



MOBILE LEARNING

Technology Futures

ABSTRACT

Mobile technology is changing how learning is designed and delivered. 95% of Americans now own a cell phone of some kind. Many businesses equip their employees with company phones. Use of mobile phones will only continue to increase. With 5G right around the corner, the power of mobile technology will also increase. I will forecast futures of mobile learning in the US by 2025.

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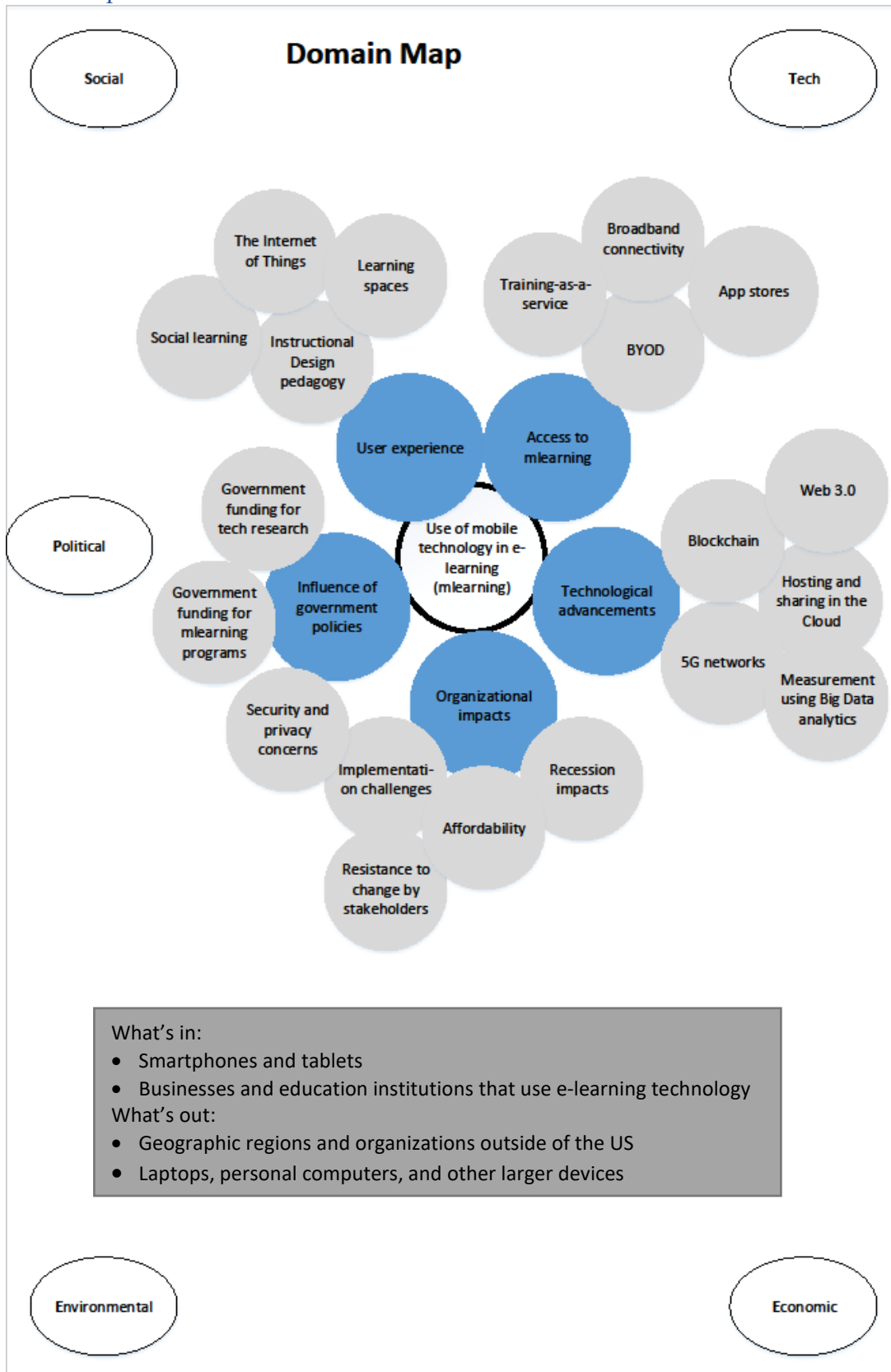
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Framing

1.1 Framing the Domain

Key issue(s) or question(s)? (Exploratory or strategic)	I am forecasting mobile technology futures in e-learning by the year 2025. <u>Exploratory 1</u> : How will mlearning be used in training? <u>Exploratory 2</u> How will mlearning be used in education?
Domain definition (<i>subject of the forecast</i>)	Mobile technology is changing how learning is designed and delivered. 95% of Americans now own a cell phone of some kind. Millennials, the first generation to have access to the internet from childhood, are now the largest generation in the workforce. Generation Z, the first generation born after the start of the tech revolution, are starting to enter the workforce. This is changing how trainers and educators are approaching learning. Mobile devices are more ubiquitous. Learners are more tech savvy. Many businesses equip their employees with company phones. Use of smart phones and tablets will only continue to increase. In addition, advances in technology may continue to make mlearning better and more accessible. In this paper I forecast how mlearning can be used internally within my organization, a global solutions provider, as well as for external organizations the company may provide solutions to.
Client	An international IT solutions provider.
Geographic Scope	Industries and educational institutions primarily the United States.
Time horizon	The approximate timeframe for the 3 horizons H1: 2011 to 2016 H2: 2017 to 2021 H2: 2022 to 2025
Domain Map (Boundaries, Categories, What's in & What's out)	Separate PDF

