

Influence of Online Learning in Medical Education is Neither Disruptive Nor Supplementary: It's Time to Walk Parallel!

Suban Mohammed Gouse Saleem¹, Helen Suban Mohammed Gouse^{2*}

¹Consultant, Learning, Teaching and Assessment Center, QAC & Head of Pathology Division, Ibn Sina National College for Medical Studies, Jeddah, Kingdom of Saudi Arabia.

^{2*}Supervisor, Learning, Teaching and Assessment Center, QAC & Assistant Professor, Division of Anatomy, Ibn Sina National College for Medical Studies, Jeddah, Kingdom of Saudi Arabia.

ABSTRACT

Technology enhanced education; an ever-evolving process is not a novel concept in medical education. The supporters of online learning stated that disruption of Tertiary Education Institutions (TEI) is inevitable and created hype. Within the passage of time, the hype slowly faded which is supported by articles concluding that traditional medical education cannot be replaced by online learning. Medical educators attempted a hybrid or supplementary strategy. Even then it led to stagnation due to the need of appropriate infrastructure and resources to implement supplementary strategy. Further to move over the change curve and reach the 'plateau of productivity' to successfully utilize the online learning technology in Medical Education, requires a newer strategy and business model. Here, the complementary strategy and conceptual framework of complementary business model is proposed as stipulation to overcome the weakness of Tertiary Education Institutions (TEI) and online education providers to enhance the delivery of outcome/competency based Medical Education.

Keywords: Online Learning, Medical Education, Disruptive Strategy, Complementary Strategy.

*Correspondence to:

Dr. Helen Suban Mohammed Gouse,
Supervisor, Learning, Teaching and Assessment Center,
QAC & Assistant Professor,
Division of Anatomy,
Ibn Sina National College for Medical Studies,
Jeddah, Kingdom of Saudi Arabia.

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INTRODUCTION

"The challenge for medical educators is to be aware of the new changes and to consider how the latest technology can be used to enhance learning" ¹

E-learning has two components, learning, and technology. Academic Learning is a cognitive process to achieve knowledge, skills, and competencies through various forms educational strategies in the learning, teaching, and assessment within a curricular framework. E-learning concept is deeply rooted in early 1960's with the concept of Computer Assisted Learning (CAL).² Many terminologies are associated with E-learning like web-based learning, online learning, distributed learning, computer-assisted instruction, or Internet-based learning. Blended learning is a combination of electronic or online learning with traditional brick and mortar based learning, for example, a lecture or demonstration is supplemented by an online tutorial.³ Recent advancement in Information Communication and Technology (ICT) has caused online learning to evolve. The MOOC, Massive Open Online Course concepts were relatively

new, and it started proliferating and taking different forms such as xMOOC, cMOOC, quasi-MOOC, tMOOC, to name a few.⁴ Some other types of online learning such as small private online courses (SPOC) have developed using the same technology, thereby catering to the needs of the learner.

MOOC development created heated debate among the academicians, and further split them into two groups, the MOOC supporters, and MOOC skeptics. The New York Times, named the year 2012 as 'Year of the MOOC' that created a heat wave among the academicians. MOOC supporters stated that the traditional education system would evaporate and there will be a complete replacement of brick and mortar universities. It created hype, and huge expectations, that could not be met by the MOOC favored communities. Hence the following year 2013 is famously called as 'year of the MOOC Skeptics'.⁵ The MOOC skeptics perceived the booming of MOOC as Schadenfreude effect and believed that within the passage of time, the effect would fade. It appears to be true as the articles grew more in number in favor that traditional education cannot be replaced by MOOC.⁶

Medical educators made attempts regarding integrating E-learning into existing traditional Medical Curriculum. They also cautioned such integration should be carried out after needs assessment and well-devised plan along with the arrangement of adequate resources.⁷

In this paper; two parts are discussed;

1. The status of online learning: is it disruptive or supplementary: In this part, theories and concepts behind the disruption & supplementary strategies and its relationship with Medical Education have been discussed in two sub sections: a) Concepts of online learning disrupting Medical Education Institutions(MEI); b) Hybrid online learning as a supplementary strategy.
2. A complementary strategy for online education: In this part, the need of complementary strategies are analyzed based on the various principles and theories, proposed a conceptual framework for a complementary strategy for Tertiary Education Institutions(TEI) as a third generation strategy as an effective means of integrating the online education in the traditional curriculum of Medical Education.

