Analysis of Big Data Business Intelligence Tools Using Technology Acceptance Model In a Healthcare

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*Abstract— **Big Data Business Intelligence tools are an important aspect relating to analysing data quicker for any organization or sector. Business Intelligence (BI) tools are application software which helps in analysing large volumes of data quicker. Once the BI tools are implemented, companies or user feel difficult to get most benefit from them due to lack of user knowledge leading to user acceptance, this led to motivation of the study. To study and analyse the Big Data BI Tools in Healthcare using TAM and to suggest the ways to improve the efficiency and effectiveness of Big Data To analyse the technology acceptance factors influencing the end users of big data BI Tools, this study is conducted in a reputed hospital located in Bangalore. This study was initiated by having a study on literature reviews based on TAM models in healthcare, which gradually helped in identifying important factors influencing the acceptance and satisfaction of healthcare BI Tools users. The questionnaire was framed based on the factors identified and obtained data was analysed using IBM Statistics SPSS 25 and SMARTPLS 3 data analysis tools, Tests like reliability, factor analysis, descriptive statistics, correlation test, Regression analysis, Bootstrapping, PLS algorithm tests were done. The test depicted in five main factors such as perceived ease of use, perceived usefulness, attitude, perceived risks, intended outcomes, that helped in influencing the acceptance and satisfaction of end users using Big data BI Tools, This study also revealed that most of the responses use BI Tools on daily basis, but still failed to use most of the features of Big Data BI Tools, This enables us to know that Training and development programmes must to given to users, Management should get involve the end users in Big Data BI tools by educating them the importance of Big data BI Tools, also with the help of Information technology, user technology and perceived ease of use has to be improved.***

Keywords— Technology acceptance model, Big Data, BI Tools, User Acceptance, Perceived ease of use, Healthcare BI Tools

I. INTRODUCTION

Big Data consists of strategies like reporting, visualization, OLAP, records mining, device learning, analytics etc. So, as length of records will increase over time, there's a want for aggressive intelligence withinside the company world, for its higher existence. Business knowledge devices (BI apparatuses) are planned with the essential objective to recover, change and screen an association's information to acquire business knowledge. But, getting the right data isn't what makes a BI instrument tally. Conveying something similar in the sufficient measure of time is what makes it an optimal BI apparatus. It's anything but a total bundle of removing, changing and incorporating information to produce bits of knowledge utilizing different strategies like mining, measurements and prescient examination.BI instruments can go from straightforward Excel-feed apparatuses to Multidimensional information-based instruments. Be that as it may, all in all, it very well may be classified into summed up or enormous information-based apparatuses that work on organized, semi-organized or unstructured information. Therefore, Big Data BI Tools systems are considered as important of any advanced organization. Big Data BI Tools market is becoming the that largest market in the IT field, and its vendors are the leading vendors in the IT world.

Technology Acceptance Model (TAM) is one of the most popular modules that study user acceptance. In Fig 1, Davis (1989) proposed TAM which provides a basis of how external variables influence belief, attitude, and intention to use. TAM model is known to be the widely spread model that can be used in predicting the acceptance of IT and IS system.
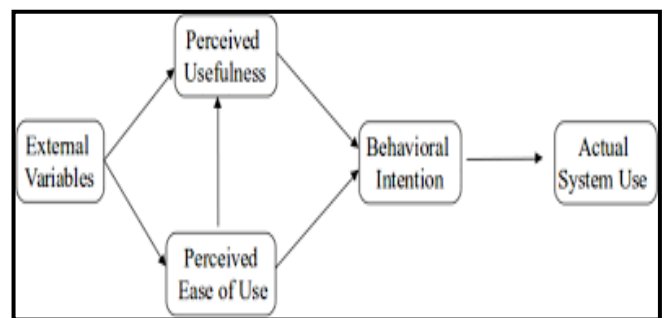

Fig 1 figure showing factors influencing technology acceptance model

II. LITERATURE REVIEW

Syeda Ayesha Kamal, Muhammed Shafiq, Priyanka Karia (2020):
This exploration was led targeting researching factors impacting ideas of TAM, Usage of TAM refereed to capacity

of usability, tech uneasiness, social impact, hazard and protection from innovation. The assessment revelations concerning factors including evident risk, trust, working with conditions and assurance from change can help in the arrangement and palatable course of action of telemedicine organizations in non-mechanical countries. Respondents were for the most part patients. Mental components – value, esteem, inspiration, self-viability.