1.2 Domain Map



1.3 Current Assessment

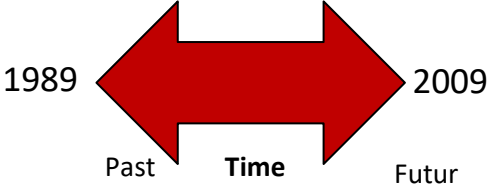
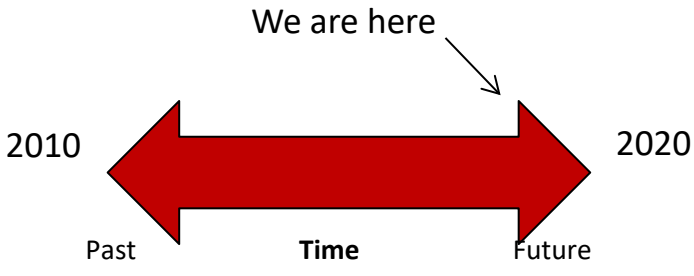
Category	Description
<p>Current conditions (important facts about the domain today)</p>	<p>Political, Environmental: The World Bank begins the executive summary for its 2019 State of Broadband” by reporting “In 2019, the world crossed a number of major thresholds in global internet adoption. Back in 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. This year also marks the 30th birthday of the World Wide Web, and 25 years since the first e-commerce transaction.” (World Bank, 2019, p. ix.)</p> <p>Social, Technological: Patil (2019) writes 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. Small and medium-size 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.</p> <p>Whether it is online shopping or gaming, app development companies are focusing on improving User Experience in every possible sector. This same process is followed for mobile learning as well” (Patil, 2019, para 1,2).</p> <p>Technological: According to Caitlyn McGarry, “Overall, 2019 is the year that 5G starts to take off, but 2020 is when next-generation networks will have a meaningful impact on the masses. Next year is not only when we expect the first 5G iPhone, it's also when networks will offer nationwide coverage. That's when we'll begin to see the full potential of 5G.” (McGarry, 2019).</p> <p>Technological: “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, Yoney Kirsal, and Amala V Rajan., 2018).</p> <p>Economic, Technological:</p>

	<p>“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).</p>
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1.4 Stakeholder Analysis

Stakeholder	Role	Level of Importance (1=low, 2=med, 3=high)	Interest
Digital learning providers	Producer	3	New startups and existing firms produce new apps and platforms on which to host them.
Technology manufacturers	Producer	2	Technology firms, particularly mobile phone and communications produce the hardware and infrastructure on which everything resides.
Solutions providers	Provider	1	Solutions providers can act as the ‘middlemen’ that drive the adoption of emerging technologies by organizations.
Public and private educational Institutions	Consumer	3	The needs of students within schools at all levels will drive the production and purchase of content and technologies.
Governments	Consumer/Provider	3	Governments can both act as a consumer for the learners within their organizations, and a driver of technology and research through funding and initiatives.
Business	Consumer	3	The needs and desires of learners within small and enterprise business will drive purchase of technology and content on the private sector side.

1.5 Era Analysis

Pre 4G Era	4G Era
 <p>1989 ←→ 2009 Past Time Futur</p>	 <p>We are here 2010 ←→ 2020 Past Time Future</p>
<p><u>Key features</u></p> <ul style="list-style-type: none"> • Rise of the World Wide Web <ul style="list-style-type: none"> ○ Slow connection speeds • Personal computers become a fixture in homes <ul style="list-style-type: none"> ○ Computers are large ○ Many don't have internet • Business start to use e-learning to train employees • Cell phones become popular • No social media 	<p><u>Differences from previous era</u></p> <ul style="list-style-type: none"> • Smartphones with apps begin to dominate • Technology becomes smaller and more portable • Wireless networks • Technology moves to the cloud • Internet of Things (IoT) • Social media a primary mode of interaction

1.6 History

- Web 1.0
 - 1989 - English scientist Tim Berners-Lee invents the World Wide Web
 - 1991 – First web browser (CERN) release to public
 - Early 1990’s – first online only courses offered in schools.
 - 1992 – First smartphone (Simon Personal Communicator) with apps created
 - 1994 – Simon Personal Communicator unveiled to customers
 - 1994 – First use of portable computers in classrooms
 - 1996 – Google project founded by Larry Page and Sergey Brin
 - 1997 – First use of mobile devices in field study
 - Mid-1990’s – Telecom companies begin offering virtual private network (VPN) services
 - 1999 – Napster, the first peer-to-peer network, launched
- Web 2.0
 - Early 2000’s – E-learning becomes widespread with businesses
 - 2000 – First tablet PC released by Microsoft
 - 2000 – First widespread use of PDAs in classrooms
 - 2004 – Facebook launched, beginning the rise of social media
 - 2007 – iPhone released
 - 2004 – First Web 2.0 conference hosted
 - 2008 – Android phone launched
 - 2008 – Blockchain technology invented
 - 2008 – The first MOOC (massive open online course) is launched at the University of Manitoba
 - 2008 – The first mobile learning apps for iOS and Android
 - 2009 – Blockchain released to public
 - 2009 – 4G network technology launched
 - 2010’s – Social learning becomes widespread
 - 2011 – Launch of iCloud
 - 2011 – BYOD use begins to become widespread
 - 2012 – *Udacity* founded
 - 2013 – edX consortium launched and platform open sourced by MIT
 - 2017 – 81% of developed world population uses the Internet
- Web 3.0
 - 2020? – 5G scheduled to be launched in the US
 - Digital natives become most of the workforce

1.7 Scanning Hits

Scanning Hit 1

Title	The Biggest Mobile Learning Trends For 2019 - eLearning Industry		Author	Ritesh Patil			
Source	Patil, R. (2019, February 3). The Biggest Mobile Learning Trends For 2019 [Web log post]. Retrieved from https://elearningindustry.com/mobile-learning-trends-for-2019-biggest .		Date	February 3, 2019			
STEEP Categories	Social, Technological		Keywords	Instructional design, user experience, mlearning			
Type	Actual event	New trends	New cycle	New plan	Potential event	New info	New issues
	Already happened, but few know about and implications not fully developed	Consistent increase or decrease, more or less of something over time	Recurring increase and decrease, more and then less of something over time	Publicly announced intentions	A potential happening or occurrence	Information that has just been released	Debate, conflict, decision, "Should we/the y..."
Brief description of	This blog post forecasts the biggest mobile learning trends for 2019. The 9 trends to look out for are: Augmented Reality, location-based technology, virtual reality, a shift to the Cloud, smart speakers and voice Assistants, AI and Machine						