1. The Status of Online Learning - Is it Disruptive or Supplementary?

a) Concepts of Online Learning Disrupting MEI:

The two theories put forward by online learning supporters or producers in favor of disruption of Tertiary Education Sector are 1. Disruptive Innovation Theory; 2. Leapfrogging Theory. Theory of Disruptive, coined by Harvard Business School professor Clayton Christensen, describes an innovation which creates a new market and value network, will eventually displace existent markets or technologies.⁸ In other words, disruptive technologies will find an initial place in markets where the alternative is nothing and innovation are competing against non – consumption.⁹ Joseph Schumpeter coined the Leapfrogging Theory, explicates that radical innovations create a new paradigm, allow such innovations to leapfrog ahead of traditional practice.¹⁰

In the context of Tertiary Education, disruptive, innovative educational technologies will create a new paradigm & leapfrog the normal non-scalable current educational model, such impacts are beyond one's understanding.

Based on the theories mentioned above, MOOC is expected to disrupt the Tertiary Education Sector initially in the developed countries and shift into the 'new markets' of developing countries, and create a positive impact on the students through getting access to quality education.¹¹ Francisco Marmolejo, the representative of World Bank, started an MOOC initiative in Tanzania through the University of Dar es Salaam with the help of Coursera to develop IT skills needed for specific job vacancies in the engineering sector.¹² Such an attempt emphasizes that MOOC or any online learning model need to be customized and specific according to specific conditions of those nations. It may serve as a life line for disseminating quality education in some of the Tertiary Education sectors.

Can this situation be applied to Medical Education? As Medical Education is moving towards Competency Based Education,¹³ the curriculum must be designed to incorporate Knowledge & Cognitive skills, Interpersonal and Responsibility skills, Ethical & Moral skills, Information Technology & Numerical skills, and Psychomotor Skills. The expected learning outcomes must be

specific at an appropriate level for the undergraduate Medicine Program. In vocational educational training, broader competencies are highly required to uphold professional skills. Especially future physicians need to develop research & scholarly skills to become lifelong learners, and also they equally need communication & leadership skills to handle patients and community, hence training on broader competencies in medical education cannot be underplayed.

In general, there are four phases in the curriculum of undergraduate Medicine Program; 1. General Science and Basic Medical Sciences Phase, 2. Pre-clinical Phase, 3. Clinical Sciences Phase, & 4. Internship Phase. In each of these phases have courses with specific outcomes/competencies. In the General Science and Basic Medical Sciences Phase, courses are taught with outcomes more emphasizing on the knowledge and cognitive skills with minimal Interpersonal & Responsibility and Information communication & Numerical skills. In the Pre-Clinical & Clinical Sciences Phase, courses are taught with outcomes more emphasizing on the knowledge and cognitive skills, Information communication & Numerical skills, Psychomotor skills with minimal Interpersonal & Responsibility. In the internship, outcomes targeting specific competencies in various clinical postings related to psychomotor skills, and it also emphasizes on the Interpersonal & Responsibility skills, communication, leadership & teamwork skills, Research & scholarly skills, Ethics and Professionalism, and Information communication & Numerical skills.¹²

With this background of expected outcomes and competencies in undergraduate medical education, the possibility of disruption through online learning or MOOC is not possible. Nevertheless, Medical Educationists cannot disregard the benefits of online learning. The policy makers should work intensively on the policy reformation, reorganization, and restructuring of MEI to provide space in the curriculum to adapt to the dynamic change happening in the education technologies for proper integration to enhance the delivery of outcome/competency based education.

The integration of the online teaching in traditional Medical Education needs curriculum reformation. The curriculum experts should seriously think of a combination of online and traditional learning in the various phases of the undergraduate medical education. This will result in effective delivery of outcome based education and creates an opportunity for underprivileged institutions to collaborate with other medical schools to deliver high-quality medical education.¹⁴

The involvement of multi-levels of outcomes and competencies in the medical education makes it more complex for any online learning/ MOOC or Artificial Intelligence based technologies to disrupt the MEI. The complexity to disrupt is reflecting in the statistics of MOOC productions in the year 2016. The MOOC courses related to Medical Education (Health and Medicine) was only 7.86 % when compared with other education sectors (Business and Management - 19.3 %; Computer science & programming - 17.4 %).¹⁵ The MOOC courses have not made a significant contribution and did not create change or effect in the MEI.

