International Journal of Information and Communication Sciences
2022; 7(3): 48-65
http://www.sciencepublishinggroup.com/j/ijics
doi: 10.11648/j.ijics.20220703.11
ISSN: 2575-1700 (Print); ISSN: 2575-1719 (Online)

Adopting a Student Centric Education Blockchain System

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To cite this article:
Shankar Subramanian Iyer. Adopting a Student Centric Education Blockchain System. *International Journal of Information and Communication Sciences*. Vol. 7, No. 3, 2022, pp. 48-65. doi: 10.11648/j.ijics.20220703.11

Received: June 9, 2022; **Accepted**: June 23, 2022; **Published**: August 12, 2022

Abstract: The purpose of this paper is to portray an integrated Education Model which proposes to be student-centric and using technologies like Blockchain technology which can offer security, authenticity, immutability, longevity, data, information, decentralization, no intermediator, reliability, and data integrity. Education Blockchain 4.0 is a part of the Industrial revolution 4.0 which is disrupting the education sector. Blockchain technology is in focus in the last decade amongst users, researchers and practitioners. Despite the growing interest in Blockchain technology, the education sector has not seen much progress in terms of applications. This system uses the research of blockchain-based educational applications. The world is accelerating with IoT and AI. Industry revolution 4.0 is becoming a mandatory standard and necessity in globalization and a logical outcome is Education Blockchain 4.0. It is the need in the educational system due to the disruption initiated by technologies. Quantitative Methodology will be used to prove the conceptual model that proves the relationship between various constructs using PLS-SEM, which statistically can prove these relationships. Smart Blockchain System in education will make everything digital, easily storable, immutable, secured, longevity, easy access, cost-effective, User friendly and integrable to other technologies. The proposed Education Blockchain 4.0 smart system is poised to achieve these objectives across domains and to integrate further technologies making it the most suitable choice for these applications, which is the major contribution of this study. Also, the integration of the system theory of the new student centric education ecosystem, the disruption theory for Blockchain technology in education and the stakeholder theory applied to the education. Education Blockchain 4.0 will be useful for educational organizations to be cost-effective, achieve volumes of scale by integrating various functionalities, sectors. It will be useful for making policy decisions to enhance revenue, profitability and deliver stakeholder satisfaction.

Keywords: Blockchain in Education, Blockchain Applications, Education Technology, Smart Education Systems, Education Blockchain 4.0

1. Introduction

Background of Industrial revolution, education revolution and Blockchain revolution leading to educational Blockchain 4.0 which is a smart system.

What is Industrial revolution 4.0?

The Industrial revolution from 1.0 to 4.0 has made innovative advances over the last two centuries from the steam engine (1.0) to the mass-producing assembly lines of the 1940's (2.0) to the computer age of the 1970's (3.0) to the ICT age of the current millennial which is the Industrial revolution 4.0 leading to smart systems [95].

What is Education revolution 4.0?

The learners are receivers of knowledge in the education revolution 1.0 evolved to education 2.0 where the students are interactive and collaborating. The third education revolution is student centric, and the fourth revolution is using emerging technologies to engage students and making them adapted to these technologies by activities [65, 26]. Education 4.0 combines the power of tech and discovery learning to produce competent candidates to meet the high demand for modern spaces. It has led to the use of new technologies like gamification and virtual reality in teaching, and, automatization like digital payments, cloud-enabled database management to make work easier. The Universities and Institutes need to align the teaching and education process to match the technological advances for their survival today. [19].

What is Education Blockchain 4.0? The background-

The three stages of blockchain development applications are Blockchain 1.0, 2.0, and 3.0. Blockchain 1.0 is known for the cryptocurrencies cash payment system introduced based

on peer-to-peer working. Blockchain 2.0 is improvement from the simple cash transactions to the extensive blockchain application like loans, bonds, stocks, and smart property using smart contracts [98]. Blockchain 3.0 blockchain application developed in the areas of government, health, science, literacy, culture, and art, form the currency and finance markets [1].

Most current applications of blockchain are still in the 1.0 and 2.0 stages. Most people are unaware about working of the blockchain and its application. Although many researchers have researched the blockchain application in the commercial area, blockchain application in education has been recent focus area and interest [31, 93].

Education 4.0 combines the power of tech and discovery learning to produce competent candidates to meet the high demand for modern spaces. It has led to the use of new emerging technologies like Blockchain, gamification, machine learning and virtual reality in teaching [81].

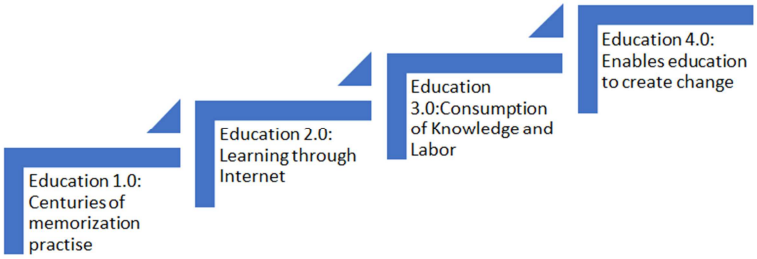

Figure 1. *What is the purpose of Education Blockchain 4.0? What is the importance? How it can be implemented? Advantages, challenges, and features.*

Blockchain technology is crucial in education 4.0 as it is a fallout of the Industrial revolution 4.0, the integration of technologies across the domain to achieve volumes of scales and make it very efficient. Education 4.0 integrates the power of technology and discovery learning to produce competent candidates to meet the high demand for modern industries. It has led to the use of new technologies like gamification and virtual reality in teaching, automatization like digital payments, cloud-enabled database management to make work easier [55]. But technologies like blockchain are transforming the process of learning and education. Digital disruption has forced educational organizations to adopt new technologies and transform the way they do business. Naturally, digital technologies and emerging technologies require people who are skilled in these new technologies [59]. There is shortage of skilled talent in crucial roles whereas the unemployment levels are going north. This would mean that the education system is not throwing up learners with the necessary skills as required by the industry [76]. The most known reasons for the shortage have been associated with lack of visibility, lack of evidence of processing these skills and limited networking resources of these people. Technology can be the key to solving the issues of connectivity and visibility. Blockchain technology can be used to cater to needs of the institutes, recruiters, and technical experts [23]. The implemented Case of Certif-ID is an example on the usefulness of Blockchain as a networking platform for skilled professionals to view and pursue from leading training institutes. The workers earn a digital certificate upon completion of courses for the skills earned, micro-credentials powered by Blockchain to show recruiters and college administrators [64]. Blockchain-based digital certificates bring in trust, transparency, and traceability which are completely tamper-proof, thereby negating the issue of misrepresentation of skills, and hence simplifying background checks. Instead of going through page-long resumes and keyword-stuffed descriptions, recruiters can base their decision on an individual's digital certificate. Recruiters can narrow down on the right candidate with the right skills in next to no time [68, 81, 82]. One of the most important ways Blockchain can boost education 4.0 is by aligning the education and employment sectors [6]. Issuing and verifying digital certificates and eliminating fake certificates can speed up the process of students being skilled and recruited [91]. A digital certificate issued on a blockchain is not controlled by any network entity. So, it is accessible by anyone who has access to its direct link/URL, forever [50].

