



DIGITAL TECHNOLOGY MEDIATED COMMUNICATION CHANGING THE FACE OF E-LEARNING

Education

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ABSTRACT

Recent studies have reported digital technology mediated tools (DTMC) is widely accepted as a learning platform today and has transformed from the use of asynchronous to synchronous tools. UK India Business Council report (2022) observes that India will need 1500 more institutions in comparison to current 959 to match growing educational needs necessitating E-Learning. The paper organizes the popular theories that explore the conceptual framework of distance education and this base is used to understand the underlying dimensions. This conceptual study will help to delineate the different constructs related to E-Learning and design a fit model. The common thread on reviewing the various theories of DTMC highlights interaction, human presence, nonverbal cues, personalization of content, socio-emotional interaction, needs gratification, social presence as valued in distance educational learning as in traditional formats of learning but the influence of these factors are more complicated due to transactional distance. The results indicate that E-Learning is characteristic of emotion deficient communication and this diminishes the retention by participants. This breeds unacceptable behavior. The study thus highlights the need for a socioemotional perspective for the achieving sustainable learning through DTMC.

KEYWORDS

Digital Technology Mediated Communication (DTMC), Transactional Distance, E-Learning, Learning Efficacy

INTRODUCTION

Disruptive technologies have been changing the face of our lives ever since time immemorial as mankind traversed through the phases of Industrial revolution beginning with Industry 1.0 credited with steam powered engines that mechanized production activity and increased productivity. This was one of the earliest innovations that helped us to span distances in a short time and thus helped to bridge distance and forge new trade deals. This then was followed with the discovery of electricity and assembly line production of Industry 2.0 that revolutionized the industrial process and made production significantly faster and at lower costs. Then came Industry 3.0 in the 20th century that resulted in the humble birth of automation with the arrival of computers. Information and communication technology resulted in the birth of robots that could automate the entire production process with little or no human intervention. It is in this era we see that the already available computer technology expanded by a network connection with a digital twin on the internet to speak evolved. Then comes industry 4.0 dominantly called as the era of Artificial Intelligence. This digital revolution in the manufacturing sector can today provide the right information to the right person in the right time. Thus, the current digital revolution lays claim to the beginning of Industry 4.0 (Desoutter Industrial Tools, 2023). This has transpired into advances in sensor usage systems, automation and digital communication technology that fosters continuous learning of production data to develop human-machine interface model that will result in predictive decision support, but also learning continuously to enhance knowledge (Nina Tvenge, 2018). This uniqueness of digital technology mediated communication transpires into the virtual classrooms to apply similar analytics that can surely narrow down the space and time gap between learners and teachers so as to address the difficulties in individual learning perceived in an E-Learning environment. This also is an advantage over the traditional learning which is more passive.

The continuing advancements in technology on learning environment directs this study to undertake exploratory research on some popular theories that describe the paradigm shift in distance education as it transforms to online education/virtual learning/E-Learning in the current context of digital technology mediated communication (DTMC). This necessitates to critically identify the constructs governing E-Learning and then to identify cause effect relationship that is more important to make E-Learning successful amidst the challenges it faces. Finally, the findings of this study will serve at a practical level for taking decisions at a Community College where an empirical study will be conducted (a constituent college of university level education) to consider E-Learning as a functional choice in its course curriculum to enable it to reach the unreachable.

THEORETICAL FRAMEWORK

"There is nothing more practical than a good theory." ~ Leonid Ilyich Brezhnev (1906-1982).

Digital Technology Mediated Communication (DTMC) popularly

known in research studies as Computer Mediated Communication (CMC) is defined as " a process of human communication via computers, involving people, situated in particular contexts, engaging in processes to shape media for a variety of purposes." DTMC learning also called as E-Learning or Virtual learning or Online learning has revolutionized the field of education and it is true that "E-Learning is not the next big thing, It's the now big thing". Learning doesn't just happen through the traditional settings of classroom or during business hours only. It happens anytime, anywhere. It is making access to education inclusive and sustainable. The surge in the online education grew post pandemic when businesses and students saw it as the only way to continue their education as the unprecedented global lockdown suddenly closed schools, colleges and universities to their dismay. This has been a phenomenon reported by studies conducted globally (Yusof, I. J., et al, 2022) and discoursed in many forums. What initially was seen as a channel to sustain business operations through digital technology mediated tools became widely accepted as a learning platform.

