MANIFESTATIONS OF BLOCKCHAIN TECHNOLOGY IN EDUCATION DOMAIN: A CASE STUDY OF INDIA

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Abstract

Today, it is indubitable that information technology has gained pioneer position in terms of innovation, creativity, digitized ledger, immune ability and many more. Blockchain is evident in changing the picture of current scenario in multifarious domains. One of the areas where Blockchain is demonstrating its features is Education Sector. This study is undertaken to study the theoretical framework of Blockchain Technology in Education Sector. This study intends to examine the efficiency of BCT in Education Domain. This paper gives a bird eye view of satisfaction level of employees of Blockchain Technology in education sector during pre-implications period and post-implications period. The samples are selected from various educational institutions who are implementing this technology into their operations. A structured questionnaire was used as a research tool to collect primary data from respondents. The collected data from the questionnaire were analysed using statistical tools like Wilcoxon signed rank test and Paired t-test.

Key Words: Innovation; Digitized Ledger; Immune ability; Blockchain Technology

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Introduction

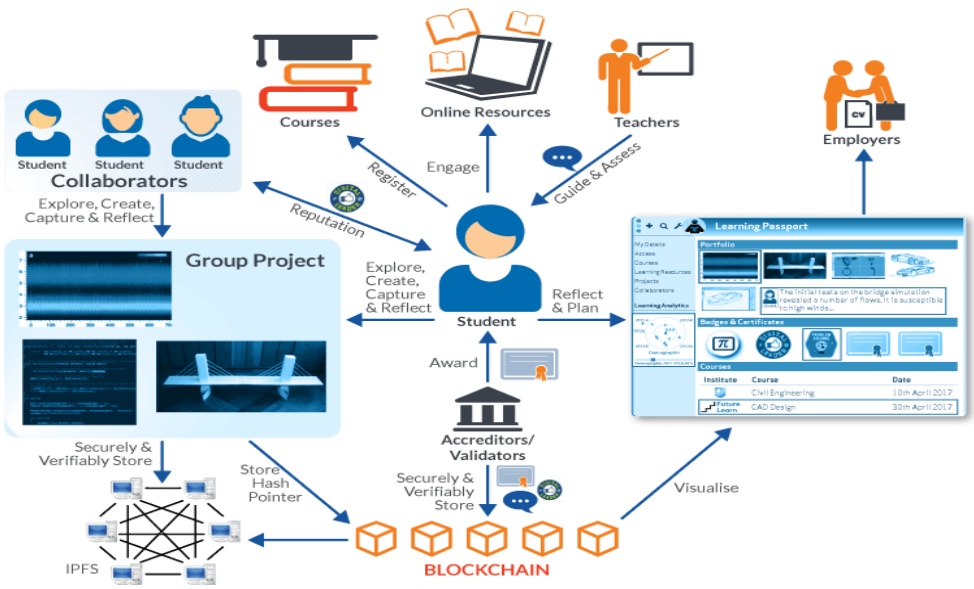
In the world of innovation and creativity, information technology plays a vital and prominent role when it comes to advantages and features it provides. One of best upshot of IT is Blockchain Technology (BCT). It has accelerated the rate of growth in various domains. Blockchain technology has evolved over a period of time from 1991 where Stuart Haber and W Scott Stornetta inaugurated a cryptographically secured chain of blocks in the biosphere of information technology. This potential technology went through many experiments of creativity and innovation from 1991 to 2008. Then, in 2008 Satoshi Nakamoto presented a model for blockchain through a white paper. Soon after it, in 2009 they implemented in public ledger for transactions made using Bitcoin.

For an amateur, Blockchain technology is a digitised public ledger that helps in storing E transactions. It provides various mileages like integrity, arduous to change data, validation of data. This whole notion functions on the term "HASH" that adverts to unique mathematical encrypted function associated with each block. Every block contains its own hash as well as hash of previous block. Any renovation in information of one single block will result into change into hash of that particular block and consequently hash of other blocks making the process cumbersome and abstruse. Blockchain facilitates transparency, speed, trust between all stakeholders, traceability of information, security across the channel.

