Adopting Cloud-Based Learning Technology in Enterprise Organizations

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Introduction

Describing the problem

Traditional e-learning applications and learning management systems can no longer meet the training needs of large enterprise organizations, so new learning technologies will need to be adopted and implemented. The nature of content consumers is also changing. Learners are increasingly digital natives. It will be more challenging to engage future learners with traditional computer-based training modules as the number of smartphone users increases. Traditional on-premises e-learning courses can take months to design and develop, are often difficult to engage diverse learner audiences with, and are not easily reusable when content becomes outdated. Portability is a growing necessity in a faster-paced world. Learning and development departments within enterprise businesses need to be ready to adopt these changes and shift their programs in response to ensure education and training that meets the needs of employees is delivered, and performance goals are met.

The informational communication technology systems which are used to deliver content must be considered more than ever when designing instructional systems. Learning needs to be cost effective, portable, and scalable, and more engaging than ever. Organizations face decisions as to whether to use internal ICT systems, external systems, or a hybrid of both to deliver content. Regardless if the system used, in order for learning to remain effective and engaging in a mobile information-based world, it needs to be timely and accessible.

The possible solution

Cloud computing allows for fast transfer and large storage, that can be personalized for the learner and include face-to-face communication, file sharing, and collaboration. For learning

and development professionals, the instructional design process should include not only the development of internal content, but the selection of external cloud-hosted online content. Internally developed e-learning still has its place in L&D programs, particularly when it comes to training for proprietary applications and internal policies, but the selection of externally hosted content now increasingly replaces the selection of internal media. Instead of deciding whether to deliver content via an online video or a document, training professionals are increasingly choosing which vendor to purchase or stream online course from.

Cloud computing decreases usage cost and increases transmission capacity for information and thus needs to be adopted as a platform by learning and development organizations. Cloud computing is beneficial to learning performance because it allows for anytime, anywhere learning that can be face-to-face or asynchronous. It is also economical because it reduces infrastructure by using datacenters instead of hosting onsite. Cloud-based learning can be provided as a subscription or service, to supplement or in some cases supplant existing education and training programs.

Current Assessment

The state of learning and development

There is growing demand to provide self-paced learning outside of the physical workplace. The e-learning industry has seen tremendous change within the last five years and is expected to grow from $107 billion in 2015 to $325 billion by 2025 (McCue, 2018). The state of learning and development is in transition. New technologies are changing how content is consumed and delivered. L&D departments and content producers need to rethink existing training models and methods in order to accommodate and adopt new technologies. In terms of

the business world this means that large organizations face challenges in delivering performance results while reaching workers both onsite and remotely. According to Jennings (2019), "For L&D to remain relevant, we need to develop new, business focused and technology-enabled ways to support workers to deliver business results" (p. 6).

Arets, Jennings, and Heijnan (2016) cite the need for "a reference model that helps organisations extend their focus on learning and development beyond the classroom and course-based eLearning to build more resilient workforces and create cultures of continuous learning" (p. 1). 70-20-10 is a commonly used formula used by enterprise organizations and originally developed by Lombardo, Eichinger, and Robert (1996) which suggests a proportional breakdown of how people learn effectively. It holds that individuals obtain 70 percent of their knowledge from job-related experiences, 20 percent from interactions with others, and 10 percent from formal educational events. However, new forms of communication are changing how organizations think of information transfer. Evans and Wurster (2000), describe the transfer of information as a trade-off between media richness and reach. According to Daft, et al., (1984), media richness refers to the capacity media to facilitate shared meaning and understanding in a manner that is immediate, allows for multiple cues, conveys broad sets of concepts and ideas, and has a personal focus. In general, the greater the reach, the less the richness, and vice-versa (Evans and Wurster, 2000). But with the advent of powerful information and communication technologies that allow for instant communication, the 70-20-10 tradeoff no longer applies. It is now possible to have increasing amounts of both richness and reach. Whelan (2018) believes the framework may be closer to 50-20-30, though this ratio can vary from organization to organization. Training Industry (2018) proposes this model be revised as an On-the-Job, Social, Formal (OSF) ratio which represents a relative amount of learning from these three sources,

because there is no single ratio of learning sources that is best for everyone. 70-20-10 may not reflect the current market in which new online technologies have emerged. Mobile, cloud, app-based technologies foster more informal anytime, anywhere learning, which 70-20-10 does not factor into its model. Therefore, if we think of 70-20-10 instead as OSF, the model becomes adaptive to the technology and its stakeholders within the organization.

