Literature Review

## Lifelong learning

### Motivation

Education, along the development of our society, has been changed to adapt with individuals and social requirements. The direction of these changes is suggested to be lifelong in the Memorandum on Lifelong Learning published in 2000 by the Commission of The European Communities (Commission of The European Communities 2000). Lifelong policy has been discussed in various research as the heart of education since the beginning of the 21st century.

The motivations behind the needs of transformation in learning and teaching have been suggested by multiple authors to be the progress of globalization and the fast-changing in knowledge economy (Commission of The European Communities 2000; Glastra, Hake & Schedler 2004; Grace 2005; Jarvis 2004; Laal 2011; Mwaikokesya, Osborne & Houston 2014). As every aspect of the world is becoming globalized, competitiveness and demands are increasing at a phenomenal speed causing both organizations and individuals to have no choice but being adaptive to ever-changing circumstances by continuous learning and upskilling (Glastra, Hake & Schedler 2004; Mwaikokesya, Osborne & Houston 2014). Besides, a variety of more specific reasons, which, to some extent, are parts of the globalization progress, have also been mentioned by others in their research. McCombs, in her research in 1991, considered that market needs of highly skilled employees and short jobs restructuration time in 21st century would necessitate continuous learning and retraining (McCombs 1991). In 2010, Blewitt has recognized the needs of lifelong education for the Library of Birmingham project when the downrate in citizens’ skills and the economic figures were witnessed (Blewitt & Gambles 2010). More recently, while (Hanemann 2015) mentioned illiteracy as a problem needs to be solved by lifelong education; (English & Mayo 2019; Schuetze 2014) have taken under-represented people, who are “for example indigenous groups, immigrants with language barriers, people with a disability, and those from remote or rural areas”, into account when proposed lifelong learning as a solution. They have elaborated the needs of social cohesion built through education, which were proposed by multiple international lifelong learning discourses. The idea was to create opportunities for those people who are usually excluded from the labour market, especially migrants, to be facilitated to get the job they deserve regardless their prior learning or working environment.

### Concept

Despite of the wide use and reference in multiple discourses, the definition of the term lifelong learning still remains unclear. The meaning of the terms such as ‘vocational education’, ‘technical education’ and nurse education’ are, to some extents, clarified, while the more generic term of ‘lifelong learning’ and other interchangeable alternatives – ‘education permanente’, ‘further education’, ‘continuing education’, are not as clear (Aspin & Chapman 2007). Besides, according to (Stock 1979) cited in (Aspin & Chapman 2007), lifelong education are implicitly those educational offerings after the completion of formal education which are usually referred to as ‘adult education’, ‘career education’ or ‘recurrent education’. Different perspectives of lifelong learning are discussed based on its transformation throughout the history affected by relevant situations of world (Grace 2005) and on diverse points of view of writers (Mwaikokesya, Osborne & Houston 2014). (Grace 2005) has discussed in detail about the changes in conceptualizing lifelong learning since its first proposal in 1919 during the first World War, to its further perceptions which are results of different forces including information technology revolution (1970s), globalisation and corporatism (1980s), and privatisation and government absconding (1990s). While (Mwaikokesya, Osborne & Houston 2014) have elaborated on lifelong learning’s diverse definitions by providing different perspectives from a variety of writers. One of the commonest ways to define lifelong learning is to look at it as a combination of formal, non-formal and informal education (according to Coombs & Ahmed, 1974; La Belle, 1981; Tuijnman & Boström, 2002 cited in Mwaikokesya, Osborne & Houston 2014), and simultaneously, take ‘life-wide’ and ‘life deep’ perspectives into consideration. The complexity in defining lifelong learning has been proposed to be originated from its multi-dimensional nature of the concept itself as claimed by Doukas (2010) and Field (2006) in (Mwaikokesya, Osborne & Houston 2014).

