The Open Innovation Strategies towards Learning Effectiveness in Education Industry: with Special Reference to Sri Lanka

D.M.I.A. Gunarathne
International College of Business and Technology

ABSTRACT
Digital transformation is a significant disruptor in education industry. Growing concerns arise in terms of adoption of technology by education industry due to disruption. The current study is focused to assess the adoption of open innovation strategies to learning effectiveness in education industry with special reference to Sri Lanka. The study consisted of 115 respondents studying in various disciplines in a range of programs such as Diploma, HND, Degree and Postgraduate programs. The participation in the experiment by the each unit was voluntary and no monetary reward was offered for taking part. The learning effectiveness was measured using portfolio - dossier profile developed by O'Neil and Wright. The empirical evidence support the hypothesis indicating a positive correlation to exist. The study reveals that the Sri Lankan education industry institutions should make use of open innovation strategies in for effectives in learning performance of students. The results of the study offer implications for industry players to rethink about their educational offerings and to consider the way in which the entire business model is organized. Thus, the players in the industry must incorporate a curriculum that facilitate active learning strategies to use by learners. Further, the institution should make use of new technology, facilitate the ability of a learner to set the learning pace and make the learner understand the outcomes of learning at the beginning of his or her learning for improved learning effectiveness.

Key words: open innovation, education strategies, Sri Lanka, learning effectiveness

INTRODUCTION
Technology drive innovations within organizations, challenging the silo mentality and the privacy of traditional operations. Known as open innovations, the concept is aged back to 1960s, yet became famous in 2003, with the work done by Henry Chesbrough, a professor of the Haas School of Business at the University of California with his book named "Open Innovation: The new imperative for creating and profiting from technology". Open innovation is a distributed innovation process that is aligned with the ecosystem theory (Chesbrough and Bogers, 2014). Open innovation ecosystems have been widely researched in many industries recently ranging from software, food, telecom, education, open offices, open banking and smart cities. Among others, in education industry, open learning environment (OLE) field appears to have been evolving (Wong, Zeng, & Ho, 2016).

Theoretically, open learning involves "….processes wherein the intents and purposes of the individuals are uniquely established and pursued"; ** OLEs…support the individual's efforts to understand that which he or she determines to be important" (Hannafin, Hall, Land and Hill, 1994) as cited in (Hannafin, Land, & Oliver, 1999). In other words, open-endedness refers to the learning objectives and the means through which the learning objectives are achieved. Accordingly, learning objectives can be 1). externally specified 2). externally induced or 3). generated uniquely to each learner individually. However, the way in which they are framed can vary considerably. The individual determines how to proceed based on her or her unique needs, perceptions and experiences, distinguishes known from unknown, identify resources available to support learning efforts, and formalizes and tests personal beliefs.

Education literacy in Sri Lanka is one of the highest in the region ever since we gained the Independence. The Sri Lankan education is primarily been funded by the central government. In year 2018, the 2.1% (Business Wire, 2018) was allocated in 2015. Sri Lanka has recorded 98.77 percent (D'Souza & Moore, 2017) of literary, which is one of the highest among many other Asian countries despite 27 years of civil war in the country. For instance, enrollment to the primary and secondary school were on the highest in the region. Among the nations in Asia, only Sri Lanka and Maldives has been able to achieve high human development index in the region as per the United Nations. The government mission for education industry in Sri Lanka is "to become the regional educational hub by opening up for the overseas investors and attracting the global universities". According to the Government sources, Sri Lanka has a strategic vision to attract 50000 (Ministry of Higher Education, 2018) foreign students and 10 international Universities.

Digital transformation is a significant disruptor in education industry. However, persistence issues in the current education system does not allow much room for such improvements. There World Bank imposed some conditions in funding this project until Sri Lanka address the weakness in the current system such as recurrent strikes, insufficient information on quality, and a limited reputation for academic research. At policy level, the government should agree the condition to promote the country among the international students. The current level of technology adoption is limited to the creation of digital presentation using the multimedia technology and usage of online open resources. Sri Lankan education industry will feel pressure largely by global and regional players soon, with the disruption due to system challenges. Therefore, the Sri Lankan education institutions must have a broader focus in developing their digital transformation strategy. Disruption must be viewed as an opportunity than a threat, due to high literacy rate prevalent in the country to change the landscape of the industry. Sri Lanka is viewed as favorable destination among foreign students due to its limited restrictions in visa processing, availability of affordable accommodation for foreign student and the benefit of currency exchange rate benefit.