Disruption can happen at the curricular level which will demand restructuring and reorganization of MEI. The Online/ MOOC models of learning can only strengthen the MEI but cannot replace or disrupt them.¹⁶

b) Hybrid Online Learning as a Supplementary Strategy

Seimens¹⁷ explained the principles of Connectivism through online learning. The principles of Connectivism aligns well with the principles of Adult Learning.¹⁸ The natural alignment of these principles in the online learning plays a beneficial role in medical education. Blended Learning is defined as the integration of online or electronic learning with face-to-face instruction, appropriately designed according to the course learning outcomes and contents, and not a just combination.¹⁹ Blended learning can improve the quality of education, but depends on the quality of the instructional design.²⁰

Based on the principles of Connectivism and adult learning, authors²¹ described the MOOC based Hybrid initiatives. They categorized six different hybrid initiatives that integrate MOOC technologies with face-to-face (f2f) instruction: 1. Local Digital Prelude, in which the first part of the course is completely online (MOOC-based) and then continues with a second traditional f2f part; 2. Flipping the Classroom, in which students work every week with MOOC-based online content at home and then go to class to reinforce their understanding of what they studied at home; 3. Canned digital teaching with f2f tutoring, which consists of MOOC-based contents that students use to prepare their exams in semesters where there are no f2f classes, having the faculty available at office hours for tutoring; 4. Canned digital teaching in the f2f course, which corresponds to using MOOC-based contents as a textbook in an f2f residential course; 5. Remote tutoring in f2f courses, which consists of digital interventions (live or canned) from experts to complement a traditional course; and 6. Canned digital teaching with remote tutoring, which corresponds to completely online MOOC-based courses complemented with video-conferences for tutoring.

Since the surge of MOOC growth and seemed benefit made the Higher Education institutions (HEI) to explore on integrated MOOC initiatives into their curriculum as kind of internal innovation. In this context, the hybrid is a broad term inclusive of any learning model that integrates online learning and related technologies into a traditional curriculum. However, such attempts are in preliminary stage regarding with Medical Education.²²

An enthusiastic group from the academic fraternity around the world is involved in the study of the efficiency of Hybrid learning in part or complete course within the undergraduate Medicine Program. Most of the studies were conducted in the field of Basic Medical Sciences such as Anatomy²³, Physiology²⁴, Biochemistry.²⁵ Some studies were also conducted in the field of Clinical Sciences such as Family Medicine, Osteopathic Medicine in Clinical Training²⁶ and Clinical Medicine.²⁷

The above-referred studies infer that blended learning plays a supplementary role in the traditional curriculum. The online learning plays an effective role, but it should not replace traditional learning because contact sessions determine the effectiveness of the online learning in medical education. These studies also mentioned that the success of Hybrid learning depends upon many factors but one prime factor commonly identified is f2f synchronous interactions between students and teachers play a vital role in shaping the learner. The studies based on clinical sciences emphasized that f2f interactions during clinical rounds are necessary to develop patient centered communication skills, competency in providing culturally sensitive care and exhibiting professionalism in all aspects of physician's life.²²

These studies also provided certain tips to be remembered during the construction of a hybrid model for the courses in undergraduate medicine program; 1. The course design should separate the components distinctly into the online or other modality of E- learning and f2f teaching, 2. The balance between f2f and E- learning depends upon factors such as learning outcomes & the level of course content, 3. Course organizers and instructors must be provided enough support and training to handle the hybrid model, 4. The effectiveness of the hybrid model depends on the availability of infrastructure, competent technical staffs, appropriate learning management system and collaborative tools, effective feedback and reflective system.

The study from the developing countries¹¹ high lightened the following challenges related to E-learning; 1. cost of the technology; 2. lack of appropriate support staffs; 3. In effective expertise partnerships; 4. Lack of availability of collaboration or partnership with globally renowned ICT providers; 5. In adequate training of faculty and students. These challenges act as a road block to maximize the adoption and integration of technology in curriculum delivery while implementing hybrid learning. The authors also inferred that pedagogical goals are meant to drive the choice and use of technology. Long term partnership and collaboration is mandatory to ensure the expected benefits of the technology.