Daft, et al. (1984) classify the communication media used in daily life as, in order of decreasing richness: face-to-face, telephone, personal documents, impersonal unaddressed documents, and numeric reports. Face-to-face is considered the richest medium because it provides immediate feedback. Sun & Cheng (2007) emphasize the importance of transmitting the sufficient amount of correct information to reduce uncertainty. Cloud-based learning reduces this uncertainty by providing a pipeline for immediate feedback via fast data transfer. Its fast transfer and large storage capabilities allow for richer forms of learning that can be personalized for the learner and include face-to-face communication and web meeting tools. Cloud computing can be used to combine all four forms of communication media, in addition to newer forms of shared media such as instant messaging, blog content, and social media.

Technology enhanced learning review

The use of online technology in learning has historically consisted of two main categories: synchronous and asynchronous e-learning. Synchronous e-learning takes place at a set time and requires the communication of two or more people. Common technology sources of synchronous e-learning are virtual classrooms, whiteboards, audio and video conference, application sharing, chats, and instant messaging. Asynchronous e-learning is student-directed, self-paced learning that can take place at any time. Sources of asynchronous e-learning include computer and web-based trainings, audio/video recordings, reading material such as wikis and

blogs, e-mail, and discussion forums. Increasingly asynchronous and synchronous courses are being combined to include both face-to-face or instructor-led, and self-paced components; what is known as *blended learning*. In blended learning, the classroom is utilized to conduct exercises and interaction. Learners may use e-learning courses to prepare for the lesson before they come to the class, and to practice and review the content afterwards.

E-learning courses are hosted in a learning platform such as a learning management system (LMS) used to assign, deliver, and administer, and track content. Learning platforms that were originally developed to host computer-based training are now increasingly being used to administer classroom courses as well. This further allows for the integration of synchronous classroom instruction with asynchronous multimedia content. Teresevičienė, et al., (2015), in describing the increased use of learning management systems on college campuses observe that:

> While some 10 years ago learning management systems were deployed almost solely in e-learning contexts, many campuses, perhaps the majority, now use them. Students on-campus access their learning resources in the form of study modules, course readings and digital library resources through the LMS, send their work for assessment to the LMS, and communicate with their professors and with each other by email and other messaging systems. Teaching materials now include video and audio and other multi-media, and direct students outwards to the web to find and evaluate resources. Learning analytics monitor student progress using data management systems to underpin interventions to individual students in need (p. 9).

The ubiquity of mobile devices, in particular the smartphone, has created a demand for mobile-friendly learning, and content that is responsively designed for use on multiple devices. As social media has grown into a dominant form of online communication, with smartphones as

a communication tool, social learning that allows learners to collaborate and network is also being utilized more. Tools such as Microsoft Teams allow users to collaborate, chat, and view and share content all within the same space. Game-based learning, also known as "gamification," uses games to create engagement and motivation that compatible with mobile learning because such games can be delivered in app-based format. "Provision of learning resources for mobile learning can enhance the emergence of new teaching methods and practices which will respond to concrete features of these devices." (Teresevičienė, et al., 2015, p. 18).

Technology enhanced learning (TEL), requires adherence to an instructional systems design framework in order for it to be effective. One such commonly used framework by L&D departments in enterprise organizations is the ADDIE model. ADDIE is a systematic approach consisting of five phases: Analyze, Design, Develop, Implement, and Evaluate. ADDIE is an instructional design process that aims for a learner-centered approach to instruction. With cloud-computing becoming widespread, may be a need to update thinking on such trusted models or update them to fit a broader, more systemic context. New instructional design frameworks should include analysis and evaluation of software, courseware, and information communication technologies to deliver positive outcomes.

Horton (2012) defines e-learning open-endedly as the use of electronic technologies to create learning experiences. These learning experiences have in the past been primarily formal and taught by instructors and module-based online courses. However, with the emergence of mobile and cloud technologies that allow for more informal anytime anywhere learning. E-learning instructional design informs decisions on what authoring tools, management systems, and other technologies to buy or license, and directs the development of content and the selection of media (Horton, 2012).

Cloud-based technology

Technology overview

Cloud computing is using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer (Aggarwal, 2018). The term "cloud" computing has been in use since the mid 1990's. Its initial launch for public use came in 2006 when Amazon released its beta platform Elastic Compute Cloud (EC2), which formed the backbone of Amazon Web Services (AWS). At the heart of cloud computing is its service-based model, which frees up the user from direct management through networks hosted in datacenters. This helps reduce IT infrastructure costs, free up resources, and improve return on investment.