However, there is an imbalance in the research conducted on OLE in the past globally, due to its high focus on micro-level research for a decade, covering only three areas i. e 1). distance education systems and theories, 2). management, organization, and technology and 3). teaching and learning in distance education (Wong, Zeng, & Ho, 2016). This has been evidenced in the previous research findings in 2005 as well (Bozkurt, et al., 2015). Secondly, the majority of macro-level researchers used cross-border collaboration, the meso-level and micro-level appeared to have come within the border with greater emphasis on empirical, especially quantitative research work. These three findings jointly uncover a trend that more research effort has been devoted to studying the emerging, innovative ways of learning, such as of massive open online courses (MOOC), in which students were from various levels, communication was made online, and traditional face-to-face interactions between students and instructors were absent.

As stated above, technology advancement is significant, and adoption is inevitable to any organization to stay competitive. In education industry, research on open learning strategies and institutions are few and there are significant areas that require theoretical and empirical explanations. The previous research discussed above has discussed the effectiveness of education experience in open learning environment in micro, macro and meso level. However, there have been limited studies on the macro level studies, while even the limited studies have not focused open learning strategies and the institutions. Hence, this opens up the discussion on effectiveness of open learning strategies adopted by an institution.

THEORETICAL BACKGROUND AND THE LITERATURE REVIEW
The digital learning environment
The digital learning environment consists of three types namely, virtual learning environment (VLE) given by the educator, personal learning environment (PLE) the tools or the techniques available to the student to manage his or her own learning and the social networking sites (SNS) that facilitate the networking, connections and interaction with other peers (Henry, Marco, & Rob, 2013). This study is based on the UML class diagram developed based on learning networks by Koper (2009). The model is based on four key principles.

- a person learns by (inter)action in/within the external world;
- the real world can be considered to be composed of social and personal institutions, which provide the context for (inter)actions (activities);
- a context is a container for a collection of things, human beings, and tools in a specific relationship; and
- Learning can be considered as a change in behavior or the capacity to behave in a given fashion (Schunk, 2012).

Above points have been studied by several other researches who conducted research on OLE environments and have confirmed that the construction of technology and platform is the foundation; the development of seamless learning requires close integration and integration with related technologies (Xin, Zuo, & Huang, 2018). Seamless learning is defined as an intelligent learning state, which is based on the integration of information technology means and equipment, physics learning environment and digital learning resources. There are commonalities in the open learning environments and the seamless learning environments as such based on the definitions as both addresses the digitally enabled learning environment with the ability to integrate the learning experience. Hence, the researcher reasonably assumes that the concepts covered under seamless learning and the open learning environments are much similar and that they can be used interchangeably.

Open Learning Effectiveness
The evidence on digitally enabled education was primarily drawn on technology acceptance model by the researchers, and they identified that seamless integration, seamless switching between platforms, sharing of resources and data synchronization between learning process and behavior as important aspects of integration. However, the significant effort required to develop the pre-lecture independent learning materials and the provision of spontaneous feedback remain as a drawback to implementation of digital enablers (Chew, Jones, & Wordley, 2018). Additionally, according to (Hautz, 2018) the network size, how individuals are connected and the strength of ties between participants can significantly influence outcomes. Several other researchers also identified the limitations of integration in terms of managing costs, problems associated with initiation of innovation, low enthusiasm shown by the teachers as main drawbacks in the process of integration (Xin, Zuo, & Huang, 2018). Hence, they argued that the external influences by the government in order to adopt a competitive approach to select social capital with investment and operational management capabilities could mediate the effect.

Two folds of expectation exists in technology acceptance in higher education by the stakeholders as students in higher education have high expectations that educators will integrate this technology to assist them in learning, while many educators are reluctant to integrate educational technology in teaching and ban mobile devices from their classes (Hiew & Chew, 2016). Thus, it is critical for HEIs to understand their own institutional goals and address these seams strategically to support their transformation into technologically astute

institutions. In social capital theory, there is a good argument to this saying that the social relations can lead to motivation and that motivation is linked to the goals and objectives. In addition, there are newer technologies in which learners can visualize their personal learning progress and design learning plans for themselves making learning omnipresent and highly contextual for all learners (Kinshuk & Kumar, 2018).