2. A Complementary Strategy for Online Education:

Online education providers strategically approached with intent of disruption, led to intense debates among the academicians, policy makers and managers of TEI. The online education supporters predicted that TEI is nearing the doom's day; such harsh predictions created *schadenfreude* climate, and the skeptics of online education took a cynical stand.⁶ Theoretically, online education especially MOOC related technologies steeped in a Hype Cycle (Figure 1).

After that inflated expectation fails to reach the peak, the standards set by the technology during the triggering point. As the nature of the Hype cycle, online education has to slide into the trough and experience failures. The understanding of the pain points will take a new turn and lead to slope of enlightenment.²⁸ Here, in online education, the new turn is a "supplementary strategical" approach called as a hybrid model (second generation strategy). Certainly, this strategy created a favorable climate among the academicians and policy makers to disseminate the online education in the traditional curriculum of Tertiary Education Programs.

The changing situation of online education has to be related to the Kubler-Ross model²⁹ of "Change Curve" to progress further and infiltrate the technology into the TEI and transform the learning experience rather replacing the traditional system. According to the change curve (figure 2), the disruptive strategy model created hype and shot up in hype cycle but created shock & denial (stage 1), and frustration & depression (stage 2) among the members of TEI; further change to supplementary strategy model pushed the members to come out of stage 2, and migrating to experiment (part of stage 3), it has to reach integration to complete the stage 3; once the integration is complete then online education will reach "plateau of productivity" of the hype cycle, where the product attains its purpose.

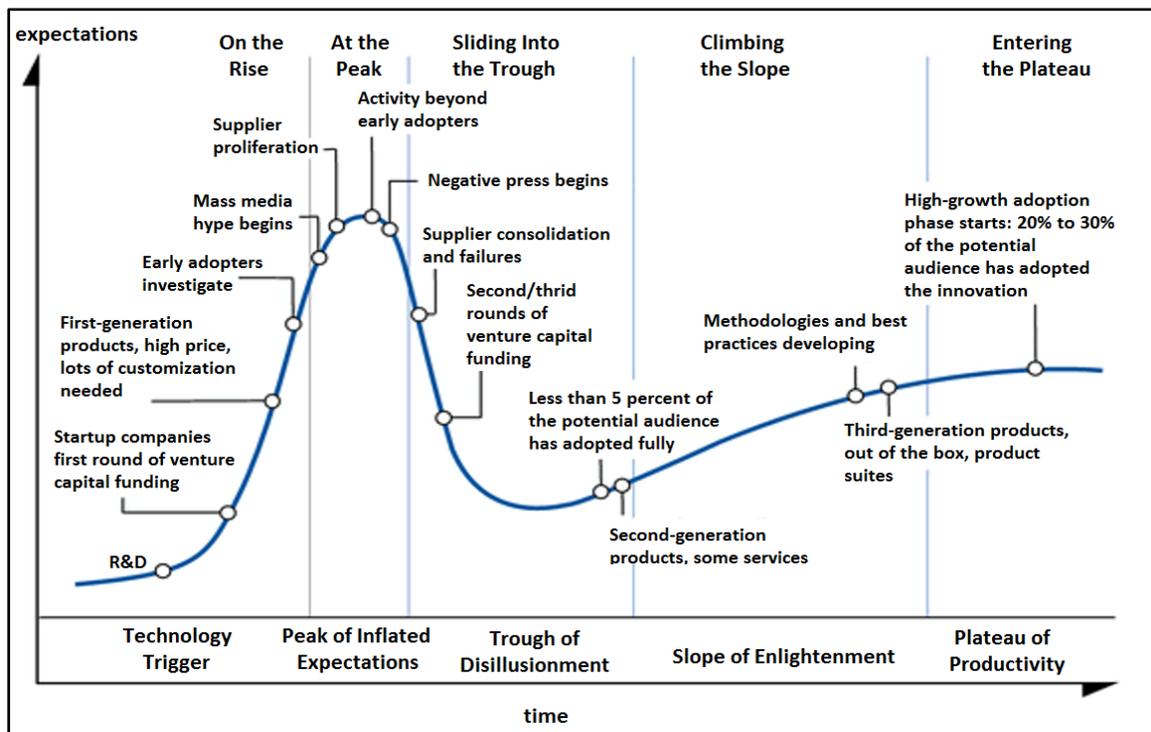


Figure 1: from Hype Cycle Diagram, adapted from Gartner, Inc. by Olga Tarkovskiy.