the item	Learning, better hardware configurations, 5G connectivity, and the rise of mobile apps.				
How could the future be different as a result?	The global mobile learning solutions market will reach \$35 billion by 2020. There will be new tools and vendors, micro-assessments, mobile coaching, and performance support.				
What are the potential implications for ...?	...Stakeholder name:		E-learning designers, mobile learning vendors, businesses that currently offer, or want to offer training on mobile devices		
	Mobile learning will be accessible to more people and businesses. Apps will provide a better user experience and perform faster. There will be more opportunities for employee development				
Horizon	H1 Confirming (baseline scenario) confirms the baseline future	H3 Resolving (between scenarios) indicates one scenario becoming more probable	H5 Creating (new scenario) indicates a potential new scenario	Impact (0-5) 5 - It will create new pedagogy and opportunities for learning in more spaces.	Plausibility (0-5) 4 - Some of this already happening. Some still hasn't happened yet.
Scanner	Richard Tomchuk		Date Submitted 10/24/2019	Novelty (0-5) 4 - Published at the beginning of this year.	Timeliness (0-5) 1 - Not all predications have happened yet. We're still

				waiting on 5G, for example
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Scanning Hit 2

Title	Blockchain For Mobile App Development		Author	Juned Ghanchi			
Source	Ghanchi, J. (2018, September 19). Blockchain For Mobile App Development. [Web log post] Retrieved from https://elearningindustry.com/blockchain-for-mobile-app-development		Date	September 19, 2018			
STEEP Categories	Technological		Keywords	New technology, big data			
Type	Actual event	New trends	New cycle	New plan	Potential event	New info	New issues
	Already happened, but few know about and implications not fully developed	Consistent increase or decrease, more or less of something over time	Recurring increase and decrease, more and then less of something over time	Publicly announced intentions	A potential happening or occurrence	Information that has just been released	Debate, conflict, decision, "Should we/the y..."
Brief description of the item	The article discusses the use of blockchain technology in mobile applications, specifically mobile learning. The author explains how blockchain can be incorporated into mobile apps, and key considerations.						

How could the future be different as a result?	Blockchain was originally developed as a decentralized database technology for cryptocurrency transactions. Its use is now expanding to include other applications. Growth is projected at 42.8% annually until 2022. Mobile transactions increasingly are not only limited to financial transactions.				
What are the potential implications for ...?	...Stakeholder name:		Training managers, trainers, field solutions engineers, sales reps and other employees who use company mobile devices		
	Mobile learning apps supported by blockchain technology will be more secure and allow for better storage and transmission of information, and better analytics				
Horizon	H1 Confirming (baseline scenario) confirms the baseline future	H3 Resolving (between scenarios) indicates one scenario becoming more probable	H5 Creating (new scenario) indicates a potential new scenario	Impact (0-5) 5 – Mobile learning will move to the forefront of digital learning.	Plausibility (0-5) 5 – It's already happening
Scanner	Richard J. Tomchuk		10/27/2019	Novelty (0-5) 3 – It's been around for a couple of years, but we have yet to fully leverage it.	Timelines (0-5) 0 – Despite the title, the content is more general and not oriented

				specificall y toward mlearning .
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Scanning Hit 3

Title	What Blockchain Technology Can Do for Online Education		Author	Dr. Michael J. Garbade			
Source	Garbade, Dr. Michael J. (2019, October 14). <i>What Blockchain Technology Can Do for Online Education</i> . [Web log post]. Retrieved from: https://hackernoon.com/what-blockchain-technology-can-do-for-online-education-88b6e2da7e7d		Date	October 14, 2019			
STEEP Categories	Technological		Keywords	New technology, big data, peer-to-peer			
Type	Actual event	New trends	New cycle	New plan	Potential event	New info	New issues
	Already happened, but few know about and implications not fully developed	Consistent increase or decrease, more or less of something over time	Recurring increase and decrease, more and then less of something over time	Publicly announced intentions	A potential happening or occurrence	Information that has just been released	Debate, conflict, decision, "Should we/the y..."
Brief description of	Garbade analyzes how blockchain technology can be used to solve problems in education, through the use of peer-to-peer learning platforms						

the item					
How could the future be different as a result?	Currently, the online education and professional development sector faces a myriad of challenges, including poor cross-platform collaboration, threat of data theft, and difficult in authenticating certifications. Blockchain might be used to fix these issues through the use of decentralized peer-to-peer e-learning platforms that utilize smart contracts and tokens and provide tools content creators can use to teach hands-on skills and knowledge without the constraints of centralized learning platforms. Decentralized data storage could also offer more protection for student data. For employers that use certifications, blockchain could provide easier confirmation of authenticity, given that blockchain provides an immutable, publicly available online record with which to verify an employee or potential hire's learning history.				
What are the potential implications for ...?	...Stakeholder name:	Training managers, trainers, field solutions engineers, sales reps and other employees who use company mobile devices. Also, recruiters and hiring managers.			
	Mobile learning apps supported by blockchain technology will be more secure and allow for better storage and transmission of information, and better analytics. Peer-to-peer learning platforms could free trainers and learners of the constraints of traditional learning management systems.				
Horizon	H1 Confirming (baseline scenario) confirms the baseline future	H3 Resolving (between scenarios) indicates one scenario becoming more probable	H5 Creating (new scenario) indicates a potential new scenario	Impact (0-5) 5 - Mobile learning will move to the forefront of digital learning.	Plausibility (0-5) 5 - It's already happening

Scanner	Richard J. Tomchuk	Date Submitted 10/24/2019	Novelty (0-5) 5 – Very new	Timeliness (0-5) 3 – Author has a PhD in Finance and has founded multiple tech startup but does not specialize in learning.
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Scanning Hit 4