Education Blockchain 4.0 uses emerging technologies like big data, machine learning and analytical learning to change the operations of institution, teachers and students. The transformation of education blockchain is sure to continue since it has already happened for 5 years [92]. Blockchain technology will evolve future educational models by enhancing opportunities for educational institutions and professionals. The integration and utilization of information and communication technology (ICT) are leading this evolution [60]. The present global education context uses emerging technologies to transform the traditional models of educational institutions [75, 77, 79]. Blockchain can support the student-centric model allowing the learner option to select teachers and experiences from more than one educational institution, based on analysis of their competencies. Crypto-currencies and payment portal of Blockchain might handle the confirmation of cross-border certifications and can be used to register different teachers from different institutions globally [47]. The future learners will not necessarily attend a whole course at one only institution. Smart contracts in an integrated blockchain can use information for machine learning putting the student in charge of the learning process and an adaptive path for new interactions [103, 105]. Analytics can recommend or create courses to students as per their skills and skills required trends. Multiple learning spaces can recommend transactions

with any environment by identifying learner needs, directing learning and its records as a guide using Blockchain assurances on reliability in the certification [57, 71, 88].

2. Literature Survey

The Blockchain technology research paper focuses on five main themes: (1) Blockchain technology applications developed in education. (2) benefits that can accrue by using blockchain technology in education. (3) Challenges faced in adopting education blockchain technology. (4) Organization challenges of adapting Blockchain. (5) Environmental challenges in adopting Blockchain technology. A detailed results analysis of each theme conducted an intensive discussion based on the findings. This paper throws light into other educational areas that could benefit from blockchain technology [8, 9, 27].

Blockchain and its implementation features to cater to education needs and stakeholder's role:

The Blockchain has features to address the education industry challenges of lack of transparency, inefficient paper-based record-keeping processes, motivate students to learn by including gamification to perform well in class, address poor student and teacher accountability, and lack of trust in educational merits and academic degrees due to fraudulent practices [17, 51, 62, 63].

Transparent and improved record-keeping:

The immutable blockchain storage features ensures the record created once, is safe and secured, unalterable. Then the information is accessible to all the educational system participants and to be shared between institutions. Student's digital portfolio can record task, assignment, participation in school and extracurricular activities as blocks and visible to the counsellors, teachers school administrators, recruiters and employers. [28, 36, 44]. Blockchain systems can protect intellectual property rights, enable supervision and facilitate accreditation of schools, colleges, and universities, and eliminate fraudulent diplomas and transcripts. Blockchain educational records is easy to access and quickly transfer to network of institutions and organizations, including potential employers [29, 54, 56]. The students can share a digital link to provide access to their profile to authorized people to not undermine confidentiality. Blockchain technology system ensures complete authenticity of credentials and student records as it has secured history of changes with signatures [23, 53, 71].

Enhanced student accountability using smart contracts

Smart contracts are useful in executing tasks, activities and assignments in timely manner and record the same, by Teachers. All instructions and conditions like due date, deadlines are spelt out in the smart contract. The student is given access to subsequent lessons or awarded credits or given certificate automatically using the Smart Certificate [19, 22, 39, 43]. The Smart contract acts as the motivational element that is missing in traditional education systems [103, 108, 18, 36].

Incentivize participants to achieve greater results

Cryptocurrency and tokenized credits ensure efficient reward systems to motivate the participants students, teachers and administrators to contribute to the educational process by creating new learning material and to participate in research. The system valuation and investment are tokenized to share with the participants to use the system and involve others in the process, to induce usage and gain scalability. The Smart contracts are used to issue awards in cryptocurrency for completed tasks. Teachers will be able to incentivize students even further by giving special credit to high performers [16, 24, 14, 27]. Blockchain technology uses gamification in modern education and take it to the next level. Tokenized credits become the currency to trade, pay off student loans, purchase school supplies, securing learning materials, and cover other educational expenses. The tokens are used for rewarding students for achieving outcomes from the university and this could significantly reduce student dropouts as it serves as motivation for them [12, 13, 32].

Learning performance tracking and individualization

Blockchain offers transparency of data and so educators can review resources on monitor and student performance can be controlled. Smart contracts usage and their output as tools to identify the struggles of student, schools can manage to offer customized environment for learning. Recorded student performance data on blockchain is available to inter district institutions to improve educational practices [11, 29, 102, 103]. So, such blockchain system can assimilate performance statistics on a district, state, and national level and enhance healthy competition among institutes improve the level of education [28, 73, 101].

Introducing verifiable lifetime student transcripts

In the current situation it is troublesome in obtaining transcripts from educational institutions. The process of getting certificates and verification is difficult due to various reasons of negligence of proper systems by Institutes and recent fraudulent practices making employers and academia suspicious of certificates submitted. Blockchain can support students with an online digital transcript available to stakeholders anytime, it is needed. The learner transfers between institutes and colleges can be streamlined using transcript which can be verifiable academic credentials and can be used for potential employee verification [74, 80, 100]. The common database can support and collaborate Institutions using blockchain by providing portfolio of educational achievement [4, 11, 12]. An educational blockchain platform can allow students to create their digital portfolios which would store all their educational merits, such as:

1) Degrees obtained
2) Proficiencies of experience
3) Certificates of courses finished
4) Micro-credentials or achievements
5) Top up certificates or awards
6) Attendance records and assessment scores

The learner portfolio can portray the student credentials for University enrollment or for employer verification before issuing Job offers to candidates. The database developed including all candidates, potential and current, can be used by employers across the global to identify candidate's worth

employing and this created database would be motivation for students to perform better, to be noticed by corporate [2, 10, 11]. Although the blockchain adoption benefits in the education sector are evident, there is hesitation amongst educators who are resisting transformation [2, 7].

Blockchain resistance and challenges:

Smart systems are used by most educational Institute and this is the main barrier to blockchain adoption. Institutes use offline document management systems and student information systems for storing records, and educational materials. Educational Organizations have already invested in Smart systems and the infrastructure, hardware and software for integrating it into their processes. Lots of man hours and money have been invested in training the technicians and staff on these systems and it would be hard for them to shift from centralized systems to decentralized systems at short notices [72, 10, 82].

Volumes of users or Blockchain scalability is another reason which is a major challenge for Educational blockchain as it will test the feasibility of sustaining such investments. The more information is added to the blockchain, by creating new blocks, the speed of working is reduced and it takes more time to analyze the historical data. Recent research has some solutions to increase the speed of transactions on the Blockchain using smart contracts however these discoveries need to be tested in real time [72].

Infrastructure investments in the initial stages are high and few management supports is forthcoming as the risk perception involved is high and the future benefits are difficult to justify at this stage. The costs involved are related to change the environment, set up the infrastructure, the blockchain development costs, and staff training. It is difficult to forecast the actual benefits of the blockchain integration estimating the management expenses, enhanced record-keeping efficiency and effectiveness of the payments and rewards tokenization [87].

Blockchain Training and Development

Education sector should take the lead in innovation and transformation towards industrial 4.0 and 5.0 hence use the latest technology, networking solutions and integration of the emerging technologies. Blockchain can impact education, by enhanced transparency, optimization, and simplification of common processes. It motivates learners to study and acquire skills for better employment prospects by keeping record in secured manner which can easily be verified [73].

High energy needs of massive Blockchain system

The energy needs of any system depends on the architecture and design of the system, the same applies to the Blockchain system in education. It depends on the scalability and the number of transactions and the proof of work for further additions to the block which can be minimized by reducing the redundancy factor. This energy aspect has to be further researched specifically to understand the best way to reduce energy consumption and consider alternate source of energy like solar, wind to reduce the cost and scan the availability of such facilities [88]. So, as per this cited article, the consumption of energy factor is not so prohibitive as most authors predict it to be.

