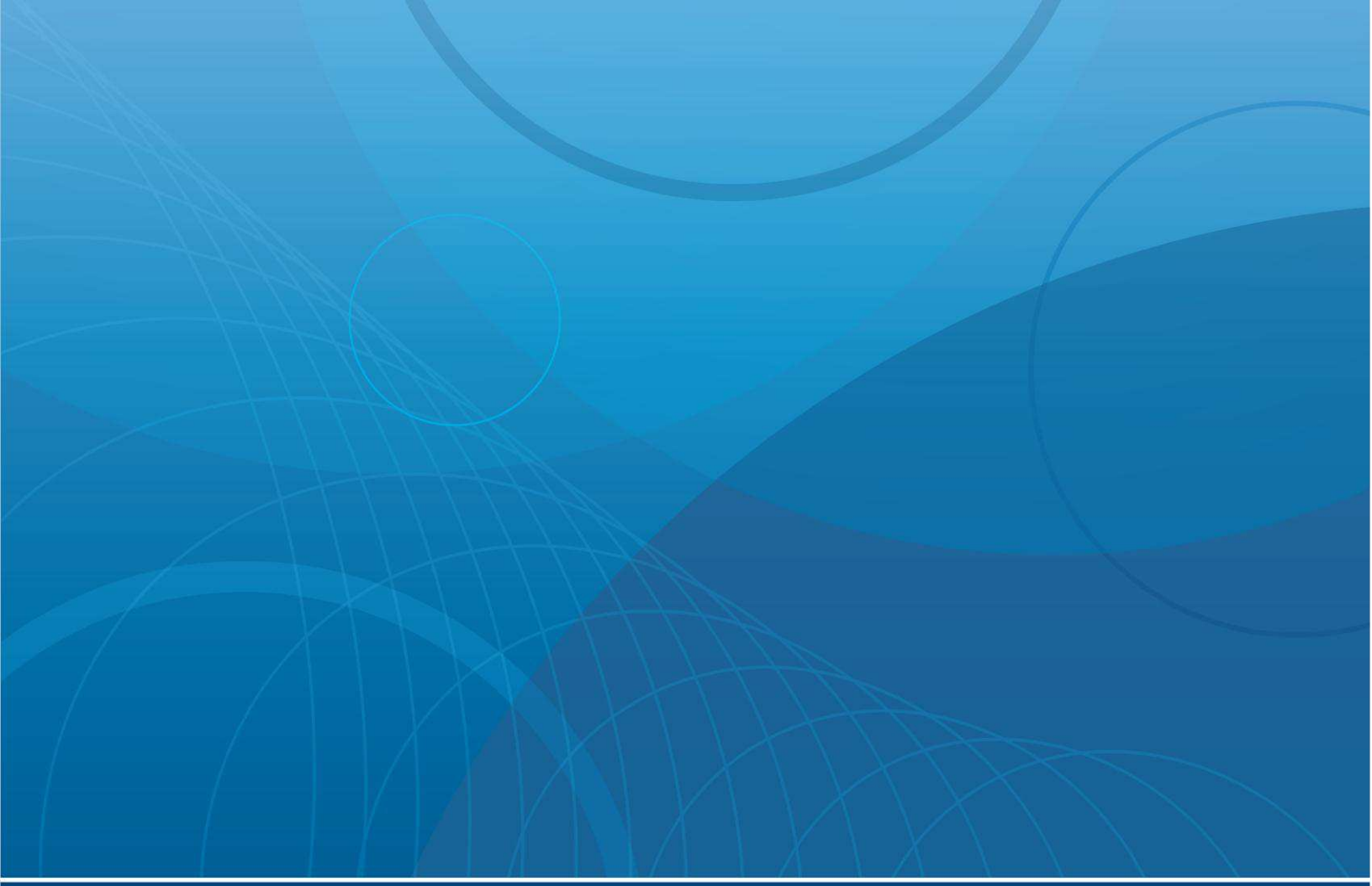

NRC·CNRC Information and Communications Technologies

Learning and Performance Support Systems: Personal Learning Record

User Studies White Paper

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Introduction

LPSS is a Learning and Performance Support System developed by the National Research Council of Canada (NRC) as a single point of success to development and training needs, and ultimately, career development and enhancement. LPSS emphasizes an individualized learning path with context aware support. Core technology development projects include: learning services network and marketplace; automated skills development and recognition; a personal learning assistant to view, update and access training; and lifetime management of learning and training records and credentials. Another research project will extend LPSS resources to make available simulation-based activities and data to specific online communities with the aim of developing new algorithms such as recommenders and analytics based on hands-on learning activities. The main objective of the NRC's LPSS program is to design, deploy, refine and commercialize an online system for improving people's learning and work performance.