Though online education has its history way back in 1960 itself. It has been constantly challenged in terms of quality of online content, technology adoption constraints, lack of interaction amidst the lack of quality internet connection (World Economic Forum Report, 2016). Platforms for E-Learning like Coursera in its Impact report 2021 has seen registrations grow 3 times in 2022 compared to the overall growth of 3 years pre-pandemic and has gained momentum ever since. India had the second largest enrollments on Coursera (13.6 million) only after US (17.3 million) (World Economic Forum Report, 2022). This trend only sees to move upwards as Industry 4.0 dominated by AI is displacing jobs in its initial phase and seeks to reskill employees or students with the latest skills is indispensable. Growing aspirations among young people in India to be qualified, demand and capacity mismatch, disruptive work order displacing workers, need to upskill/reskill has only narrowed towards E-Learning technologies that can meet the learning needs of our people and also result in successful learning experience (Sanjay Rajpal et al., 2008).

As India needs to face many of these challenges in education sector amidst the huge demographic dividend that it boasts, a strategic approach to skilling our population will help India reap rewards while countries like Japan, Germany, France and etc. need to bother of their ageing population and lack of labor at the levels of unskilled, semiskilled, skilled and at the super skilled levels. Governments the world over have recognized that education plays a major role in maximizing human potential, to develop an equitable society with justice for all and thereby help in capacity building for national development. As India needs to be an innovator rather than copying innovations from the Western counterparts, a strong education system is imminent.

A report published by UK India Business Council, 2022 has clearly mentioned that by 2030 India will have around 140 million college

going young population. But there is a wide demand and capacity mismatch as out of 959 higher education institutions across India today, 28.6 million are educated by 756 Universities. This means India will need 1500 more institutions to match the growing demographic dividends educational needs. Considering various other ambitious projects of our Government of India to increase the Gross Enrollment Ratio (GER) into schools facilitated by Right to Education Act and the introduction of National educational Policy (NEP) aiming to increase GER from 26.3% in the year 2018 to 50% in 2035, only posits the need for more higher education institutions offering quality education (The Times of India, 2022). Surely in India education is nothing short of economic liberation to millions and this calls for understanding E-Learning conceptual frameworks to evaluate it as a channel to deliver quality education. Hence this study would examine on the theoretical dimensions in E-Learning environment to design an abstract model for a more concrete validation and testing.

METHODOLOGY

"It is the theory which decides what we can observe" ~ Albert Einstein (1879-1955)

The aim of the paper is to organize the literature that explores the conceptual framework of distance education and this base is used to understand the underlying dimensions of the study. This will help to provide the perspectives of different theories and then it may be categorized if needed. It may also provide sound directions for undertaking an empirical study. It is true that theoretical studies have received a welcome and hostile approach in research studies. It is a valuable tool in envisioning a bigger picture of the study rather than narrowing down on our perspectives. Hence this conceptual study will help to delineate the different constructs related to E-Learning environment and help to design a better model for studying (Terry A., 2004). This, will also contribute not only towards development of new models but deepen our knowledge on the study, help test hypotheses, estimate relevant constructs that ultimately are aimed at improving the way of E-Learning. To achieve the aim of the study, the researcher uses a theory driven systematic review of literature and uses a theory-based content analysis (Salminen, 2011; Sun et al., 2018; Timonen, 2021) to identify and delineate the constructs of the study.

RESULTS AND DISCUSSION ON E-LEARNING THEORIES

A number of theories have evolved over time to understand the transaction of education delivery from teacher/learner to the learner and between learner and content. A constructive approach to study drivers of acceptance and use of E-Learning can help make it a sustainable model of learning.

Social Presence Theory

Social Presence Theory (SPT) is a framework discussed even before the onset of computer mediated communication. SPT was developed by Short, Williams and Christie, 1976 on the pillars of "intimacy" and "immediacy". The former is a measure of belonging and how we understand the nonverbal clues in spite of physical distance and the latter describes strength of the relationship. This theory brings about the relationship between social presence of an individual and his experience level determined by the medium of communication. This is defined by the media quality comprising of "social cues and active nonverbal channels when social/interpersonal information is transmitted through a medium" (Gunawardena, 1995).

