The Advantages of Using Technology in Human Resource Training and Development

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Abstract

Technology is a massive part of today's world. Nearly all companies and corporations in every corner of the world use technology in one form or the other. Advancements in enterprise technology have helped business to streamline and automate multiple business operations. Transaction processing, customer relationship management and resource planning are a few examples of how much technology has changed and streamlined business processes over the years.

Statistics show that there has been an increase of 2.932 billion internet users in the last decade. Therefore, there is room for technology to streamline multiple other business processes, one of which is employee training. Technology in employee training is thus defined as the use of technological tools such as audio-visual imagery, gamified software and massively open online courses, amongst others, to assist the process of employee training. With companies becoming further decentralized every day, the need for technology-infused employee training is increasing. The use of techniques such as gamification, massively open online courses and AR/VR provides companies with multiple benefits which include greater quality control, an increase in employee satisfaction, employee retention and workplace efficiency. Studies conducted by Talent LMS Research shows that employees feel 89% more productive and 88% happier when their workplace training is gamified. However, the same study shows that 43% of employees have never noticed gamification in their workplace training. This suggests that there is significant room for improvement.

Companies such as Kahoot, Mindflash, Udemy and Skill Pill have capitalized on the opportunities proposed by technology-driven employee training and developed a suite of products and services that have already been heavily implemented. According to statistics and research performed by Kahoot, over 97% of all Fortune 500 companies use Kahoot in their employee training.

This paper seeks to highlight the possible scenarios where technological tools could be infused with existing HR training protocols to yield better results. It also seeks to highlight the exact benefits of each form of infusion by using secondary statistics from firms such as Statista and TalentLMS Research, amongst others. The paper seeks to elucidate on the various successful methods by which technology has already been implemented in training protocols. Lastly, this paper seeks to explain the possible applications of technology-driven training and its advantages.

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Introduction

The practice of developing and training the human resources of a company is extremely old, perhaps even as old as the concept of education. On examining the history and stories behind the evolution of education, we find that the earliest instance of education is the use of survival-driven learning, which was taught by primitive humans to ensure greater survivability of the human race during the age when they were exposed to the elements and organisms of nature. This was followed by the influence of religious beliefs; classical works of art and literature on formal education. Thereafter, education began to be influenced by war and military strategy which caused major changes in the landscapes of scientific and technical education, so as to fulfil the demands of scientific and technological warfare. This was succeeded by job skills training and the era of science-driven management techniques brought about by the Industrial Revolution. Following that, the phenomena of military-like leadership development programs based on WWII practices along with formal training of workplace teams became the norm. Finally, the most recent evolution in the field of formal education took place, which was the development of individuals, organizations and communities for work-related motives and an increased focus on the holistic development of humans rather than turning them into single-purpose units of the workforce. **(Swanson & Torraco, 1995)**

With new technological advancements occurring at a rapid pace, it has become imperative for HR teams to ensure that the knowledge and abilities of their workforce are abreast with the evolving technologies. The existing methods of training and development used by companies have undergone immense changes in the past decade. Gone are those days when workplace training was characterised by paper-and-pen learning sessions conducted by supervisors within the workplace. With the major strides that technology has made in the past few years, workplace training can now be programmed to occur on the trainee's demand and at a time and place of their choosing **(Kraiger & Ford, 2007).** With the advent of technologies like gamification, massively open online courses, virtual reality and augmented reality, workplace training has become increasingly interactive, immersive and personalized. The practice of training and developing human resources has grown out of the limited spectrum of tasks and objectives that it was assumed to have included. It is now viewed as a tool used in promoting overall team efficiency and morale as opposed to the earlier vision of it being a tool used for individual employee improvement. Apart from that, the concept of training and development in the 21st century also motivates organizations and businesses to achieve a competitive advantage through collective and collaborative learning. **(Noe, Clarke, & Klein, 2014)**.

Even though the effectiveness of pre-2010s techniques of training and development have been tried and tested, they possess a myriad of flaws that drive them closer to obsoletion every day. One of those major flaws is the lack of scalability. As the firm grows larger, it becomes increasingly

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difficult to facilitate the same quality of information exchange on larger scales. With globalization being one of the main goals of companies around the world, it becomes increasingly vital to devise training strategies and regimens that will allow every overseas subsidiary of the company to maintain the same levels of quality as the parent branch. It will also assist HR managers in maintaining a unified and singular corporate culture in all branches of the company, irrespective of linguistic, social and developmental barriers.

Apart from this, another flaw is the logistical challenges it poses. The use of primitive knowledge-sharing tools such as printed worksheets, booklets, physical lectures by trainers, etc. dramatically increase the company's training and development expenditure. The maintenance of security for confidential training material(s) through the use of brick-and-mortar infrastructure such as safety deposit boxes, manpower security, vaults, etc. also result in a profound increase in the training and development expenses. Apart from the logistical challenges, the use of paper, plastic and other non-biodegradable materials also result in a large carbon footprint.

The efficacy and retention of the knowledge imparted through trainers in physical classrooms is also experiencing a decline due to the decline in average human attention spans and slower paces of learning. According to the United States National Institute of Health, the average human attention span has decreased by 15 seconds since the year 2000, to a dismal figure of 8.5 seconds. **(National Institutes of Health, NA)**. This implies that the training and development imparted upon the global human workforce must be interactive enough to promote greater knowledge retention.