Title	5G technologies boosting efficient mobile learning		Author	Helen C. Leligou, Emmnouil Zacharioudakis, Louisa Bouta, Evangelos Niokos			
Source	Leligou, H. C., Zacharioudakis, E., Bouta, L., Niokos, E. (2017). 5G technologies boosting efficient mobile learning. MATEC Web Conf. 125 03004 (2017). DOI: 10.1051/mateconf/201712503004. Retrieved from https://www.matec-conferences.org/articles/mateconf/ref/2017/39/mateconf_csc2017_03004/mateconf_csc2017_03004.html		Date	2017			
STEP Categories	Social, Technological		Keywords	Other important terms that describe the piece			
Type	Actual event	New trends	New cycle	New plan	Potential event	New info	New issues
	Already happened, but few know about and implications not fully developed	Consistent increase or decrease, more or less of something over time	Recurring increase and decrease, more and then less of something	Publicly announced intentions	A potential happening or occurrence	Information that has just been released	Debate, conflict, decision, "Should we/they ..."

			over time				
Brief description of the item	<p>Abstract: The needs for education, learning and training proliferate primarily due to the facts that economy becomes more and more knowledge based (mandating continuous lifelong learning) and people migrate among countries, which introduces the need for learning other languages, for training on different skills and learning about the new cultural and societal framework. Given that in parallel, time schedules continuously become tighter, learning through mobile devices continuously gains in popularity as it allows for learning anytime, anywhere. To increase the learning efficiency, personalisation (in terms of selecting the learning content, type and presentation) and adaptation of the learning experience in real time based on the experienced affect state are key instruments. All these user requirements challenge the current network architectures and technologies. In this paper, we investigate the requirements implied by efficient mobile learning scenarios and we explore how 5G technologies currently under design/testing/validation and standardisation meet these requirements.”</p>						
How could the future be different as a result?	5G technology will allow for more personalized learning, and more collaboration, and anytime, anywhere learning.						
What are the potentials?	...Stakeholder name:			Training managers, trainers, field solutions engineers, sales reps and other employees who use company mobile devices.			

ntial impl icati ons for ...?			Also, recruiters and hiring managers.		
Hor izon	H1 Confirming (baseline scenario) confirms the baseline future	H3 Resolving (between scenarios) indicates one scenario becoming more probable	H5 Creatin g (new scenario) indicates a potential new scenario	Impact (0-5) 5 – This is the next expected big change to mobile technology	Plausibility (0-5) 5 – 5G is coming. The only question is when
Sca nne r	The person submitting the hit	Date Submitted 10/28/2019		Novelty (0-5) 1 – The conference paper if from 2017.	Timeline ss (0-5) 5 – Conference paper.

Scanning Hit 5

Title	The Role of 5G Networks in the Field of Medical Sciences Education		Author	Yöney Kirsal Ever; Amala V. Rajan			
Source	Ever, Yoney Kirsal, and Amala V Rajan. The Role of 5G Networks in the Field of Medical Sciences Education. 2018 IEEE 43rd Conference on Local Computer Networks Workshops (LCN Workshops) (2018): 59-63. Retrieved from: https://ieeexplore-ieee-org.ezproxy.lib.uwstout.edu/document/8628579		Date	October 1, 2018			
STEEP Categories	Economic, Technological		Keywords	Other important terms that describe the piece			
Type	Actual event	New trends	New cycle	New plan	Potential event	New info	New issues
	Already happened, but few know about and implications not fully developed	Consistent increase or decrease, more or less of something over time	Recurring increase and decrease, more and then less of something over time	Publicly announced intentions	A potential happening or occurrence	Information that has just been released	Debate, conflict, decision, "Should we/the y..."

Brief description of the item	<p>Abstract:</p> <p>Over the past decade, rapid developments in computer and communication technologies have emerged for the use of Internet of Things (IoT) in various fields and collection and providing security in terms of privacy and integrity, of big data on a daily basis is a challenge. Researchers are revealed that, it is expected to have 25-50 billion devices with minimum number of 6 devices per person on a huge amount of IoT based activities by 2020. 5th generation wireless systems (5G) are on the horizon and IoT is expected to form majority of the 5G network paradigm. IoT technologies have started drastically change landscape of various industries. Considering these changes, technological innovations are providing new ways of education and learning materials for educators to help their teaching and communication methods with their learners. New opportunities alter teaching and learning. Especially, in order to increase quality and quantity of learning and teaching in higher education institutions, blended learning approaches have been emerged. This adopts use of virtual learning environments (VLEs) into traditional teaching mechanisms through both instructor and learner generated contents. Findings suggest that Generation Z use e-learning materials more effectively and efficiently revision tools than their textbooks and their own notes respectively. As new opportunities in technologies become more mature, the volume of data published will increase rapidly. This paper investigates and identifies how these emerging technologies of IoT in 5G will be integrated on education sciences like medicine. The paper aims to present how learners will get quality education through improvements in digital imaging, decision on diagnostics, and knowledge to treatment.</p>	
How could the future be different as a result?	<p>Employee performance, and on the job results, will be improved through the use of IoT technologies.</p>	
What are the potential implications for ...?	...Stakeholder name:	<p>Customers in the healthcare industry.</p>
	<p>The company may be able to offer these solutions to healthcare customers.</p>	

Horizon	H1 Confirming (baseline scenario) confirms the baseline future	H3 Resolving (between scenarios) indicate one scenario becoming more probable	H5 Creating (new scenario) indicates a potential new scenario	Impact (0-5) 5 – Will affect entire healthcare system	Plausibility (0-5) 4 – 5G will be rolled out in 2020 or 2021, so these changes are likely to be implemented
Scanner	Richard Tomchuk		Date Submitted 10/27/2018	Novelty (0-5) 3 – a year old	Timeliness (0-5) 5 – Conference paper