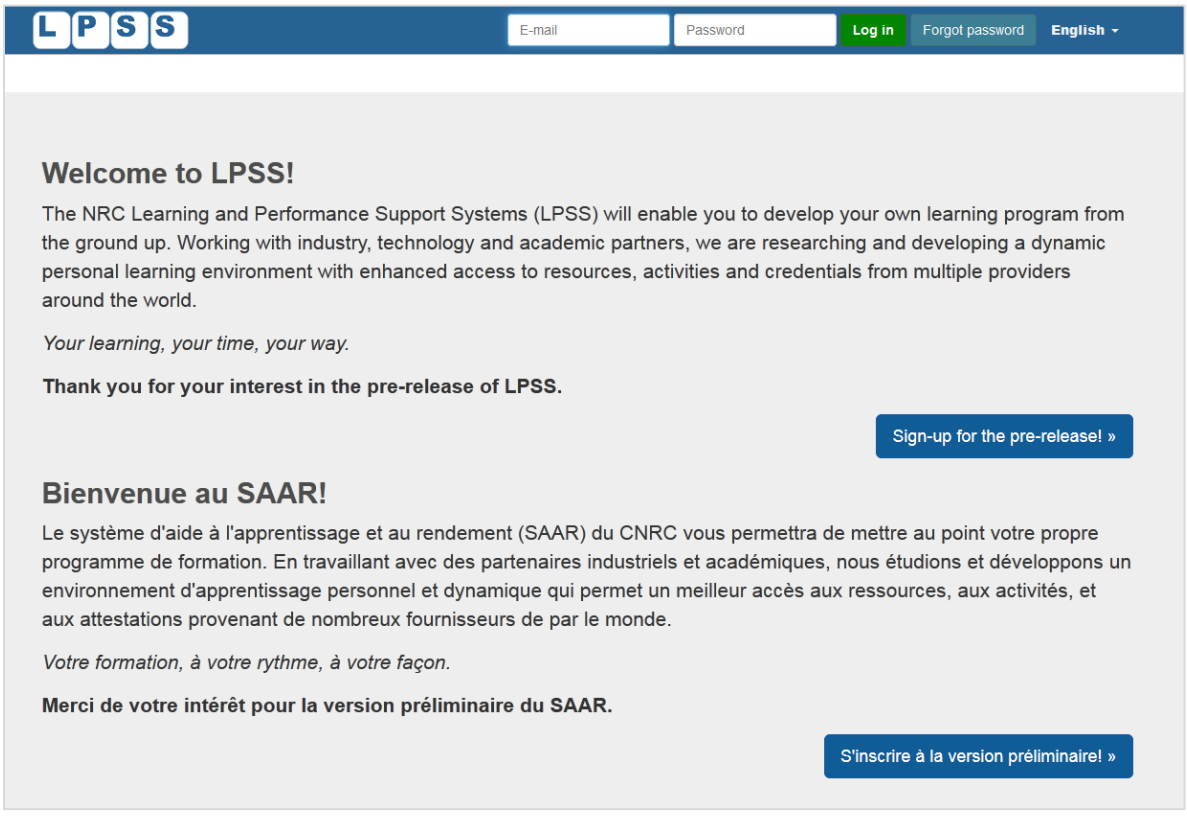


Figure 1.Welcome screen for the pre-release of LPSS at www.lpss.me

Figure 1 shows the welcome screen for the pre-release version of LPSS available at www.lpss.me. By clicking on the sign-up link, a registration form with pre-release terms and conditions of use is presented to the user. Currently the form must be filled out and submitted by the user in order, and a username and password to log into the LPSS platform is sent by email.