All of these points are paving the way for a radical change in the way HR managers and teams perform training and development activities. One of the most viable solutions for these problems is technology-infused workplace training practices. These practices involve the use of tools such as gamification, massively open online courses, collaborative sharing, individualized training, virtual and augmented reality to modify existing training programs so as to decrease costs, increase knowledge retention and increase workplace efficiency. It also involves the use of tools such as data analytics, online surveys, certification exams and other review systems to test employee retention and efficacy of training.

The total training and development expenditure incurred by companies in the United States for the year 2018 was approximately $87.6 billion out of which 34% was spent on procuring new technologies and equipment **(Training Mag, 2018)**. This shows that companies are increasing their investment into newer, evolving technologies to ensure the delivery of high-quality, bespoke and relevant content to the learner. Investing in the right kind of training and development tools for a company's workforce is crucial in ensuring efficient usage of resources as well as ensuring high retentivity of applicable knowledge amongst the trainees.

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The objective of this paper is to elucidate the concepts, highlight the advantages as well as the disadvantages (if any) of three major technologies that are currently trending in workplace training:

- Gamification
- Massively Open Online Courses (MOOC)
- Virtual and Augmented Reality (VR/AR)

Literature Review

Human Resource Development (HRD) is formally defined as a process by which the workers, employees and other skilled labour of an organisation or business are assisted in a consistent and organized manner so as to (i) acquire or hone the skills necessary to carry out various activities that are associated with their present or expected future roles; (ii) develop their inborn abilities as individuals as well as discover and exploit their own inner potential for their own and /or organisational development purposes; (iii) develop an organisational culture in which superior-subordinate relationship, teamwork and collaboration among subunits are strong and contribute to the professional well being, motivation and pride of employees. (Rao, 2003). HRD is also defined as a series of organized actions performed within a given time window and intended to inculcate and bring about change in the behaviour of the employees, whereas (Desimone, Werner, and Harris, 2002) reflect the modern application of HRD as a group of systematic and planned activities fabricated by a company to provide its employees and workers with the opportunities to learn necessary skills and abilities to live up to current and future requirements that their occupation and/or designation might pose.

(Society for Human Resource Management [SHRM], 2002) states that there are two primary operators of change in HR: technology and talent management. There are two factors in which change in HR processes depend upon; technology and talent supervision. Innovations in the field of technology will radically alter and revolutionize the manner in which business processes are performed and accomplished, including the processes that comprise HRD. Humans have been witness to path-breaking technological marvels in the past decade. With the advent of technologies like 4G, 5G, Internet of Things and Cloud Computing, amongst others, the concepts and methodologies involved in training, teaching as well as developing trainees and employees have undergone an evolution. A majority of the tools used by companies in their employee training programs today are a result of the culmination of multiple path-breaking technologies, resulting in a tailor-made suite of applications that streamline employee training and boost trainee knowledge retention. This suite of applications may be collectively referred to as ‘e-learning applications’ in the industry. (Selvan, 2015) stated that training in virtual classrooms using e-learning applications

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allows HR managers to guide and teach numerous employees rapidly as well as to evaluate their improvement through digitized testing applications. (Horton, 2000) put forward the argument that e-learning might be the most radical discovery to transform education technology since the invention of the chalkboard.

One of the main advantages of e-learning applications is that it allows trainees to learn knowledge that is specific to their level of understanding in a self-paced course format. This allows the trainee to access the knowledge portal at a time and place of their convenience, thereby increasing learners interest in the course. The trainee's retentivity of the knowledge is also much higher since he/she can easily revisit complex concepts within the portal at the trainee's demand. Research has explicated that e-learning grants greater flexibility, effectiveness and comfort for learners in addition to decreased expenses as compared to those incurred in executing traditional education techniques (Salas, DeRouin, & Littrell, 2005; Welsh, Wanberg, Brown, & Simmering, 2003). The teaching and workplace instructors fraternity is divided on the topic of whether or not to rely on technology for training. Some researchers argued that web-based instruction is advantageous because it allows the trainers and trainees to exploit the benefits caused by increased customization, versatility, and learner control (Hiltz & Wellman, 1997; Salas et al, 2005). However, the researchers on the other side state that the use of these technologies is much less efficient because it quarantines learners from one another, thereby reducing learner interaction and teamwork. Apart from that, they claim that it also reduces communication amongst learners and furthermore, it also minimises trainee fulfilment (Piccoli, Ahmad, & Ives, 2001; Richardson & Swan, 2003). The problems of isolation and reduced communication are tackled by incorporating the concepts of gamification into e-learning applications. The presence of elements such as leaderboards, progress bars, in-game currencies, etc., allow the trainee to compare one's progress with oneself as well as with one's colleagues in a constructive manner. Additionally, some tasks and projects relating to the trainee's curriculum can be designed to promote working in teams instead of working individually. These tasks boost collective morale as well as promote communication and understanding amongst colleagues.

1) Gamification

Gamification is a recent buzzword that is used in the world of business loosely to describe anything that might even be remotely related to gaming. According to (Sitzmann, 2011), the phenomenon of using games in the realm of business is not innovative and it has been around for a long time, but gamification as a notion is unique and much more modern. It may be formally defined the process of enhancing certain processes by infusing it with gaming elements (such as leaderboards, points, career graphs, etc.) to increase the interest generated by it, thereby boosting the productivity of the person performing the task. Research performed in recent times demonstrates that gamification of training components, such as the usage of points, badges and leaderboards along with other more detailed aspects such as challenges and plot stories can be employed to positively

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affect training results (Armstrong & Landers, 2018). In 2015, researchers exhaustively examined the psychological hypotheses of motivation to evaluate which one of them yielded the most optimistic results. This was being done to find the best result set that could aptly illustrate the outcomes of gamifying training motivation. In doing so, the researchers identified five principal theory-based motivational frameworks that demonstrate the feasibility of being suitable: the theory of gamified learning, classic learning theories, expectancy theory, goal-setting theory and self-determination theory. These theories collectively point toward a turning point in the effectiveness of gamified training as well as the motivation derived by it.