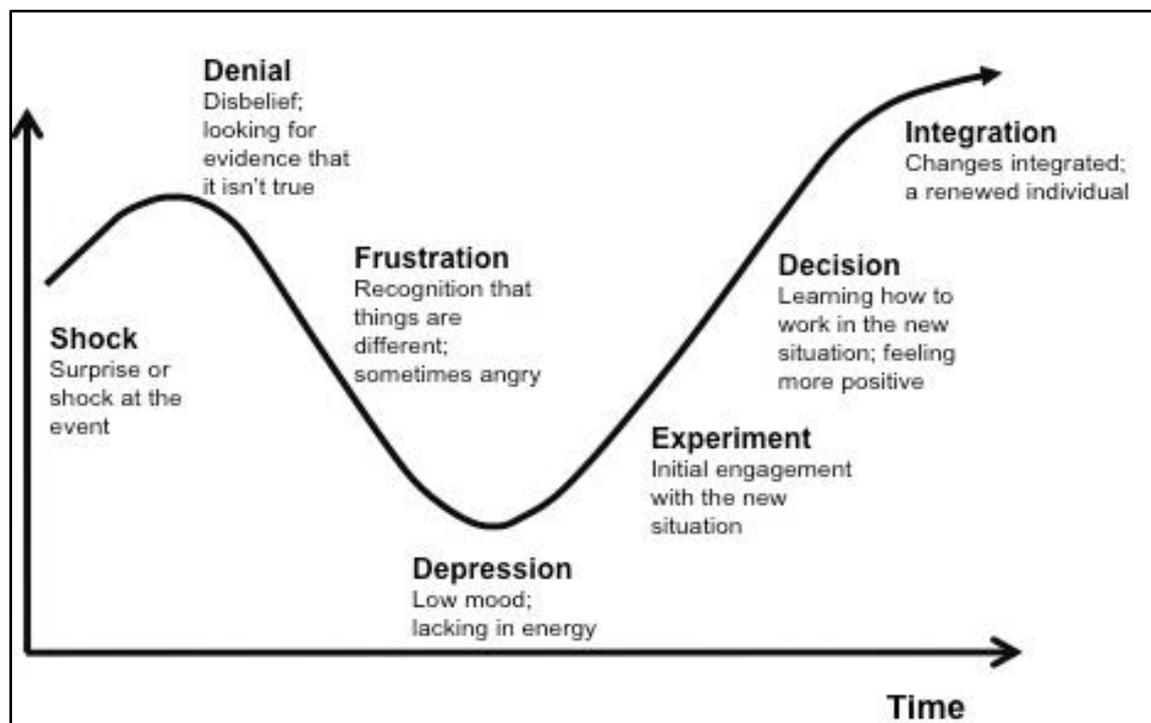


Figure 2: Kubler – Ross Change Curve, adapted from Optima Training (UK) Limited.

Regarding the MEI, the disruptive strategy of online education did not influence the undergraduate Medicine Program.³⁰ The supplementary strategy, i.e., blended/hybrid model of online education is only at a preliminary level.³¹ The blended/hybrid model is implemented in only one or two courses of entire Medicine Program in only a few Medical Colleges all over the globe and rare event to be seen in low and middle-income countries.³² Hence, to become an effective model for tertiary education, the present strategy of online education has to be revisited to develop a newer strategy and business models (third generation) to enter into “plateau of productivity” in a hype cycle.

Authors³³ recognized Zhang’s five models to integrate online education especially MOOC into the tertiary education curricula and organized them according to the relevance for the institution. The list of models, organized from low to high relevancy, are the following:

- 1) MOOC as a learner services (added value services),
- 2) MOOCs as Open Resources (component of a course),
- 3) Flipped classrooms (Institutions have to provide flipping learning material as a course component),
- 4) Complete MOOCs (assessment takes place in MOOC),
- 5) Completion of MOOC is recognized as credit.

The authors work gave insight that the implementation of online based hybrid initiative depends on two factors

1. Institutional capacity,
2. The demand for integration in the curriculum.

Institutional capacity refers to the availability of infrastructure, human resources (academic & technical staffs), technological partnership, institutional collaborations and financial resources required for implementing and maintaining the online integrated (blended/hybrid) approach along with traditional face to face learning. The institutional capacity classified into low and high based on the variables mentioned above.