Workplace skills and its recognition: The future trend in Education is going to be studying on the job or at the workplace and get credit for this education from prior learning or experience learning which has not been done this date. Learner's study or educate oneself, be employable and apply the skills and learning at the workplace, so workplace is the best place to learn. This is indisputable [14].

Smart Education student centric system using Blockchain 4.0

The smart Universities propose to use emerging technologies like Internet-of-Things technology, machine learning, cloud computing technology, Radio Frequency Identification (RFID) technology, 3D printing, ambient intelligence technology, smart agents technology, artificial intelligence, augmented and virtual reality technology, remote (virtual) labs, location and situation awareness technologies (indoor and outdoor), Wireless Sensor Networking (WSN) technology, and sensor technology (motion, temperature, light, humidity, etc.), to impart skills and competencies for the Industrial 4.0 jobs [104, 54]. This ensures learners will experience the smart education, seven abilities such as Problem Solving, Communication, Self-development, Information Acquisition, Global Trend Acquire, Resource Management, and Convergence Thinking can be improved [44].

Stakeholder interest in student-centric smart Blockchain education system

It is the stakeholder pressure and the changing environmental situation which is propelling the education system from traditional to smart student centric model using emerging technologies like Blockchain [16]. The student and parents are facing difficulty due to the rising cost of education across the globe and the reducing employment opportunities, thus making the investment unviable [73]. The banks, financial institutes are facing high defaults in the education loans and affecting the loan insurance business [5]. The Universities are forced to shift to online education due to social distancing in the COVID situation and thus making the teachers training, software, hardware investment necessary to meet this demand [80]. The investments made in brick and mortar are no longer yielding the same returns [47]. This is going to disrupt the education sector for betterment and make it student centric [49].

Integration of

A. System theory (part change will change whole)- Systems theory is the interdisciplinary study of systems. A system is a cohesive conglomeration of interrelated and interdependent parts which can be natural or human-made. Changing one part of a system may affect other parts or the whole system. It may be possible to predict these changes in patterns of behavior. - student centric + technology enabled system across domains. [](Jackson, 2018); [](Lim et al., 2020).
B. Disruption theory for Blockchain technology in education (BCT will change education) - Disruptive Innovation refers to a technology whose application significantly affects the way a market or industry functions. An example of modern disruptive innovation is the Internet,

which significantly altered the way companies did business and which negatively impacted companies that were unwilling to adapt to it. BCT is capable of disrupting the current education system by its features which are needed in current smart education [62, 49].

C. Stakeholder's theory in education: Company's stakeholders are described by Dr. Freeman as those groups without whose support the education ecosystem would cease to exist. These groups include customers, employees, suppliers, political action groups, environmental groups, local communities, the media, financial institutions, governmental groups, and more. This view paints the education environment as an ecosystem of related groups, all of whom need to be considered and satisfied to keep the education system healthy and successful in the long term. How the stakeholders of education can be impacted by these changes in the education ecosystem [104].

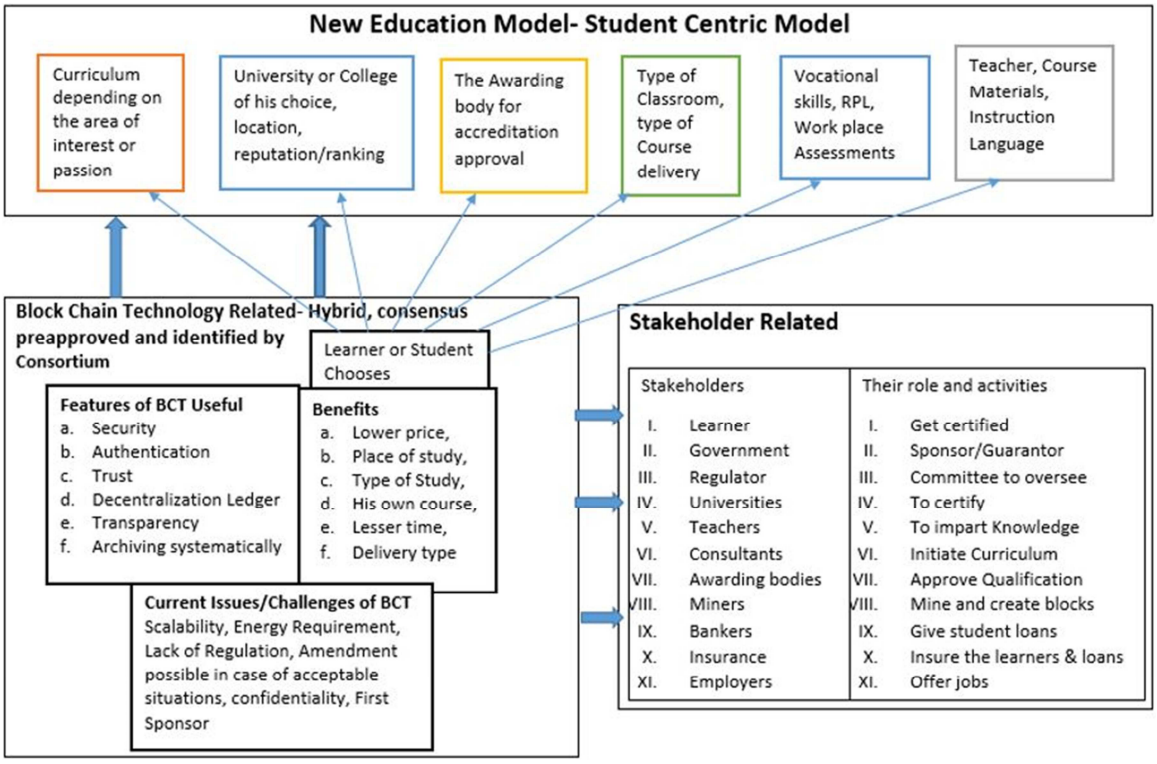

Figure 2. *Research Framework showing the interface between Blockchain Technology, New Education Model & Stakeholders.*

Some known use cases- Blockcerts: educational credentials management, APPII: CV builder to showcase verified educational merits to employers, ODEM: educational products and services marketplace, Sony Global Education: digital transcript management, BitDegree: online education platform with a gamified experience, Disciplina: individualized learning management system [65, 71].

The Research Framework for "Student-centric- New Education Model using Blockchain technology" and it is coined as "Student Centric Blockchain Education framework model" which has the vision to reach Education to every child across the World irrespective of creed, caste, religion at an affordable price. The above objective is also Sustainable Development Goal which the UN Development bodies have been struggling with for quite some time to implement. The below Research framework model has the potential to reach to every child at minimum cost [47].

3. Scope of Research

The research study captures the Blockchain implementation in education which can satisfy the latest needs of the education sector involving the latest technologies in line with the Industrial revolution 4.0 which integrates technologies across sectors. The technical architecture and the Blockchain details are beyond the scope of this study. The sample for data collection would be restricted to education sector, experts in IT as it is difficult to connect knowledgeable people in Blockchain technology in the time and with limited resources. All these above-mentioned restrictions would be areas of further research. The main scope in the current COVID situation is the need for a new educational framework, so the focus of this paper is the suitability of Blockchain in education. The study involves the study of the education Blockchain features, benefits, and challenges associated with the Blockchain to match with the needs of the modern new educational smart student centric model.

