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Social, technical and economic realities collide: the perfect storm for personal learning

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NRC-CNRC

Information and Communications Technologies

Social, technical and economic realities collide:

The perfect storm for personal learning

March 2015



National Research
Council Canada

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Overview

The face of learning has changed. Over the past two decades, learning has evolved from traditional instructor-led classroom training to distance learning to e-learning to virtual learning environments and to massive open online courses. And, the face of learners has changed as well.

Today, our learners span six decades of varying experience levels—all familiar with and equipped to leverage digital learning technologies. For the first time ever, though, we have teens and 20-somethings who have never known life without access to content on-demand. They literally let their fingers do the walking.

Which brings us to today's realities.

In Canada—and other areas of the world—there are unfilled job vacancies because we have a skills shortage. Rick Miner, Ph.D. refers to this trend as “people without jobs, and jobs without people.”*

Like no other time before us, the world is ripe for the next wave of learning: open digital-based Learning and Performance Support Systems (LPSS). Today's learners need an adaptive digital application that connects them to learning opportunities to drive performance goals over their lifetimes. LPSS is not just the delivery of traditional structured courseware—it's also the delivery of mashups

from other learners, games, simulations, podcasts, videos, pictures, diagrams, infographics and more. All ages of people can derive value as can the companies looking to fill job vacancies. Furthermore, people in their teens and 20s will be the first generation to benefit from personal learning technologies that adapt to their learning needs, that evolve as their careers evolve, that securely store their learning records over their lifetimes.

This white paper explains the building blocks that work in tandem to enable enterprises to accelerate the on-boarding of skilled workers and enable networked learners to leverage LPSS.

Furthermore, this white paper is a call-to-action to potential ecosystem partners—platform partners, learning management software vendors, independent software vendors, courseware developers—who enjoy a technical challenge, enjoy collaborating with like-minded technical experts and have the appetite to be first to market with personal learning support for enterprises.



* Rick Miner, Ph.D., is the author of *The Great Canadian Skills Mismatch: People Without Jobs, Jobs Without People and MORE*, 2014. Dr. Miner has over 40 years of experience working in Canada's post-secondary sector. He was most recently the President of Seneca College, and before that held senior administrative positions at the University of New Brunswick and Saint Mary's University. He is now a principal at Miner and Miner Management Consultants.

The TripAdvisor of learning – reimagined

Think back to 1990. How did you “plan” your vacation? How did you reserve your airline tickets, vehicles, accommodations, entertainment, restaurants and more? Twenty-five years ago, many of us sat down face-to-face with a trusted travel agent who guided us through achieving our vacation goals.

Fast forward to 2015. Are you familiar with hotel.com? Expedia.com? TripAdvisor.com? We access these portals anytime, anywhere and from any device for all of our travel needs. Plus, insights from experts and users provide us with images, videos and text comments to gather additional data that helps to continually improve our decision-making processes.

As far as these portals have come, they still have miles to go. Consider how much better it would be if you had a personal travel application that enabled you to save or

bookmark the countries and hotels you researched, the articles you read, the videos that intrigued you, the reviews you favoured, the reviews you wrote?

You could even have a digital passport that you wouldn't have to renew [like you do with physical passports]. And all your accumulated credentials, like travel points, wouldn't disappear and start over every time a new year starts. Your personal travel application could be accessible from your laptop, your tablet, your smartphone, your smartwatch, your TV—even your car—and would serve as your gateway to all things travel.

Imagine exactly this—but for learning. Open digital-based Learning and Performance Support Systems (LPSS) are the 21st Century-and-beyond TripAdvisor of learning—but better. Furthermore, enterprises, educational institutions, and networked learners are ready to pay for this service.



What makes LPSS achievable today?

In the last two decades the face of learners and learning has changed.

Training has evolved from traditional instructor-led classroom training to distance learning to e-learning to virtual learning environments (VLEs) to massive open online courses (MOOCs).