However, there are some notable definitions which are offered by thoroughly accumulation of literatures. For instance, (Laal 2011)’s definition of lifelong learning suggests learning ought to be carried out throughout different stages in life and, should be from all sources including school, workplace, home and community (life-wide). Furthermore, the author also considers lifelong learning not only as “the continuous building of skills and knowledge during one’s life, that occurs through experiences faced lifetime”, but also as the way to provide learners with further opportunities to upgrade skills and acquire advanced learning (Laal 2011). Besides, Jarvis (2017) in his book defines lifelong learning in the “new social movement” as follow:

*“The private, existential definition of lifelong learning is about the process of transforming experience into knowledge and skilIs, etc. and resulting in a changed person, one who has grown and developed as a result of the learning.” (Jarvis 2007)*

As mentioned above, although the concept of lifelong learning still remains somewhat vague, its influences on learning and teaching are notable. It has been appearing in multiple international discourses regarding educational directions for nations and international organizations, and being mentioned as the principle to be adopted in teaching and learning (Schuetze & Slowey 2000).

### Objectives of lifelong learning

As lifelong learning’s concept embraces multiple social dimensions (Mwaikokesya, Osborne & Houston 2014), its objectives are also linked with wide range of social developments. While social inclusion and cohesion are discussed to be the latest aims of lifelong learning, proposed by multiple policy documents published by UNESCO, OECD and other organizations, in the early 2000s (Grace 2005; Jarvis 2004; Schuetze & Slowey 2000); further recent researches suggest that lifelong learning focused on providing personal fulfilment and development opportunities for learners (Aspin & Chapman 2007; Laal 2011). Nevertheless, those aims envisage the same objectives of preparing all types of learners, regardless their classifications of traditional, non-tradition or under-represented, to become active citizens and employable in the fast-changing world and demanding labour market (Aspin & Chapman 2007; Grace 2005; Jarvis 2004; Laal 2011; Schuetze & Slowey 2000). By providing learners with opportunities to be retrained, update their skills and knowledge via continuous development, the vision of lifelong learning supports the idea of building bridges between different components, actors, institutions, processes, learning spaces (life spheres) and moments (life phases) to develop holistically designed learning systems (Hanemann 2015).

### Learning and teaching methods supporting lifelong education

#### Learning

Numbers of motivations have led to different trends in teaching and learning in order for individuals and organizations to cope with the increasing demands. Various new ways of learning have been proposed to be either emerging or replacing traditional classroom-based learning, including e-learning, distance learning and self-directed learning (Blaschke 2012; Laal 2011; Schuetze & Slowey 2000; Schuetze 2014; Zhang & Nunamaker 2003), which, to some degree, can be relates to lifelong learning. Laal (2011) suggests that learners have to be active to acquire new knowledge and skills to upgrade themselves using lifelong learning facilities (Laal 2011). Furthermore, according to the author, knowledge can be conveyed collaboratively instead of being distributed by specialists, managers or teachers in relevant organizations. As cited in (Laal 2011), Fischer and Ostwald (2000) claim that lifelong learners can also be required to share their knowledge to build the learning facilities, not only consume knowledge in there. In addition, learners are able to get access to wider range of distance learning and e-learning programmes (Schuetze 2014; Zhang & Nunamaker 2003) which allows them to learn self-directedly with enhanced flexibility. Blaschke (2012) also discussed about heutagogical learning approach (self-determined learning); it is a comprehensive approach in which learning is proactive and learners determine what to learn and how to learn it by themselves based on their experiences. The author also discussed the link between heutagogical learning approach and distance learning method in which the latter is considered to support self-determined learning and teaching; furthermore, by applying heutagogy, students are better prepared for their career and becoming lifelong learners, also motivated in their learning as they can study what is the most relevant and interesting to them (Blaschke 2012).

#### Teaching/ Educational provision

Educational system, as a result, needs to be redesigned to become learner-centric, open to various kinds of learner, flexible to participate, and thus, lifelong oriented (Laal 2011; McCombs 1991; Mwaikokesya, Osborne & Houston 2014; Schuetze & Slowey 2000; Zhang & Nunamaker 2003), so that courses can fulfil the needs of lifelong learners. (Schuetze & Slowey 2000) also emphasizes the significant influence of flexibility offered by an educational system on lifelong learning; the authors claimed that flexibility in entry routes, study modes, credits accumulation over place and time, financial support, and linkages and pathways connecting various sectors of education and training.

### Difficulties in implementing lifelong learning

Difficulties in putting lifelong learning in practice has been recognized and discussed for years. Despite there have been some changes to adopt lifelong learners, but, in general, the demands for more open, flexible and equitable system are yet to be fulfilled (Schuetze & Slowey 2000). Schuetze and Slowey also claim that this problem is caused by a couple of factors. Firstly, complicated transformations and cooperation involving different systems including education, workplace and social organizations are required; this idea is also supported by (Bennett & Ryley 2007). Secondly, it is a variety of concepts about lifelong learning which has been hindering policy makers to build a holistic framework for a lifelong learning education system.