2) Augmented Reality and Virtual Reality (AR/VR)

Augmented reality (AR) is an upcoming technology that is revolutionizing the computer-human interface. In its essence, it is a technology used to build advanced, usually, visual-heavy interfaces by using interactive and wearable visualization systems to devise, develop and execute new, original techniques that allow the user to exhibit digital information in the form of interactive and realistic models that overlap over existing real-life infrastructure (Haritos & Macchiarella, 2015; De Crescenzio et al., 2011).

Virtual Reality may be defined as the electronic simulation of artificially developed, computer-based environments experienced via specialized head-mounted eye goggles and wired clothing and accessories, thereby empowering the end-user to experience and interact with realistic and immersive three-dimensional environments (Coates, 1992).

The usage of AR and VR technology allows trainees to practice training in simulations that would be otherwise expensive or harmful to recreate. Researchers believe that the use of AR and VR promote easier understanding of complex subjects because it was shown that the use of AR and VR technology to virtually solve a complex task instead of studying about it improved the task's efficiency. (De Crescenzio et al., 2011). AR and VR have been known and used extensively in the airline industry in the form of flight simulators. In the late 1940s, Curtiss-Wright became the first company known to have developed a flight simulator that contained display, audio and movement capabilities that enabled it to deliver a life-like aircraft flying experience to the pilot. This device was the first known precursor to modern flight simulators and perhaps the earliest known example of VR-based training.

Hospitals and medical training centres have also been known to be extensive users of VR-based training as it allows students to visualise situations in an increasingly better manner as compared to their diagram-based counterparts. In a study conducted by (Burdea et al., 1999) involving the use of VR-based simulators to teach the process of diagnosing prostate cancer to non-medical as well as medical students, it was observed that after only five minutes of training the group of people participating in the study, the non-medical students had a correct diagnosis rate of 67% in

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malignant versus nonmalignant tumour cases. Surprisingly, this was a better result than the urology residents, who got a correct diagnosis rate of 56% in the exact same trials.

Apart from this, AR-based training and VR-based training has also been proven to deliver effective training in fields such as driving, dance, brain stimulation, stroke rehabilitation, physical rehabilitation, amongst many undocumented others. (Bayarri, Fernandez and Perez, 1996; Chan et al., 2010; Burdea et al., 1999; Rose, Brooks and Rizzo, 2005; Keshner, 2004)

3) Massive Open Online Courses

Massive Open Online Courses, colloquially known as MOOCs (pronounced mooks), are defined as those full-length academic courses (available as videos) that can be distributed and programmed to serve a high number of learners from all over the world while being available at minimal to no cost to the learners. These courses must accomplish all of the above tasks while having minimal registration requirements and must be delivered through the medium of the Internet. (Perna et al., 2014).

The phenomena of MOOCs was preceded by the concept of correspondence courses. Correspondence courses were those courses wherein the trainee could study at home and come to a recognized educational institution solely for the purpose of evaluations. This phenomenon was welcomed at the time as it allowed working people to gain academic credentials while earning money. The earliest known instance of the usage of correspondence courses is in the year 1840 (Lease & Brown, 2009). The United Kingdom's Open University (2014), an academic institution committed to delivering higher education to learners at a distance using emerging technologies, enrolled its first batch of learners in 1971. The Sloan Commission began funding educational schemes aimed at using the innovations of the Internet in the year 1992 (Picciano, 2012), and between the years 2000 and 2007, the phenomenon of open education and online learning gained tremendous traction and began expanding its reach further beyond the previously known scopes (Universities UK, 2013).

The Connectivism and Connective Knowledge online course offered in 2008 by Downes and Siemens's is perhaps one of the first official MOOCs used for corporate and HR training purposes. (Dodson, Kitburi & Berge, 2015). Since then, the idea of MOOCs as an effective training tool has been popularized and widely accepted. Multiple universities offer MOOC courses on their own platforms such as MIT OpenCourseWare, Harvard Business School HBX, Indian Institute of Management Bangalore IIMBx, to name a few.

Between June 2013 and June 2014, there was a 327% increase in the total number of MOOCs available. The increase in the count was phenomenal, from 615 to 2,625 courses in total. (MOOCs.co, 2014; Dodson, Kitburi and Berge, 2015).

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The most popular MOOC providers (the one with the highest number of active learners) are Coursera with 45 million learners, followed by edX with 24 million learners, Udacity with 11.5 million learners and finally Swayam and FutureLearn with 10 million learners each. The total number of courses offered by these top five MOOC providers is 8,520 courses, along with 50 full-fledged degree courses that is equivalent to a degree issued by a university. Out of these around 2,500 courses, along with 11 online degrees and around 170 micro-credentials were added in 2019 alone. The total number of learners that used MOOCs in 2019 was 110 million. (Class Central, 2019)

Research Methodology

This paper is based on secondary data collected from various journals, magazines, books, websites and other sources. For the purposes of this study, various articles and sections of multiple journals, research papers, magazines and books were referred to. The research material was studied in-depth to deduce the author's viewpoint about the technologies that this paper seeks to discuss. Additionally, multiple peer-reviewed studies and journals were studied to understand the current stage of awareness that the world possesses about the effects of technology in the workplace.