Other research conducted on digital education environment has identified that, whether the delivery done on wholly online or blended are important for undergraduate students for lifelong learning in an energy-starved world where digital modes of delivery may be de rigueur (Adam, Nel, Adam, & Nel, 2009). Despite the competitive advantage given to the teaching organization, it has its own limitations in the use of knowledge media and issues abound concerning how the learning process is affected by the use of knowledge media and how this is reflected in student evaluations of teaching. Such measures of student satisfaction in service studies have found to be on the type of product, and the service attributes that customers experience (Gustafsson and Johnson, 2004). Further, they identified that the face-to-face students expressed positive comments about being able to access reruns of the lecture and tutorial discussions in streaming video format, confirming the earlier in-class experience, for the same reason.

Active learning
Dewey and Piaget as cited in (Daouk, Bahous, & Bacha, 2016) active learning involves reading, discussing, writing, and developing skills of which a few of the most important are those of evaluation, reflection, analysis, and synthesis which is based on constructivist theory. Other researches who conducted research on constructivism has also suggested that learning is the 'optimal challenge and adaptation to differences' (Cornelius-White and Harbaugh, 2010). In fact, "people learn through authentic experience and reflection" as they also develop and learn through "experiencing within their environments". As such, learning is student centered, the teacher become the creator of learning experience, and the students are allowed to experience it in flexible manner.

The core aspects of active learning are identified as speaking, listening, writing, reading, and reflecting (Bean, 2011). However, in order to make this a valuable writing experience for students, teachers should give them clear instructions as to the topic of the writing assignment as well as explanations of keywords such as "analyse", "argue", "describe", or "critique" in the prompts that indicate the main purpose of the task (Fink, 2003). Consequently, the competent writing help students to process new information in their own way, critical reading allows students should be engaged in scanning, sorting, summarizing, understanding, relating items, and identifying faulty logic or inferring messages (Bean, 2011). The students' involvement in the learning process is presumed to be associated with improved overall performance. Hence, authentic learning is a strategy for educators to design blended learning environments, in which learning became a more enjoyable process, and can increase in comprehension of learning materials with a technology-backed environment (Heidi, Tan, & Neo, 2015).

Learning technology
Advancement of technology in recent past has paved the way for many institutions in higher education to consider a way to transform traditional pedagogy into blended learning, thus to maximize students' learning efficiency and academic success (Garrison & Vaughan, 2013). In doing so, there are three main stakeholders who may affect by education innovation namely, students, teachers and administrators by changing the way you teach, learn and interact with students. However, the majority of current learning is based on –campus for many students and teachers, yet many initiatives exist for them to adopt. Among the new technologies, virtual

classrooms, room centric technologies such as bring your own device (BYOD), blended learning, flipped classroom, smart building technologies and virtual reality dominates significant portion of open innovation in the education industry.

Virtual classroom is a teaching and learning environment in which learners can interact, communicate, view and discuss presentations, and engage with learning resources while working in groups, all in an online setting. It uses the commonly available video conferencing applications to be connected with multiple learners virtually to a common setting. A virtual classroom is known as a virtual learning environment (VLE), in which it facilitate the use of interactive activities, interactive learning modules, educational games, educational apps, teacher centered content, two way sharing of classwork and homework, real time assessments, collaborative learning and personalized learning based on learning style and preferences (Zhu & Qi Wei, 2017). Usually in a VLE, there is no necessity to have an instructor in place; hence, it is an unsupervised virtual classroom, characterized by self-paced learning experience with pre designed learning materials by students. VLE allows automating examinations and marking of activities. VLE can be useful in science and engineering classes where students use models to demonstrate certain capabilities or functionality of designs or models.

Bring your own device (BYOD) – BOYD is making significant improvements in education industry. The feasibility of a program delivery was determined based on availability of resources in the past. Hence, investment of own technology was an important consideration in the overall budget for many education institutions. However, it has changed significantly due to the BYOD concept where the institution encourage the participants to bring their won devices, while facilitating the platform to use it in terms of plug ins, access to connectivity and space. BOYD has benefited the education provider by shifting the cost structure towards the user in the business model. According to research, education industry has the highest percentage of people using BYOD for work at 95.25%.