In today's diegesis, this neoteric technology is being used in multifarious domains like insurance, banking, healthcare, cryptocurrency, education, promotional techniques and so on. Blockchain technology opens doors for new efficacies. Blockchain is becoming indispensable slice of heterogenous domains fabricating its implementation at a accelerated rate. Blockchain comes into panorama when the security predicament arises.

Corresponding to all other domains, in education sector also data breach eventuates. For instance student information leakage with limited financial information, student verification at education premises which are manipulated to create fake identities and records. Blockchain immune technology helps in securing the data by eliminating the risk of manipulation, change or leakage of data in midway. It also downscales the cost factor associated with physical maintenance of records of each student by converting the data into digitised manner. Moreover, it also eliminates various middlemen in the process enhancing the efficiency throughout the channel.

With the advent of blockchain technology in education sector, it is going to change the landscape of learning regimen. There is a huge potential in implementation of blockchain technology in education sector making it more digitised, transparent and secure. Data security and preservation is one of the focal concerns of today's cutthroat and arduous habitat of IT. It can only be minimised or eliminated by the implementation of highly advanced and secure technology known as "Blockchain".



Source: https://www.learnovatecentre.org/will-blockchain-disrupt-education/

Literature Review

Varghese al. (2019) highlighted that this innovative technology acts as a enabler to minimise the distance between principles and practices of India's digital economy and thus technological inputs to achieve the big picture of financial inclusion. Chen al. (2018) address the application of this technology in various domains such as healthcare, cryptocurrency, healthcare, advertising, insurance, copyright protection, energy, and societal applications. The study revealed that in addition to the use of blockchain in areas mentioned above, this technology is spreading its wings other domains also like education etc. Abou al. (2019) tries to identify the current picture according to the literature and tries to identify the prominent sectors to study and domains where Blockchain innovativeness can be applied. His findings also stated that this technology implementation is confined to certain sectors only. For instance healthcare, government, energy and finance etc.. Tribis al. (2021) focused on the systematic review of the implementation of this innovative technology in one of the areas of commerce that is supply chain management. The analytical exercise was carried out by procedures of SLR defined by Kitchenham and Charters (Kitchenham B 2007) to perform the research methodology. The study concluded that there is a wider scope of implementation of blockchain technology in supply chain.

Mendez al. (2019) studies that Maximization of application of blockchain technology in education sector. He concluded that this technology can be implemented to various areas of academics like, evaluation at university, education-industry cooperative system, keeping records of degrees, E-Learning, Educational Certificate, examining student capability, Online Quiz Scheme Based on Double- layer, online education, maintaining privacy of student data. Turcu al. (2020) focused on further examining the risk, vantages and challenges associated with the implementation of this technology in education domain keeping in alignment of standard and guidelines to maintain quality essence. Ullah al. (2021) studied the key determinants that have impact on use of this technology in online learning. The study also Provided an extensive concept of technology acceptance model by collaborating it with diffusion theory. It was found that it would have a significant impact on implication of blockchain technology in smart learning environment. Alammary al. (2019) emphasised on use of this technology in education sector and prominently focused on vital aspects like its application, benefits and challenges in education environment by extraction of data from various papers and also revealed that this technology is at initial stages in this sector of education and yet to be explored.

Raimundo al. (2021) examined the use of this innovative technology in higher education. The study is supported by careful recognition and synthesis of information via Meta-search, Inclusion criteria and screening of data. The paper focused on the intensive analysis of Systematic Bibliometric Literature Review on this technology applications in the higher education sector. Berryhill al. (2018) concentrated on vital knowledge or information that must be equipped in public servants so that they are able to understand what the blockchain actually is, what benefit could it bring with its implementation on government operations. Also suggested to make the employees aware of its oppurtunities and challenges which they might face as a result. The analytical exercise was carried out by the PoW model—the most common consensus and Proof of Stake model is used. Bitcoin platform—requires. The study revealed that the blockchain technology is at infancy in terms of public sector applications. Filippi and Hassan (2018) revealed that legalities are able to limit the negative impact of this technology through code. The decentralized nature of this innovativeness and outcome stated the new vital challenges in terms of legalities.