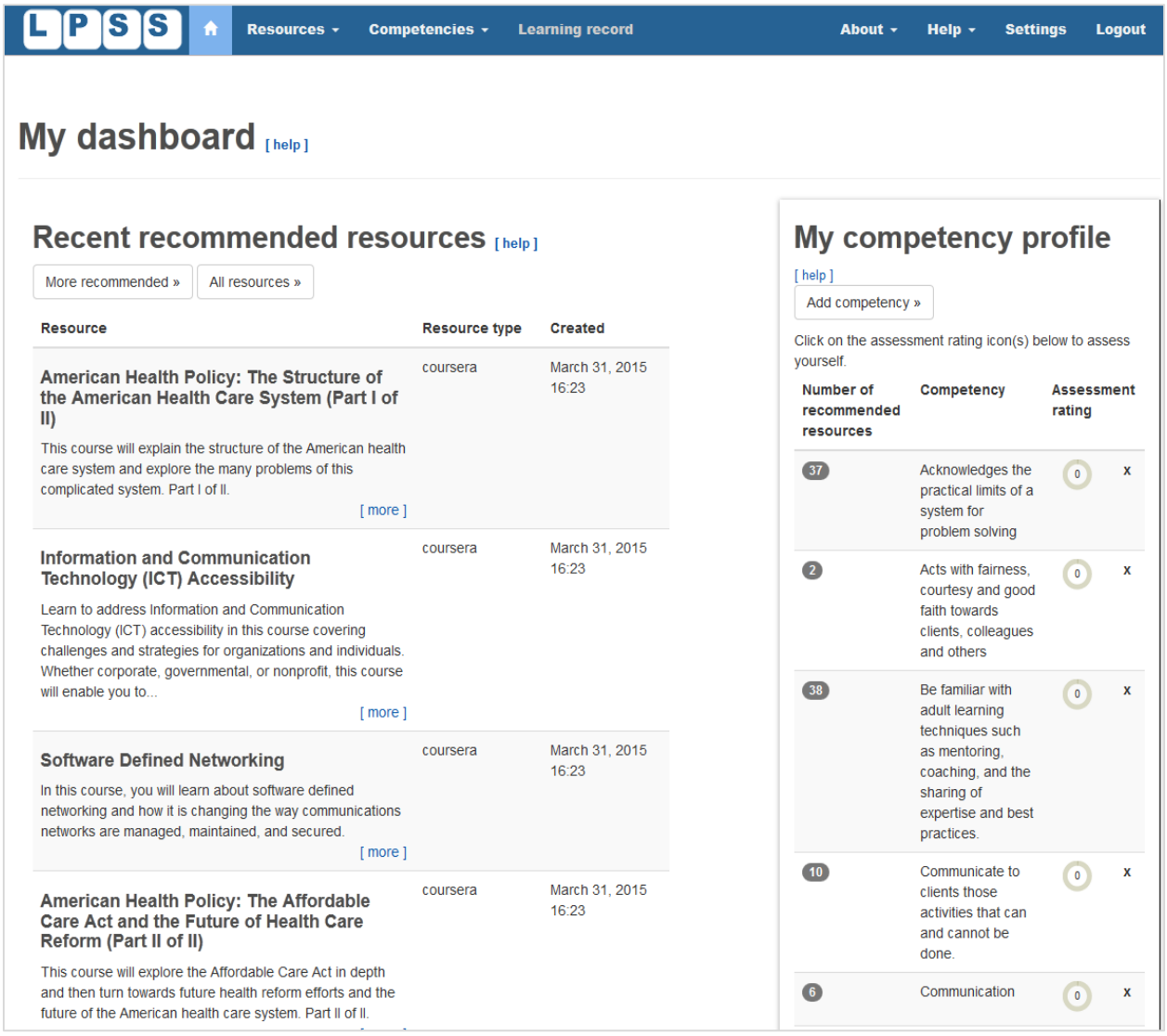


Figure 2. Example dashboard for the pre-release of LPSS at www.lpss.me

Figure 2 presents the My Dashboard component which is the user's personal LPSS home page. It displays the user's Recent Interesting Resources and Competency Profile. Competencies the user has browsed and selected are also listed on My Dashboard, as well as recommended resources associated with these competencies. The user can also complete a

self-assessment for any number of competencies. The user can return to their dashboard from anywhere in the LPSS system by clicking on the LPSS icon or home icon at the top left of the page. A number of functionalities have already been implemented that allow the user to add and manage resource feeds such as websites, twitter accounts and course related feeds, a calendar of resource events, an LPSS toolkit which is managed like a bookmark, personal events manager, recommended resources, among other functionalities.