And today, our learners span six decades of varying experience levels. While that seems like a lot of generations, each share something in common—they're familiar with and equipped to leverage digital learning technologies.

Like no other time before us, technical, social and economic drivers have collided to create the perfect storm to make LPSS a commercial reality.

For the first time ever, we have teens and 20-somethings who have never known life without access to content on-demand. They literally let their fingers do the walking. Many in this generation will have 5 to 7 careers—not just one. This generation will use LPSS throughout their lifetimes to preserve their personal data and to use algorithms that adapt to meet their evolving needs.

<p>Technology Drivers</p> <ul style="list-style-type: none"> • Reliable, increased wireless bandwidth technologies • Trusted ecommerce solutions • Proven security solutions • Advanced interoperability based on industry standards • Responsive mobile technology • Secure cloud services 	<p>Social Drivers</p> <ul style="list-style-type: none"> • Desktops, tablets and smartphones are ubiquitous; upsurge of connected devices like cars and smartwatches • Six decades of people (teens, 20s, 30s, 40s, 50s and 60s) live in a connected world enjoying access to content anywhere anytime • With more and more services migrating online, dependency on the internet is the norm • High comfort level with social networks • High comfort level with e-learning
<p>Economic Drivers</p> <ul style="list-style-type: none"> • Baby boomers are exiting the work force • Shortage of skilled labour in a multitude of sectors • Companies need to provide rapid retraining as the work environment changes quickly • A knowledge-based economy requires a more educated work force • Access to traditional education remains a barrier for many students because of economic and time constraints 	<p>Commercial Drivers</p> <ul style="list-style-type: none"> • Many baby boomers are choosing a second career over retirement • People entering the workforce today will have more than one career over their lifetimes; in fact, many people have 5-7 careers over their lifetimes • A new generation of digitally-oriented students will benefit from personal learning support that enables lifelong access and cloud-based storage of records • Enterprises and networked learners around the world are ready to pay to access learning opportunities

Economic realities are driving ever-increasing learning consumption

In Canada, there are unfilled job vacancies because we are in a skills shortage. Rick Miner, Ph.D. calls this “people without jobs, and jobs without people” (see chart 1).

Learning has changed. Learners have changed. There are jobs but not enough skilled workers. Game-changing LPSS offers a solution. The LPSS framework is a collection of learning services and resources that more efficiently deliver personal training to employees. Furthermore, the market efficiencies lower enterprises’ training costs.

Source	Areas	Shortage	Comment(s)	Time Frame
Mismatch Study	Various	2.3 million	Analysis Follows	2031
IBM	Cloud, Mobile Analytical and Social Computing	100,000	Specialized Areas	2016
Engineers Canada	Various Engineers	95,000	Retirees	2020
Agriculture Council	Various	90,000	Additions	2013
Construction Council	Various	219,000	Retirees	2020
Environmental Careers	Various	100,483	Retirees	2022
Electrical Councils	Various	45,000	New	2016
Food Processing Council	Various	32,500	Retirees	2015
Information and Communications	Various	105,000		2017
Petroleum Council	Various	15,000	New	2015
Printing Industry Council	Various	41% of Industry Retiring	Retirees	Soon
Supply Chain Council	Various	27,000	Current Vacancies	Now
Supply Chain Council	Various	60,000	Replacements	Annual
Tourism Council	Various	114,000 228,000	Unfilled Unfilled	2020 2036
Trucking Council	Various	199,800	New	2017
OECD	Various	33.6% Under Qualified	2005 Data	Now
OECD	Various	23.7% Over Qualified	2005 Data	Now
CIBC (2012)	Various	25 Shortage Occupations	1% unemployed	Now
CIBC (2012)	Various	20 Surplus Occupations		Now
Certified General Accountants of Canada (2012)	Various	24.5% Under Employment	Recent University Graduates	Now
C. D Howe Institute	Various	Accepted Skills Mismatch	Suggestions to Improve	Now

Chart 1. Rick Miner, Ph.D. (2014 Research Report, page 17), *The Great Canadian Skills Mismatch: People Without Jobs, Jobs Without People and MORE.*

The LPSS ecosystem

You've heard the saying, "it takes a village to raise a child." Well LPSS takes an ecosystem (see diagram 1).