Table of references on which the Conceptual model constructs have been derived from:

Table 1. *Gap analysis used to build the conceptual model.*

Serial No	Article Reference	Major Findings or Gaps mentioned	Factors or constructs Identified	Factors or constructs used in the article
1.	[1]	Internal and External Stakeholders identified, Geographical restriction of participants	Conduct survey across countries and domains if possible to get better results	Hence the participants were selected from different countries and across various educational domains as possible.
2.	[66]	Technology usage is the new higher education strategy, implement change, these moves the organization to future strategy to be effective.	Technological Integration, Organization readiness to adapt	Technology integration with emerging technologies
3.	[3]	The internal and external stakeholders' perception of university comparison will help to identify gap between them. Also, between the various programs and faculty can be made	perception between internal and external stakeholders, programs and faculties and facilitate availability at the university	Organization facilities available and infrastructure, perception of various stakeholders like Learners, faculty etc.
4.	[83]	The principals being School leaders play an important role in strategizing the teacher's ICT integration by ensuring integrated mission and vision to all subordinates.	ICT integration, Geographic restriction, Scope to check other regions.	Survey taken across various regions and various education domains
5.	[13]	To capture the student's perception of employer's preferences. Additional data of employers' perceptions will add to the validity of the findings, and be of interest to future researchers. The sample size can be improved to make the findings more reliable	Students' perception of employers' preferences, employers' perceptions, alumni.	Successful implementation is very likely given the Employee's mindset and perceptions
6.	[72]	Employability confidence & Economic and market labour conditions. study needs to be done for other geographical areas and more categories Impact of country-specific influencing factors needs to be studied	Primary Research using Questionnaire and PLS-SEM for validity and reliability and secondary research to identify these factors	These independent variables and their relations need to be confirmed by consensus of experts vide pilot survey, online interviews (30 participants) and online Questionnaire survey [72].
7.	[18]	To enhance digital student, experience the rich technology rich environment is the aim of the research	Student perception, technical skill acquisition, Improvements in soft skills perceived	The above student-centric education model with Blockchain 4.0 model, using emerging technologies and across all domains promises to meet the requirements of all the stakeholders and satisfy them fully [15].
8.	[78]	The reality is altered by the fourth industrial revolution. The emerging technologies like artificial intelligence (AI), augmented reality (AR), big data and the internet of things impact employment opportunities and industries, education sector is also responding to these changes and societal demands.	Curriculum for soft skills development and technology capabilities	The benefits of such a system are time saved, skills are certified, making it convenient for employees going into academics, minimum cost, better satisfaction for the stakeholders [46].
9.	[67]	Education sector is being reshaped by technological. Emerging technologies can be integrated to systems to deliver customized learner experience leading to relevant, flexible and deep learning experience.	Integrated systems use new and emerging technologies Physical campuses coupled with seamless experience leads to enriched blended learning	This would mean that the education system is not throwing up learners with the necessary skills as required by the industry [76].
10.	[46]	The large student loans have increased their burden upon graduation. Lack of accountability of the Universities towards learner skills imparted and relevant to Industry, to get jobs. University invest in brick and mortar campuses to deliver learning experience using integrated technological platforms	Advanced emerging technologies reshape education to curve out integrated systems.	Then the information is accessible to all the educational system participants and to be shared between institutions.
11.	[90]	There are shortcomings in implementing educational technology principles due to resistance, non-acceptance of technology, organization culture leading to delay in adoption	implementing educational technology, pedagogical, organizational, cultural and other factors	The new technologies have multi-faceted influence on the various stakeholders in Education. This has changed their roles, responsibilities, and expectations of the stakeholders [90]
12.	[58]	In addition to more and more specialized technical knowledge, they need new multidisciplinary skills and competencies. There is a real mismatch between the industry demand and the labour market offer.	Collaboration between universities and industries, Integration of technical and non-technical skills and competencies into education to meet Industry expectation.	This is happening due to the mismatch in the skills and competencies of the job's requirement to the Employee/User with other skills which are not having any demand. The education system should recognize this mismatch and try to fill in the gaps. There is lack of regulatory bodies for the Blockchain System to get global consensus and scalability.

Serial No	Article Reference	Major Findings or Gaps mentioned	Factors or constructs Identified	Factors or constructs used in the article
13.	[99]	Cerberus is blockchain credential verifying system which promises to be more efficient, easy and intuitive to use, and effectively reduces fraud. Cerberus provides blockchain-based solutions and credential verification ecosystem based on real scenario of fraud threats. It uses smart contracts to manage digital credentials using cryptographic identification	data privacy, transcript verification, and selective disclosure of data. alleviate the problem of fake credentials.	Blockchain technology-based system supports authentication of student credentials and records secured by signatures or passwords [53].
14.	[20]	The teachers provide focused instruction, feedback (appraisal) and suggest future direction (refinement) to learners and small groups of students in continuous evaluation method. Therefore, this observed change in performance levels of students	providing focused instruction, feedback (appraisal) and suggesting future direction (refinement) to individuals and small groups of students.	the regulators to track the student progress
15.	[42]	The authors suggest a semantic analytics approach of student activities data to create enhanced technology learning system to track implicit competencies or lack of it, hidden in activities.	Competency modelling in technology-enhanced learning systems	The AI, Data analytics, ML has simplified the lives of administrators, government officials, the regulators to track the student progress and their certifications.
16.	[97]	Since knowledge and skills in IT change rapidly, it may be difficult for lecturers to always keep pace with new knowledge and gain new IT skills to educate students. By incorporating different stakeholders into the traditional teaching and learning undergraduate classes, it helps the school both in terms of educating the academic and teaching staff and the students	(1) active learning, (2) problem-based learning, and (3) the closeness between students and the stakeholders	The technology is the main cause of changing Stakeholders roles, responsibilities and expectations in Modern Education
17.	[22]	This study suggests recruitment, education, training, and retention model evidence to alleviate 'policy-induced problems' in Malaysia, to address the demands and needs of the population.	Restricted to Malaysian dental workforce and to senior professionals	The technology is the main cause of changing Stakeholders roles, responsibilities and expectations in Modern Education
18.	[16]	Higher education institutions are expected by stakeholders to impart knowledge, attributes, skills and competencies to be employed and contribute to national economy in digital age. The upgraded graduated work force enables employers to train these people to be technology readiness, adapt themselves and be flexible, agile to handle complex work issues. In industry 4.0. So, the education stakeholders need to coordinate and cooperate for this integrated system	Smart education, Stakeholder theory. Education Blockchain 4.0 Student centric smart system. Smart Universities use: Self-organization and re-structuring. Logical reasoning Awareness and Adaptation Self-learning, anticipation	The Research Framework for "Student-centric-New Education Model using Blockchain technology" and it is coined as "Student Centric Blockchain Education framework model" which reaches every child across the World irrespective of creed, caste, religion at an affordable price. The above objective is also Sustainable Development Goal which the UN have been struggling with for quite some time to implement. The below Research framework model has the potential to reach to every child at minimum cost (Iyer et al. 2020).
19.	[82]	This research studied the variables which impact BIM in Chinese Construction Industry and the relationship between the variables can vary as the BIM technology advances and is an area of future study.	The BIM adoption used the integrated TAM-TOE framework for BIM adoption. Identify external variables, Technical factors, Economic factors, Organizational factors	Hence, there's the necessity to vary the mindsets of those educators towards the utilization of technologies within the classroom to satisfy the present demands of learners
20.	[51]	Changing Student Expectations Students seek: 1) Flexible/shorter options to fit busy schedules 2) Less debt 3) Evidence of mastery of specific abilities and knowledge 4) Resistance to change and insecurity	Insecurity, threat, Resistance	The mindset to use and towards the usage of these technologies need to drastically change. The resistance and insecurity towards technology need to be removed by training and by workshops to give these Employee/User the feel of technology use and the benefits it brings (John et al., 2019).
21.	[44]	The 4th Industrial revolution involves using various new emerging technologies to provide smart education system. This paper suggests 6 steps to achieve this 4th industrial revolution. This study verifies the smart education effectiveness by evaluating student's expectation about smart education using survey questionnaire. The smart education system can utilize the 4th Industrial revolution to enhance the education sector to deliver student satisfaction.	The first step is to review technologies that could enable smart education. The second step defines smart education adopts 4th industrial revolution technologies. The next step is to extract the keyword through literature review while the keyword can constitute the smart education and further analyze the findings on education sector.	This ensures learners will experience the smart education, seven abilities such as Problem Solving, Communication, Self-development, Information Acquisition, Global Trend Acquire, Resource Management, and Convergence Thinking can be improved (Han et al., 2018).