Xie al. (2019) emphasized on the role of this innovative technology in changing the picture of smart cities from smart citizen, smart healthcare, smart grid to various other domains. The study revealed how this technology functions and how it should be implemented to solve problems in smart cities.

Chamola al. (2020) discussed the importance of this technology in validating certificates by using one of feature that is distributed ledger system. With the help of this technology, generation of false diplomas can be eliminated. Holotescu al. (2018) highlighted that blockchain technology and its platforms, existing global and government initiatives with the application of blockchain technology in other areas. It was found that blockchain technology will be useful in education and policy makers in taking various steps to explore and to use blockchain in institutional projects and curricula. Nguyen al. (2018) examined the this technology and its potential to grow and develop the future by providing several inputs for further research. The study resulted that Blockchain has the capability to assist companies or institutions

that facilitate it to ensure transparency, democracy, decentralization, effectiveness and safety. Blockchain use will support the various industries in next few years.

Kulkarnia al. (2021) discussed the various ways to upload and verify educational documents on a decentralised blockchain system. The study concluded that a tamper-proof system is required, and Blockchain could be the flag-bearer in that common direction.

Alshahrani al. (2020) emphasized to analyses on blockchain adoption in education sector, specially in generating and distributing the certificates of students in higher education sector. The paper represented the framework for future work, which will involve implementing the dAPP for smart certificates (DASC), the use of this innovative technology in education domain is also stated in this paper. Machado al. (2019) conducted a study on analysing the scientific functions of BCT in education. The analytical exercise was carried out by bibliometric analysis. The study revealed that prominent current operations of the Education institutions implementing this technology are – distribution of degree certificates and accepting BCT based cryptocurrency payments. Dave al. (2019) discussed the various implications of blockchain technology that will provide help in development of a nation. The study concluded that firstly the demerits should be removed related to implementation of blockchain technology after that blockchain can become boom and will provide fruitful results to industry and nation.

Malibari (2020) examined the three major themes – learning applications made using blockchain technology, contribution and merits of blockchain technology to education sector and problem faced while using blockchain technology in learning. The analytical exercise was carried out by analysing various relevant articles retrieved from electronic database like IEEE Xplore and ProQuest. The study concluded that now blockchain is implemented in different fields and providing privacy, security or managing data effectively. Fedorova al. (2020) studied that analysis of opportunities and challenges of this technology in higher education.

The researcher supported its study through systematic literature review. Also it resulted that this technology is gaining momentum in education domain which is changing the scenario of interaction between students and professors.

Dziatkovskii and Hryneuski (2017) highlighted that a model which states the operations of BCT educational institutes and also states its steps to implement through balanced approach of appropriate strategy to implement it into the process. The study also answered some technical solutions to many issues in educational domain.

Haugsbakken and Langseth (2019) studies that whether blockchain technologies can democratize and helps in automation of learning of students, minimisation of cost, and be adopted in higher education. The researcher also stated that this technology is not directly trusted because it provides safety, encrypted technology. Kamisalic al. (2019) studied the various uses of this technology in solving different perspectives within the education ecosystem. The study revealed that this technology has great scope to change the picture of current education.

Objectives

1) To study the conceptual knowledge of Block Chain Technology in education sector.
2) To examine the efficiency of Block Chain Technology in education sector.
3) To compare the satisfaction level of employees of Block Chain Technology in education sector during pre-implications period and post-implications period.