National Research Council (NRC) of Canada is at the forefront of learning technologies. NRC developed next-generation component technologies and, from these, developed a basic working prototype of LPSS for demo purposes. NRC will collaborate with technology partners who have the appetite to commercialize these and additional building blocks.

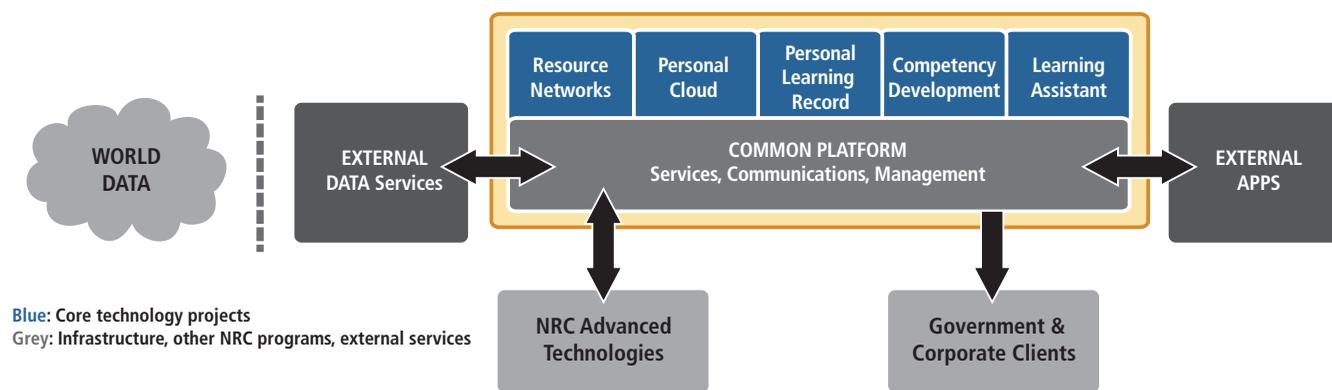


Diagram 1. Learning and Performance Support Systems framework

Common framework

Core commercial properties combine to create a common framework through which learning services and resources are offered by third parties. The minimum core properties of the LPSS framework are:

- Technical interoperability standards such as SCORM, LTI, common cartridges and Experience API (xAPI)
- Robust security software
- Robust eCommerce software
- Responsive mobile technology
- Advanced data and information harvesting services*, which sift through massive amounts of big data to deliver the learning services that best achieve each networked learner's goals
- Advanced data and information synchronization services*, which manage all of the accounts each networked learner uses at any given time
- Adaptive learning software* adapts to each networked learner's unique needs. In other words, the software assesses learning performance and presents appropriate learning services.

* Novel component technology developed by NRC.

LPSS delivers learning opportunities to networked learners wherever they are in the world, on any device, at any time. LPSS allows consumers to save personal learning records—generated over a lifetime—to a secure personal cloud,

while pushing badges, certificates and credentials to professional network accounts similar to services like today's LinkedIn. No data is lost. Personal data is secure.

LPSS will evolve over time as the only limitation is technology providers' imaginations and consumers' imaginations.

"We've been hearing a lot about Canada's shortage of skilled workers – in the news, in Parliament, and from businesses across Canada. It's a challenge for our country as a whole, and for each of the companies we represent. The Canadian Chamber of Commerce ranks it at the very top of the 10 barriers to improved Canadian competitiveness. Estimates vary but many forecasters agree that more than a half million unskilled workers in our country won't be able to find work in the coming decade – even as 1.5 million job vacancies go unfilled."

- Excerpt from an address by Michael Denham, Canadian President and Country Managing Director for Accenture, to the Toronto Board of Trade, April 11, 2013.