#### Prior learning recognition

Moreover, it has been said to be essential to have a prior learning recognition scheme to facilitate lifelong learners to acquire from different types of higher education providers (Bennett & Ryley 2007; Commission of The European Communities 2000; English & Mayo 2019; Schuetze 2014), especially when the diversification of higher education institutions is quite wide (Schuetze 2014). Prior learning recognition is claimed to foster lifelong learners to be able to accumulate qualifications from various higher education providers regardless the qualification types and institution types, which implies more flexibility and control over their own study and development (Bennett & Ryley 2007; Schuetze 2014), as well as equal opportunities of access to lifelong education for different types of learners(English & Mayo 2019; Jarvis 2007; Schuetze & Slowey 2000). In short, prior learning recognition aims to have lifelong learning accepted and implemented as part of contemporary world (Commission of The European Communities 2000). In fact, the targets of having ‘decentralised certification procedures’ and ‘a transparent recognition of qualifications scheme’ have been set for European Union in 2000 (European Parliarment 2000). Since then, or even before that, various schemes and procedures were introduced and implemented such as Accreditation of Prior Experiential Learning (APEL), European Credits Transfer System (ECTS), however, they are all considered to be either not clear enough in study descriptions or slow in processing time which hinder learners to apply for recognition of their prior learning (Bennett & Ryley 2007; English & Mayo 2019).

## Digital badge

### Motivation of digital badge in education

According to (Cambridge Dictionary), certificate is “the qualification that you receive when you are successful in an exam”. Evaluation is claimed to be an essential aspect in learning processes (Yildirim et al. 2016); it is used to show what knowledge and/or skills learners have acquired from their learning, help them realize their inadequacies and make improvements. Conventionally, certificate or diploma is awarded to learners as a document describing their capability after they successfully complete the learning (Yildirim et al. 2016). However, there have been multiple driving forces that demand for the new way of certificating qualifications.

According to (Yildirim et al. 2016), classic certificates are not good enough in presenting information about learners’ knowledge and skills, and standard test and letter grades are not as effective as using digital badges in showing learners proficiency. In (Lockley, Derryberry & West 2016), it is thought to have digital badges to facilitate the process of credentialing of lifelong learning and satisfy the need for personalized learning approaches. Moreover, both (Lewis & Lodge 2016) and (Yildirim et al. 2016) suggest that the process of verifying one’s capabilities for a job can be fostered by the use of digital badge thanks to its more sharable and transparent feature comparing to the classic certificate. (Mah 2016) also identifies the limit of traditional degree in certifying generic skills in education that it is not able to validate the relevance of those generic skills in different levels of education, and thus, recommended digital badges as the promising alternative.

### Concept of digital badge based on badge

The concept of badge has been there for a long time. It has been primarily used in the military as the symbol of soldiers’ competence and achievements (Yildirim et al. 2016), or bravery and good conduct (Delello et al. 2018). In addition, there are various badge’s practices are utilized in other fields such as sport, industry, business, entertainment, group programs and especially education, “which has been one of the primary users of symbols and badging” (Ellis, Nunn & Avella 2016). Moreover, it has been said in (Lockley, Derryberry & West 2016) that digital badge, which was first introduced in 2010 by Mozilla (Ellis, Nunn & Avella 2016), has been promisingly expected to make crucial impacts on the whole field of education.

(MacArthur Foundation 2017) defined digital badge as an online credentialing system; badges’ design facilitates validation of learning in multiple settings including informal and formal and promisingly changes the way learning is credited. A digital badge is a credit but also a symbolic visualization of people’s credentials (Otto & Hickey 2014), which could symbolize a certification, a credential, a competency or a soft skill (Janzow 2014). The same idea was supported by (Ford et al. 2015). As cited in (Delello et al. 2018), Delello and McWhorter (2015) claimed that “a digital badge is comprised of micro-credentials including the purpose of the badge, the date the badge was awarded, who issued the badge, and who earned the badge”. According to (Mozilla 2016), digital badges are “verifiable, stackable, and portable” for online sharing via social media. (Finkelstein, Knight & Manning 2013) considered badges as the new mechanism to recognize and showcase ones’ knowledge and competence. Or it just a way to indicate the completion of an objective (Ellis, Nunn & Avella 2016). Additionally, using digital badges may motivate the race between earners (Schenke, Tran & Hickey. 2013).