In terms of technology enhanced learning, the deployment and management of traditional e-learning requires large investments in infrastructure. Limitations on these investments are running up against the needs of learners, who increasingly require access to content outside the classroom. This is especially true of large enterprise organizations where more employees are working remotely or traveling more frequently. Remote learning requires a learning platform such as a learning management system (LMS) to access content. Cloud hosted learning management systems offer an affordable accessible option. According to Aggarwal (2018), cloud computing provides an effective solution to this problem. It not only saves money for the organization, but also provides the e-learning resources anywhere, anytime through the internet. This is possible because cloud computing is a system that provides information technology resources on demand over the internet and the user can pay for the resources as per the usage. These services can be used on the cloud through virtual servers.

Advantages of the cloud-based model

Efficiency for providers and users is a benefit of the cloud-based model. In addition to being cost effective, cloud computing offers a scalable and dynamic learning. With technology constantly changing, the cloud-based environment supports the creation of a new generation of e-learning systems, and these systems are able to run smoothly in a wide range of hardware devices (Alajmi et al., 2017). It also allows for content to be easily shared, whereas traditional e-learning is not as easy to share or collaborate on. Large storage capacity also allows for a wider variety of content. Learning can be personalized and targeted towards specific users.

Advantages of cloud computing in e-learning include subscription-based pay-per-user, anytime anywhere availability and Infrastructure as a service (IaaS). With subscription services, organizations do not have to buy or install the computing resources. Instead they can use these virtually from the cloud and they have the flexibility of using these resources from any location wherever they are. The computing power and storage provided by the cloud is available to the organization at a very low cost because they are paying per user as opposed to hosting infrastructure on-premises (Aggarwal, 2018). The biggest challenge organizations face in adopting an e-learning system is the requirement of adequate infrastructure and resources to implement state of the art e-learning systems. Infrastructure as a service means that the infrastructure required to run applications and operating systems is provided by the cloud service provider. The client does not have to buy the equipment but makes payment to the service provider for using their equipment (Aggarwal, 2018). Examples of such platforms are the cloud-based versions of learning management systems such as Blackboard and Moodle that can be adopted for various teaching and learning purposes, including *bring your own device* (BYOD).

BYOD is more of a policy-based initiative which makes learning resources available on the devices of learners. Such resources can made available in the form documents, videos, modules, or applications. Institutions either utilize their existing IT infrastructure or implement software-as-a service (SaaS) apps to support the secure and efficient execution of a BYOD policy. If BYOD implementation is done on the cloud, it saves money for the educational institutions in terms of the infrastructure and storage of learning content, and it also enables the students to access the learning resources on the cloud not just within the campus but outside the campus also (Aggarwal, 2018). For enterprise organizations that adopt a cloud-based model, it operates in the same way.

Cloud hosting and storage allow more people access content remotely, and data analytics will allow for better tracking of this data. Organizations will need to embrace the possibilities of equipping employees and learners with company issued devices or allowing more BYOD. Technology tools will continue to emerge. For example, facial recognition technology in phones could be leveraged in training, role-playing, simulations, and in the field to assess how each learner is applying new learning. Based on that assessment, the learner could be directed back into an LMS where custom follow-up training is waiting for them (Heim, 2018).

Organizations also face challenges in leveraging e-learning in a manner that engages learners. The use of technology in learning needs to be tailored to each organization and standardized across departments. Teresevičienė, et al., (2015) believe that mobile equipment itself is not useful in terms of education. However, advances in mobile technology and the proliferation of smart devices are increasing their pedagogical value. Smartphones now allow for social interaction and engagement on a level with the PC. Mobile learning, while still having its user experience limitations, is rapidly catching up to e-learning and taking a larger role in

blended learning, especially with BYOD. Obstacles to technology enhanced learning

implementation in the classroom exist in the form of lack of teacher input on the development of

innovations, insufficient support, resources, time, professional development, human and

technological infrastructure, inadequate institutional culture, and teacher attitudes.

Teresevičienė's (2015) integration criteria groups into: *strategy and management, information*

communication technologies and infrastructure, continuing professional staff development, TEL

curricula, support systems, quality assurance, marketing, and *business development*.

To successfully implement cloud-based learning, organizations need to identify

preconditions, assess needs of stakeholders, create responsive action plans, and evaluate their

impact. Management support, organizational learning culture and institutional policy are crucial

for implementation of TEL. Strategic planning is critical to success (Teresevičienė, et al., 2015).