(Source: <http://indigenasolutions.com/solving-our-skills-gap-challenge-michael-denham-accenture/>)

LMSs and CMSs

Enterprises, educational institutions and more will still need learning management systems (LMSs) and content management systems (CMSs). LPSS will enable LMS and CMS vendors to adapt to demand for secure and private personal learning support.

Instructionally-designed content by ISVs

The market opportunity for independent software vendors (ISVs) will grow exponentially. ISVs' existing courseware, simulations and games—and the development of new commercial learning services—can be delivered directly to networked learners via LPSS. In other words, LPSS delivers learning services to a global marketplace of paying networked learners. Furthermore, the sum can be greater than its parts as ISVs leverage the parts to solve any type of learning problem. ISVs should update their software to assure interoperability with the LPSS framework.

“When MOOC-mania first exploded, a general panic arose in higher education: Would MOOCs make colleges and universities obsolete?”

- Read *“Using MOOCs in Corporate Training Programs”* at <http://www.yourtrainingedge.com/using-moocs-in-corporate-training-programs/> by Bryant Nelson.

Commercial applications for LPSS

As stated earlier, the need for education and training is at an all-time high. In partnership with industry, LPSS can provide enhanced access to learning opportunities whenever and wherever they are needed. Furthermore, because Canada is experiencing a skilled labour shortage across all major sectors of the economy, the commercial applications span all major sectors (see the sidebar entitled Pain Points: Canadian Mining & Oil Industry). Here's a sample of five commercial applications.

Enterprises

Corporations can deploy their own LPSS installation for use by employees to provide more efficient personalized training. Corporations benefit from lower training costs created by market efficiencies; common training records across numerous training providers; and recruitment and retention supported by direct access to learners.

Small-to-medium enterprises (SMEs)

SMEs suffer the same shortage of skilled and unskilled labour as enterprises, compounded by the fact that resources and budgets are constrained. Leveraging services like LPSS, SMEs can provide access to employees, achieving the same value as larger enterprises (see Enterprises).

Government organizations

Government organizations can deploy LPSS for social assistance programs where constituents need retraining, adult education, training for persons with disabilities, training for immigrants, and more.

Educational institutions

LPSS offers educational institutions the opportunity to offer each student more choice in how they prefer to consume their personal learning opportunities.

Networked learners

With LPSS, individual networked learners can consume content for their personal growth. Whether retraining for a career change or adding a skill set, networked learners will take control of their personal learning goals whenever and wherever it's convenient.

In all applications, learners benefit from saving their learning to their personal clouds.

“The main business constraints identified by SMEs are the shortage of labour both skilled and unskilled (56%) and management skills and time constraints (40%).”

- A quote by Canadian Federation of Independent Business that appears in the Minister's Advisory Council on Workforce Development: *Canada Manitoba Roundtable on SMEs and Skills Development*

(Source: http://www.amsc.mb.ca/wp2/wp-content/uploads/MACWD-Roundtable_FINALweb.pdf 2010 (p12))

Pain Points: Canadian Mining & Oil Industry

Excerpt from an address by Michael Denham, Canadian President and Country Managing Director for Accenture, to the Toronto Board of Trade, April 11, 2013

“The Canadian Mining Industry Human Resource Council estimates the need for 140,000 new hires in the industry by 2021.

In another example, in B.C., the government foresees a windfall of some \$100 billion in revenues over 30 years coming from the province’s liquefied natural gas exports. But construction of LNG terminals may be slowed by a shortage of skilled workers – especially with companies in the oil sands already struggling to find the right people, and the number of jobs there expected to increase by 73 per cent over the next decade.

These examples are typical of the challenge we face. And just to ramp up the degree of difficulty a little more: in a globalized world, other countries are facing similar shortages of skilled workers – and as governments, as countries, as individuals, they too are racing to find solutions, and a new way forward.”