In this paper we first outline our findings in the literature on major research topics in the field of learning performance support systems, including features and tasks related to system use, user behavior patterns and types of learner characteristics, with a focus on the use of personal learning records in particular. We also discuss the various users studies conducted for the project that feed into the development of the system. The next section will present key findings of literature surveys which focused specifically on technologies, products, and research related to the Personal Learning Record project.

Literature searches

Literature searches were conducted to inform research and development efforts within the LPSS program. There are a number of distinct but related technologies developed through four LPSS projects (namely, Automated competence development and recognition, Personal learning record, Resource repository network, and Personal learning assistant, that will lead to an enhanced overall learning solution (i.e., LPSS). Simulation-based research within LPSS will also focus developing new algorithms such as recommenders and analytics based on hands-on learning activities.

LPSS research and development efforts have been underway since April 2014, starting with a literature search to inform the LPSS program on research and emerging trends in the area of learning management systems. The literature search was completed in July 2014 by NRC's Knowledge Management team. Searches were conducted in various scholarly, bibliographic databases. The search targeted four databases (*Scopus, IEEE xPlore, ERIC*, and *Business Source Complete*) chosen to provide good coverage of theoretical, scholarly, technical, business, and practical aspects of the domain.

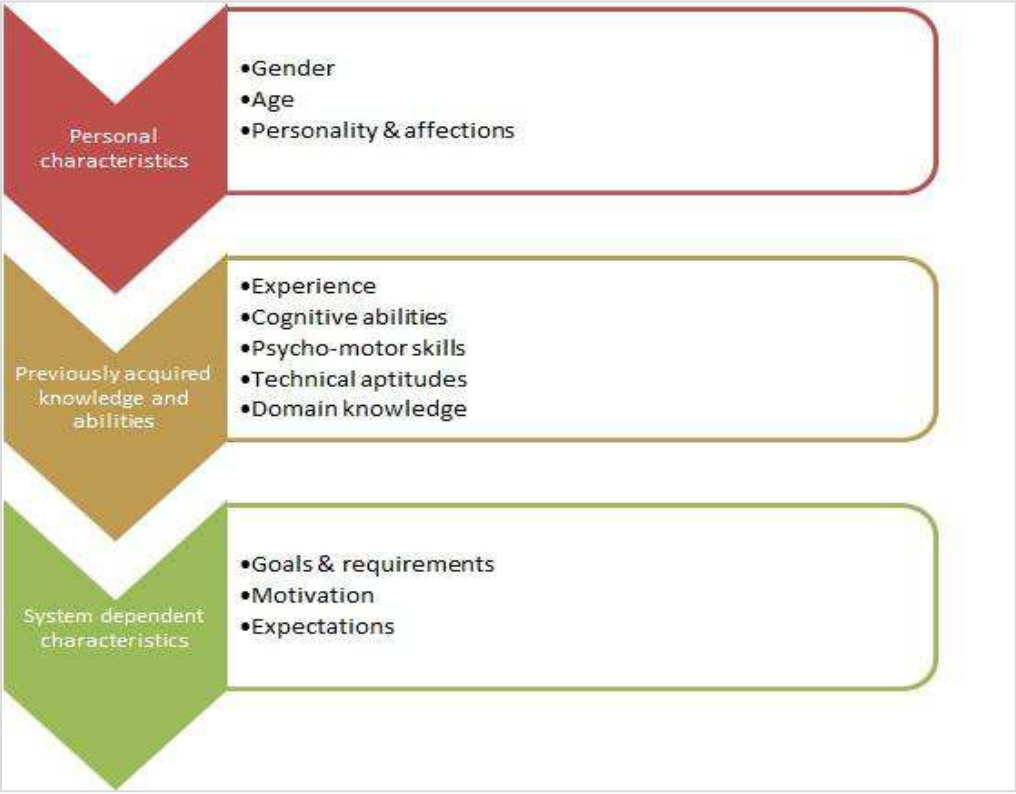
The search was also guided by the following themes: major (dominant) research topics in the field of learning performance support systems; emerging topics — i.e. topics which demonstrate accelerating research interest (based on the last five years alone); areas of opportunity or technical challenges/gaps to be addressed; topics (e.g., techniques, tools and technologies) that correlate most strongly with personalization, among others. Results from the search and analysis of the data provided a high-level view of the state of the art, and an understanding of challenges and opportunities in the domain of digital, personalized systems for the management of learning. Further drilling down into specific topics such as user groups and application areas revealed important subject areas and resources to tap into such as features and tasks related to system use, user behaviour patterns and types of learner requests to increase efficiency or engagement with systems for the management of learning.