Hypotheses Of Study

The researchers aim to test the following null hypotheses:

1) H_0: Employees are neutral on the factors measuring the satisfaction level of employees (Median = 4).
2) H_0: There is no significant difference in the satisfaction level of employees of Block Chain Technology in education sector during pre-implications period and post-implications period.

Research Methods

Questionnaire Framework

The questionnaire was prepared by researchers themselves according to the requirement of objectives. Pilot study was conducted on five respondents while finalizing the questionnaire for content coverage and to test its validity. However, their responses were not considered while analyzing the data.

Determination of sample size

According to Cochran (1977), for a population that is finite and where primary variable of interest is categorical, formula for sample size (n) is:

Sample size (n) $\frac{(z^2 * p * q * N)}{(N-1) * e^2 + (z^2 * p * q)}$

where,

- N is population size (207 here)
- z = value for selected alpha level

Ary, Jacobs, & Razavieh, 1996 suggested a 5 per cent (.025 in each tail); therefore, z =1.96 at 5 per cent alpha level.

- (p)(q) = estimate of variance
- e = acceptable margin of error for proportion being estimated = 0.05 for categorical data (Krejcie & Morgan, 1970)

Putting the values of N, z, p, q and e in the formula; we get n = 200.

Reliability and Validity Test

Reliability is tested using cronbach alpha method. Reliability test applied on sample size of 50 respondents from questionnaire. The reliability score questionnaire was 0.805 with 16 statements and 50 sample size.

Validity is assessed by two parameters-

a) Face Validity- The degree to which a procedure, especially a psychological test of assessment, appears effective in terms of its stated aims. In my study, respondents understood the intentions of statements of questionnaire as stated by the researcher. Thus, validated face validity.

b) Content Validity- The content validity (also known as logical validity) refers to the extent to which a measure represents all facets of a given construct. In my study also all the parameters of Block Chain Technology are covered in 16 statements with good Kaiser-Meyer-Olkin (KMO) Test value). i.e. - KMO value is 0.630 with significance value is 0.000. Thus, established the content validity.

Sample selection

To see how the teaching and administrative staff view Block Chain Technology endeavours of Saintgits Institute of Management (SIM), Kerala and Globsyn Business School (GBS), Kolkata and whether their views commensurate with pre and post implication of Block Chain Technology, a self-structured and pre-tested questionnaire has been administered on Teaching and Administrative Staff. Questionnaire includes 6 statements with 16 parameters considered in a statement for measuring effectiveness of implications of Block Chain Technology in education sector. The sample includes 100 respondents each from both above mentioned management schools working at teaching and non-teaching level.

Sixteen statements were framed on 7-point Likert Scale. Pilot testing was done for Likert statements. Wilcoxon signed rank test was used to test how likely it is to have a result as in our sample, or even more extreme if the median in the population is indeed a certain value (4 here). If this chance is very low, the population most likely has another median than the one expected. A low p-value indicates that the median is significantly different from 4 (being neutral).