Blended learning, also known as hybrid learning - a style of education in which students learn via electronic and online media as well as traditional face-to-face teaching (Zhu & Qi Wei, 2017). Blended learning enhances faster acquisition of knowledge in a more personalized experience and enable hands on learning experience. The following figure illustrate the blended learning approach and the learning tools commonly adopted in education innovation.
Flipped classroom challenges the conventional notion of classroom-based teaching by introducing the learning material to students before the class. The classroom time then is used to deepen the understanding through discussion with peers and problem-solving activities facilitated by teachers. Flipped learning has not been rigorously evaluated as a pedagogy in higher education (HE), but case studies are emerging, in ever greater numbers, which document measurable improvements in student and teacher motivation, increased attendance in class, and better grades, as a result of using the flipped approach (Hamdan et al. 2013). The flipped learning deepen learning, develop higher-level cognitive skills, move students away from passive learning and towards active learning, engage in collaborative activity, enhances peer learning and problem-based learning.

Smart buildings along with Internet of Things (IoT) are structures that utilize automated processes to control security, heating, lighting, air conditioning, ventilation, and other systems of a building (Downes, 2007). Now, with the coming of the Internet of Things, its benefits to the industry will increase further. IoT based technology acts as a means to set up safety measures for students, enable school boards to manage limited resources and provide users of educational institutions with access to reliable information. In addition to enhanced learning

experience, IoT offers safety and security features combined with RFID (Radio Frequency Identification) technology with IoT enabled devices, campus security can keep track of individuals on the premises. Some colleges provide RFID enabled wearables to students such as wristbands, wristwatches or smart ID cards that can track and trace students within the premises. These gadgets also help parents to track students' involvement in studies. The information generated through this technology will be real time and accurate.

Augmented reality is a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. Though it is not a novel concept in many other instances, AR is somewhat novel in education. Variety of AR application in learning exists, such as 3D modeling and animations via special gadgets like holographic lenses. AR in educational apps come in three areas 1). the ones specialized for students, 2). the ones for kids, and 3). apps for self-education.

Managing own learning
The major portion of previous research on macro level were conducted based on constructivism learning theory, which is rooted in several aspects of Piaget and Vygotsky's cognitive theories. According to constructivist learning theory, learning is mainly student centered, where the teacher gives the main idea to students, and the student should develop his or her own learning experience. Hence, the learners' knowledge is their own life, their style and their life is an experience they get (Aljohani, 2017). Thus, a clear process in which it facilitate interaction between the two parties that can allow achieving individual learning goals separately determines the effectiveness of learning. The constructivist learning theory in that sense is mostly focused on the institutional context to reflect the formal, educational environment, with some focus to interaction between the learners. However, it does not emphasis on peer and the personal contexts.

The research on constructivism is based on the belief that it arises from the shift of behaviorism thinking to cognitive thinking (Suhendi & Purwarno, 2018). Accordingly, Constructivism is the formation of knowledge as an active subject that creates cognitive structures in their interactions with the environment. Hence, the learning occurs through discovery. To be effective, constructivism can be used to interpret the learning outcomes and facilitate a conducive learning environment to support that learning. However, that can vary with the different learning situations, and hence expect the learner to have background of knowledge, experience, and interests in order to create a unique relationship in building their knowledge. Accordingly, the researcher argues that teaching means organizing the environment so that learners are motivated and actively involved in exploring meaning and appreciating uncertainty.

Learning challenges
However, Sri Lanka lacks significantly the technology adoption in many fields, and education is one of that. Named as digital divide, 'digital divide is an economic and social inequality in the access to, use of, or impact of information and communication technologies (ICT)'. The concept of digital divide initially referred as the difference between having or not having access to technology. The current notion of digital divide yet focuses on 'who, with which characteristics, connects how to what'. One third of our population have access to internet and almost equal amount are using social media on average. Digital connectivity in Asia-Pacific has reached 40 percent while Sri Lanka has reached 29% (Kemp, 2017). Surprisingly, smart phone penetration in Sri Lanka are 131% (Kemp, 2017) of the population. However, almost all Asian and Middle East countries lag behind the global statistics in internet penetration. Among other countries, internet penetration in Sri Lanka is 32% (Kemp, 2017). which is well below most of the

countries in the Asian region. A true transformation in education industry is need for development.