Further consideration of system users in the design of the architecture and features of LPSS components and the use of personal learning records in particular was the focus of a second literature search which was completed in August of 2014. This second literature search was conducted using the Scopus bibliographic database (including abstracts and citations for academic journal articles), using the following combination of keywords: personal + learning + user in the title or abstract. In all, 14 citations were found and the concepts which appeared most frequently from the article descriptions are included in Figure 3. The importance of each word or tag is shown by font size (i.e., the bigger the word, the higher the count) and color.

Figure 3. Word cloud of keywords from descriptions of source texts

The research literature points to individual user characteristics and user features that are important in the design of learning systems, including the design of adaptive and intelligent systems. Table 1 highlights key characteristics which can influence user end goals, knowledge, preferences and experiences in user interactions with an intelligent learning system [1][2].

Table 1. Important user characteristics in learning system design



The analysis of user characteristics is an essential part of an adaptive system development process and points to features that have been successfully employed in many adaptive systems. The research literature [1] highlights navigation preferences of users as reflecting their cognitive styles in several dimensions: field dependent vs independent, holist vs serialist, verbalizer vs imaginer.

For example, field dependent learners prefer guided navigation, while field independent learners favor navigation freedom. Those having verbaliser and imager cognitive styles apply different browsing strategies. For example, screen enlargement options for learners with low

spatial ability or an appropriate redesign of a non-adaptive interface can impact the overall quality of the learning experience for learners with different cognitive styles.

A framework for designing intelligent interfaces for e-Learning Systems may be considered in the design of learning and performance support systems like LPSS, as well as its functionalities. Individual user characteristics are crucial to consider in designing features that are relevant for the system's adaption, for advancing personal learning experiences beyond the one-size-fits-all approach and to ensure that user individual characteristics are taken into account to accomplish quality learning with proper performance support mechanisms in place [2].

User studies involving collaborative learning spaces [3] have looked at the linking of learning resources, sharing and filtering of learning resources, visualization, archiving resources and detailed levels of anchors for linking learning resources, including the need for referencing paragraphs, sentences, words, timestamps, and annotations. Researchers [4] have also looked at linking course data to allow for different recommendations for users with different educational backgrounds.

This is of particular relevance for the design of LPSS functionalities such as a personal recommender [5] and toolkit in providing enhanced access to resources, activities and credentials in a dynamic personal learning environment. Literature on Personal Learning Environments [6][7][8] highlights the need for a common set of standards to enable personalization from available components, learning resources and interaction derived from learner profiles, and standard features designed specifically to meet individual needs and preferences of user groups. LPSS will be conducting various user studies to collect information on system use, perceived usefulness, perceived ease of use, and user satisfaction with the various tools and functionalities available within LPSS; factors that have also been identified as critical in influencing the success of learners using an LMS and blended learning approach [9].

LPSS user studies

User studies draw on combined quantitative and qualitative approaches to produce both the holistic view and the robust data needed to triangulate and thereby validate data collected [10]. This is also part of an agile methodology for information and requirements gathering as an iterative process and with various user studies anticipated. The intent of user studies in the context of Personal Learning Record research is to focus on individual LPSS users, their particular wants, needs, motivations, expectations and tasks to be performed in order to inform the research and development of the system. Information and requirements gathering on current use and user/client requirements related to personal learning records will be refined accordingly. The research team has started to conduct user studies in the form of a questionnaire for LPSS end users. Content that LPSS users share and store on the system will also be analyzed. Conducting user studies with prospective users/clients as part of the agile methodology for research and development will also be crucial—for example, prospective clients will be contacted to participate in user studies which will include online surveys and interviews.

As a part of the development of LPSS.me the LPSS team has been gathering user feedback on an ongoing basis. Currently the primary means of collecting user feedback includes gathering responses from the user's emails directed to the feedback@lpss.me email link listed on the LPSS.me website as well as anonymous feedback gathered through on online survey. Between December 2014 and March 2015, 127 user survey invitations were sent to all individuals who registered for LPSS accounts (excluding NRC employees). The survey included 21 questions related to learning and performance support system features and functionalities, with one question on formal recognitions and an open text field for further elaboration. As of March 27, 2015, 25 LPSS users have completed the survey. This user survey is ongoing, and user feedback will continuously feed into the development of LPSS.