### Learning theories behind certificate

#### Self-regulated

Knowles (1975), cited in (Blaschke 2012), defined self-regulated (or self-directed learning) as “a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes.” According to (Wills & Xie 2016), it is a “strong predictor of success across disciplines, academic groups, and contexts.” The method may be further enhanced by achievable goals and constructive feedback from educators. In a curriculum with digital badges, students usually customize and perform their ownership and responsibility over their own learning. As digital badge’s features facilitate personalization of learning objectives and learners’ self-determination, it is considered to foster self-regulated learning.

#### Self-efficacy

Self-efficacy is defined as the behaviour of setting goals based on learners’ perception of their own knowledge and skills (Wills & Xie 2016). It helps learners aware of their capabilities by comparing their work against standard (Wills & Xie 2016). Self-efficacy is thought to be enhanced by digital badges by offering evidence of their performances against which they can evaluate their current competence and providing a motivational system to encourage continual progress (Wills & Xie 2016).

#### Gamification

(Department of Education 2014) described gamification in education as using game-like elements in learning to improve student engagement. The document also suggested an effective game usually includes a sequence of goals and progressions, rules, story elements, high interactivity, and constant feedback with reward. Some social elements, such as teamwork and communication may also be integrated (Department of Education 2014). In (Mah 2016)’s discussion of gamification theory under digital badge, it was said that digital badges may motivate leaners to be on top of their studies and skills, so that encourage them to improve their competence or find out a new learning paths. The same feature of gamification in education was mentioned in the Australia Curriculum (Department of Education 2014). It is also supported by (Wills & Xie 2016) who also claimed that game design represent many crucial standards for self-regulated learning.

#### Expectancy

Expectancy theory is formed based on elements of behavioural psychology related to incentives and rewards. According to (Delello et al. 2018), Expectancy theory consists of “three main components. 1) Expectancy: One believes their effort will result in meeting a goal; 2) Instrumentality: Meeting the goal will result in a reward; and 3) Valence: The value of the reward is attractive to the individual.” This model suggests that human motivation is effected by an outcome and the interest one has in it (Delello et al. 2018). An example in academic was given by Hancock 1995 in (Delello et al. 2018) that an assignment is given to the student, then the reward of it will be evaluated by the student whether it is worth putting their effort to solve the assignment.

### Benefits of digital badge

As a result, digital badge has manifold benefits to offer. According to (Yildirim et al. 2016), it improves student’s success in the course as it attracts students to acquire these badges, so their achievement levels increase; digital badge motivates learners to earn more as they feel successful and rewarded; digital badge is the showcase of academic achievement, because it is the reward of ones who accomplished particular learning objectives; it effects study habits, because in order to earn badges, students need to adjust various things in their lives and reconstruct their study habits; digital badges are thought to share same properties as diplomas, certificates and achievement letters, which means they can be used instead of traditional competency qualifications. Apart from that, (Lockley, Derryberry & West 2016) also claimed that digital badge enables flexibility in learning and teaching, as well as facilitate non-formal learning credentials. Moreover, the utilization of digital badges also provides transparent and information-rich outcomes when learners finish their learning thanks to the digital badge’s ability of holding various information; as digital badges are stackable, they may disrupt education positively, “making learning achievements more accessible” (Lockley, Derryberry & West 2016); digital badge is considered to foster prior learning and experiences recognition process, thus, facilitate different types of learners to get access to higher education (Lockley, Derryberry & West 2016). All three researches (Delello et al. 2018), (Lockley, Derryberry & West 2016) and (Yildirim et al. 2016) mentioned that digital badge makes learners more employable by either being used as applicant’s qualifications of competence or as additional references to applicant’s resume, so that applicants can show everything they have to their desire employer. (Ellis, Nunn & Avella 2016) elaborated on this idea that organizations consider the particular value and meaning of the users’ badge (for example, a qualified technician), and based on that, they can easily choose suitable employees to fit the missing roles (for example, a technician).