Private investment in university education operated under state regulations and standards - could improve the quality of education through competition, enhanced access to university education and resource mobilization. Further, practitioners should change to become dynamic centers of teaching and learning that respond to changes in the market in a timely manner. Education is being a service; modernizing education is primarily driven by on campus experience. This research attempts to study the innovation and modernizing strategy effectiveness in private higher education industry in Sri Lanka.

Collaboration
In counting the peer, institutional and the personal context, the Unified Modeling Language (UML) class diagram is useful. The model is based on the learning networks by Koper (2009), but has been simplified and adapted emphasizing the integration perspective. The peer context is centered on the social networking, enabling a person to interact in several roles – varying from novice to expert – with other persons or peers. The interaction depends on the tools available for individuals to interact such as a moodle, canvas, course sites, udemy system. The institutional context reflects the formal, educational environment in which the teacher for students to use them in achieving educational goals shares the educational instructions. The type of information may vary by the course unit, and be used in different instructional objects such as case studies, nature of classroom arrangement, reading materials and assessments. The personal context is the layer that is under control of the person which includes setting learning goals.

Table 1: Meta-Analysis table

Variable	Author/s
Active learning, Learning technology, Managing own learning, Learning challenges	Esyin Chew, Lim Jen Nee Jones, Scott Wordley 2018
Collaboration	Organizational trust index, International Association of Business communicators
Learning effectiveness	O'Neil & Wright, 1995

Source: author

HYPOTHESES OF THE STUDY
Educational institutions across many countries are now supporting e-learning environments with the use of technology than traditional learning methods (Khalid, Yusof, Heng, & Yunus, 2006). Despite the fact technology supports the way forward in presenting the teaching content to students, there are still uncertainties regarding the efficiency in use of the technology in online teaching and learning (Chung, 2008); (Luo, Boland, & Chan, 2013) due to various reasons. However, a growing concern remains as the current graduates do not possess the right set off skills demanded in the workplace (Tan, Teo, & Chye, 2009), the industry need to adopt more productive strategies to enhance the graduate profiles (Abdullah, 2010). In creating an authentic and relevant learning environment, the use of technology can facilitate the engagement of learners. Thereby, they improve the individual skills such as critical thinking, contextual learning and communication (Mahajan, 2012) as web based systems facilitate the platforms for efficient practices (Collis & van der Wende, 2002). It can also be reused, interoperable and accessible when used to create online learning environments (Kerdprasop & Kerdprasop, 2008). Virtual learning environments are almost real (Herrington

& Kervin, 2007); (Lombardi, 2007) if carefully and properly designed, it can motivate and engage students (Butler,2009) and give them an unforgettable learning experience. Hence, in creating an authentic blended learning environment, the fundamental concepts discussed by (Herrington & Kervin, 2007) could be supported by the use of multimedia and web technologies: based on the discussion above, the flowing hypothesis is developed:

H1: Active learning is positively related to learning effectiveness.

Organizational technology orientation have positive relationship with the innovation. Consumers prefer high tech products due to its innovativeness (Gatignon & Xuereb, 1997). The previous research also has identified that the technological capability of a firm is an important determinant for innovation (Cooper & Kleinschmidt, 1994); (Song & Parry, 1998) and product differentiation (Porter, Competitive Strategy, 1985). In successful innovation, a meta-analysis of 40 studies suggested that the technical proficiency to be the most critical factor in innovation (Montoya-Weiss & Calantone, 1994) that allows firm to create the potential competitive advantage which cannot be easily imitated by competition (Cooper, 1985); (Gatignon & Xuereb, 1997); (Song & Parry, 1998). Further, this hypothesis is supported with studies conducted by (Noble, Sinha, & Kumar, 2002); (Shane & Ulrich, 2004); (Zhou, Yim, & Tse, 2005). Hence, the researcher present the following hypothesis:

H2: Learning technology is positively related to learning effectiveness.