Brock, V. and Khan, H.U (2017)
Since the time the improvement of tremendous data thought, experts have started applying the plan to various fields and endeavored to study the level of affirmation of it with prominence models like development affirmation model (TAM) and it assortments. In such manner, this paper endeavors to take a look at the factors that related with the use of huge data examination, by synchronizing TAM with legitimate learning capacities (OLC) framework.

Shanyong Wang, Jun Li, Dingtao Zhao (2017)
The justification this paper is to apply a comprehensive advancement affirmation model to take a gander at the clinical data inspector's objective to use clinical enormous data getting ready strategy. Social effect, Mentality, Usability. This exploration analyses the clinical information expert's expectation to utilize clinical enormous information handling method and gives a few ramifications to utilizing clinical large information preparing strategy.

Jamil Razmak, Charles Bélanger (2018)
The inspiration driving this paper is to really measure (assess) how an illustration of Canadians sees the comfort of electronic individual prosperity records (PHRs) and, meanwhile, to extend Canadian patients' consideration regarding PHRs and work on specialists' confidence in their patients' ability to manage their own prosperity information through PHRs. Test size of doctors, geolocation factor, discernment. Was limited to doctors. The inspiration driving this paper is to really check (assess) how an illustration of Canadians consideration regarding PHRs and work on specialists' confidence in their patients' ability to manage their own prosperity information through PHRs.

Rahimi, B., Nadri, H, Lotfnezhad Afshar, & Timpka, T (2018)
One essential model used to fathom clinical staff and patients' advancement assignment is the development affirmation model (TAM). This article overviews circulated assessment on Hat use in prosperity information structures improvement and execution as for application domains and model expansions after its hidden show, Adoption of different advances. Geoinformatics, Electronic solution, Hospital data framework. The result showed that telemedicine applications peaked some place in the scope of 1999 and 2017 and is the ICT application region most as a rule inspected using the Hat, proposing that affirmation of telemedicine applications during this period was a huge test while manhandling ICT to make prosperity organization affiliation.

III. OBJECTIVES & RESEARCH METHODOLOGY

A. Objectives:
[1] To study and analyze existing big data BI tools in a hospital
[2] To identify the factors for user acceptance and satisfaction of current big data BI tools in a hospital
[3] To analyze and access the selected factors for user acceptance and satisfaction of current BI Tools in a hospital
[4] To recommend and suggest the ways of improving the usage and user satisfaction based on results opted.

B. Research Methodology:

Sample Method: Random Sampling
Sample Size: 65 respondents
Respondents: BI Tools users in healthcare
Sampling design: Random sampling
Data source: Primary data and secondary data
Research Instrument: Questionnaire is used for collecting primary data
Research territory: Bangalore
Research Approach: Survey Approach

IV. DATA ANALYSIS & INTERPRETATION

This study focuses on understanding the Big Data BI Tools used in hospital understanding user acceptance factors affecting technology acceptance model, the factors are perceived ease of use, perceived usefulness, attitude, perceived risks and intended outcome.

Questionnaire was designed in Likert scale format which contained, Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree.

After the data collection process, the data analysis was done using statistical tool IBM SPSS STATISTICS 25, statistical analysis like reliability test, factor analysis and SMARTPLS 3 was used to construct path coefficients and bootstrapping was done to know the significant between factors connections.