It is observed that naturally social presence is more in offline communications than in online communication. This is because of the asynchronous communication tools that are used to communicate and lack human presence and/ or nonverbal cues. There is suppression of demographic variables during the interaction and this manifests into behavioral problems like disinhibition, flaming etc. DTMC has been criticized for its lack of effectiveness and appropriateness in its group of devices such that only "the fax machine received a lower mean rating than e-mail, while direct communication, telephone, voice-mail, and letters were all rated better" (Westmyer et al., 1998). In fact, low social presence increases the impersonal nature of the medium.

Social presence is described as the extent to which a person is looked upon as real in DTMC while some view it as an "emotional inter personnel connection" (Gunawardena, 1995). Literature has supported that teacher presence (Caskurlu et al., 2020) and learner feeling his social presence enhances DTMC and also there is a gap to address social presence in online learning environments from the perspective of students (Amundson A, 2021).

Social Information Processing Theory

Although Internet made its presence in the mid 1990's, one could see its prevalence in terms of adoption in late 1970 to 1980 in professional, educational and in recreational avenues. In the early days, it was much criticized for the absence of nonverbal cues that would personalize interactions. The absence of this may result in communications being devoid of social and interpersonal interactions. This form of asynchronous communication through text messaging, email and through social media platforms was criticized for absence of coherence and dehumanizing (Rockart & DeLong, 1988; Walther, 2015) and lacking socioemotional context in online communication (Joseph B. Walther, 2015). As the human element plays an important role in decoding emotional expressions, the lack of it may result in antagonism with no socioemotional expression. Many studies went to confirm on the need for human element that can recognize emotions and deliver to need. The same is also emphasized in Community of Inquiry model (Sune Mare, 2021) that a community learning can enhance learner success. Contradictory views that some individuals were better adapted to nonverbal cues of the medium was also reported (Steinfeld, 1986; Walther 2015). At this point of time, Social Information Processing (SIP) theory came of shape explaining how the asynchronous or nonverbal online communication of the digital technology mediated communication transpires to achieve relationship with its audience in a way similar to offline communication. This is obtained through combination of "message elements from different cue systems may be duplicative, complementary, contradictory, or otherwise intertwined with one another" SIP theory was a big eyeopener where the monopoly view of nonverbal cues was broken down and it brought forth the new "notion of verbal/nonverbal interchangeability" became functional approach overtime (Carlson & Zmud, 1994) and leading to a broader term of social information processing.

The SIP theory proposed that individuals apply the process of decoding and encoding when there is absence of nonverbal elements in communication and develop depth of relationship as they do when they interact in person. However, this takes more time than through direct communication as they have "to construct cognitive models of partners and emit and receive messages with which to negotiate relational status and definition". Empirical research conducted in this regard also supported the SIP theory and the same observation has been replicated in other studies (Hian, Chuan, Trevor, & Detenber, 2004). Self-disclosure though takes time among participants through nonverbal elements it is observed to be relatively stronger. Thus, SIP theory reinforces the aspect of verbal /nonverbal interchangeability that would make communication effective in digital technology mediated learning. It is one of the few theories that strongly stresses on the importance of nonverbal cues as a functional part of digital technology mediated communication rather than a structural aspect. Researchers have begun to realize that contemporary interactions of social nature are not conducted through one medium or another but through a combination of channels.

Hyper Personal Communication Theory

Parallel to SIP theory the hyper personal communication theory HPCT says that the digital technology mediated communication is ineffective due to their low social interaction characteristics of impersonal and interpersonal communication (Dubrovsky, Keiser & Sethna, 1991). DTMC has today come a long way from connecting globally distributed systems (impersonal) to individuals (interpersonal) (Turoff, 1991). The growing presence of "online friendships" and virtual communities only undermines the inappropriate and/or ineffective social interactions that take place through DTMC and in some case has been found to far exceed the interpersonal relations built online (Jones, 1995) and called as hyper personal relations by analyzing media interaction with "source, receiver, channel and feedback process" that augments DTMC further more (Reid, 1991).