### Limitations of digital badge

While digital badge has some educational limitations which were identified by multiple researches (Delello et al. 2018), there are also some difficulties in implement a comprehensive and trustworthy digital badge system. Adopting digital badges has to face a variety of challenges which were discussed in (Lockley, Derryberry & West 2016). Firstly, it requires major restructures in terms of institutional approaches, strategies and culture. Secondly, digital badges are considered as an instrumental element competency-based framework, the process of putting those together is, however, cumbersome. Thirdly, the adoption digital badges may imply the requirement of changes in assessment methods which is, in its nature, a major undertaking. Fourthly, the currency of digital badges demands wide acceptance across higher education providers and firm validity in earning and owning them. And, fifthly, to provide valid and secure badges, institutions face the challenge of building an infrastructure to enable the deployment within the curriculum. This was considered as the key problem, solving it would lead to digital badges being accepted by employer (Lockley, Derryberry & West 2016).

## Blockchain in education

Blockchain is an emerging distributed ledger technology which was introduced in 2008 and become a promising technology that will make noticeable impact to the world (Panetta 2016). It has been researched in various sectors, even some of the blockchain-based applications (BBAs) have started making the differences (Zou et al. 2020). However, the application of blockchain in education is still in the inception, yet the number of researches on this topic has been dramatically increasing in the recent years (Zou et al. 2020), (Alammary et al. 2019), (Malibari 2020). Various researches have been conducted to study about integrating blockchain into education field, suggesting variety of enhancements which could be brought to the current systems (Alammary et al. 2019), (Malibari 2020). According to (Alammary et al. 2019) and (Malibari 2020), majority of them discuss about certificate management and learning outcomes management (Badr et al. 2019; Curmi & Inguanez 2019; Daraghmi, Daraghmi & Yuan 2019; Jirgensons & Kapenieks 2018; Kanan, Obaidat & Al-Lahham 2019; Rachmat & Albarda 2019; Rasool et al. 2020; Shrivastava et al. 2019; Turkanovic et al. 2018), some discuss about evaluating learners’ capability (Deenmahomed, Didier & Sungkur 2021; Zhao, Liu & Ma 2019), some suggest securing collaborative learning environment (Ocheja, Flanagan & Ogata 2018; Ocheja et al. 2019; Worthington 2019), and numbers of other problems in education sector (Mohan 2019; Srivastava et al. 2018). Most of those research papers suggest using public blockchain or public blockchain-based system, such as Bitcoin, Ethereum and Blockcerts (Ethereum and Bitcoin based), while a limited number of papers proposed private blockchain as the solution.

References:

Alammary, A, Alhazmi, S, Almasri, M & Gillani, S 2019, 'Blockchain-Based Applications in Education: A Systematic Review', vol. 9, no. 12, p. 2400.

Aspin, DN & Chapman, JD 2007, 'Lifelong Learning: Concepts and Conceptions', in DN Aspin (ed.), *Philosophical Perspectives on Lifelong Learning*, Springer Netherlands, Dordrecht, pp. 19-38.

Badr, A, Rafferty, L, Mahmoud, QH, Elgazzar, K & Hung, PCK 2019, 'A Permissioned Blockchain-Based System for Verification of Academic Records', in *2019 10th IFIP International Conference on New Technologies, Mobility and Security (NTMS)*, pp. 1-5.

Bennett, S & Ryley, P 2007, 'The Bologna Process and Lifelong Learning: Complexity and Flexibility as Watchwords for Change', *Journal of Adult and Continuing Education*, vol. 13, no. 2, pp. 213-30.

Blaschke, LM 2012, 'Heutagogy and lifelong learning: A review of heutagogical practice and self-determined learning', *The International Review of Research in Open and Distributed Learning*, vol. 13, no. 1, pp. 56-71.

Blewitt, J & Gambles, B 2010, 'The Library of Birmingham Project: Lifelong Learning for the Digital Age', *Journal of Adult and Continuing Education*, vol. 16, no. 2, pp. 52-66.

Cambridge Dictionary *Definition of 'Certificate'*, Cambridge University Press.

Commission of The European Communities 2000, *A Memorandum on Lifelong Learning*.

Curmi, A & Inguanez, F 2019, 'BlockChain Based Certificate Verification Platform', in Cham, pp. 211-6.

Daraghmi, Daraghmi & Yuan 2019, 'UniChain: A Design of Blockchain-Based System for Electronic Academic Records Access and Permissions Management', *Applied Sciences*, vol. 9, no. 22.