Several of the LPSS survey questions were demographic. Overall, respondents to the LPSS survey were well informed, highly educated older professionals, with many years of work experience. Figure 4 show the age range of survey respondents.

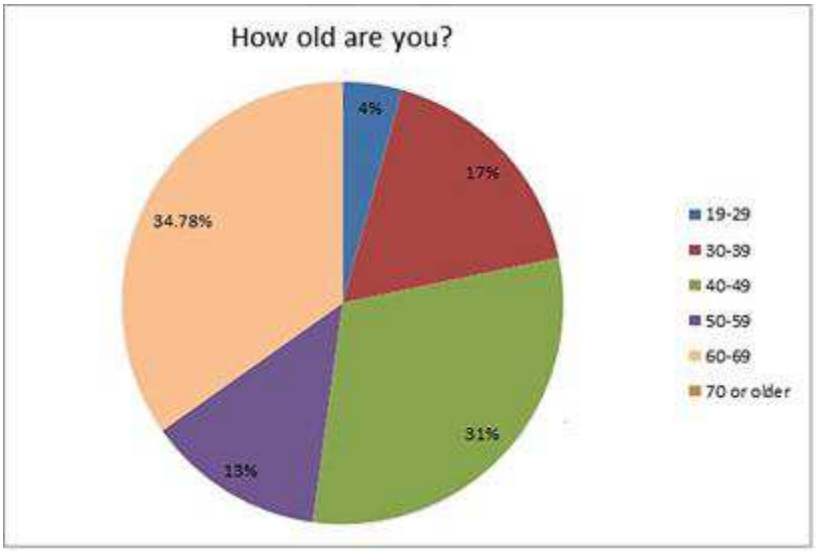


Figure 4. Age range of LPSS survey respondents

The largest group of respondents (34.78%) were in the 60-69 age range category (4.35% age 19-29; 17.39% age 30-39; 30.43% age 40-49; 13.04% age 50-59). 21.74% of respondents were female, 78.26% were male. 13.04% of respondents had obtained a post-secondary degree, 86.65% had graduate degrees (with 3 respondents noting in the text that they had obtained PhDs). As well, 4.35% of respondents have 3-5 years' experience working; 34.78% have worked from 11-20 years and 60.87% have worked more than 20 years (23 respondents). The majority of respondents (60.87%) worked full-time outside their home, with some also noting they work both in and outside of the home – teaching online, doing freelance work, etc. Several respondents self-identified as students.

Other questions were asked to gauge the LPSS.me user's familiarity with Learning and Performance Support Tools. Most of the survey respondents (58.33%) had used Learning and Performance Support tools in the past and had at least some knowledge or experience of a variety of online resources including Browsing, searching and accessing online resource (100%); Publishing, sharing and managing their own learning resources (96.96%) ; managing an online learning system for others (96.96%); setting a personal learning goal online (92.71%); using an online tool to assess your own knowledge level (96.96%); and using an online too to add learning resources that will automatically be harvested (92.71%).

Most of the questions were asked in order to gather user requirements for LPSS.me as well as solicit feedback from the users about their initial experiences with LPSS.me. When asked what they would like a learning and performance management system (like LPSS) to do for them, survey respondents noted that they wanted a system that identifies gaps in their skills and highlights things of interest to them for anytime/anywhere self-learning, as well as networks them with other learners. See Table 2.

Table 2. What survey respondents would like LPSS to do for them

Would like to see a way to network around common interests.
I would like to identify gaps in my skills that are required for particular job roles (e.g. management) and follow a structured path that would allow me to attain these skills.
To be able to learn anytime, not have a fixed time.
Network me with other learners interested in similar competencies. Create an online sharing and learning environment that is transparent, accessible, personal, friendly, inviting.

One question was aimed specifically at formal recognitions for online learning, as part of the focus on Personal Learning Records. We asked, “In the past, have you received any of these formal recognitions for online learning?” Figure 5 presents response patterns for 25 respondents, 23 responses having been obtained on the formal recognitions questions specifically. Of importance is that 60% had received a formal digital certification (e-credential, e.g., open badge). This is an important option to consider for LPSS users to display and manage digital certifications of various types (formal, information, statements of accomplishments).