Results and Conclusion

To ensure efficient and meaningful learning amongst trainees, the training curriculum should be designed or redesigned from the ground up to (a) include academic content that is significant to trainees, (b) incorporate tools and provide sufficient time for practice, (c) furnish trainees with significant control over the learning process as well as provide them with feedback mechanisms, and (d) give trainees an opportunity to interact with fellow learners so as to boost the trait of teamwork and team spirit **(Noe & Colquitt, 2002).**

The use of technology in aiding learning amongst trainees largely incorporates all of the four points that were deemed as necessary by Noe and Colquitt in the above passage. The use of MOOCs has resulted in content being generated which trainees deem meaningful and worthwhile to learn. The use of online delivery platforms and private content delivery networks allows for the incorporation of practice windows and tests which are used to determine the proficiency of the trainee in the test.

According to a study conducted by **(Dicheva et al., 2015),** it was inferred that elements such as points, badges and leaderboards were found to positively influence educational metrics. The metrics that were affected by gamification brought about constructive changes such as higher learner engagement, increased attendance, increased participation, and minimization of the gap between high and low-scoring trainees. The authors thereby concluded that gamified learning

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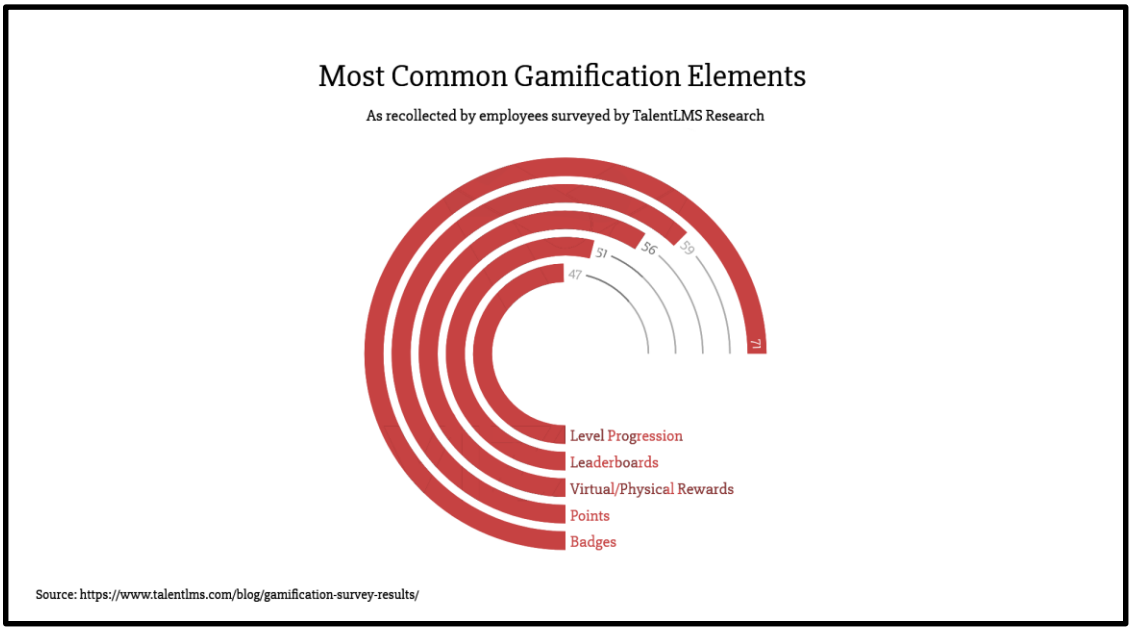
systems were more motivating and interesting compared to other conventional learning systems and mechanisms.

As stated by **(Armstrong and Landers, 2018),** the use of gamification elements such as a point system, a leaderboard, amongst others, have evoked a generally positive response from learners and that their integration into organizational training practices can yield a much better response from trainees in terms of generating eagerness to learn amongst trainees. It can have a massive impact on the learning performance of the trainee as well, but the goals implied by the elements in these gamified systems must be researched upon and chosen carefully in order to be fruitful. Like the abbreviation 'SMART' used in the business world to classify goals, the goals set by gamified training platforms for trainees should be Strategic, Measurable, Attainable, Relevant and Time-Bound, to yield maximum learning efficacy.

Studies conducted by TalentLMS Research involved the survey of 900 employees to ask them about their gamified learning experiences. 374 employees reported that they had never experienced gamification in their workplace and were disqualified. The studies revealed the following statistics:

There is an astronomical increase in employee satisfaction and employee happiness when gamified elements are used. Employees feel 89% more productive and 88% happier when they learn in a gamified workplace. 61% of respondents received gamification-infused workplace training. 83% of those who receive gamified training feel motivated.