Performance outcome has a direct impact with the amount of planning that is undertaken to achieve the outcome. There are number of studies conducted to identify this (Gunasekaran, Patel, & McGaughey, 2004); (Hil, Jones, & Schilling, 2014). Many strategies to win in business have one in common, that is to lift the power in relation to competitors to succeed (Porter & Kramer, 2002). There are important characteristics to be noted specially with small and medium companies, in considering the above. They occupy fragmented, un-economical, at times unattractive and risky small market segments seeking for better returns. As a result, they engage in innovations seeking for better economies, even with small research investments (Nichter & Goldmark, 2011). However, various studies have identified SMEs to be more innovative even in absence of appropriate planning as a determinant of success which later has resulted them to fail in the market. Based on above discussions, the following hypothesis is developed:

H3. Managing own learning is positively related to learning effectiveness

The dynamic challenges can have a significant impact on performance of organizations (Buhalis, 2000). The literature suggests that the uncertainty associated with the business environment affects business decisions, as management are unable to predict the movement of external factors. Other research conducted by (Chan, Satterfield, & Goldstein, 2012) also confirms that the impact of business practices on performance is contingent on the level of competitive intensity in the market. Both local and foreign educational environment has increasingly exposed education market in Sri Lanka and have created a hyper competition. Although, the consumer remains loyal once committed to a study program, Sri Lankan students have proven to be more sophisticated in making their educational choices. Hence, the formulation of strategy must focus on market dynamics and uncertainty while having the innovation focus in its operating environment for success (Wong, Zeng, & Ho, 2016). On the basis of the discussions above, the following hypothesis is stated:

H4. Learning challenges are positively related to learning effectives.

The success of many of our activities come from appropriate communication and collaboration. In entrepreneurship literature, knowledge sharing creates economic value through novelty (Gupta & Govindarajan, 2000) which is referred to as innovation (Miles, Matthews, Wilson, &

Brickley, 2005). Further, the firm capability to communicate and collaborate internally have an impact on effective knowledge sharing and creation of innovation. Collective entrepreneurship requires a network that allows for sharing and exchange of ideas and resources at the cognitive (e.g. team mental models, networked organizations), affective (e.g. social support) and behavioral (e.g. teamwork) levels. In the study conducted by (Reich, 1987) supports this argument, and also rejects the notion of "myth of the entrepreneurial hero" and acknowledges collective entrepreneurship and the synergetic contributions. However, if one argues that engagement naturally happens when the environment is created, the previous research by (Quinsee & Bullimore, 2011) argues that 'you can never take engagement for granted and if you do, and your initiative could suffer. Based on that, the following hypothesis is developed.

H5. Collaboration moderates the relationship between the open innovative practices and learning effectiveness.

Researchers have identified that, employing active learning strategies by teachers can enhance the overall learner performance (Daouk, Bahous, & Bacha, 2016). Most often active learning strategies are used along with traditional teaching methods. However, the use of four fundamental building blocks of active learning involves providing opportunities for students to meaningfully talk and listen, write, read, and reflect on the content, ideas, issues, and concerns of an academic subject of active learning strategies identified by (Bonwell & Eison, 1991); (Meyers & Jones, 1993) can create the presence of active learning environment.

RESEARCH METHOD

The previous research attempting to understand the open learning environments have been primary done as exploratory studies in 1990s 2000s. There were two main research reviews done by Berge and Mrozowski (2001), Lee et al. (2004) as cited in (Bozkurt, et al., 2015) on this topic. The reviews analyzed the research topics, as well as methods, and citation trends of OLE research for last two decades mainly. Zawacki-Richter (2009) as cited in (Bozkurt, et al., 2015) developed the classification of such research results using in depth Delphi study from eminent researchers on this topic in 695 articles published in five prominent journals. The most studies adopted quantitative research methods recently. The variety of sources for data collection has been broadened owing to recent advances in technology, especially the emergence and widespread application of social network services, and big data technology. It seems desirable that a greater effort should be made to explore the potential usage of various types of data in addressing research topics apart from learning and teaching, particularly in macro-level research, such as how open educational resources or MOOCs penetrate the learning activities for global users of the internet, and mobile networks.