(Source: <http://indigenasolutions.com/solving-our-skills-gap-challenge-michael-denham-accenture/>)

An excerpt from Canada’s coming economic headache: A serious shortage of skilled workers (2014)

“A shortage of skilled workers will be one of Canada’s greatest future economic challenges, Employment Minister Jason Kenney told a skills summit Wednesday. The construction, mining and petroleum sectors are examples of industries that will face serious shortages of skilled workers over the next decade, he said.

Currently 30 per cent of the skilled trade workers in Canada are baby boomers, Kenney said, adding that they will soon retire.

“They are going to take with them a lifetime of knowledge and skill,” he said.

In 2012, a McKinsey Global Institute report estimated that by 2020, the global economy could see 90 to 95 million more low-skill workers than employers will need.”

(Source: <http://business.financialpost.com/2014/06/25/jason-kenney-canada-skilled-workers/>)



Snapshot: Value to consumers

The Learning Value Chain (see sidebar) is a general framework for evaluating the learning effectiveness and the business value of training and human resource investments (Gillis & Bailey). There are numerous “consumers” who stand to achieve a return on investment (ROI) from LPSS.

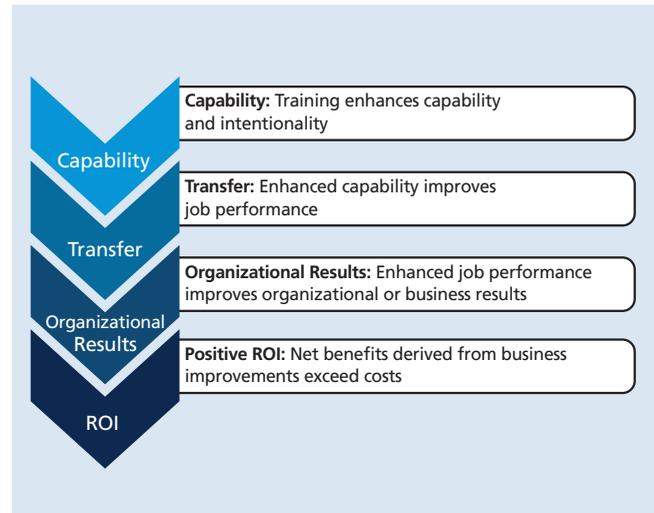


Diagram 2. Learning Value Chain – Training activates a chain of critical outcomes.¹

	Enterprises*	SMEs	Governments	Educational Institutions*	Networked learners / students
Convenience of learning anytime anywhere on any device	X	X	X		X
Personalized learning	X	X	X		X
Access to volumes of learning	X	X	X		X
Decrease training costs	X	X	X		X
Deliver retraining, adult education, and training for immigrants and persons with disabilities	X	X	X	X	X
Decrease time associated with training programs, which saves money	X	X	X	X	
Cost effective approach to providing learning services		X	X	X	
Decrease IT costs	X		X	X	
Generate new revenue streams in the global marketplace				X	
Increase customer lifetime value (CLV)				X	X
Fill open job requisitions	X	X	X		
Recruitment and retention supported by direct access to learners	X	X	X		
Faster on-boarding	X	X	X		
Common training records kept across numerous training providers	X	X	X		

*CIOs/CTOs at educational institutions and enterprises can also be collaborators. Working with NRC, an expert in next-generation learning technologies, minimizes risk and accelerates time to market.

¹Source: Lynette Gillis, Ph.D., CTDP & Allan Bailey

Centre for Learning Impact at http://www.cfli.ca/downloads/pdf/articles/r4c_learning_value_chain_final_fall_2009.pdf

Snapshot: Value to collaborators

LPSS is the next generation of learning. With NRC’s component technologies, advisory services and state-of-the-art facilities, everyone in the ecosystem can minimize risk, accelerate time to market and increase revenue.