The employees recollected the following gamification elements as the most influential and the most retentive when surveyed:



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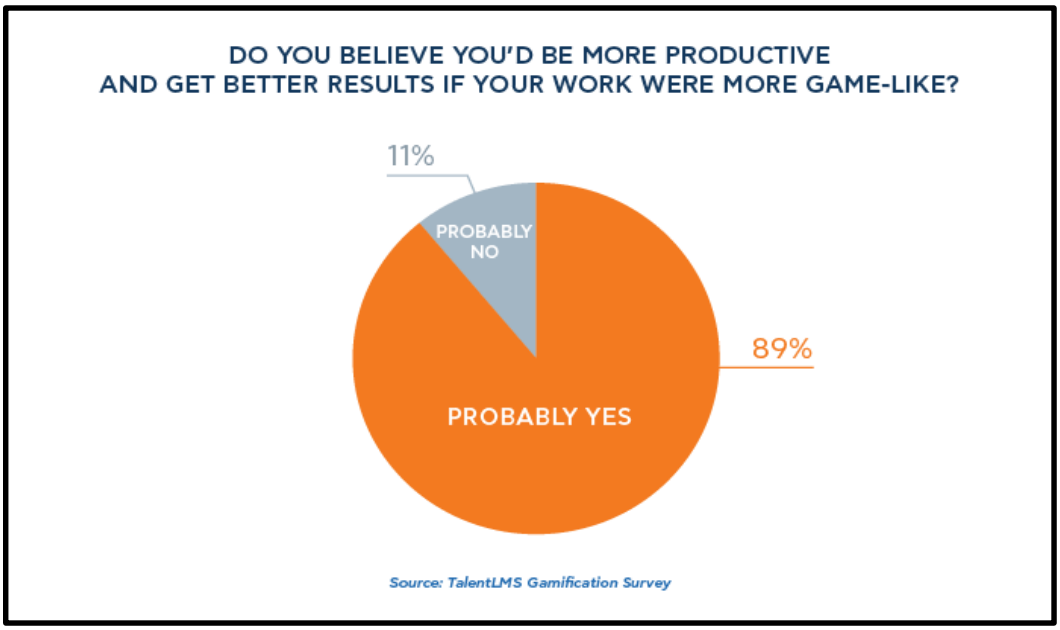
Employees also believed that they would be more productive if their work resembled a game in some aspects.



MOOCs also play a starkly important role in human resource training and development. The efficacy of MOOCs as a tool that facilitates personalized and self-paced learning has gained popularity in the yesteryears. In fact, the year 2012 was known as "The Year of the MOOC" as per an article by the Times Magazine **(Pappano, 2012)**, and 2014 was colloquially called "The Year of the Corporate MOOC" **(Nielson, 2014)**. MOOCs provide an extremely low-cost means for organizations to educate and train their manpower with high learning efficiency **(Dodson et al., 2015).**

Today, MOOCs have become an indispensable tool for personal learners, corporate training and educational institutions alike. Symbiosis International (Deemed University), a university with 41 daughter institutes in Pune, Bengaluru, Noida, Nashik, Hyderabad and Nagpur, has embraced the MOOC revolution and it requires its students to complete one MOOC course (in at least one subject) as a part of their evaluations in every semester.

In the sectors of corporate learning and private learning, statistics reveal that the number of MOOC courses available on the internet as of the year 2019 is a staggering 13,500 courses, with 2,500

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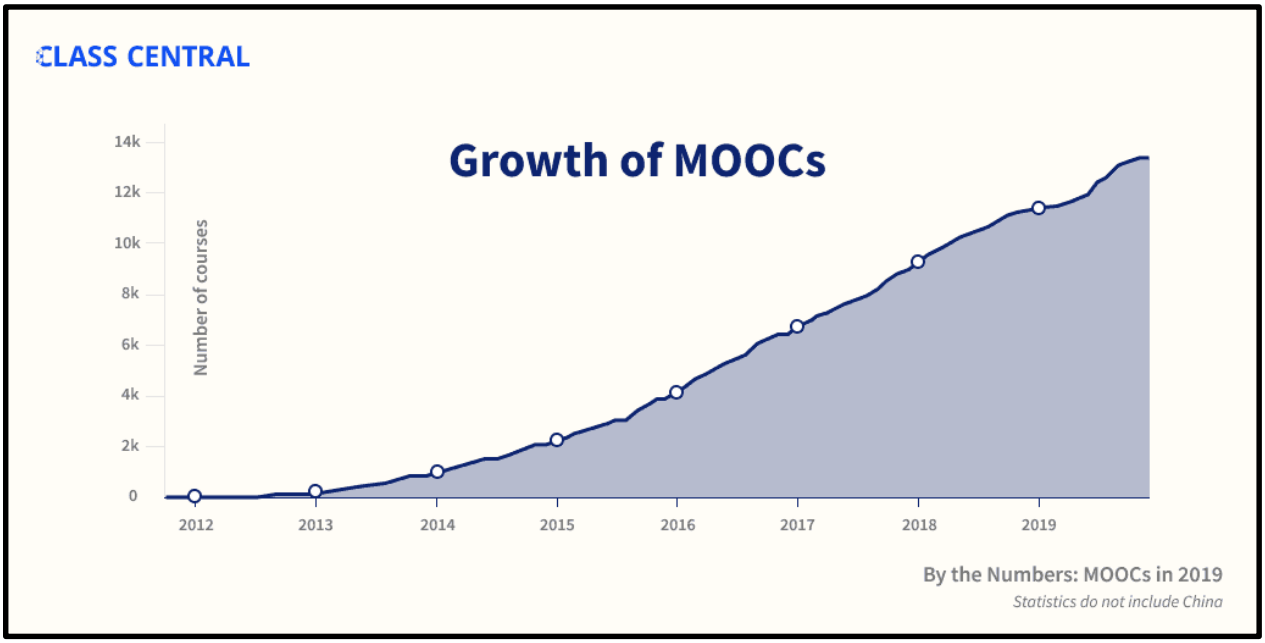
courses being added in the year 2019 alone.