According to positivist paradigm, the most appropriate tools for of social research are the scientific methods (Sarantakos, 1996). Therefore, it is essential to study society and people as we see them rather than as they are interpreted by philosophers and theologians. As a result, until 1960s social sciences in general and sociology in particular were largely positivistic in theory as well as in methodology, with the typical sociological research including mainly survey methods and experiments, and being directed towards quantification, the and the use of statistics and computers (Sarantakos, 1996). Social surveys and experiments are frequently viewed as prime examples of quantitative research and are evaluated against the strengths and weaknesses of statistical, quantitative research methods and analysis.

At the ontological level, being a positivist, the researcher assumes that the knowledge is objective and quantifiable in other words the reality is objectively given and is measurable using properties, which are independent of the researcher and his or her instruments. The

research design for this study is conclusive research and studies the causal relationship that is analyzed through quantitative methods. Information regarding the effectiveness of integrating active learning strategies and students and teachers' perceptions are expected to receive from questionnaires.

Accordingly, questionnaire method has been used as supported in research conducted by (Daouk, Bahous, & Bacha, 2016) with 115 sample size, with 27 statements, related to effectiveness of active learning strategies and their effectiveness regarding such techniques, on a Likert scale from strongly agree to strongly disagree.

RESULTS

The unit of analysis in the study was a student who has registered with for any academic program. The study consisted of 115 respondents studying in various disciplines in a range of programs such as Diploma, HND, Degree and Postgraduate programs. The participation in the experiment by each respondent was voluntary and no monetary reward was offered for taking part. The below table summarizes the participant characteristics.

Table 2: Distribution of Respondents by the program enrolled and the duration of the study.

Variable		Frequency	Percentage
Program enrolled	Diploma	30	26.1
	HND	32	27.8
	Degree	28	24.3
	Postgraduate	25	21.7
Length of study	less than 6 months	45	39.1
	6-12 months	40	34.8
	13-18 months	30	26.1

Source: survey data 2019

On average, around 20 to 28 percent respondents were selected from each program to take part in the experiment based on random sampling. They are active students at least for 6 months minimum in the program they are following.

In order to ensure reliability of instruments, internal consistency statistics were used. As recommended by (Nunnally, 1978); (Lu, Gabriel, Vecchi, & Reichler, 2007) construct reliability and the dimension were assessed using Cronbach's alpha coefficient. The results presented in table 2 summarizes Cronbach's alpha value for each variable that is measures. As shown in the table, the minimum value obtained for a variable is 0.613 while the maximum value was 0.992, which indicates a high level of internal consistency of the scale. Since, the alpha value exceeds 0.50 recommended by Hair et al. (1995) and confirmed the reliability of the factors.

Table 3: Reliability statistics

Scale	No. of Items	Cronbach's Alpha
Active learning	4	0.613
Learning technology	3	0.841
Managing own learning	4	0.867
Learning challenges	5	0.887
Collaboration	6	0.992
Open learning effectiveness	5	0.896

Source: survey data 2019

The effectiveness of open innovation in education industry were assessed based on five dimensions: active learning, learning technology, managing own learning, learning challenges and collaboration. According to descriptive statistics in table 3, overall mean vale towards effectiveness of performance in open innovation was high as the values obtained were above 3.67.

Table 4: Descriptive values of factors contributing to innovation success in performance.

Scale	Mean	Standard Deviation
Active learning	4.30	0.46
Learning technology	4.11	0.73
Managing own learning	3.96	0.72
Learning challenges	3.99	0.74
Collaboration	4.10	0.75

Source: survey data 2019

Further, the Pearson correlation analysis was conducted in order to examine the relationship between the overall performance effectiveness of open innovation in an education institution. The findings of the study revealed that the each contributing factor has a significant positive correlation towards the open innovation success within an institution. The highest correlation coefficient (r = 0.868) was obtained between organizational performance and managing own learning and it was significant at 0.01 level (2 tailed). Further, the findings of the survey indicated that other all other variables indicated a strong positive correlation to exist at p = 0.01. Therefore, the study revealed that it supported H1, H2, H3, H4 and H5 by its empirical evidence and hence, concluded that open innovation practices positively contribute to the organizational success mentioned in the study.

Table 5: Correlation matrix.

	Active Learning	Learning Technology	Learning Challenges	Collaboration
Active Learning	1			
Learning Technology	0.714**	1		
Managing Own Learning	0.868**	0.847**		
Learning Challenges	0.825**	0.822**	1	
Collaboration	0.789**	0.782**	0.872**	1
Open Learning Effectiveness	0.734**	0.950**	0.883**	0.816**
**. Correlation is significant at the 0.01 level (2-tailed).				