	Platform Partners	LMS/CMS Partners	Courseware Partners
Minimize risk	X	X	X
Accelerate time to market	X	X	X
Increase revenue stream from licensing, monthly subscriptions, product sales and maintenance and support services to a global marketplace	X	X	X
Defend customer base		X	X
Achieve first to market advantage	X	X	X
Increase brand awareness	X	X	X
Expand customer base	X	X	X
Increase customer lifetime value (CLV)		X	X

Why collaborate with NRC?

NRC’s reputation and expertise are recognized internationally. Partners leverage and gain access to NRC’s expertise in many forms.

Gain access to next-generation technology expertise

- World-class component technologies de-risk solution development and accelerate time to market
- Enhanced next-generation learning technologies
- Impartial performance evaluation and validation of innovative solutions
- Established partnerships and solid working relationships with leading-edge institutions, software developers and learning technology leaders
- Proven track record for successfully developing, transferring and licensing learning technologies to solution providers

Leverage world-leading technical and advisory services and competencies

- Data mining and analytics
- Decision support systems
- Human-computer interface (HCI) usability
- Learning and collaborative technologies
- Machine-based learning/reasoning
- Natural language processing

Gain access to state-of-the-art research and testing facilities

- Mobile Human-Computer Interaction Laboratory: Performance and usability for mobile applications
- Voice-Multimodal Laboratory: Performance and usability for voice, e-business and m-commerce applications
- e-Citizen Laboratory: Software prototype development, third party technology evaluation, focus groups, and design and training sessions

Conclusion

This environmental scan highlights the technical, social and economic drivers that will propel the commercial success of LPSS.

The LPSS ecosystem of technology providers has the opportunity to enable:

- A rich learning marketplace where networked learners can access and purchase a broad selection of learning services provided by third-party content and service providers
- Automated recognition of competencies, and analysis of workflow and job skills that develop customized training programs for specific roles
- A cloud-based personal learning record that manages a networked learner's learning records and credentials over a lifetime, making it easier to identify qualified candidates and potential skills gaps
- Contextual assistance and access to references and learning materials on demand from any device

NRC brings its unique combination of expertise in deep analytics, data representation and HCI and aims to improve the personal learning experience by providing more insight into learning patterns—plus much more.

About NRC

The National Research Council of Canada (NRC) is the Government of Canada's premier research and technology organization (RTO). Using its experience, intellect and facilities, NRC teams deliver technical and research solutions to government departments and industry clients.

More specifically, NRC can:

- Solve the most challenging technical problems
- Trigger technology innovation and new ideas
- Accelerate the path to product commercialization
- Increase certainty around technology choices
- Reduce costs and help grow revenues for its client base

NRC offers the services of researchers and technologists with industry experience – specialized, purposeful, and available technical expertise accompanied by objectivity, extensive networks, and a customer-centric commercially oriented attitude. Clients have access to specialized and unique testing and research facilities and an inventory of technology, processes, and systems from many sectors that can be adapted to address specific needs.

Call-to-action

Would you like to be among the first to provide personal learning support to enterprises and their employees?

Please contact:

Pierre Charron

Email: pierre.charron@nrc-cnrc.gc.ca

Telephone: (613) 990-0336

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

Test Drive: Take NRC's basic LPSS for a test drive today at http://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/lpss_intro.html

List of acronyms

API	Application programming interface (routines, protocols and tools for building software applications)
CLV	Customer lifetime value (in marketing, CLV is a prediction of the net profit attributed to the entire future relationship with a customer)
CMS	Content management system
HCI	Human-computer interface
ISV	Independent software vendor
LMS	Learning management system (software application for the administration, documentation, tracking, reporting and delivery of electronic educational technology education courses or training programs)
LPSS	Learning and performance support systems
LTI	Learning tools interoperability (a LMS standard created by the IMS Global Learning Consortium)
MOOC	Massive open online course
ROI	Return on investment
SCORM	Sharable content object reference model (an e-learning technical standard)
SME	Small-to-medium enterprise
VLE	Virtual learning environment

Resources

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