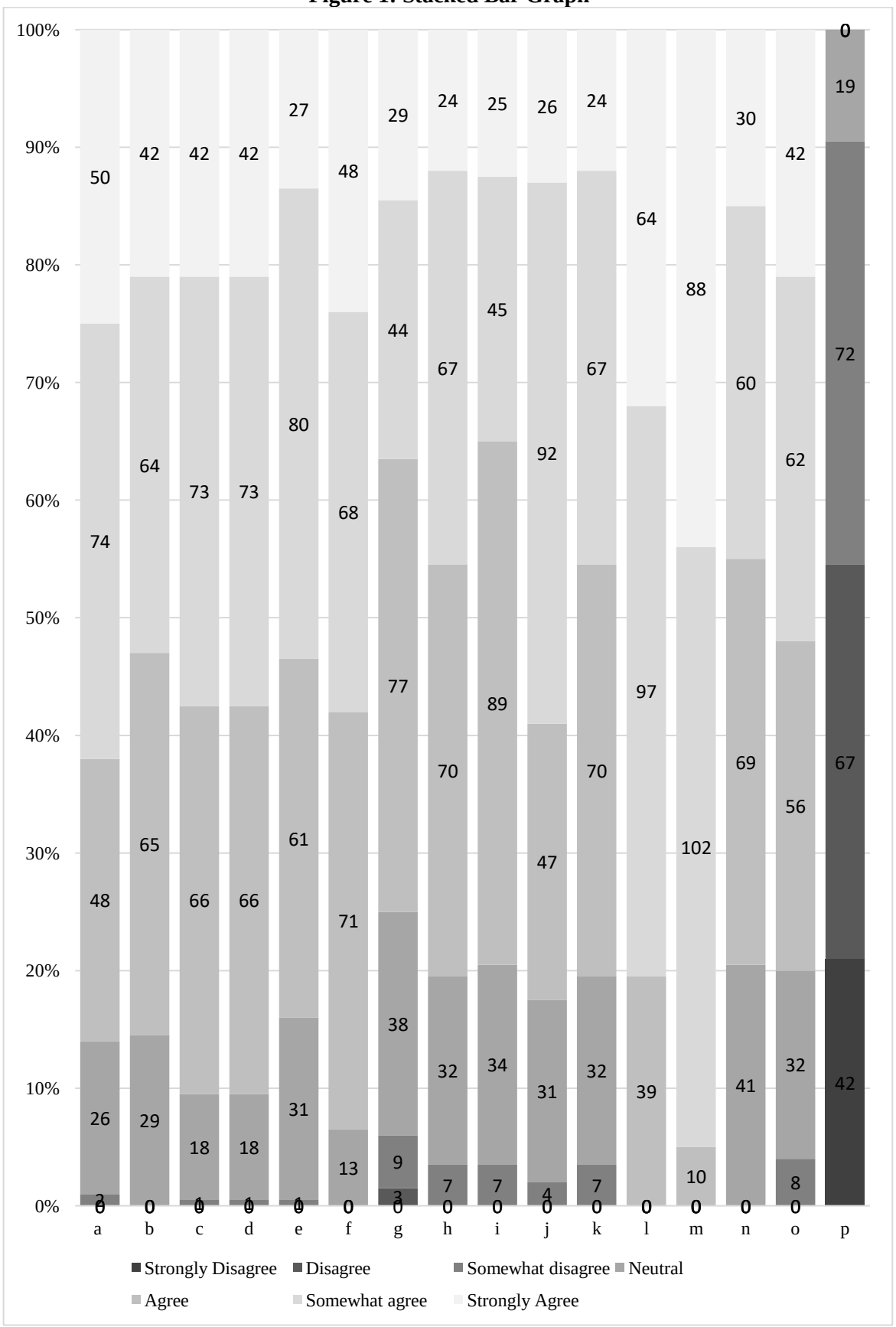
Paired t-test was used to compare the satisfaction level of employees of Block Chain Technology in education sector during pre-implications period and post-implications period. p-value less than 0.001 indicates significant difference in pre and post implication periods.

Findings and Discussions:

Section - I

One of the key objectives of the study is to measure the efficiency of Block Chain Technology in education sector. It analyses the behaviour of respondents to measure the same using 16 factors on seven-point Likert scale. Figure 1 shows the same with the help of bar graph that goes from strongly agree to strongly disagree.

Figure 1: Stacked Bar Graph



Source: Survey Data

Now, to check if the respondents have inclined towards either agreement or disagreement in any of the factors, One-Sample Wilcoxon Signed Ranks Test is used. Table 1 gives the results for the same.