As shown by the above data, it is clear that the MOOC revolution has begun and is far from being over. However, the corporate and educational sectors of the world must decide on th2e level and type of accreditation to be given to MOOCs. There are multiple online degree programs available on platforms such as edX and Coursera, a total of 30, but there is yet to be given some clarity on the weightage it has on a person's employability profile. For example, a person who has completed an advanced degree in statistics from a formal institution might be given more preference during hiring as opposed to one who has done the same degree from an online platform, even though they both have the same skill set. Similarly, there is no concrete research which says that a person who has acquired skills through MOOC courses during corporate training will stand to gain additional perks while shifting jobs, due to the lack of formal recognition and acceptance of MOOC credentials.

That being said, MOOCs are one of the best tools to impart effective education during human resource training and development. Their versatility and concise nature allow them to be indispensable in teaching important and niche skills. Moreover, the self-paced nature of MOOCs allows it to be much more widely accepted amongst learners as compared to a classroom environment. MOOCs have experienced a meteoric rise in the past decade, as shown in the infographic below, and will continue to do so as long as their efficacy and reliability as human resource training tools is maintained.

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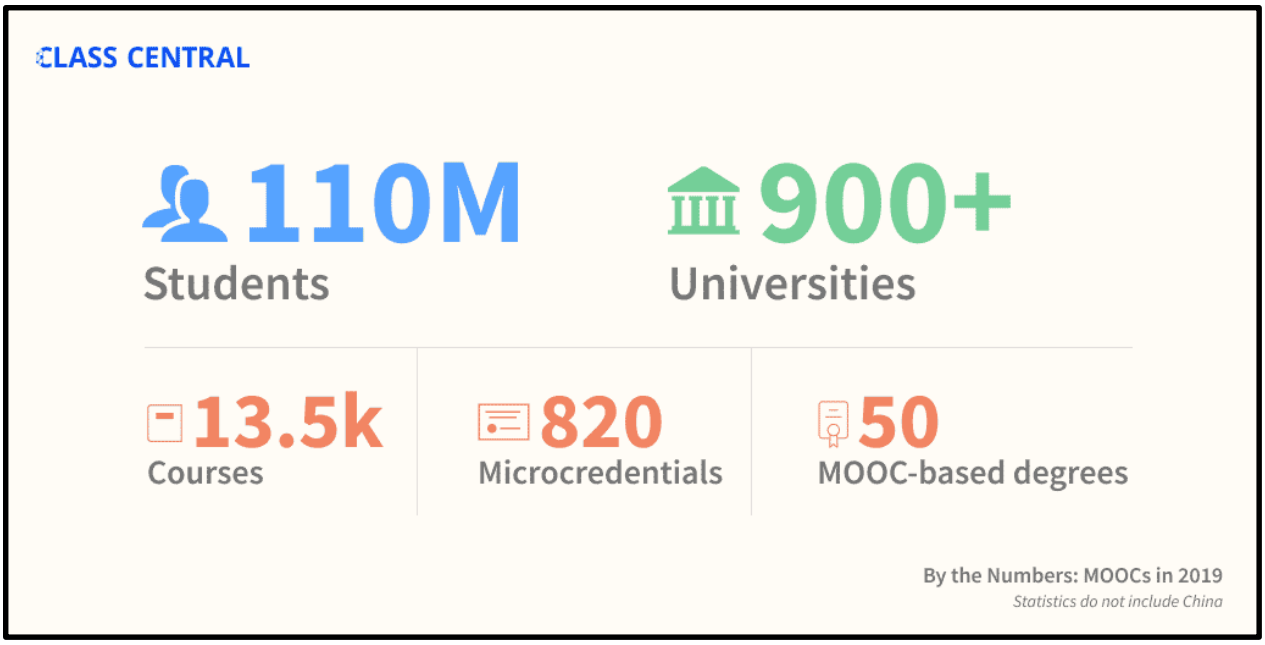

The use of AR and VR in corporate training is still a nascent phenomenon, owing to the large initial investment. A single unit of HTC Vive Pro Starter VR kit, containing a VR headset along with two controllers, costs INR 119,990 **(Gears of Future, 2020),** along with the additional cost of a computer designed to handle VR computational workloads**.** The large upfront investment is the major factor that is hampering the growth of VR and AR in the field of HR training and development. However, major strides have been made in the acceptance of VR and AR as an effective training tool. VR equipment has been used since the 1990s in the airline pilot training industry in the form of flight simulators. There also exist simulators for various types of vehicles such as buses, trains, trucks, ships, etc. Apart from that, customised VR simulators are being used in the medical field to train doctors to adapt and learn about the intricacies of various organs and specialized surgeries in the fields of neurosurgery, laparoscopy and ambulatory surgery. **(Yang et al., 2008; Alaraj et al., 2011).** Apart from that, VR and AR can also be used in corporate training as well as formal education systems to explain concepts in subjects such as physics, chemistry, mathematics, abstract algebra, differential geometry, application-based economics, pure finance, etc.

Even though there is a lack of data for corporate training, AR and VR show tremendous potential in becoming an important tool in HR training. Once the costs reach an acceptable level, companies will choose to invest in such systems as it yields extremely high learning efficiency. That being said, there will be a problem of designing (or redesigning) the training and development curriculum in such a manner that it fully utilizes the capabilities of a VR or AR system, but that is a concern that will be dealt with in the future years.