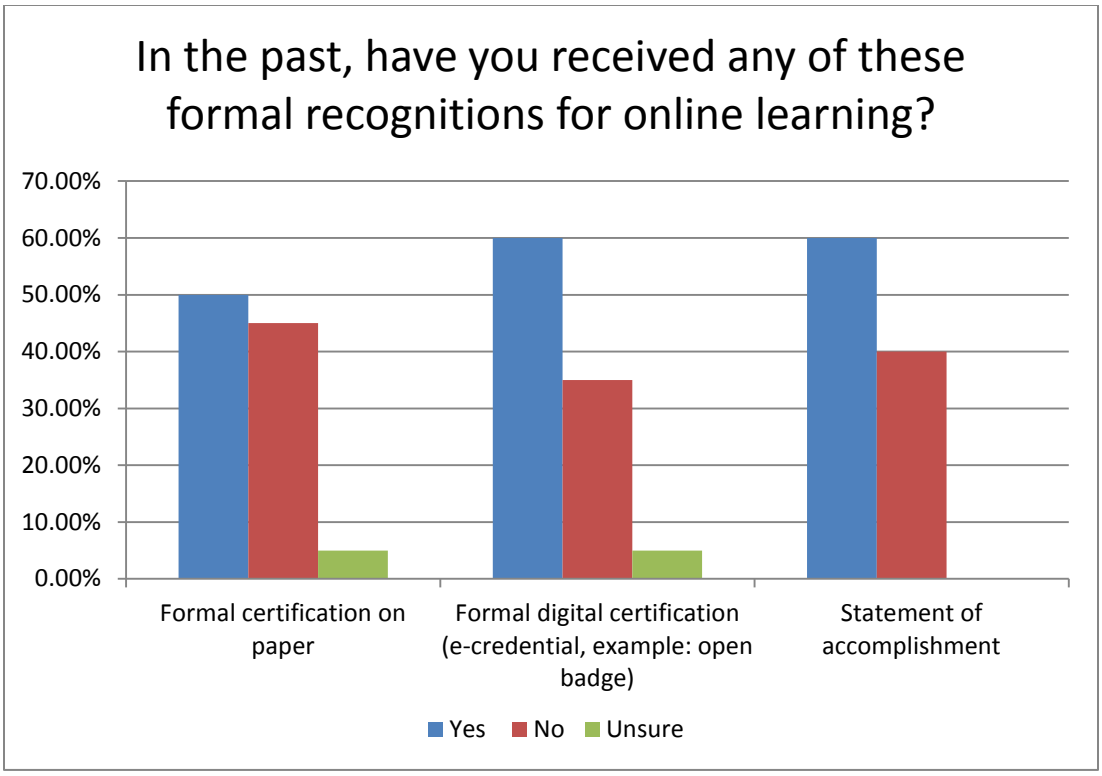


Figure 5. Formal recognitions received for online learning

When asked to share their experiences with formal recognitions obtained for online learning, respondents elaborated on their experiences in an open text field. Table 3 presents a sampling of the types of experiences they shared as well as some of the current issues and challenges.

Table 3. Responses for experiences with formal recognitions

In house certification teaching for an online university. Wikipedia badges for courses in the area of OER
Old tech certifications, Microsoft etc. Some more recent open badges, but really just to test the concept
They become dated quickly
I think one of the concerns with online learning is that there are no assurance standards of the kind that come with accredited higher education courses. Sure, I have completed the Carpe Diem MOOC, but nobody will know what that means. However, student outcomes in traditional f2f courses are often equally nebulous, and success does not mean understanding or transformation.

Distributed Learning Instructor Course DND; eLearning Design Course DND, Full Circle Associates Online Facilitator Course; Gilly Salmon Carpe Diem Online Course Badge

[...] what the org. puts on it's elearning site? some good; those have certificates and digital stuff like PALMS, ROLE is being used. They give that kind of stuff. Recognition ...humm; might be better to frame learning to results of what we are trying to do with it... results, dead ends, etc.

I completed my MEd primarily online. Completion of this learning led to a pay increment at work

[...] a PhD and also I am a teacher, so my priority is just learning, just that.