Scanning Hit 6

Title	<i>Millennials, Goldfish, and Other Training Misconceptions: Debunking Learning Myths and Superstitions</i>		Author	Clark N. Quinn			
Source	Quinn, Q.N. (2018). <i>Millennials, Goldfish, and Other Training Misconceptions: Debunking Learning Myths and Superstitions</i> . Alexandria, VA: ATD Press		Date	2018			
STEEP Categories	Social		Keywords	Training, millennials, instructional design			
Type	Actual event	New trends	New cycle	New plan	Potential event	New info	New issues
	Already happened, but few know about and implications not fully developed	Consistent increase or decrease, more or less of something over time	Recurring increase and decrease, more and then less of something over time	Publicly announced intentions	A potential happening or occurrence	Information that has just been released	Debate, conflict, decision, "Should we/they ..."
Brief descripti	Quinn challenges accepted ideas on how Millennials, including how they utilize technology.						

on of the item					
How could the future be different as a result?	More effective training can be delivered to younger members of the workforce, based on sound pedagogy and not assumptions.				
What are the potential implications for ...?	...Stakeholder name:	Trainers and training managers			
	Use of emerging technologies for training and learning could be altered.				
Horizon	H1 Confirming (baseline scenario) confirms the baseline future	H3 Resolving (between scenarios) indicates one scenario becoming more probable	H5 Creating (new scenario) indicates a potential new scenario	Impact (0-5) 2 – Adopting some of these ideas could lead to improved outcomes.	Plausibility (0-5) 2 – It could change how some learning technologies are used.
Scanner	Richard Tomchuk	Date Submitted 11/4/2019	Novelty (0-5) 4 – Book was published in 2018	Timeliness (0-5) 0 – Relevant to future uses of technology, not	

				technological developments.
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Scanning Hit 7

Title	The State of Broadband: Broadband as a Foundation for Sustainable Development		Author	The International Telecommunication Union of the World Bank Group			
Source	World Bank Group. (2019). The State of Broadband: Broadband as a Foundation for Sustainable Development. Washington, D.C.: Website. Retrieved from https://www.itu.int/pub/S-POL-BROADBAND.20-2019/en		Date	2019			
STEEP Categories	Political, environmental		Keywords	Other important terms that describe the piece			
Type	Actual event	New trends	New cycle	New plan	Potential event	New info	New issues
	Already happened, but few know about and implications not fully developed	Consistent increase or decrease, more or less of something over time	Recurring increase and decrease, more and then less of something over time	Publicly announced intentions	A potential happening or occurrence	Information that has just been released	Debate, conflict, decision, “Should we/they ...”

Brief description of the item	This annual report from the ITU/UNESCO Broadband Commission for Sustainable Development showcases the state and trends in broadband deployments around the world. Analyses the current state of broadband and makes policy recommendations.				
How could the future be different as a result?	More people will be able to get online. There will be more opportunities because better high-speed internet access can develop knowledge economies, foster digital transformation in government services and digital transition across economic sectors. It can enable sustainable development.				
What are the potential implications for ...?	...Stakeholder name:	The company and its customers			
	The company can be a provider of these solutions.				
Horizon	H1 Confirming (baseline scenario) confirms the baseline future	H3 Resolving (between scenarios) indicates one scenario becoming more probable	H5 Creating (new scenario) indicates a potential new scenario	Impact (0-5) 5 – It could fundamentally transform society	Plausibility (0-5) 5 – There is a strong push to adopt these recommendations among nations

Scanner	Richard Tomchuk	Date Submitted 11/4/2019	Novelty (0-5) 5 – This was just released	Timeliness (0-5) 5 – It is a primary change driver.
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Scanning Hit 8

Title	The Future of Learning? Well, It's Personal		Author	Anya Kamenetz			
Source	Kamenetz, A. (2018, November 16). The Future of Learning? Well, It's Personal. <i>NPR</i> . Retrieved from https://www.npr.org/2018/11/16/657895964/the-future-of-learning-well-it-s-personal		Date	November 16, 2018			
STEEP Categories	Social, political		Keywords	Collaboration, personalized learning, privacy			
Type	Actual event	New trends	New cycle	New plan	Potential event	New info	New issues
	Already happened, but few know about and implications not fully developed	Consistent increase or decrease, more or less of something over time	Recurring increase and decrease, more and then less of something over time	Publicly announced intentions	A potential happening or occurrence	Information that has just been released	Debate, conflict, decision, "Should we/they..."
Brief description of the item	This article describes how personalized learning using emerging technologies is reforming education. The use of software will allow each student to proceed through a pre-determined body of knowledge, most often math, at his or her own pace.						

How could the future be different as a result?	Students will be better educated because they will receive customized instruction at exactly the point when it's need.				
What are the potential implications for ...?	...Stakeholder name:		Education customers.		
	Implemented effectively, it could improve learning outcomes. But resistance from some teachers and students, as well lack of understanding of the concepts of personalized learning may make it difficult to implement effectively. Also, the technology required may be too expensive for some school districts.				
Horizon	H1 Confirming (baseline scenario) confirms the baseline future	H3 Resolving (between scenarios) indicates one scenario becoming more probable	H5 Creating (new scenario) indicates a potential new scenario	Impact (0-5) How much is this event or information likely to change the future for that person, group or domain 5 – It could revolutionize education.	Plausibility (0-5) How likely will this change actually affect the future? 3 – There is a lot of resistance.
Scanner	The person submitting the hit	Date Submitted 11/4/2019	Novelty (0-5) 4 – A year old	Timeliness (0-5)	

				2 – NPR is a respected source of journalism, but this piece focuses more on pedagogy than technology.
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Additional Scanning Hits Template

Title	The title of the piece			Author	The primary author of the piece		
Source	Citation and link (if available)			Date	The date the piece appeared		
STEEP Categories	The one or more STEEP categories the piece relates to			Keywords	Other important terms that describe the piece		
Type	Actual event	New trends	New cycle	New plan	Potential event	New info	New issues
	Already happened, but few know about and implications not fully developed	Consistent increase or decrease, more or less of something over time	Recurring increase and decrease, more and then less of something over time	Publicly announced intentions	A potential happening or occurrence	Information that has just been released	Debate, conflict, decision, "Should we/they ..."
Brief description of the item	A short paragraph describing the event or the new piece of information. What happened or what new information appeared?						
How could the future be different as a result?	A brief comparison about the future before and after this event. How does the future change a result?						