A low institutional capacity means that the institutional capability to provide infrastructure, human resources, and financial support for only traditional delivery of curriculum. A high institutional capacity means that the institutional competence to develop online learning materials, plan asynchronous and synchronous collaborative learning system without affecting the staff – students ratio for face to face learning, restructuring of infrastructure, relevant change in the tertiary education policy and management.

The demand for integration in the curriculum refers to intrinsic nature of the learning outcomes of the program creating pressure to look for other strategies to effectively deliver the outcomes in a better format to enhance the learning opportunity for learners to achieve the learning outcomes.³⁴ For an undergraduate Medicine

Program, the learning outcomes involving the knowledge & cognitive domains are delivered through interactive lectures, small group discussion such as problem-based learning, directed self-learning, case based discussions and so on can be better delivered through online using collaborative tools. And the resources and facilities can be redirected for developing skills related to psychomotor skills such as clinical examination, procedures, lab experiments and also more contact hours can be allotted for developing broader competencies such as communication, leadership, ethics, professionalism, research, and scholarship.³⁵

A low level of demand from the curriculum means less number of learning outcomes in the knowledge and cognitive domains and more number of learning outcomes in the psychomotor skills and other broader competencies. In such state, the necessity of online integration is minimal because the curriculum demands more face to face.

A high level of demand from the curriculum means more or medium number of learning outcomes in the knowledge and cognitive domains and medium or less number of learning outcomes in the psychomotor skills and other broader competencies. In such state, the necessity of online integration is maximum because the curriculum demands medium or minimal duration of face to face.

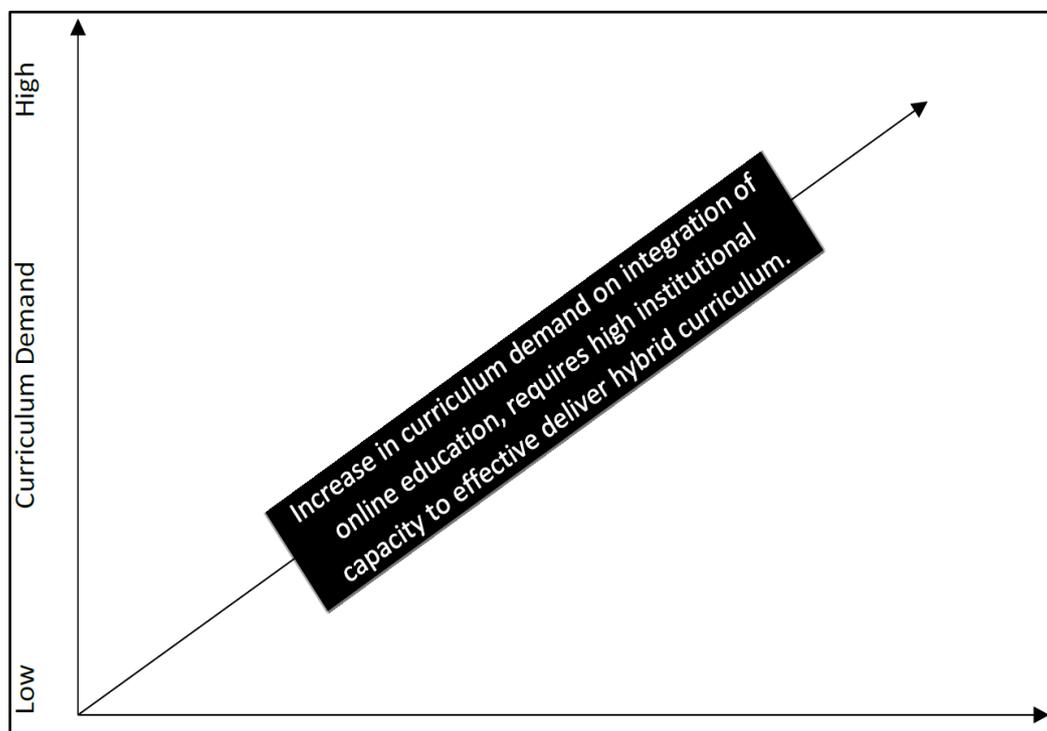


Figure 3: Curriculum demand on integration of online education and Institutional Capacity

The figure 3 X – axis indicates institutional capacity, and Y – axis indicates demand in the curriculum, this shows the increasing demand for integration in the curriculum requires a high institutional capacity for adapting to online integration.