Source: survey data 2019

The linear regression analysis was conducted to predict the degree to which innovation dimensions influence the success of organizational performance in education industry. The results of the study indicates a high level of predictability in use of learning technology with a $r^2 = 0.95$ with p = 0.00, while the lowest recorded was active learning $r^2 = 0.73$ with p = 0.00. Therefore, it is evident that organizational performance can be highly improved through open innovation when learning technology is better incorporated in to study experience than other aspects. Despite, the other aspects of open innovation also are important to consider by the organization as the p = 0.00 for all measures aspects.

Table 6: Regression model on open innovation and organizational performance.

	R^2	F	Sig.	Beta	t	Sig.
Active Learning	0.73	131.69	0.00	0.73	11.48	0.01
Learning Technology	0.95	1051.16	0.00	0.95	32.42	0.00
Managing Own Learning	0.87	360.23	0.00	0.87	18.98	0.00
Learning Challenges	0.88	398.12	0.00	0.88	19.95	0.00
Collaboration	0.82	224.93	0.00	0.82	15.00	0.00

Source: survey data 2019

The multiple regression analysis was conducted to measure the overall predictability of the model. The results of the output indicate ($r2 = 0.968$, $p = 0.000$) that the regression model is statistically significant and predicts the behavior of organizational performance could be significant improved by use of learning technology, learning challenges, managing own learning, collaboration and active learning strategies incorporated into studies by an organization. Therefore, the study results support the H6 positively.

Table 7: Multiple regression analysis.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.968[a]	.937	.934	.19570
a. Predictors: (Constant), Collaboration, Learning Technology, Active Learning, Learning Challenges, Managing Own Learning				

Source: survey data 2019

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	62.130	5	12.426	324.462	.000[b]
	Residual	4.174	109	.038		
	Total	66.304	114			
a. Dependent Variable: Open Learning Effectiveness						
b. Predictors: (Constant), Collaboration, Learning Technology, Active Learning, Learning Challenges, Managing Own Learning						

Source: survey data 2019

DISCUSSION OF RESULTS

According to the empirical results discussed above, success of open innovation in education industry in Sri Lanka is determined by the use of learning technology, use of active learning methods, learning challenges set for the student, and the ability to manage own learning experience by the student. Further, the impact of these factors are moderated by collaboration. Hence, the use of the mentioned factors in education should facilitate collaboration between the parties involved for better performance results. The results of correlational analysis revealed that all factors have a strong positive correlation towards the organizational performance in education industry. Therefore, the findings of present study based on empirical results are consistent with the previous literature in open innovation in other parts of the world.

Further, each factor contributing to success of open innovation has positive correlation, signifies the facts that Sri Lankan education industry institutions should adopt the open innovation practices for better performance results. The attention priority by the organization

could be listed based on finding as incorporating learning technology, set learning challenges, facilitating to manage own learning experience, collaboration and adopt active learning strategies.

CONCLUSION

The study was to assess the adoption of open innovation strategies to succeed in education industry with special reference to Sri Lanka. The empirical evidence support the hypothesis set in the beginning of the study indicating a positive correlation to exist. Therefore, it reveals that the open innovation could be used by organizations in education industry in Sri Lanka for better economic results. The results of the study offer implications for industry players to rethink about their educational offerings and the entire business model in which they operate. Therefore, the players in the industry must incorporate a curriculum that facilitate active learning strategies to use by learners. Further, the institution should make use of new technology such as BYOD, virtual learning environments, flipped classroom facility, and blended learning to engage learners in their studies. Further, the ability of a learner to set the learning pace was identified as an important aspect of learning success. Hence, it is recommended organizations to design courses in a sandwich mode so that, the learner could manage his/her own learning experience depending on his or her learning style. Finally, it also recommends institutions to make the learner understand the outcomes of learning at the beginning of his or her learning, so that, clear outcomes and the challenges set for the learner could improve the learning effectiveness. In conclusion, based on empirical evidence, the researcher concludes that open innovation strategies have a positive impact towards the success of organizational performance outcomes.

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