In spite of the deficiency in DTMC, hyper personal theory sees a seemingly strong and intense relationship with reciprocation established that does not go unobserved by some studies. Walther (1996) that denotes "communication that appears more desirable than what we tend to experience in analogous to direct face to face interactions". This results from the planned message from the producer, an ideal self-presentation, information management provided by asynchronous tools to positive feedback loop in the system. This attributes to better relationship development and collaboration among the participants. HPCT though two decades old,

its tenets hold good and there is paucity of research as to the limitations of the model in today's online environment (Scott, G.G., 2020).

Transactional Distance Theory

As DTMC used in E-Learning mostly required independent learning and provides individual autonomy, many studies have been conducted to provide insights on the same and to understand the environment in such distance learning methods. The Transactional Distance Theory (TDT) is very popularly reviewed in many distance education studies (Michael Moore, 1972 & 1993; Garrison 2000) and is articulated around the basic tenets of structure, dialogue, learner autonomy and transactional distance. Moore connotes that distance education is the "universe of teacher-learner relationships that exist when learners and instructors are separated by space and/or by time". This theory contributes to the conceptual framework of the paper as it exhorts that the "distance in E-Learning is only transactional in nature and is not spatial or temporal". Technological advances have combined synchronous and asynchronous learning and has resulted in better interaction and reduced transactional distance between the learner and teacher. This is indeed the key factor in distance education.

Bischoff et al. (1996) defines transactional distance as "the perceived interpersonal closeness between the teacher and student, among students, and between other students and the teacher, as perceived by the student respondents". The use of synchronous methods in DTMC for work or for learning started much later and researchers then explored their role in reducing the distance and promoting interaction to facilitate personal and cognitive interaction (Sharma, 2006; Yang & Liu, 2007). These studies focused on synchronous tools like online messages, teleconference and videoconference. Soon, Web 2.0 exemplified by higher bandwidth, multimedia prowess and interactive features resulted in a higher level of audience participation and revolutionized learning options available with institutions. Using synchronous tools in an online learning environment was seen to provide a win-win situation between the teacher and student in continuously assessing performance and restructuring course (Moore, 1997; Schullo et al., 2007). This is what Moore had been theorizing that lack of synchronous or nonverbal cues creates a psychological space/gap in communication that leads to potential misunderstanding between student and teacher (Leon, 2011; Jason Dockter, 2016).

Moore (1997) in TDT stressed upon the need for quality rather than frequency of the interactions, student centric course offering flexibility rather than rigidity and learner autonomy as defined by need for independence and interdependence. A number of studies have tested on Moore's theory and have confirmed it as a valuable framework to analyze distance-based learning (Chen, 2001; Force, 2004). Moore's theory of TD analysis Thus, transactional distance plays a dominant role in distance education and is also a relative concept than absolute and is also a cause of concern in offline learning. Understanding and alleviating transactional distance can make online learning more effective (Gokool-Ramdoo, 2008). This, then shifts our focus on exploring how an educational program can be evaluated in terms of the basic tenets of TDT, so that a global theory can be formulated to develop educational programs. There is a limitation of research in this context (Gorsky and Caspi, 2005).

Social Cognitive Theory

The cornerstone of Social Cognitive Theory (SCT) rests on efficacy/readiness shown by learners in adoption of technology. In other words, this theory opines that human motivation and action is built around positive thinking. This theory posits the triadic nature of individual behavior where individual behavior, personal and environmental facets influence each other in a reciprocal relationship (Carillo, K. D., 2010). The environmental facet comprises of social concerns with family, friends, peers, encouragement received and imitation of others act. The other dimension is support from others and social norms. The personal facet includes learned activity. The behavioral facet is about "use, adoption and performance". SCT further revolves around six motivational factors of self-efficacy, self-control, attributions, goal orientation, intrinsic versus extrinsic motivation, and self-regulation that has been discussed in offline environment but less in online environment like E-Learning. These factors have been grouped under three categories of Do I have the ability to do, why am I doing? and how to do? This has been iterated in studies post pandemic too that social support as theorized by SCT is strongly associated with efficacy in E-Learning and was stronger among male students (Hongying Yu & Jihong Zhou, 2022).