The nature of outcome/competency based Medical Education highly demands integration of online education, but most of the institutions are at low level of capacity. The discrepancies between the demand in the curriculum for online education integration and institutional capacity led to the stagnation in the change expected by a hybrid model of online education.

Michael E. Porter in 1979 published in Harvard Business Review about the five competitive forces that shape strategy.³⁶ They are the threat of new entrants, bargaining power of customers, bargaining power of suppliers, the threat of substitute products or services and rivalry among existing competitors. He argued that state of competition in an industry depends on these five competitive forces, if the forces are weak, it will be easier to establish a business in an industry and vice versa. Porter also mentioned of factors (but not forces) that reshape the industry or business. One of such factor is Complements. Complements are

products or services used together with an industry or industry's product. The need of complements arises when the customer benefit of two products combined is greater than the sum of each product's value in isolation. For example, hardware and software are valuable together and worthless when separated. By using the five forces framework, creative strategists may be able to spot an industry with a good future and develop a newer strategy.³⁷

Ural³⁸ analyzed the higher education & MOOC industry through the lens of Porter's five forces. Oguz Ural utilized the work of Marshall³⁹ and included six additional forces such as industrial growth, technology, innovation, employers, accreditation, and government in his analysis and pointed towards that these forces ultimately decides on the fate of the MOOC industry.

Regarding undergraduate Medical Education, the curriculum, institutional capacity, traditional mindset of policy makers and staff's adaptability act as internal forces blocking the entry of online education into the campus. In addition to these forces, Downes' new forces such as digitalization, globalization, deregulation also creates dynamic changes in the online education industry.⁴⁰

These forces are strong and play against the integration of online education. To transform traditional TEI, there is demand of the third generation strategy to move forward and influence the TEI especially Medical Education sector.

The most important force which was mentioned lightly as a factor by Porter is Complementors. And it was well stated by the previous CEO of Intel, Andrew Grove; Porter has forgotten to mention a sixth force namely the power, vigor, and competence of complementors.³⁸ Complementors are companies that sell products which add value because the sold product better satisfies customer demands.

In Tertiary Education sector, there is a need and demand for complementors. The importance of complementary products is not just MOOC, if they do so it will act as substitutes or supplementary. It is a "Complementary strategy" devised to overcome each other (TEI and MOOC or Online Education Providers) weaknesses through each other (TEI and MOOC or Online Education Providers) strength.

The complementary strategy will create a new business opportunity and provide solutions to the existing threats and problems. The TEI weakness related to institutional capacity on integrating the online education should come to the complementary service provider company. And the present problem of the Online Education service providers such as Validation of learning content, Outcome based Learning Resources, Attrition Rate, Student Support System, Credit System, Quality Assurance, etc. will be resolved through TEI.

In future, there will be high demand for the complementary products in figuring out demand and profitability of many THI. The number of complementors is increasing in the market will be an indicator for an increase in demands. Most importantly, if complementors are weak, and complementary products are not attractive then it can limit profitability and growth of the TEI itself. The advantage of complementors is they can have Business to Business (B2B) and direct customer based business strategy.

In today's context, it is very important to know that technology opens doors to new innovative systems and processes resulting in the creation of new business strategies. The disruption of the markets and the reason why we are reshaping the way we look at

strategy and business has been the consequence of disruptive technological innovation.

In opposition to Porter's statement in his generic strategies model, in today's disruptive markets, one cannot only be sure to lead the competition by being a leader in price (cost leadership), unique (differentiation), and specific business product (specialty market). But truly there is a lot of opportunities in complementary strategy, and its business model is an essential service for TEI; the business also involves educational technology so that disruption will be a regular event.

The business model for integrating online education in the TEI: Complementary business model creates a value proposition for institutions, complementors, and students.

- For institution and complementors, it creates value in the product service, market positioning and competitive advantage.
- For students, it creates a technologically advanced learning environment with the complete advantage of traditional learning and provides great opportunity to enhance their knowledge, skills, and competencies without compromising the values, ethics, and professionalism.

Recently, collaborative models are emerging in the online education markets, especially from Harvard Medical School through the office of external education. The open invitation publicized on their website for other institutions to partner with HMX courses. It is a preliminary stage; only four courses are available. And targeting preparatory level students for Medicine Programs.