What are the potential implications for ...?	...Stakeholder name:		The name of the person, group, organization, community, country or domain		
	Future consequences of this event for a specific person, group or domain. State the person, group or domain that would be affected.				
Horizon	H1 Confirming (baseline scenario)) confirms the baseline future	H3 Resolving (between scenarios) indicates one scenario becoming more probable	H5 Creating (new scenario) indicates a potential new scenario	Impact (0-5) How much is this event or information likely to change the future for that person, group or domain	Plausibility (0-5) How likely will this change actually affect the future?
Scanner	The person submitting the hit	Date Submitted	Novelty (0-5) How new is this event or piece of information to those involved?	Timeliness (0-5) Is the source reputable? Are there confirmations elsewhere?	

References

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Forecasting

2.1 Forecasting Baseline

Trends (can say “more,” “less” or “continuation” of a change)	See Baseline Trends below.
Plans (announced intentions/plans of key stakeholders)	<ul style="list-style-type: none"> Qualcomm projects 175 million to 225 million 5G smartphones in 2020 with more than 450 million in 2021 (Dignan, 2019). 5G service is already going live in major cities.
Projections (baseline forecasts made by others, if any)	<ul style="list-style-type: none"> E-learning will grow to \$325 Billion by 2025 (McCue, 2018). “The Global Mobile Learning Market was valued at USD 10.93 billion in 2016 and is projected to reach USD 179.21 billion by 2025, growing at a CAGR of 36.45% from 2017 to 2025” (Verified Market Research, 2018).
Cycles	<ul style="list-style-type: none"> Faster devices and faster connection speeds. Increased broadband and mobile infrastructure in developing areas. Emergence and adoption of new technologies.
Constants	<ul style="list-style-type: none"> The need for human teachers. The need to learn new information and skills. Public education institutions.

2.2 Baseline Trends

STEEP	Trend
Social	<ul style="list-style-type: none"> Mobile devices become an integral part of the learning experience. Demand for social and micro learning increases.
Technological	<ul style="list-style-type: none"> More learning apps for mobile devices are produced. Data storage and transfer is more secure. Analytics allows for tracking of mobile learning. More cloud hosted training improves access. More mobile infrastructure bridges the digital divide. “Among the most important 5G features, high data rates enable communication of performance and affect-state relevant data which fuel learning experience personalisation and adaptation” (Leligou, 2018). I interviewed a K-12 learning publication salesman, who stated that within the last ten years we’ve seen the shift to 1:1 initiative where every student in a district gets a device of some sort. (Vangeli, D, personal communication, November 18, 2019).
Economic	<ul style="list-style-type: none"> Growth of e-learning and mobile learning markets. The market is going in the direction of more apps. There are many startup companies that are very targeted towards science, language arts, reading

	<p>(for example: NoRedInk) (Vangeli, D, personal communication, November 18, 2019).</p> <ul style="list-style-type: none"> • Within the education sector, all publishing companies are selling digital content. You can pick your device and access (Vangeli, D, personal communication, November 18, 2019).
Environmental	<ul style="list-style-type: none"> • Broadband connectivity enables efforts to achieve international sustainable development.
Political	<ul style="list-style-type: none"> • Governments fund technology, research, and education initiatives.

2.3 Baseline Analysis

<p>a. Evidence for the change: People still need to learn how to think and asking a student to do an essay or research project on their phone is just not practical (Vangeli, D, personal communication, November 18, 2019).</p> <p>i. Assumption Teachers will still be required to teach students how to think and learn (Vangeli, D, personal communication, November 18, 2019).</p> <p>1. Alternative (opposite) assumption: Future students and teachers will be digital natives.</p> <p>a. Reason for the alternative: When today’s young people raised on the internet become educators, curriculum specialists, and administrators over the next 20 years we will see the next big shift (Vangeli, D, personal communication, November 18, 2019).</p> <p>b. Reason for the alternative: Improved infrastructure and access will bridge the digital divide.</p> <p>ii. Assumption Projects like essays will always be easier to complete on a larger device like a laptop.</p> <p>1. Alternative (opposite) assumption: Future applications will be more user friendly, including desktop applications which move to mobile.</p> <p>a. Reason for the alternative: Applications like MS Office are going mobile.</p> <p>b. Reason emerging technologies such as virtual assistants.</p>	<p>Some learning may never be conducive to mobile platforms.</p>
<p>b. Evidence for the change: Tech is already maturing thanks to Google Assistant, Siri, Alexa and phones with incredibly accurate face-scanning technology (McFerran, 2018).</p> <p>i. Assumption New technology will be affordable and available to all:</p>	<p>Future technology will replace the smartphone.</p>

<p>1. Alternative: Advanced technology will only be available to those who can afford it.</p> <p>a. Reason for the alternative: Economic inequality</p> <p>b. Reason for the alternative: The digital divide</p> <p>ii. Assumption required to use the evidence: Further advancements in technology will lead to a smartphone-free future.</p> <p>1. Alternative: Smartphones will become cheaper, and more readily available, and will continue to be used by the majority of the world's people.</p> <p>a. Reason for the alternative: Technologies such as TVs, personal computers, radios etc., have historically become cheaper and more readily available.</p> <p>b. Reason for the alternative: Smartphone user experience will improve.</p>	
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2.4 Alternative Future Inputs

Trend Breaks	<ul style="list-style-type: none"> • Hardware and infrastructure advancements • Economic cycles
Events (including wildcards)	<ul style="list-style-type: none"> • Recession • New technologies that emerge
Issues (including conflicts, controversies, dilemmas, choices)	<ul style="list-style-type: none"> • Privacy concerns – blockchain and advancements in information security such as multi-factor authentication are improving digital privacy, but there is still a long way to go, particular with regards too • Consumers rejecting technology – what is done with technology is ultimately up to the consumer, and individuals and organizations may reject use of mobile technology in learning out of the aforementioned privacy concerns, fear of the unknown, or budgetary restraints. Much of the latter two come about as a result of access problems caused by... • The digital divide – there is a still a stark difference in levels of access across regions, particularly in rural and developing areas. Being able to use the technology comes down to the access. You can give a child a loaner phone or iPad, or push learning apps out