Information collected in the surveys was captured and added to the project management and issue tracking environment, under user feedback, as activities for programmers to resolve.

Personal learning record use cases

Information gathering was also conducted by email in February 2015, with 2 professionals who were partners and collaborators on another implementation project under LPSS, on open badges and e-credentialing.

Respondents were asked to describe their current use of personal learning records and information was gathered from their email responses, as presented in Table 4.

Table 4. Responses from professionals on their current use of personal learning records

I currently use Savvyfolio.net, a multi-institutional ePortfolio system based on Mahara, which is hosted by my company. I use the system every day as a display case for the open badges I have earned, a learning journal and also as a knowledge portfolio, i.e. demonstrating knowledge about particular topics

I am also interested in the Open Badge Passport, an Open Badge storage and sharing platform to be released as open source by the creators of Open Badge Factory. This can be seen as a skills passport/microportfolio for badge earners or a Personal Learning Record

One respondent commented on current inefficient processes for tracking certification and professional designations in her workplace. Table 5 presents details of her email response along with a suggestion for use of LPSS to improve on these current processes.

Table 5. Tracking certifications and professional designations

An example of inefficient certifications and professional designations tracking within government sector:

We currently fill in a word document called the "Learning Passport". It contains a table to list your training, cost, dates, etc. Each time you add a course/change anything, it gets hauled out, changes made, signature from the boss…couldn't be much more ineffective. It is not entirely common for anyone to check to see if you did the training – we did track the costs, but nothing about whether the training actually mattered.

Then, there is the Performance Management Agreement. There is a space for training courses/PD. The action plan (is to be filled for low performers) and the talent plan is for high fliers.There is no coordination between what departments are using such as the passport and the PMA (there is a new template for 2015). So, you just make a decision to fill in the forms and repeat the info.

Then, HR will receive the high level stats – who filled in the Passport and the PMA and come back to the Assist Secretaries to say x% of the passports / PMAs are "completed" – that is filled in and signed off….no one tracks rates of completion of the courses, etc… The check mark goes in peoplesoft. There is a module in peoplesoft to track training but we didn't have it.

For certifications and professional designations, I added mine to the passport so they were paid. Employees need to make a case that they are using them. It seems there is even less attention/capacity to seek, log, track and manage professional designations.

So how can LPSS help me better manage inefficient certification related processes? The bottom line would be to send an alert to my boss to sign off when my training is completed so my training can be recognized in my performance management agreement and the cost reimbursed.

Client focused user studies

As part of LPSS implementation projects with a client focus, user studies will include interviews with prospective end users who will be using LPSS and Personal Learning Record capability, including viewing, managing, storing, and earning certifications and recognitions as part of individual learning records, over a lifetime.

Baseline information will be collected from clients and end users in the following interview questions:

- Have you ever taken a learning or training course online for personal or professional reasons? If yes, please describe it.
- If the person receiving the training obtained some kind of certification, please describe it.

Conclusion

The LPPS component design, deployment and refinement process will be informed by ongoing environmental scans, research literature reviews and user studies as well as ongoing user feedback from email responses and inquiries, surveys, and targeted interviews with end users. System and learner's usage data will also be analyzed to explore personalized patterns leading to successful learning experiences and to inform research on aspects of social, adaptive, and personalized systems. This work is part of an agile methodology focused on enhancing the platform and augmenting the tools and functionalities available to learners to support their formal and informal learning throughout a lifetime.

Currently, basic functionality of the Personal Learning Record includes search and display of captured learning events which can be used to determine optimal learning paths, to discover learning resources and to manage skills and competency development over a lifetime. The Personal Learning record component will define how user learning activities are represented, captured, and leveraged in a meaningful way; data associated with learning activities includes ratings, test results, performance measures, and the like, in a distributed learning and work environment.

The challenges include coordinating the design and development of complex system components and core technologies to form a powerful distributed learning and work environment. Throughout the LPSS research and development process, we expect to collect large sets of user system interaction data with plans to extract meaningful data about learning behaviors and patterns. Ethical as well as privacy and trust issues around user tracking and personal data usage [12] will be at the fore of system improvements and research endeavors. Regular publication activities such as white papers will provide insights into current LPSS research and development efforts, with information about the tools and functionalities available.

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Click: Learning and Performance Support Systems at http://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/lpss.html

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