Implementation planning must be undertaken with environmental, organizational and learner

level challenges in mind. Environmental challenges include social and economic challenges.

Organizational level challenges include developing infrastructure, maintaining internal support

for initiatives, and policy adherence. Intrinsic and extrinsic motivation, behavioral and cognitive

needs are challenges faced at the learner level.

Impact analysis

Looking at the global picture, the World Bank (2019) began the executive summary for

the state of broadband by reporting

In 2019, the world crossed a number of major thresholds in global internet

adoption. Back in 1969, when the very first data packets were transmitted over what is

now known as the internet, the network comprised just four network nodes at US

universities. Today, the latest data estimate 21.7 is billion connected devices – and growing fast. And whereas the first data packets were only a few kilobits, today on average over 74,500 GB of data are sent over the internet every single second. According to ITU, 2019 marks the first full year when more than half of the world has begun to participate online in the global digital economy (p. ix).

With the emerging of mobile and cloud technologies that allow for anytime anywhere learning, the learning experience is becoming less formal as smartphone use increases. Patil observed that as the number of smartphone users is increasing with each passing day, the mobile learning solution and its experience have been shifted from just a process to a pivotal element in organizations of all sizes. Enterprise businesses also need a feasible solution to provide an exceptional mobile learning experience to their employees. It has become crucial to address this need because every 5th adult in U.S. accesses the internet from their smartphone only (2019).

The rollout of 5G networks in 2020 is expected to be a pivotal change driver. 5G is the foundation for realizing the full potential of Internet of Things (IoT). In terms of learning, this means app-based, personalized, real-time e-learning, rather than the traditional point-and-click module format. 5G makes possible app-based learning that is shorter and more targeted. "5G is on the horizon and IoT is expected to form majority of the 5G network paradigm. Also, further innovations in IoT is expected to happen with emerged cloud computing technology with intelligent 'smart' devices" (Ever, et al., 2018, p. 59).

A key driver in the area of mobile content and security is blockchain technology, which provides a decentralized, secure, and transparent way to make, record, and verify transactions. This will enable organizations to allow employees to remotely exchange information, such as learning data, more securely. Furthermore, it will allow for the use of smart contract or self-

executable protocols that respond automatically to some predetermined triggers that can be used in mobile apps for driving automation. Automation can improve the learner experience and reduce the amount of back-end work required of learning and development departments.

Blockchain as a being adopted a technology standard and is expected to improve IT security and user privacy. "By 2021, the blockchain market spending is predicted to cross $9.7 billion from just $945 million in 2017. IDC predicts that in 2018 alone spending on blockchain will be a whopping 2.1 billion. The technology will experience 42.8% growth every year until 2022. Lastly, a staggering 71% of business leaders across niches think blockchain will be the key factor in the uplifting of technology standard" (Ghanchi, 2018, para. 2).

The 2020 Covid-19 pandemic has forced organizations to adopt quickly to social distancing measures which have closed schools and businesses and forced people to learn and work remotely. The effects of this are not yet fully known, but e-learning has turned into an essential service. The need for easily accessible online learning has increased, and demand will remain as long as mass quarantines are in place, and likely after the pandemic has passed. However, mass shutdowns may slow the rollout and adoption of new technologies such as 5G, forcing organizations to rapidly adopt cloud-based learning using existing technologies, which presents challenges to L&D departments.

Recommendation

As information communication technology use continues to play a greater role in daily organizational processes, the need for e-learning will grow, and at the same time will the need for organizations to use ICTs in education. Cloud-computing allows for e-learning that can be completed remotely on a computer at home, or from a smartphone. The ICT systems which are

used to deliver content must be considered when developing instructional systems. Organizations need to invest in learning that is cost effective, portable, and scalable, and engaging. Cloud-based learning that can be provided as a subscription or service, should be considered to alongside of, or as a replacement for, training programs.

The on-premises e-learning model may become obsolete and give way to subscription-based models. New instructional design frameworks should include analysis and evaluation of software, courseware, and information communication technologies to deliver positive outcomes. To successfully implement cloud-based learning, organizations need to identify preconditions, assess needs of stakeholders, create responsive action plans, and evaluate their impact. Management support, organizational learning culture and institutional policy are crucial for implementation, but the accessibility and cost effectiveness of cloud-based learning can provide an incentive for reluctant stakeholders.

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