Deenmahomed, HAM, Didier, MM & Sungkur, RK 2021, 'The future of university education: Examination, transcript, and certificate system using blockchain', *Computer Applications in Engineering Education*.

Delello, J, Hawley, H, McWhorter, R, Gipson, C & Deal, B 2018, 'Gamifying Education: Motivation and the Implementation of Digital Badges for Use in Higher Education', *International Journal of Web-Based Learning and Teaching Technologies*, vol. 13.

Do Education 2014, *The final report of the Review of the Australian Curriculum*, by Department of Education.

Ellis, L, Nunn, S & Avella, J 2016, 'Digital Badges and Micro-credentials: Historical Overview, Motivational Aspects, Issues, and Challenges', in pp. 3-21.

English, LM & Mayo, P 2019, 'Lifelong learning challenges: Responding to migration and the Sustainable Development Goals', *International Review of Education*, vol. 65, no. 2, pp. 213-31.

2000, *Lisbon European Council Conclusions*, by European Parliarment.

LLIaC System) 2013, *The potential and value of using digital badges for adult learners (American Institutes for Research Draft Report for Public Comment)*, by Finkelstein, J, Knight, E & Manning, S.

Ford, E, Izumi, B, Lottes, J & Richardson, D 2015, 'Badge it!: A collaborative learning outcomes based approach to integrating information literacy badges within disciplinary curriculum', *Reference Services Review*, vol. 43 no. 1.

Glastra, FJ, Hake, BJ & Schedler, PE 2004, 'Lifelong Learning as Transitional Learning', *Adult Education Quarterly*, vol. 54, no. 4, pp. 291-307.

Grace, AP 2005, 'Lifelong Learning Chic in the Modern Practice of Adult Education: Historical and Contemporary Perspectives', *Journal of Adult and Continuing Education*, vol. 11, no. 1, pp. 62-79.

Hanemann, U 2015, 'Lifelong literacy: Some trends and issues in conceptualising and operationalising literacy from a lifelong learning perspective', *International Review of Education*, vol. 61.

Janzow, P 2014, 'Connecting learning to jobs through digital badges', *The Catalyst*, vol. 42, no. 2, pp. 9-11.

Jarvis, P 2004, 'Lifelong Learning and Active Citizenship in a Global Society: An Analysis of European Union Lifelong Learning Policy', *Journal of Adult and Continuing Education*, vol. 10, no. 1, pp. 3-18.

Jarvis, P 2007, *Globalization, Lifelong Learning and the Learning Society: Sociological Perspectives*, Routledge, London, DOI <https://doi.org/10.4324/9780203964408>.

Jirgensons, M & Kapenieks, J 2018, 'Blockchain and the Future of Digital Learning Credential Assessment and Management', *Journal of Teacher Education for Sustainability*, vol. 20, no. 1, pp. 145-56.

Kanan, T, Obaidat, AT & Al-Lahham, M 2019, 'SmartCert BlockChain Imperative for Educational Certificates', in *2019 IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology (JEEIT)*, pp. 629-33.

Laal, M 2011, 'Lifelong Learning: What does it Mean?', *Procedia - Social and Behavioral Sciences*, vol. 28, pp. 470-4.

Lewis, M & Lodge, J 2016, 'Keep Calm and Credential on: Linking Learning, Life and Work Practices in a Complex World', in pp. 41-54.

Lockley, A, Derryberry, A & West, D 2016, 'Drivers, Affordances and Challenges of Digital Badges', in pp. 55-70.

MacArthur Foundation 2017, 'Digital badges'.

Mah, D-K 2016, 'Learning Analytics and Digital Badges: Potential Impact on Student Retention in Higher Education', *Technology, Knowledge and Learning*, vol. 21, no. 3, pp. 285-305.

Malibari, NA 2020, 'A Survey on Blockchain-based Applications in Education', in *2020 7th International Conference on Computing for Sustainable Global Development (INDIACom)*, pp. 266-70.

McCombs, B 1991, 'Motivation and Lifelong Learning', *Educational Psychologist*, vol. 26, pp. 117-27.

Mohan, V 2019, 'On the use of blockchain-based mechanisms to tackle academic misconduct', *Research Policy*, vol. 48, no. 9.