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The projected uses and advantages of using gamification, MOOCs and AR/VR in training and development processes are numerous. These technologies have the potential to revolutionize how workplace training is conducted. Even though the penetration of these technologies into the workplace training domain has occurred and its use is increasing, there is still a large part of the workforce that hasn't experienced technology-based training. Hence, it is important for organizations and businesses to explore the possibilities of changing certain aspects of their training program to use technological tools such as the ones mentioned above. Eventually, the goal of every organization's human resource management team should be to shift to a completely digital, custom-made curriculum that uses technological tools so as to yield maximum trainee satisfaction, learning efficiency, knowledge retention and effective application of knowledge in business processes.

Limitations and Scope

The most significant limitation in the execution and compilation of this paper would be the lack of data available for technologies used in corporate training. Additionally, there was also a time constraint experienced by the author due to prior professional and academic commitments. Additionally, the time constraint also prevented the author from gathering primary data from businesses and analyzing it to derive the impact of technology-assisted learning. This might prove to be a major roadblock in establishing the academic worthiness of this paper. That being said, the author has attempted to turn this study into a descriptive study so as to elucidate the efficacy of the technologies on the basis of secondary and tertiary data as well as make estimations about the impact of the technology in the future.

The scope of this study extends to all HR teams in those businesses that undertake training and development programs for their employees. Essentially, the size of the company should be large enough to justify the purchase of bespoke technological training solutions, but from a research standpoint, any organization willing to invest in digitizing their employee training and development program is eligible to be affected by this study.

References

Alaraj, A., Lemole, M.G., Finkle, J.H., Yudkowsky, R., Wallace, A., Luciano, C., Banerjee, P.P., Rizzi, S.H. and Charbel, F.T., 2011. Virtual reality training in neurosurgery: a review of current status and future applications. *Surgical Neurology International*, *2*.

Armstrong, M. B., & Landers, R. N. (2018). Gamification of employee training and development. *International Journal of Training and Development*, 22(2), pp. 162–169.

Armstrong, M.B., Landers, R.N. and Collmus, A.B., 2016. Gamifying recruitment, selection, training, and performance management: Game-thinking in human resource management. In *Emerging research and trends in gamification* (pp. 140-165). IGI Global.

Armstrong, M.B. and Landers, R.N., 2018. Gamification of employee training and development. *International Journal of Training and Development*, 22(2), pp.162-169.

Bayarri, S., Fernandez, M. and Perez, M., 1996. Virtual reality for driving simulation. *Communications of the ACM*, 39(5), pp.72-76.

Bell, B.S., Tannenbaum, S.I., Ford, J.K., Noe, R.A. and Kraiger, K., 2017. 100 years of training and development research: What we know and where we should go. *Journal of Applied Psychology*, 102(3), p.305.

Burdea, G., Patounakis, G., Popescu, V. and Weiss, R.E., 1999. Virtual reality-based training for the diagnosis of prostate cancer. *IEEE Transactions on Biomedical Engineering*, *46*(10), pp. 1253-1260.

By The Numbers: MOOCS in 2019, Class Central, 2019. Available on https://www.classcentral.com/report/mooc-stats-2019/ (Accessed 4th February 2020)

Callan, R.C., Bauer, K.N. and Landers, R.N., 2015. How to avoid the dark side of gamification: Ten business scenarios and their unintended consequences. In *Gamification in education and business* (pp. 553-568). Springer, Cham.

Chan, J.C., Leung, H., Tang, J.K. and Komura, T., 2010. A virtual reality dance training system using motion capture technology. *IEEE Transactions on Learning Technologies*, *4*(2), pp. 187-195.

Desimone, R. L. Werner, J. M., & Harris, D. M. (2002). *Human resource development. (3rd ed.)* Orlando, FL: Harcourt College Publishers

De Crescenzio, F., Fantini, M., Persiani, F., Di Stefano, L., Azzari, P., & Salti, S. (2011). Augmented Reality for Aircraft Maintenance Training and Operations Support. *IEEE Computer Graphics and Applications*, 31(1), pp. 96–101.

Deterding, S., Dixon, D., Khaled, R. and Nacke, L., 2011, September. From game design elements to gamefulness: defining gamification. *In Proceedings of the 15th International Academic MindTrek Conference: Envisioning future media environments*, pp. 9-15

ISSN 2348–0661 Print

Dodson, M. N., Kitburi, K., & Berge, Z. L. (2015). Possibilities for MOOCs in Corporate Training and Development. *Performance Improvement*, 54(10), pp. 14–21.

Gueutal, H., Stone, D.L. and Salas, E., 2005. The brave new world of eHR: Human resources management in the digital age.

HTC Vive Pro Starter Kit Product Page, Gears of Future, 2020. Available on https://www.gearsoffuture.com/products/htc-vive-pro-starter-kit?variant=31739023884363&currency=INR&gclid=CjwKCAiAyeTxBRBvEiwAuM8dnVUHa7p977BC0MhBtsObJtNPfUA5d0jk2HCIECM2-SlupJUoYxxaXxoCgCsQAvD_BwE (Accessed 4th February 2020)

Horton, W. K. (2000). *Designing Web-based Training: How to Teach Anyone Anything Anywhere Anytime*. Hoboken, NJ: Wiley

Keshner, E.A., 2004. Virtual reality and physical rehabilitation: a new toy or a new research and rehabilitation tool?