Table 1: Hypothesis Results

S.No.	Factors	W-statistics (p-value)	Results
a.	Identifying ways of automating business processes among partners.	15174 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
b.	Faster Transactions	14706 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
c.	Enhances Integrity and Visibility	16619 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
d.	Lower Transaction Cost	11538 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
e.	Stronger working relationship with partners	14334 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
f.	Saves Time	17578 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
g.	Reduction of Risk	12482 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
h.	Better Efficiency	13923 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
i.	Elimination of Middlemen	13522 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
j.	Decentralisation	14261 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
k.	Transparency	20100 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
l.	Better security	20100 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
m.	Improved Traceability	20100 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
n.	Real Time Transactions	12720 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
o.	Privacy	13936 (<0.001)**	Significantly different from 'neutral' at 1 % LoS
p.	Complicated	0 (<0.001)**	Significantly different from 'neutral' at 1 % LoS

Source: Survey Data

Note: ** - significant at 1 %

Results of One-sample Wilcoxon signed-rank test indicate that out of 16 factors, median was significantly different from 'neutral' in all factors at 1 per cent level of significance. It can also be seen from the Figure 1 that the responses were inclined towards "agreeing" to the factors in all but one which was "complicated" in which the employees significantly inclined towards "disagreeing". The results imply that efficiency of education sector is increased due to block chain technology.

Section - II

Another objective is to compare the satisfaction level of employees of Block Chain Technology in education sector during pre-implications period and post-implications period is fulfilled using Paired t-test.

Table 2: Hypothesis Results

No.	Factors	95% Confidence Interval of the Difference		t-value	Significance alue (2-tailed)
		Lower	Upper		
a.	Identifying new ways of automating business processes among partners	-2.91021	-0.252979	-28.198	<0.001**
b.	Faster Transactions	-2.96988	-2.61012	-30.585	<0.001**
c.	Enhances Integrity and Visibility	-2.46083	-2.00917	-19.517	<0.001**
d.	Lower Transaction Cost	-2.67181	-2.34819	-30.589	<0.001**
e.	Stronger working relationship with partners	-3.17956	-2.82044	-32.946	<0.001**
f.	Saves Time	-3.45792	-3.08208	-34.315	<0.001**
g.	Reduction of risk	-2.69720	-2.30280	-25.000	<0.001**
h.	Better Efficiency	-3.26245	-2.89755	-33.288	<0.001**
i.	Elimination of middlemen	-3.24710	-2.89290	-34.183	<0.001**

j.	Decentralization	-3.69681	-3.38319	-44.516	<0.001**
k.	Transparency	-4.38417	-4.15583	-73.749	<0.001**
l.	Better security	-4.19909	-3.90091	-53.568	<0.001**
m.	Improved Traceability	-4.58535	-4.27465	-56.231	<0.001**
n.	Real Time Transactions	-3.75050	-3.41944	-42.699	<0.001**
o.	Privacy	-3.37364	-2.95636	-29.913	<0.001**
p.	Complicated	2.82626	3.18374	33.152	<0.001**

Source: Survey Data
Note: ** - significant at 1 %

From Table 2, p-value less than 0.001 indicates significant difference in pre and post implication periods. Negative t-statistic furthermore implies that employees were more satisfied during post-implication period than during pre-implication period. These above parameters influenced the respondents towards higher satisfaction level for block chain technology implementation.

Significance Of the Study

After the implementation of Blockchain Technology, there is a change in the working of the organizations or institutions. Also, change has been also observed in the satisfaction level of teaching and administrative staff of education institutes. Thus, the analysis of satisfaction is required to understand the impact of Blockchain Technology in Education Sector as further scope its implementation can be enhanced.

Limitations

Although the research tried to cover all aspects of Blockchain implementation in Education Sector like employee satisfaction pre and post implementation of Blockchain Technology in Educational Institutes, challenges they are facing. However, there are certain limitations of the study like Respondents are not willing to reveal all opinions, the inherent limitations of sampling may be present in the study, and the investigation is only possible in a limited area.

Conclusion

Through our research we are able to derive the conclusion that employees that includes both teachers and administrative staff are more satisfied in post- implementation of Blockchain Technology in their institution as respondents are inclined towards agreeing except in one factor that Blockchain Technology is bit complicated to use and operate.

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