The disadvantage is the partnering institutes need to redesign the curriculum according to the Harvard courses. It will not be suitable for non – USA institutions and especially for medicine program because curriculum must be epidemiologically relevant and regionally specific.

Other MOOC producers are also inviting for collaborations to use their platform for delivering MOOC. The disadvantage is TEI must have infrastructure and resources to prepare quality MOOC. And canned MOOC will not be suitable because of nonspecific to the curriculum.

In figure 4, the strength and weakness of the existing TEI and online education providers are listed. For solving the weakness of both segments of education sectors, there is need of novel integrated service providers to have a complementary effect on both the sides. Such products must serve the curriculum according to the context of TEI can be called as "Curriculum Management Solution Providers."

They must provide integrated service using the effective information and communication technology products with different tariff plan.

Integration of technologies like;

- Learning Management System (Blackboard, Moodle),
- Curriculum management plan software for integrating online education (BLEnDT)⁴¹,
- Videos (Lecturio, primal videos), Collaboration tools (Cisco WebEx),
- Plagiarism & Assessment management (turnitin) (Pearson Assessment).

In other words, the concept of curriculum management solution is about managing curriculum in real-time using software and technologies.

Figure 4: A conceptual framework for a complementary strategy



CONCLUSION

Online education is an outcome of advancement in ICT, and it is continuously evolving and self – disruptive process. The future advancements of ICT plays a significant transformative role in improving the delivery of curriculum rather than disrupting the incumbent TEI.

Moreover, TEI is also constantly evolving from teaching focused (Newman’s “Idea of university”) to broader roles such as service, teaching and research⁴² (Kerr’s “multiversity”) and presently moving towards a “Global Research University” phenomenon.⁴² The created hype is blurring after a realization that disruption of TEI is impossible and adopted to second generation strategy “Hybrid online education.” The enthusiastic academicians in the MEI attempted blended/hybrid online education in their courses. There was no single study available in the literature that blended/hybrid online education studied on entire undergraduate Medicine Program. The reason for stagnation is due to lacunae in the institutional capability such as infrastructure, human resources, and technology availability.

Many of the studies expressed the incapability to adapt for various reasons mentioned in part 1 – b of this paper. The benefits of the blended/hybrid online education cannot be ignored or underestimated because the outcome/competency based medical education curriculum demands integration for efficient delivery of curriculum and redirects the resources to train the future physicians on the skills related to broader competencies. Now to further move the curve up, the third generation strategy has to be applied for effective dissemination of technology in the traditional curriculum.

In this paper, an attempt was made to construct conceptual framework on complementary strategy for TEI. The goal is to identify the appropriate business model incorporating the principles of complementary strategy and create a value proposition for TEI, complementors, and students. The presented complementary business model ‘Curriculum Management Solution Providers’ may be able to provide integrated service for TEI by using the ICT technologies. The future growth of complementary business model will blur the skepticism and Schadenfreude effect created due to the unwarranted fear in the academicians community and influence the academicians with entrepreneur, new career & professional opportunity at all levels (Regional, National, and International).

Culturally relevant education is defined as a variety of learning aspects including program learning outcomes, curricular content, learning context and instructional techniques; through a lens of cultural and regional relevance. This education system support skill based education for sustainability & growth of the local community.

For an effective health science program, epidemiological relevance is highly important to devise an undergraduate Medicine Program Curriculum. It will also bring more players into the field from all corners of the world because the complementary strategy is to strengthen the curriculum in the context of Institution (Culturally Relevant Education - CRE).

Shortly, more empirical works related to the assessment of learning outcomes of individual learner will emerge due to the advancement of artificial intelligence. It creates new paradigm in the assessment system that will lead to parallel reformation in Quality Assurance system.⁴³ The newer forces will be emerging as

the technology grows and creates new environments and opportunities for unbundling and Interprofessional health education. And policy and management reformation, reorganization, and restructuring of TEI are inevitable in future.⁶ For future work, we intend to use this framework for developing a business management plan in collaboration with Research and Development of Educational Consultant Company to work on the possibilities for becoming a curriculum management solution provider in the Asia (particular in South Asia) and Middle East Tertiary Education Market.

DECLARATION

This is the final paper submitted for the Subject - Tertiary Education Policy and Management in the Graduate Certificate in Tertiary Education (Quality Assurance) at LH Martin Institute, The University of Melbourne, Australia. It was awarded as exceptional paper with highest grade H1 - 95% (August 2017).

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