Serial No	Article Reference	Major Findings or Gaps mentioned	Factors or constructs Identified	Factors or constructs used in the article
22.	[42]	Artificial intelligence (AI) can transform the ICT sector by using Machine learning, deep learning and natural language processing to enhance the communication, digital commerce, content and apps sector.	Integrating Emerging technologies in education	Soundness of the Investments for successful implementation of the new technologies (Haldorai et al., 2020).
23.	[56]	- Blockchain technology supports digital transformation and to digital certificates to be verified online - Blockchain offers education platform - Blockchain for Education platform is based on smart contracts and Ethereum platform - Blockchain ensures decentralized, secure, transparent and immutable	Impact of Blockchain on Education - Dependent Variable Independent Variable -Certification security -No amendments allowed (Immutability) - -Storage and Retrieval system	The above student-centric education model with Blockchain 4.0 model, using emerging technologies and across all domains promises to meet the requirements of all the stakeholders and satisfy them fully (Bhaskar et al., 2020). The benefits of such a system are time saved, skills are certified, making it convenient for employees going into academics, minimum cost, better satisfaction for the stakeholders (Hoel et al., 2020).
24.	[101]	The commercialization of education is leading to deterioration of quality due to lack of supervision and regulation as the regulator supervisors are not motivated and corrupt helping the owner to make a quick buck without being stopped or supervised by anybody. Most institutions are not able to serve clients due to lack of infrastructure, insufficient and poorly qualified human resource and poor management systems thus affecting the affecting efficiency, professionalism and productivity.	Inefficiency, High cost, profit motive, over-supply of education, substandard education, very limited job opportunities, Lack of Infrastructure, Lack regulation, Lack of Infrastructure, Lack regulation, corruption, Low salary for the teachers.	So, the emphasis on making a profit rather a social motive. Investors must be working on ROI which is not sustainable in the current scenario.
25.	[4]	Education opportunities should be equal to all, the educational environment, the cost per learner should be minimum and access to the best quality instructions made available. Commercialization, Commercialization of Education, Dwindling Economy are the main reasons for the deteriorating education system in most countries.	Profiteering, Substandard Education High cost Lack of Infrastructure Bad Teacher Quality due to low salary Higher Result projected Curriculum not updated	This is due to the dropping volume of students keen to pursue courses due to the high fees, not so much opportunities at the end of graduation
26.	[63]	The education transformation is valued by all economies, and it promotes knowledge flow, flow of ideas and policy to everyone. Teachers and students should be encouraged to express their ideas, same time be accountable for their attitudes and behavior which will lead to better teacher-student relation and future success.	Conduct survey across countries, across time periods to update the findings	This can be done by Government intervention and by sponsored, philanthropic educational grants, investments from entrepreneurs who are looking at education as social investment or funding the education Infrastructure as charity
27.	[47]	The student-centric education model integrates technologies like Artificial Intelligence, Blockchain Technology, Virtual Imaging, Virtual reality and Machine Learning. The model is more efficient and effective by reducing the cost, efforts, security and staff.	Using TOE theory and ADKAR theory factors as integrated model	The view point of each stakeholder will be from Journal references and reputed books and authors. In order to make in in-depth study, this quantitative research (subsequent to pilot study) is confined to education transformation using technology and the change in the stakeholder roles, responsibilities due to this transformation (Iyer et al., 2020).
28.	[102]	The study uses deducting reasoning approach with the positivism paradigm. The study collected 225 responses through a self-administered sampling, and the data analysis was done by PLS-based SEM structural equation modeling. The study confirms the hypothesized direct influences significance except the influence of facilitating conditions on actual use. Impact of facilitating conditions mediated between the intention to use and the actual use of ERP	Dependents: Social Influence Effort Expectancy Performance Expectancy Facilitating Conditions Education Firm size Moderator: Intention to use ERP Actual Usage of ERP with increased breadth of scope and larger sample size will add to the validity and reliability of the findings. Other moderators like experience and voluntariness can be moderators.	So, we accept the hypotheses and the results will prove that the new technologies adaption intention can adequately meet the requirements of the Education system and the successful implementation is very likely given the Employee's mindset and perceptions, new technologies features, the commercial angle to education and the changing environment both external and internal to the organization.

Serial No	Article Reference	Major Findings or Gaps mentioned	Factors or constructs Identified	Factors or constructs used in the article
29.	[105]	The Social distancing norm of COVID situation has interaction, communication, studies and work remote. The societal activities have changed and this includes education. Remote, online education has gained popularity. The learning management systems has enhanced the remote resource management and activities. The integrated technologies like data analysis, artificial intelligence with learning management systems in order to improve learning. This objective has used robust educational models, where activities carried out in an online mode, using virtual guidance system to learn.	The future hints at student centric model using blockchain for better security if data and processes. The IoT is the important component of this system. The improvement of the model is achieved using emerging technologies of the future.	The Model is integrated with modern technologies like Blockchain Technology, Machine Learning, Artificial Intelligence, Virtual Imaging, Virtual Reality,

4. Conceptual Framework

The contribution and Originality value of the Research: Using three theories integrated to build the conceptual model. System Theory, Blockchain induced disruption Theory, Stakeholder theory applied to education. Also, the factors, constructs, sub variables are referenced from the gap analysis done on the research articles as shown in table above.

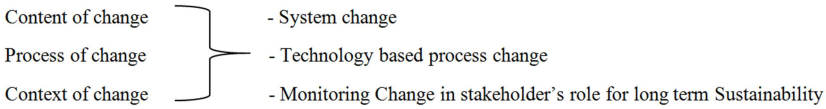

Figure 3. *Integrated Model using System Theory, Disruption Theory and Stakeholder Theory.*

Hypotheses:

H1: The content change in the organization using SMART objectives significantly influence the adoption of New Educational Blockchain 4.0 model.

H2: The process of change of the Organization significantly influences the adoption of Educational Blockchain 4.0 model.

H3: The context of change in the Organization, (remote working) situations, significantly influence the usefulness of Educational Blockchain technology 4.0 model.