A. Abbreviations & Acronyms

TABLE I Table Representing Codes Used for Identified Variables

PE01	I find Big Data BI Tools useful in my healthcare,
PE02	Using the Big Data BI Tools enables me to accomplish tasks more quickly,
PE03	Using the Big Data BI Tools increases my productivity,
PE04	Using the Big Data BI Tools, I will increase my chances of getting a better result
PU01	My interaction with the Big Data BI Tools is clear and understandable,
PU02	It would be easy for me to become skilful at using Big Data BI Tools,
PU03	I find the Big Data BI Tools easy to use
PU04	Learning to operate the Big Data BI Tools is easy for me
PU05	Would Big data BI Tools increase productivity in health care
FCA01	I have the resources necessary to use the Big Data BI Tools,

FCA02	I have the knowledge necessary to use the Big Data BI Tools Application		
FCA03	I use a specific person (or group) for assistance with system difficulties		
PR01	Using Big Data Applications Puts Privacy at risks		
PR02	Chances of occurring data loss		
PR03	Weakness of network security and inadequate software technology,		
PR04	Exposition of personal information such as personal location, and financial data		
IO01	Would use of Big Data Bi Tools Increase Speed of doing tasks		
IO02	Using of Big Data BI Tools helps in Improvement of healthcare data analysis performances		
IO03	Enables Quality improvement		
IO04	Meeting the needs of patients		

Descriptive Statistics

Descriptive Statistics was performed to know the mean and standard deviation of responses gathered from questionnaire. In the below table 1, this question was to know about the awareness, Likeliness and organization acceptance to use Big Data BI Tools, Questionnaire had 2 responses, 1 = yes, 2 = No, As the mean value is above 1.02, most of the users has said yes. And factors affecting questionnaire was framed using Likert scale method, 1 – Strongly Disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Disagree, in below Table 2, It can be analysed that all the factors or variables has the mean value of greater than 4.00 hence has a positive response for all the questionnaires.

TABLE II Table Showing Big Data BI Tools Likeliness, Awareness

Descriptive Statistics			
	N	*Mean*	*Std. Deviation*
Awareness	65	1.02	0.124
Likeliness	65	1.06	0.242
Organization using or not	65	1.02	0.124

TABLE III Descriptive Statistics of Factors Considered of TAM

Descriptive Statistics			
	N	*Mean*	*Std. Deviation*
PE01	65	4.14	1.014
PE02	65	4.26	0.889
PE03	65	4.06	0.864
PE04	65	4.09	0.861
PU01	65	4.00	0.739
PU02	65	4.17	0.762
PU03	65	4.09	0.805
PU04	65	4.29	0.744
PU05	65	4.34	0.776
FCA01	65	4.00	0.848
FCA02	65	4.05	0.837
FCA03	65	4.02	0.888
PR01	65	4.05	0.959
PR02	65	4.14	0.882
PR03	65	4.17	0.840
PR04	65	4.12	0.857
IO01	65	4.06	0.916
IO02	65	4.06	0.864
IO03	65	4.12	0.910
IO04	65	4.07	0.847

Cronbach's Alpha

Cronbach alpha tests was done to know the internal consistency of questionnaire, and factors affecting technology acceptance model in healthcare. In the below Table 3, considering all the questions in the questionnaire, the Cronbach's alpha value is 0.846 which is accepted and Table 4, shows reliability tests statistics which was performed to check the consistency of factors affecting technology acceptance model, i.e, perceived ease of use, perceived usefulness, attitude, perceived risks, intended outcome all the factors had Cronbach's value of greater than 0.7 which is considered to be better.

TABLE IV Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	*N of Items*
0.846	29

TABLE V Cronbach's Alpha of Factors considered

Reliability Statistics		
Factor	*No of Items*	*Cronbach's α (>0.7)*
Perceived Ease of Use	4	0.741
Perceived Usefulness	5	0.818
Attitude	3	0.873
Perceived risks	4	0.83
Intended Outcome	4	0.902

Rotated Component matrix

Rotated component matrix, we can interpret that there are five factors under which the questionnaire lay under. Rotated value should be more than 0.5, values less than that will be

eliminated. If there are two values in the question, that particular question will not be considered.