	<p>to people's personal devices, but that only works if they have access and or a device.</p> <ul style="list-style-type: none"> Existing pedagogies will need to be adapted to fit new methods of learning. This will require willingness to adapt new technologies and the knowledge to successfully implement them.
Ideas (including images, perspectives)	<p>Device-free future - "Users will be free from individual devices as people will have access to communications and data networks as individuals. Seeing, hearing, being seen and heard will be carried out in many new ways that fit into the situation the user finds themselves in at any given moment. However, the human tendency to have affection for objects will surely remain and will still be a driver in development" (McFerran, 2018),</p>
Key uncertainties	<ul style="list-style-type: none"> Market cycles Emergence of new technologies People's reactions to change Acquisitions of startups Mergers of large players (such as T-Mobile and Sprint). Natural disasters How we bridge the digital divide How educational institutions and business organizations adopt new technologies

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Visioning

3.1 Baseline Future

It is the year 2025. Mike is a salesman for a mid-size technology solutions firm. He begins his day by checking his business phone and receives a push alert that he has been assigned a new sales training by Corporate Learning and Development. The push alert comes via the company's mobile learning management system, which it now installs on all company phones and BYOD devices. Mike connects to the LMS, a process made easy via facial recognition login. He completes the first module in less than 5 minutes. Micro-learning and accessible learning now go hand in hand. The job demands of employees such as Mike have created the need anytime anywhere learning, and 5G networks have made this possible on their smartphones.

His coworker, Samantha, is sitting at a terminal in JFK airport, waiting for her flight from New York to Texas. While waiting, on her phone she watches a video training about a new tech product. Using a secure VPN, she will upload the product expert certificate from the technology partner to the cloud. She then checks her other deadlines, and discussion post updates. She can read course notifications wherever she is on her smartphone. Her learning materials are in the palm of her hand. Security certificates, biometric recognition, encryption, and multi-factor authentication have all made her employer comfortable in assuming the risk in order to allow her to learn on the go. The risk vs. reward in terms of performance improvement is worth it for the company, and the analytics have driven this out.

In his downtime during the workday, John, a business development manager, completes several quiz games to earn two more digital badges. In addition to helping improve his job skills, the badges will be entered into John's file and factored into his career path for his next promotion. Digital badges, in addition to being skills indicators, promote lifelong learning, and help move learning out of the classroom and into more informal settings.

Later, the team will meet over video chat for a collaborative session, to practice sales pitches for new products. The session will be graded using facial recognition and AI. The same face-recognition used to log into their phones be leveraged in training in the field to assess how each learner is applying new learning. Based on that assessment, each learner could be directed back into the LMS for personalized follow-up training.

Mike, John and Sam's manager and professional development coach Lena can track their progress in by logging into the peer-to-peer LMS on her phone. She can issue feedback and refreshers, and her learners will receive push notifications and updates in real time.

Jason, the lead sales trainer, is in a meeting with the other trainers, looking at data analytics from recent e-learning results. In analyzing and evaluating these results the team can not only personalize learning for employees, but quickly accurately determine changes need to be made. Much of their training material is now focused on agility and broken into the smaller pieces.

The trainers don't have to update an entire course or video if the material is broken into smaller pieces. They'll find the segment that needs to be updated instead of recreating the entire piece. The team can be quicker to tweak courses with more granular access to the content. If they find learners are struggling with a concept, they might reorder the course or repackage that segment to increase effectiveness.

The next morning, Mike, is meeting with a customer about a prospective deal for a mobile training platform. In advance of the meeting he receives a sales primer training with talking points and tips for the discussion with the customer. The training was automatically assigned based his synced calendar and most recent learning profile. The deal he's working on is for the purchase of a new digital learning system and equipment for a school district, that includes a strong mobile learning component. The LMS will be installable on students' personal devices, and students will be able to download some learning apps from the app store. The apps will include a social media learning app that students can use to complete do group work.

All of this is made possible through advancements in mobile technology and e-learning, and the company's willingness to invest in these changes in order to improve outcomes for its employees. In offering anytime anywhere targeted micro learning, they broke out of the box of traditional e-learning, which had become stale and ineffective. Employees are now more receptive to training content since the company has adopted the new platform. 5G technology, personalized learning using AI, and improved security make it easier for organizations to adopt state-of-the-art learning systems.

Key Assumptions

- Mobile devices will continue to become a more integral part of the learning experience.
- More employees will need to work remotely, and the demand for anytime, anywhere e-learning will increase.
- Improvements in IT security will allow more employees to be equipped with company mobile devices.
- Faster devices and faster connection speeds will provide a better user experience on mobile devices. Mobile apps will provide more effective learning content.
- Some non-proprietary content, employees will be able to log in to third-party devices. Data analytics will make tracking of these trainings possible.
- It will always be necessary to deliver some training via instructor-led or desktop e-learning.

Key Uncertainties

- Whether the L&D budget will allow for investment in mobile learning initiatives.
- What system(s) will be used to deliver mobile learning.
- Whether employees will respond positively to new learning initiatives.
- Mergers of large players (such as T-Mobile and Sprint) and how that will affect innovation.
- Natural disasters which impact communications infrastructure.

3.2 Alternative Future Matrix 2x2 Matrix



3.3 Alternative Futures

Alternative Future 1: Security Issues

By the year 2025, smartphone use has become more widespread than ever. Smartphones have become cheaper and more readily available. However, the company has resisted the adoption of new systems for learning. IT security is a bigger concern than ever. This has led to crackdown on smartphone use within the company, particularly targeted at employees' personal devices. In turn, this makes it difficult, if not impossible, for L&D to leverage mobile training for employees (Peters, 2016).

Mobile connections increase exposure to security threats. The risk of potential breaches of corporate networks still holds back many business owners from implementing mobile learning.