Conceptual Model

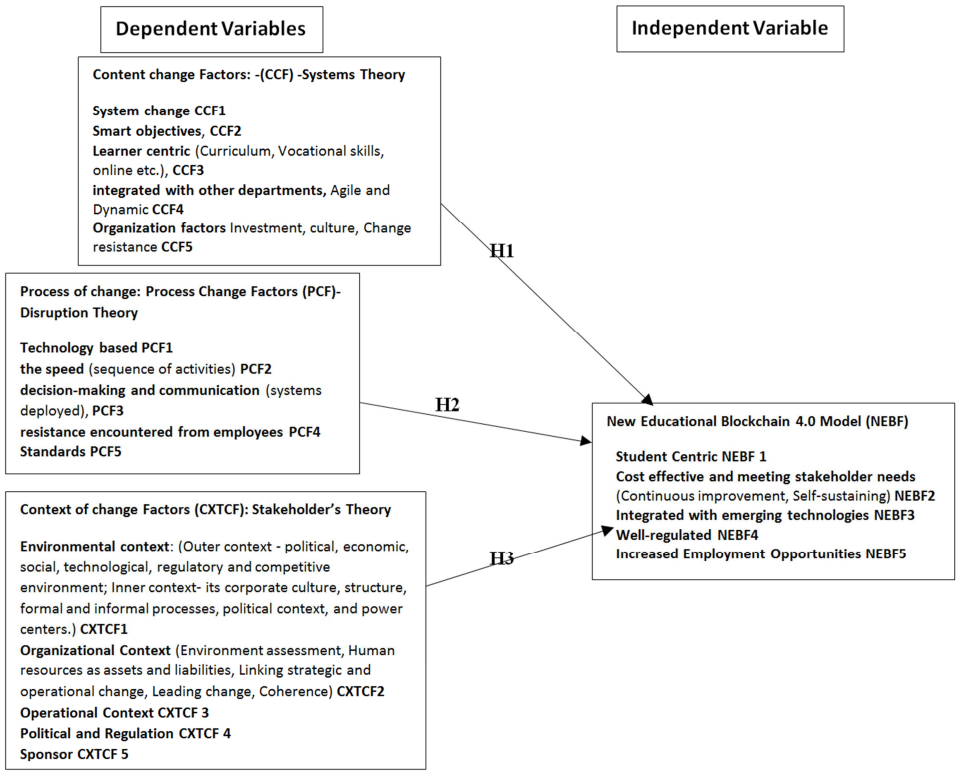

Figure 4. *Integrated SMART, Student centric education blockchain system.*

4.1. Research Problem

Problem defining: Can Blockchain handle micro-credentials for creating student-centric curriculum and courses by integrating, machine learning, analytics and big data usage?

4.2. Research Questions

a) How can the Traditional Education Model be changed to suit the needs of the current and future Education?
b) How the features, challenges, and benefits of the Blockchain be integrated with modern technologies to suit the proposed Future New Education Model?

4.3. Research Objectives

a) Review the current Education model to adopt a new Education Model suiting the current and future need of Learners.
b) To employ/implement Blockchain Technology in Education Domain and integrate across sectors.

5. Research Methodology

The Conceptual model was envisaged by getting the constructs, independent and dependent variables from the literature review done and the gaps, findings from the research articles as shown in table 1. Initially, a pilot study is done to confirm the construes, identified from the literature review to formulate the conceptual model, by involving 36 experts from the Blockchain technology industry, education industry, consultants and experts working in the interphase domain. Then a population of 900-925 across six countries India, UAE, Singapore, India, Australia, Malaysia, Pakistan, and some parts of Europe (UK) are targeted for this survey. A total sample of 386 respondents have taken part in this survey and using PLS-SEM the conceptual model tested and validated. This sample size is good for reliability and validity test as per Raosoft Sample Size Calculator for margin of error 5 per cent; confident level 95 per cent. The PLS-SEM (Adanco 2.0) is a used tool for measuring and evaluating reflective and structural measurements [72, 9].

6. Research Findings, Analysis and Outcomes

Analysis

The reflective model is assessed using the reliability, internal consistency reliability, convergent validity, and discriminant validity indicators as reported by Adanco user manual. It is important also to measure the collinearity, predictive relevance, significance, and relevance of path coefficients in the context to the overall structural measurement of the model [40, 103].

Data validation and analysis

Respondents' characteristics

Table 2. *Demographics.*

Demographic Variable	Category	Percentage			
Age Group	18-25	15.6 (60)			
	26-35	30.4 (117)			
	36-45	26.3 (101)			
	46-55	19.2 (75)			
	56+	8.5 (33)			
Gender	Male	54.30 (209)			
	Female	45.70 (177)			
DemographicVariable	Category	Percentage	Demographic Variable	Category	Percentage
Education	Highschool	1.6 (6)	Income Level	Under 5000 AED	20.8 (80)
	Undergraduate	7.8 (20)		5001-10000 AED	21.1 (81)
	Graduate	32.6 (126)		10001-15000 AED	18.3 (70)
	Masters	43.1 (167)		15001-20000 AED	16.5 (63)
	Doctoral	14.9 (57)		Above 20001	23.3 (92)
Association with the Block chain Technology		Percentage	Which region do you belong to?		Percentage
Researcher		15.4 (59)	a. Middle East		31.5 (123)
Student/Learner		12.8 (49)	b. Asian Subcontinent		26.3 (101)
Working IT Professional		10.3	c. UK and the European Union		17.3 (66)
Business Owner		18.7	d. African subcontinent		9.8 (37)
Project Manager		12.4	e. USA subcontinent		8.7 (33)
Consultant		8.3	f. Australia- New Zealand Subcontinent		6.4 (24)
Regulator		7.9			
Public		4.1			
Trader		3.8			
Miner		3.6			
Owning Domain for recording transactions		1.3			
Others		1.4			

The profile of the respondents participated in the online survey is shown in the Table 2. Survey questionnaires (926) were emailed to experts in education, Blockchain from the Academics and the Industry in UAE, Malaysia, Australia,

Pakistan, Indian Cities and Singapore WhatsApp and other social media means, but only 386 (41.68%) of respondents participated in this research. The male respondents in this research study, were 209 (54.3%), while 177 (45.7%) were female respondents. As per Table 1, the majority of the respondents aged between 26 to 55 years (76%, 293 respondents), while only 33 (8.5%) respondents aged above 56 years. As for the nationality, all the respondents were majorly UAE, Pakistani, Indian, Australians, Singaporeans, and Malaysian, which fulfilled the essential requirement of the research. The descriptive statistics showed that the majority (90%) of the respondents participating in this research were Graduates.

Model for Reflective measurement

The reflective measurement examines the validity and reliability of the measurement model. This section involves examining: (1) Loadings of indicator reliability, (2) Loadings of reliability of the construct, (3) Loading of construct convergent validity and, (4) Loadings of discriminant validity [18, 25].

Loadings of indicator reliability

The reflective measurement indicator loadings in the table 3 show above 0.7 means that the construct explained more than 50 per cent of a variable [25, 86].

Loadings of Internal consistency reliability

Internal consistency reliability examines the reflective measurement model, where earlier researchers agreed that the higher the value indicator means higher reliability. Jöreskog's rho (ρc) is used to evaluate the internal consistency reliability [52]. The minimum acceptable value for internal consistency reliability is 0.6, and the table below shows high significance or high reliability [86]. Based on findings the result showed that the Jöreskog's rho (ρc) values for each construct, that is, Content of change Factors (0.9316), Process of change factors (0.9452), Context of change factors (0.9067), New Educational Blockchain factors (0.9430), ranged within 0.6 and 0.95. Therefore, all the Jöreskog's rho (ρc) values in this research were considered as "satisfactory to good," and all of the indicators in this research were significant and reliable for the internal consistency reliability [25, 35, 50].