Kraiger, K., 2002. *Creating, implementing, and managing effective training and development: State-of-the-art lessons for practice*. Jossey-Bass.

Landers, R.N. and Callan, R.C., 2011. Casual social games as serious games: The psychology of gamification in undergraduate education and employee training. In *Serious games and edutainment applications* (pp. 399-423). Springer, London.

Landers, R.N., 2013. Gamification: A new approach to serious games in training. In *MA Lodato (Chair), RC Brusso (Co-Chair), & R. Wisher (Discussant), I-O's role in emerging training technologies. Symposium presented at the 28th Annual Conference of the Society for Industrial and Organizational Psychology, Houston, TX*.

Landers, R.N., 2014. Developing a theory of gamified learning: Linking serious games and gamification of learning. *Simulation & Gaming*, *45*(6), pp.752-768.

Lease, A. J., & Brown, T. A., 2009. Distance learning past, present and future. *International Journal of Instructional Media*, 36, pp. 415–426

Nadler, L. and Nadler, Z., 1989. *Developing human resources*. Jossey-Bass.

ISSN 2348–0661 Print

Nielson, B. (2014). The year of the corporate MOOC? Available on https://www.linkedin.com/today/post/article/20140320165303-16131081-2014-the-year-of-the-corporate-mooc (Accessed 4th February 2020)

Noe, R.A. and Colquitt, J.A., 2002. Planning for training impact: Principles of training effectiveness. *Creating, implementing, and managing effective training and development*, pp.53-79.

Noe, R. A., Clarke, A. D. M., & Klein, H. J., 2014. Learning in the twenty-first-century workplace. *Annual Review of Organizational Psychology and Organizational Behavior*, 1, pp. 245–275.

Pappano, L. (2012). The year of the MOOC. Available on http://www.nytimes.com/2012/11/04/education/edlife/massive-open-online-courses-are-multiplying-at-a-rapid-pace.html (Accessed 4th February 2020)

Perna, L.W., Ruby, A., Boruch, R.F., Wang, N., Scull, J., Ahmad, S. and Evans, C., 2014. Moving through MOOCs: Understanding the progression of users in massive open online courses. *Educational Researcher*, *43*(9), pp.421-432.

Rao, T.V., 2003. *Future of HRD*. Macmillan.

Rose, F.D., Brooks, B.M. and Rizzo, A.A., 2005. Virtual reality in brain damage rehabilitation. *Cyberpsychology & Behaviour*, *8*(3), pp.241-262.

Saettler, P., 1968. A history of instructional technology.

Salas, E., DeRouin, R. and Littrell, L., 2005. Research-based guidelines for designing distance learning: What we know so far. *The brave new world of eHR: Human resources management in the digital age*, pp.104-137.

Selvan, V.T., (2015), Study on the role of technology in Human Resources Management, *International Journal of Applied Research*, 1(7), [online] Available at http://www.allresearchjournal.com/archives/2015/vol1issue7/PartH/1-7-40.pdf (Accessed 31 December 2019)

Sitzmann, T. (2011), 'A meta-analytic examination of the instructional effectiveness of computer-based simulation games', *Personnel Psychology*, 64, pp. 489–528.

Society for Human Resource Management [SHRM], 2002, p. Ii

Steuer, J. (1992). Defining Virtual Reality: Dimensions Determining Telepresence. *Journal of Communication*, 42(4), pp. 73-93.

Stone, D.L. and Deadrick, D.L., 2015. Challenges and opportunities affecting the future of human resource management. *Human Resource Management Review*, *25*(2), pp.139-145.

Stone, D.L., Deadrick, D.L, Lukaszewski, K.M. and Johnson, R. (2015) The influence of technology on the future of human resource management, Elsevier Journals [online] Available at http://people.tamu.edu/~w-arthur/611/Journals/Stone%20et%20al%20%282015%29%20HRMR,%20influence%20of%20technology%20on%20the%20future%20of%20hrm.pdf (Accessed 31 December 2019)

Swanson, R. A., & Torraco, R. J. (1995). The history of technical training. In L. Kelly (Ed.), *The ASTD technical and skills training handbook* (pp. 1-47). New York, NY: McGraw-Hill.

T. Haritos and N.D. Macchiarella, (2015) "A Mobile Application of Augmented Reality for Aerospace Maintenance," *Proc. 24th Digital Avionics Systems Conference (DASC 05)*, 1, IEEE Press, pp. 5.B.3-1–5.B.3-9 [online] available at http://doi.ieeecomputersociety.org/10.1109/DASC.2005.1563376

Training Mag, 2018. Training Industry Report for the Year 2018, [online] Available at https://trainingmag.com/trgmag-article/2018-training-industry-report/

Universities UK. (2013). Massive open online courses: Higher education's digital moment? London, UK: Author. Retrieved from http://www.universitiesuk.ac.uk

Welsh, E. T., Wanberg, C. R., Brown, E. G., & Simmering, M. J. (2003). E-learning: Emerging uses, empirical results and future direction. *International Journal of Training and Development*, 7, pp. 245–258

Yang, Y.R., Tsai, M.P., Chuang, T.Y., Sung, W.H. and Wang, R.Y., 2008. Virtual reality-based training improves community ambulation in individuals with stroke: a randomized controlled trial. *Gait & Posture*, 28(2), pp.201-206.

https://www.talentlms.com/blog/gamification-survey-results