TABLE VI Table Showing Rotated Component Matrix

Rotated Component Matrix[a]					
	Component				
	1	2	3	4	5
PE01		.617			
PE02	.879				
PE03	.576				
PE04	.796				
PU01	.494				
PU02	.624				
PU03	.863				
PU04	.523				
PU05	.753				
FCA01				.766	
FCA02				.877	
FCA03				.758	
PR01			.717		
PR02			.855		
PR03			.731		
PR04			.823		
IO01		.904			
IO02		.859			
IO03		.752			
IO04		.839			
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]					
a. Rotation converged in 9 iterations.					

SMARTPLS Analysis

Bootstrapping

To find whether the P-value is significant or not, we used bootstrapping, where P-value should be equal to 0.00 for both inner and outer model. Below diagram figure 2, shows that inner and outer model's P- values are equal to 0.00 which shows it is significant.
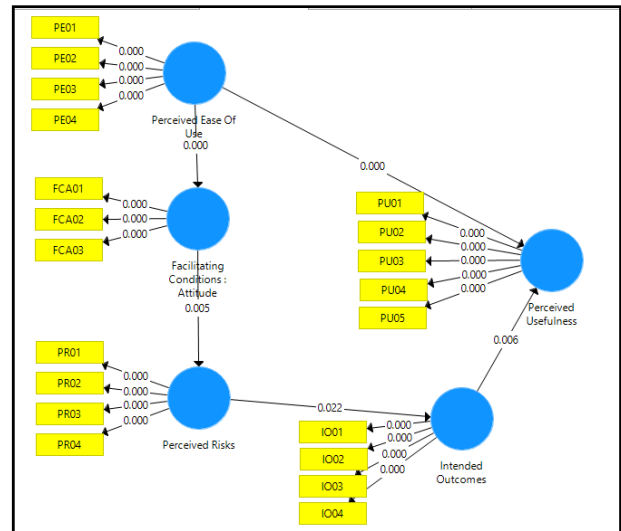

Fig 2 Figure Showing Bootstrapping SEM MODEL

V. RESULTS & DISCUSSIONS

Technology compared to past decade has been increasing for many benefits from use of them, Technology Concerning in the field of healthcare are increasing rapidly, mainly in e appointment data loading, processing tracing systems, data recording for medical information tracking and diagnosis.

Henceforth both healthcare professionals and patients have been benefitted by technology acceptance. There are many intervention programmes offered by healthcare professionals in view of diagnosis which is helped by Big Data BI Tools

Moreover, many of the Big Data BI Tools are user friendly, easy to use, clearly understandable. Questionnaire was prepared based on the factors that were identified in literature review and statistical tool were used for analysing the data that was collected from the end users of Big Data BI Tools. The data was analysis using statistical tool SPSS and SmartPLS. There were five factors identified during analysis which influence the user acceptance and satisfaction of Big Data BI Tools. All the five factors- Perceived ease of use, Perceived usefulness, Attitude, Perceived risks, intended outcomes, are the independent variables or factors that are influencing on the dependent factor, and also, five factors had its own influence on each other.

By considering the above results, the following conclusions can be drawn
• Management should strive to improve their end user's Big Data BI Tools acceptance percentage
• More training should be provided to the end users on Big Data BI Tools and make them understand each and every feature of the BI Tools.
• Although significant end users feel that Big Data BI Tools is reliable, management should try to improve on it.

- Again, using IT solutions, management to make the Big Data BI Tools easier to use. End users should be able to understand and interpret the data that is generated by BI Tools.

VI. LIMITATIONS & FUTURE WORK

A. Limitations

- The main and foremost limitation accepting big data bi tools is healthcare organizations and healthcare professionals assume is related to data security such as, Loss of personal information, chances of occurring data losses, putting privacy at risk, possibilities of network weakness and inadequate software technology, exposition of such as personal location, and financial data and many other concerns.
- The other limitation factors concerning the Big data BI Tools technology acceptance in healthcare and among healthcare professionals are Cost to the organization and conducting training and development programmes for the users, maintenance cost needed for smooth functioning of tools, cost incurred for software and hardware requirements.

B. Future Work

This study was implemented only in a hospital located in Bangalore city, Karnataka, India which can be extended and explore all over Hospitals and healthcare centers in India with results and findings, this will give more accurate results on user acceptance and satisfaction. This study can be extended for the design and implementation of simpler software.

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