Table 3. *Loadings of Indicator Loadings.*

Indicator	Content of change	Process of change	Context of change	New Educational Blockchain 4.0
CCF1	0.8137			
CCF2	0.8462			
CCF3	0.8514			
CCF4	0.8213			
CCF5	0.8098			
PCF1		0.8271		
PCF2		0.9113		
PCF3		0.7527		
PCF4		0.8420		
PCF5		0.8158		
CXTCF1			0.7364	
CXTCF2			0.6929	
CXTCF3			0.7462	
CXTCF4			0.7774	
CXTCF5			0.6984	
NEBF1				0.7440
NEBF2				0.7635
NEBF3				0.7736
NEBF4				0.7340
NEBF5				0.7635
NEBF6				0.7336

Table 4. *Loadings of Construct Reliability.*

Construct	Dijkstra-Henseler's rho (ρ_A)	Jöreskog's rho (ρ_c)	Cronbach's alpha (α)
CCF	0.9143	0.9316	0.8972
PCF	0.9260	0.9432	0.9144
CXTCF	0.9421	0.9452	0.9323
NEBF	0.9382	0.9430	0.9174

Construct reliability

Cronbach's alpha is used to find the extent of internal consistency reliability and construct reliability and examine the reliability for all the constructs. Cronbach's alpha value above 0.7 is acceptable as high reliability of multiple measures for the measurement of each construct [](Joseph et al., 2010). the results Table 4 results show, all the constructs were higher than the required value of 0.7.

Loadings of Convergent validity

The average variance extracted (AVE) generated by Adanco 2.0 is used to measure all items convergent validity associated with each construct (Cheah et al., 2018). The values of AVE need to be above 0.5 representing that the constructs explain at least 50 per cent of the item variance. The Adanco Output table illustrates that all the AVE values for the constructs in this research exceeded 0.5, which were Content of change. Process of change (0.795), Context of change (0.8540), New Educational Blockchain 4.0 (0.7982) establishing the convergent validity.

Loadings of Discriminant validity

Discriminant validity is a measure that depicts how much a variable correlates with other variables in the structural

model and to what extent they represent only single variable, and this is measured by the Fornell-Larcker criterion and cross-loadings [41, 85, 86, 87]. The diagonal bold figures are the highest in the rows and columns showing that the discriminant validity is proven in the model using Adanco 2.0 output.

Table 5. *Discriminant Validity: Fornell-Larcker Criterion.*

Construct	CCF	PCF	CXTCF	NEBF
CCF	0.7629			
PCF	0.6944	0.8592		
CXTCF	0.6522	0.8210	0.8755	
NEBF	0.5891	0.6890	0.7850	0.8980

Structural model assessment

The structural model assessment involves checking the potential collinearity between the predictor constructs to ensure the output results quality. Therefore, the process involves checking Significance and relevance of path coefficients, collinearity, and predictive relevance.

Collinearity

The results show variance inflation factor (VIF) less than 5, means there is no collinearity biased issues for each indicator in the model [](Benitez et al., 2020). This proves that there were no significant collinearity issues observed in this model.

Predictive relevance (R^2)

The coefficient of determination (R^2) measures how well the construct was explained toward all the constructs in the research. Adanco Manual and researchers suggest the minimum requirement of R^2 as 0.2, and the construct relevant and significant if R^2 value exceeded 0.2 [24, 26]. Based on the result, the value of R^2 of adoption intention was 0.663, which means that the constructs are relevant and significant, and considered as moderately high in explaining all the variables in the research model [25].

Significance and relevance of path coefficients.

The final step in the structural model assessment was the significance and relevance of path coefficients. According to [86], the t values represent a strong positive relationship. The results from the bootstrapping procedure (386 cases, 925 samples, no sign changes option) reveal that all three structural relationships were significant ($p \leq 0.05$). The results showed that all the independent constructs had a positive and significant relationship toward New Blockchain technology 4.0 adaption to Education, and the results represented that all of the hypotheses were authenticated and supported by data [25].

Table 6. *Inference of Direct Effects.*

Effect	Original coefficient	Standard bootstrap results					Percentile bootstrap quantiles			
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.5%	2.5%	97.5%	99.5%
Content change factors -> New Educational Blockchain factors	0. 243	0.0113	0.0126	6.532	0.0000	0.0000	0.0128	0.0646	0.1843	0.2405
Process change factors-> New Educational Blockchain factors	0.348	0.4479	0.1064	7.210	0.0000	0.0000	0.1787	0.2398	0.6596	0.7211
Context change factors -> New Educational Blockchain factors	0.548	0.3173	0.1128	8.712	0.0014	0.0026	0.0265	0.0949	0.5372	0.5932

The Adanco output shows that all the independent constructs had a positive and significant relationship with New Educational Blockchain 4.0 adaption across the various domains. The results illustrate that all the hypotheses were authenticated and supported by the data.

The research objective of this study was to identify the relationship between constructs of SMART Objectives (content change factors), Process of change (Brick and Click theory included) and Context of change (Change dimensions Theory.) All the hypotheses are accepted, and the relationships are statistically established through this study to achieve the primary objective.

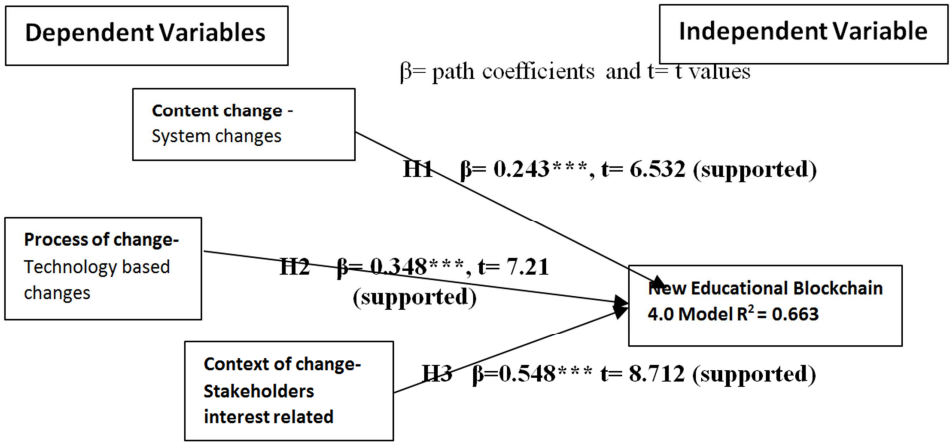

Figure 5. *PLS-SEM Validation.*

The Adanco output shows overall Model are portrayed above- all path coefficients have *** suggesting significance and consistency of the SEM. Overall $R^2 = 0.663$ means 66.3% of the relations and correlations between the constructs have been explained satisfactorily, statistically [48].

Discussions

The integrated model using the identified constructs with more relevant factors considered seem appropriate. The purpose of the research was to develop a conceptual research framework test it for validity and reliability using PLS-SEM. The useful contribution of this research paper has been getting consensus of 386 respondents- stakeholders of the Blockchain education application. The research methodology addresses the scarcity of relevant data for future researchers on this topic. The above-cited theories have their importance in a third world economy, provide equal education opportunities and other infrastructure availability. However, current COVID and recessionary situation, the above theories seem lacking to explain many factors. Hence a robust, concrete, research-based framework has been developed to contribute to further work.