Studies on efficacy in using online learning environments depict that learner confidence in using digital technologies leads to increased use of "cognitive & meta cognitive "strategies that positively influence performance in a course. Bandura (1986) throws light on the sources of self-efficacy assessment by learners from their actual, situational, motivational experiences and through physiological measures. Today there is an increasing attrition observed among online learners and many traditional courses have moved online, there is a dire need to match the increasing demand with capacity. There is an urgent need to study learner's motivation and strategies to engage with learners for effective online learning. There is a void in the studies that attempt to understand these dimensions of E-Learning to make it an effective mode of learning (Miltiadou, M., & Savenye, W. C. (2003).

SCT asserts the role of emotional factors as a person's level of confidence is proportional to his stress levels and in turn affects his motivation. There is also paucity of research and requires further investigation on the role of emotional factors on one's cognitive and behavior indices. As any self-doubt in efficacy results in distress and demotivation. Such works need further studies (Wood et al., 1989; Chiung-Sui Chang, 2014).

Uses & Gratification Theory

Most of the theories reviewed shows how the media impacts on people. Users & Gratification (UGT) theory (Blumer & Katz, 1974; Rosengren et al., 1985) by contrast explains how and why people use media for their needs and gratification. According to UGT, people are not passive users of media but they use the media for their specific needs. The focus is on user/audience-centered approach. Media offer several gratification opportunities classified as cognitive, affective, personal integrative, social integrative and tension free needs. For example, email is considered more superior to telephone as it is flexible in terms of adjusting to work schedules and across time zones (Dimmick et al., 2000).

Papacharissi and Rubin (2000) state the functional use of internet among its users and was used to satisfy knowledge seeking, entertainment, interpersonal need and convenience among users who found it as a more rewarding option. Flanagan & Metzger (2001) show the ratings of media use to meet self-fulfillment needs was in the order of direct communication channel, traditional mass media channels followed by digital technology mediated communication. It was interesting to see that internet-based tool was rated as one among the top 4 modes of need fulfillment when it comes to "learning, information, leisure, social bonding, problem solving, status and personal insight".

The UGT proposes its role in understanding the selective learner behavior commensurate with their needs (Makingu Modi, 2007; Khoo, B. T., 2020) and finally on the eLearner experience. Given the complexity in communication situations today, DTMC like E-Learning is the best choice and hence proper training for the users who engage in this media for activities like learning or for decision making needs relevant knowledge and skill for its competent usage.

Implications of Theoretical Framework

As the popular saying goes that "a good theory helps us to build upon from the known to the unknown", the review of theories related to E-Learning through DTMC helps the researcher to identify the underlying conceptual constructs. E-Learning being a subset of distance education, the former has undergone evolution with the advancement in technology from using asynchronous tools of communication to synchronous tools of communication. The education sector has never been short of innovative communication tools to foster engagement with its participants but studies do not pinpoint to one theory that underpins the exact conceptualization of the framework in education transaction. The common thread on reviewing the various theories explaining DTMC brings to light that interaction, human presence, nonverbal cues, personalization of content, socio-emotional interaction, needs gratification, social presence have been valued constructs in distance educational learning environment and the same is also agreed upon in the traditional formats of independent learning (Garrison and Shale, 1990), but the influence of these factors are more complicated due to transactional distance. This research paper also iterates the findings of previous studies on distance education.

Interestingly studies since long have been stressing on the vital role

played by interaction in supporting and describing education transaction. This study is able to draw meaningful connections that identifies the basic tenets to evaluate the success and efficacy of E-Learning environment. In the case of E-Learning as an efficient tool of learning, the perception of social presence will provide a sense of belonging and enhance feedback in the teacher-learner dyad (Short, 1976; Amundson A, 2021). Advancement in DTMC provides immense tools (Gamification, video content, collaborative platforms, virtual and augmented reality apps etc.) that help to engage learners and help build social presence. The social information processing theory also reinforces on the need for nonverbal cues / the role of human interaction that help to add personalization to the learning environment. However, SIP theory posits that this can be overcome by a combination of message elements that are complementary and supplementary to each other. The SIP theory clearly proposes that the disadvantage of the system can be handled through advanced tools evolving over time. This only calls to harness tech advancements through organizing training sessions for the participants to achieve E-Learning efficacy. A study (Al-Hayari H.S., 2023) reinforces on this fact that “transition to distance education must be based on technological foundations that enhance the educational process so that it appears as it is actually and face to face in the classroom”. It also stresses on the resistance to change to technology, fear of the unknown and impulsive behavior or emotional action and hence need to address these feelings, reactions and beliefs of learners within an educational institution for a better transition to distance learning.