Mozilla 2016, *What are open badges?*, <<https://openbadges.org/get-started/>>.

Mwaikokesya, MJD, Osborne, M & Houston, M 2014, 'Mapping Lifelong Learning Attributes in the Context of Higher Education Institutions', *Journal of Adult and Continuing Education*, vol. 20, no. 2, pp. 21-36.

Ocheja, P, Flanagan, B & Ogata, H 2018, 'Connecting decentralized learning records', paper presented to Proceedings of the 8th International Conference on Learning Analytics and Knowledge.

Ocheja, P, Flanagan, B, Ueda, H & Ogata, H 2019, 'Managing lifelong learning records through blockchain', *Research and Practice in Technology Enhanced Learning*, vol. 14, no. 1.

Otto, N & Hickey, D 2014, 'Design principles for digital badge systems. Comparative methods for uncovering lessons in ecosystem design', paper presented to 1st International Workshop on Open Badges in Education, Tallinn, Estonia.

Panetta, K 2016, *3 trends appear in the Gartner Hype Cycle for Emerging Technologies*, Gartner, <<https://www.gartner.com/smarterwithgartner/3-trends-appear-in-the-gartner-hype-cycle-for-emerging-technologies-2016>>.

Rachmat, A & Albarda 2019, 'Design of Distributed Academic-record System Based on Blockchain', in *Proceeding - 2019 International Conference on ICT for Smart Society: Innovation and Transformation Toward Smart Region, ICISS 2019*.

Rasool, S, Saleem, A, Iqbal, M, Dagiuklas, T, Mumtaz, S & Qayyum, Zu 2020, 'Docschain: Blockchain-Based IoT Solution for Verification of Degree Documents', *IEEE Transactions on Computational Social Systems*, vol. 7, no. 3, pp. 827-37.

Schenke, K, Tran, C & Hickey. 2013, 'Design principles for motivating learning with digital badges', paper presented to HASTAC.

Schuetze, H & Slowey, M 2000, *Higher Education and Lifelong Learners: International Perspectives on Change*.

Schuetze, HG 2014, 'From Adults to Non-Traditional Students to Lifelong Learners in Higher Education: Changing Contexts and Perspectives', *Journal of Adult and Continuing Education*, vol. 20, no. 2, pp. 37-55.

Shrivastava, AK, Vashistth, C, Rajak, A & Tripathi, AK 2019, 'A Decentralized Way to Store and Authenticate Educational Documents on Private Blockchain', in *2019 International Conference on Issues and Challenges in Intelligent Computing Techniques (ICICT)*, vol. 1, pp. 1-6.

Srivastava, A, Bhattacharya, P, Singh, A, Mathur, A, Prakash, O & Pradhan, R 2018, 'A Distributed Credit Transfer Educational Framework based on Blockchain', in *2018 Second International Conference on Advances in Computing, Control and Communication Technology (IAC3T)*, pp. 54-9.

Turkanovic, M, Holbl, M, Kosic, K, Hericko, M & Kamisalic, A 2018, 'EduCTX: A Blockchain-Based Higher Education Credit Platform', *IEEE Access*, vol. 6, pp. 5112-27.

Wills, C & Xie, Y 2016, 'Toward a Comprehensive Theoretical Framework for Designing Digital Badges', in pp. 261-72.

Worthington, T 2019, 'Blended Learning for the Indo-Pacific', in *Proceedings of 2018 IEEE International Conference on Teaching, Assessment, and Learning for Engineering, TALE 2018*, pp. 861-5.

Yildirim, S, Kaban, A, Yıldırım, G & Çelik, E 2016, 'The effect of digital badges specialization level of the subject on the achievement, satisfaction and motivation levels of the students', vol. 15, pp. 169-82.

Zhang, D & Nunamaker, JF 2003, 'Powering E-Learning In the New Millennium: An Overview of E-Learning and Enabling Technology', *Information Systems Frontiers*, vol. 5, no. 2, pp. 207-18.

Zhao, W, Liu, K & Ma, K 2019, 'Design of Student Capability Evaluation System Merging Blockchain Technology', *Journal of Physics: Conference Series*, vol. 1168.

Zou, Y, Meng, T, Zhang, P, Zhang, W & Li, H 2020, 'Focus on Blockchain: A Comprehensive Survey on Academic and Application', *IEEE Access*, vol. 8, pp. 187182-201.