Student-centric education model: The student-centric education model enables the learner to make the curriculum, from the grades required by the industry and follow the program from various institutes of their choice [57]. The demand for this student-centric model has emanated from the high cost of education in most countries which the learners and the parents cannot afford. This is due to the lack of employment opportunities available to even repay the loan or a guarantee that the educational skills imparted can assure a future job [19, 21]. The unemployment rates across the globe are testimony to this societal bane which has been vastly ignored by the various universities thus leaving the stakeholders dissatisfied [5].

Blockchain technology usefulness for the New Education student-centric model: The features of Blockchain immutability, lack of trust, transparency, security, decentralized ledgers, authentication, and integration with other emerging technology across domains make it suitable for education 4.0 to store, retrieve records, longevity, and secured record management without losing data or change in data. This will ensure that academicians and employers can verify certificates digitally and the saving of efforts and cost make the Blockchain implementation in education very attractive. Student Portfolio can be maintained and assessment, teaching, learning activities can be monitored [47]. The Blockchain platform requires the learners to register and to formulate their curriculum program which can be guided by educational consultants to guide them. The program is build using micro-credentials with credits leading to a certificate, Bachelor, Masters, or PhD programs. This can be electronically approved by the committee of reviewers and approvers, from the regulators [107, 37]. Then the approval is displayed on the platform for the viewers and act, notified by alerts. The University/Institute takes note of the Learner registration and the resources to be arranged-blended learning with the option of offering classroom facilities to the learner at the nearest location (college premises on the platform) [45, 89]. All activities and learner credentials are stored in the portfolio created and then on completion of the program the Learner will get the certificate from the approving University of student's choice [68].

The Blockchain features are used for this education model and can be effective and efficient. Employers have access to the student program and employ them before graduation if they are convinced of the potential. The banks can finance the learner fees as it is tied with the University to release grade. Insurers can have the business of the learners and teachers. So many other businesses can be on the platform to benefit from this venture. The education field is the best way to achieve scales of volumes as the participants have the same common goal of certifying the learner. This is a perfect Blockchain need that the participants need to be at the same level. The Government can monitor the whole education working and make laws, policies for its well-being [7].

The education stakeholder importance of the student-centric education model: The major stakeholders of modern education model are Learners, Teachers, Parents, Government, Regulators, Universities, Consultants, Awarding bodies, Miners, Bankers, Insurance companies, Employers [66]. The Learners are not satisfied as they are no Job opportunities available after finishing and paying high fees for the courses in higher education. The parents are not able to finance the children higher education due to high costs [17]. The financiers or bankers are left with high default rates due to the non-payment of the education loans as the Learners are not getting adequate paying employments [84]. This has put a lot of pressure on government agencies and society due to the unemployment rates across the globe [94]. The Universities administration, regulators and awarding bodies are under a lot of pressure to this lack of employment opportunities for the Learners and the Employers are not able to place the students due to the lack of skills [75]. The Academicians and the consultants are slowly losing their importance in the hierarchy as the jobs are not available for these Learners. Overall, the situation is dissatisfaction amongst all stakeholders [106, 77]. Education future is skills-based and less dependent on Academic lessons. Most Corporates are already relying on the skills development and skills up-gradation for their existing employees and future employees. The list includes corporates like Google, Amazon, Microsoft, IBM who are no longer looking at University degrees, certificates for their employees. This model must need the mass following for its feasibility [47].

How the envisaged model will be student-centric and meet all the educational needs of the future using modern technologies?

The new student-centric model will meet the needs of the Learners to get employment as the students will pick the curriculum and the skills required by the industry [69]. The technology and the Blockchain will lessen the cost to low

levels where it will be viable for the Learners to get these courses financed by the banks and the Employers ger readily skilled Learners to suit their requirements. The portfolio and the skills of the students are available online for the employers to select the right recruit, all at the click of the mouse [70]. The above student-centric education model with Blockchain 4.0 model, using emerging technologies and across all domains promises to meet the requirements of all the stakeholders and satisfy them fully [15]. The benefits of such a system are time saved, skills are certified, making it convenient for employees going into academics, minimum cost, better satisfaction for the stakeholders [46].

All this and other education curriculums, need to be a common platform using Education Blockchain 4.0 which easily integrates with all emerging technologies. Micro-credentials, skills-based certificates will be the building block for a learner to create their program and it is all kept and authenticated in one single Blockchain. Firstly, all regulators of major countries at least the G-20 can start, and it can be extended to all countries in phases [69].

7. Implications of This Research

Practical Implications: Blockchain integrated across domains will make it cost-effective as more scale of volumes are built. Blockchain integrated with emerging technologies will help overcome many limitations of online teaching, learning as it is interactive methodology possible.

Social implications: The social implications of this study are many folds. The Blockchain and online teaching and learning methods along with student-centered curriculum model increase the educational reach phenomenally great. Millions of learners will benefit due to the savings on cost, investment and reach that is possible with the current technologies and will be useful for social distancing and remote working option. The United Nations SDG of getting more children into the education field can be achieved and in a systematic manner.

Managerial implications: The above findings will help to take managerial decisions on investments in emerging technologies, Blockchain platforms for future education models. The decision to use the model for future education needs of the learners can be easily arranged.

8. Limitations and Future Research

The limitations of this study have been to get more sample size to get consensus on this new topic as few people are knowledgeable in education and Blockchain to give opinion. So, the survey results can be improved by conducting survey across the domains, sectors to get experts to participate in these surveys. Qualitative survey would have given more prospective on the research. Due to time and resources this type of qualitative research was not possible and can be future research envisaged. There is the dearth of primary research data on Blockchain technology in education due to the lack of experts in this domain, few people available to give expert information. The technical knowledge required for the Blockchain application to education needs to be researched in detail like the architecture of Blockchain useful for education, the energy requirements, the skills requirements, the training requirements, and the cost of investment. There is lack of regulatory bodies for the Blockchain System to get global consensus and scalability. Also, efforts can be made to get qualitative research done across the various domain experts to get better participation.

9. The Contribution and Originality Value of the Research

Using three theories integrated to build the conceptual model. The issues and challenges and the success probability of Education Blockchain 4.0 has been discussed in details and the consensus from industry experts in education and Blockchain domains have been consolidated using primary research. The conceptual model has been validated and tested for reliability using PLS-SEM. The data collected across six regions UAE, India, UK, Australia, Singapore, Malaysia, and Pakistan. This was possible due to the education institutes in contact with the authors and the working PhD students from the industry in education and Blockchain Industry which is a major contribution of this study. The study objectives have led to using a conceptual model integrating three theories-system theory, disruption theory and the stakeholder theory leading to a new model for the future research studies.

10. Conclusion

The education powered by Blockchain, and which is student-centric is the future of Global Education. The Model is integrated with modern technologies like Artificial Intelligence, Blockchain Technology, Machine Learning, Virtual Reality, Virtual Imaging. The model will be effective and efficient reducing the efforts, cost, staff hour needs and enhanced education system security [7]. Smart cities like Singapore, Dubai, Bangalore are well poised to follow the student-centric education model due to the political will, availability of the infrastructure and the skilled workforce. Education student-centric model in smart cities are the future and the investment, the process is well on its way for this educational transformation [60, 47]. The management interplay and the implementation skills will determine the success of the implementation of the new Model [33]. The chances of the Education Blockchain 4.0 been successful is highly likely as it achieves a volume of scale to make the project viable using emerging technologies and across domains.

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