The hyper personal communication which is a challenge even in traditional classrooms with large student strength can be addressed better through E-Learning where a combination of synchronous and asynchronous tools in teaching can be used to reach out to the unreachable. Especially Artificial Intelligence based learning tools can be designed based on the capacity of the learners. This leads to designing a hyper personal course package which increases online learning efficacy. Moore's TDT is found to be a very popular literature reviewed in distance education and its prime tenet is transactional distance on E-Learning. This term also connotes perceived distance between the teacher and learner due to interaction effects on “dialogue, structure, autonomy and transactional distance”. Like most theories, it also accentuates on interaction dimension (Gokool-Ramdoo, 2008). SCT gives a new dimension to the efficacy of online learning environment as driven by motivational constructs. In contrast to the focus of the earlier studies reviewed, this study is very novel as it shifts the dimension of study from technology factors, teacher proficiency/human environment to one of learner motivation in order to make E-Learning successful. This therefore can be the focus of researchers/decision makers contemplating on the use of distance education methods. Finally, the Uses & Gratification theory adds on to the literature of human actions directed towards gratification of one's need and it theorizes that usage of media by people is driven by their need /gratification motive. The plethora of digital media tools in the market need a profiling of customer base as to why and how they use it and needs to be leveraged upon for E-Learning satisfaction and efficacy.

To sum up theoretical examination of the theories explaining interest of learners in E-Learning has clearly delineated the major constructs as not only dependent on the user acceptance and use of digital learning technologies but has to be explored from the learner emotional strength per se as there only exists emotional interpersonal connection and the strength of the relationships is built over a time and can also feature hyper personal connect. Hence an emotionally strong person can find themselves efficient in learning online.

FUTURE DIRECTIONS

Theoretical analysis of published research work in the context of DTMC on E-Learning predominantly stresses on the interactivity of the media during education transaction. In fact, this requires building high degree of social presence (referred to in some researches as emotional inter personnel communication (Lowenthal, 2010) in the absence of nonverbal cues, impersonal communication and a dehumanizing environment eventually leading to low degree of emotional display. The completeness of the communication is also overridden by the extent of emotional representation of the message. The more emotion deficient a communication delivers, the retention by participants diminishes.

Thus, some very important variables to bridge transactional distance like “culture, relationship level, status, time pressure, distance, and

task ambiguity” will not be given attention and this may lead to diversion of interest and attrition (Goran B., 2001). Also, negation of emotional construct only leads to unacceptable behavior like “behavioral disinhibition, flaming, verbal aggression, and inappropriate self-disclosure”. Thus, successful communications need to focus not only on the task but also on the socioeconomic communication (Walther, 2010; 2015).

Prior studies observe that regular usage of the medium can help to improve emotional representation of communication (Carlson & Zmud, 1994). We thus see that socioemotional interaction or emotional psyche is a dominant construct influencing efficacy of E-Learning, while literature is staggering in studies that examine the influence of the learner's emotional role on E-Learning efficacy. Hence future researches should understand this behavior (Carillo K. D., 2010; Walther, 2010; 2015).

CONCLUSION

As our students are growing in this tech era, technology adoption or harnessing tech tools that enhance interactivity and reduce transactional distance in distance education cannot be overlooked upon. This is even more true when the number of students wanting to enter higher studies are more than the educational institutions available in our country. This demand -capacity mismatch can be met only through adoption of E-Learning. In this scenario providing information on the predictors of success in online learning environments will help the traditional as well as online learning environments to be more sustainable in education transaction. Omkar Goswami (2023), corporate and economic research group (CERG) advisory in India has debated on the condition of education in India is in a terrible state as 2011 census points out that only 36% in 25 to 34 age group have passed class 10 and above, 24% have passed class 12 and above and less than 13% have obtained graduation. There is only a marginal change in these statistics over the years as the next census details are pending. The scenario means there are a huge number of people without academic qualifications. The identification of suitable models of online education in general and in specific segments can help to design sound E-Learning to face the dire situation in our education system.

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