Differences from baseline:

- Minimal organizational adoption.
- More restrictions on employee and learner use.
- Limited BYOD; learners choose, and are often encouraged, to learn new skills using MOOCs and third-party learning apps.
- Analytics are more difficult; independently completed courses and certifications must be tracked via workflows and other means.

Alternative Future 2: Content Challenges

By the year 2025, mobile learning has grown, but primarily as a supplemental tool to traditional classroom and e-learning. BYOD is more common than in AF 1, but user experience and content presentation still pose challenges. Larger devices such as laptops continue to be needed for more complex learning. Despite cloud storage, better connectivity, and longer device lifecycles, continued limitations of mobile devices include interaction with the mobile learning software and privacy and security concerns (Ismail, 2016).

Differences from baseline:

- Adoption is still widespread, but with less technological change.
- BYOD allows trainers and educators to assign and track learning via integrated learning apps and systems installed on learners' devices.

Alternative Future 3: The Digital Divide

By the year 2025, mobile technology has grown, but the digital divide remains wide, and learning opportunities are limited to those individuals and organizations who can afford it. Many advancements have been made in terms of connectivity, user experience, AI, automated learning, and other technology. But only the largest organizations can afford to adopt these technologies in their L&D programs. Internet access is still a major issue, especially in rural areas, further exacerbating a world of tech haves and have-nots. Many teachers and trainers do not possess the skills they need to utilize the technology effectively. Cyber security is a major problem, as cyber criminals seek to exploit general lack of knowledge of new technologies where they are implemented.

Differences from baseline:

- Less widespread adoption of new technologies.
- Mobile learning primarily supplements classroom and computer-based training; there is less standalone content.

Alternative Future 4: Beyond the Smartphone

By the year 2025, the smart phone has become obsolete, and new technologies have emerged to allow for true anytime, anywhere learning for everyone. Non-physical AI-driven devices become widespread. Wearable technology replaces the smartphone. AI replaces teachers in many settings. Automation creates new opportunities for learning. This ushers in the post smartphone era, which integrates wearable technology with drones that are built on the same technology as smartphones, using similar microprocessors and sensors, and it is predicted that wearable drones will be the next "smartphone" revolution by 2030 (Segal, 2015).

Differences from baseline:

- Technology surpasses baseline technologies; we are into a new technological frontier.
- Many security issues have been resolved.
- Innovation keeps pace with adoption.

References**Alternative Future 1: Scanning Hits**

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Summaries

4.1 Baseline Future Summary

Title & Brief Description	Digital Natives
Abstract	<p>Mobile technology is changing how learning is designed and delivered. 95% of Americans now own a cell phone of some kind. The next generation of workers will be digital natives. Use of mobile phones will only continue to increase. Network speeds will also increase. Faster devices and faster connection speeds will provide a better user experience on mobile devices. In educational and training settings, mobile devices will continue to become a more integral part of the learning experience. More employees will need to access training remotely, and the demand for anytime, anywhere e-learning will increase. Many businesses equip their employees with company phones. Improvements in IT security could allow more employees to be equipped with company mobile devices, or access content remotely from their own devices (BYOD). Data analytics will make tracking of these trainings possible.</p>
Key Drivers	<p>The most important inputs that are shaping the baseline future</p> <ul style="list-style-type: none"> • Faster networks – 5G • The Internet of Things • Blockchain technology • Cloud storage and hosting • Analytics • BYOD • Digital natives

4.2 Alternative Future Summary

Title & Brief Description	Beyond the Smartphone
Abstract	<p>The smart phone has become obsolete, and new technologies have emerged to allow for true anytime, anywhere learning for everyone. Non-physical AI-driven devices become widespread. Wearable technology replaces the smartphone. AI replaces teachers in many settings. Automation creates new opportunities for learning.</p>

Key differences from today and the baseline	<p>Bullet points of the major differences from the present and the baseline “at a glance”</p> <ul style="list-style-type: none"> • The smartphone goes the way of the cellular phone. • Replaced by smaller, wearable gadgets. • Innovation at a faster pace.
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E-learning is an industry that is growing rapidly. Within both the public and private spheres, there is growing demand to provide self-paced learning outside of the classroom, and increasingly outside of the academic and workplace campus itself. 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). This research paper has been a look into the next five years. The future of e-learning is mobile learning. Not only is the demand there, but emerging technologies are making the shift to mobile learning possible. The question is, to what degree this shift will happen and how fast.

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. While 5G is set for commercial availability sometime around 2020, the industry is already working to develop new global standards and pre-5G products to benefit industries everywhere (Collela, n.d). More people will be connected, in real time, and connections will be more reliable. While this rollout is not expected to happen quickly, businesses need to be ready to tap into new technology. In terms of learning, this means app-based, personalized, real-time e-learning, rather than the traditional point-and-click module format. 5G will make app-based learning that is shorter and more targeted possible. The mobile learning experience is shifting from just a process to a pivotal element in organizations of all sizes. Small and medium-size 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 (Patil, 2019).

Security continues to be an issue for many organizations, and in that area another key driver 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.

As smartphones become more ubiquitous and powerful, organizations will need to embrace the possibilities of BYOD, or equipping employees and learners with company issued devices. Cloud hosting and storage allow more people access content remotely, and data analytics allows for better tracking of this data. Technology tools will continue to emerge. For example, face-recognition technology in our 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).

Finally, the nature of content consumers is changing. Learners are increasingly digital natives. It will be more challenging to engage future learners with CBT modules as the number of smartphone users increases. Computer-based trainings can take months to design and develop, are often difficult to engage diverse learner audiences, and cannot be easily updated when the content falls out of date, which happens more frequently in an increasingly faster-paced world. The in-house instructional design model may become obsolete and give way to app-based and training-as-a-service content created by businesses that specialize in developing such training.

In summary, over the next five years, technology and e-learning, are going to become smaller, faster, more personalized, and more automated. Mobile learning represents the future of e-learning in a mobile world. Organizations need to be ready to adopt these changes and shift their roles in response to ensure workplace training that meets the needs of employees and clients is delivered.

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