

The Impact of Information Technology and Analytics on the Performance of a Hospital: Scale Development in Indian Context



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Abstract: Today, in the era of analytics and Information Technology, analysing every form of data is possible. Be it manufacturing, Supply Chain, Retail, Service, Product, Sales Marketing or be it Pharmaceuticals and Healthcare. In recent times hospitals are facing the issue of over-crowding and medical staff is not able to deliver the healthcare properly. With the help of the Information Technology System used in hospitals for routine work, high quality and high amount of data can be generated. With the capabilities to analyse the data accurately for the internal operations, planning, and forecasting for the benefits of the patients in deciding the nature of the treatment, medicines used or the probable adverse drug reaction pharmacologically, the performance of the healthcare organization increases. The study concentrates on the scale development for the constructs which can improve the operational performance by using the information technology and the care analytics.

Key Words: Healthcare Analytics, Information Technology, Hospital Performance

I. INTRODUCTION

Healthcare is one of the critical sectors in every country; on the other hand, it is an essential factor for the growth of the country also. The increase in the cost for the healthcare sector for the individual as well as the government has contributed to making healthcare as an essential area of research. In the country like India, though the death rate for the various diseases decreased over the period, the healthcare cost has also increased [40]. On the other end, during the time of disasters and communicable diseases, it has been observed that hospitals are overcrowded, and the patient is not able to get best treatment because of the congestion of the patients in the hospitals. With the disorders like diabetes, cardiac arrest or high blood pressure, it has also been observed that the patient does not have full information on their disorder type, like the patient does not know which medicine they are taking.

For deciding the nature of treatment for such kind of complex diseases, it is crucial to know about the previous medication, other diseases and allergy towards the molecule [43].

There are studies on the Information technology in healthcare set up, which mostly concentrated towards the areas like, institutional and market factors [11], strategies to adopt IT on different levels [18], information technology for the purpose of medication safety [35], Electronic Health Record adoption for the performance [2]; [12].

However, Information technology includes many more systems which includes EHR but not limited to, as information systems and technology can also include ERP [1],[16], SCMS [30] and several other systems.

On the other side, healthcare analytics is a separate discipline. There are many models developed. With the different data mining techniques it is possible to observe and analyse different kinds of diseases under the different type of situations. With or without prominent data inclusion, there are several models which have been made available to predict the various types of conditions. However, data needs to be in the analysable format to get the insights.

IT is essential to use analytics and get the job done correctly with the right accuracy and precision. With the sophisticated instrumentation in IT, it is possible to create the coordination and integration among the departments and with the accurate, adequate, timely and credible data it is possible to run real-time analytics to improve the efficiency and performance in terms of patients' care for the healthcare organization.

II. LITERATURE REVIEW

A. Theoretical Underpinnings:

a. Resource Based View (RBV)

A resource-based view [6] suggests that for creating a competitive advantage for the firm, a resource should be Valuable, Rare, Inimitable and Organizational Specific. A resource should increase the capability or decrease the delay in time and process to be as a valuable and it should be copied by the competitors. At least the overall impact of the resource should be organizational specific and embedded in routine to create the complementarity between the other resources. With the RBV, the firm should also focus on building internal capability or enhancing it instead of looking for opportunities outside.

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IT as a resource improves the speed, coordination, integration and decreases the inefficiency in the process, and the overall impact cannot be copied as it is learning method and relationship between IT and the business person also impacts, which is unique and inimitable.

b. Dynamic Capability

Dynamic capability can be defined as an extent to which firm can integrate, built and reconfigure internal and external competencies to respond to the fast-changing dynamic environment [49]. Dynamic capability is more towards the outside orientation of an organization, as organizations must be agile enough to change according to the market requirement and fulfil the demand generated by the market.

c. Cybernetic Control Theory

As IT is a kind of a self-regulatory system, [44], Cybernetic control theory offers a theoretical understanding that how IT system provides a means by which a manager (hospital administrator) can effectively develop the different kinds of strategy and organizational capabilities. [50] In his Cybernetic control theory [22] highlights the importance of getting timely data, analyzing the deviations and differences between the expectations and reality, and making a decision to match the expectations and reality for an organization. On the other hand, IT adoption offers a way by which real-time, high quality and accurate data can be obtained by the medical staff, administrator and other relevant personnel in the hospital environment and make a quick decision on the nature of treatment, instruments, equipment, and medicine to be used in the procedure.

The study emphasis on the digitization of hospitals and usage of care analytics to improve the performance of a healthcare organization to provide the better healthcare to a large group of citizens and in an efficient manner with the optimized cost. Based on a systematic literature review, the study has developed items/scale for IT adoption, Care Analytics, and Performance, with the case study of a hospital which is practicing the IT and analytics and makes the propositions based on the literature and case study.

B. Care Analytics:

For an effective decision making in industry, business analytics is required, as its framework includes the integration between people, process, technology and the future of the organization by providing the flexibility [39]. It is vital for any business to align between the business and data also to get a competitive edge in the market. Analytics is all about the process of development of actionable insight for a given problem definition and the application of statistical models and analysis against existing and simulated data [15]. Process mining is essential for healthcare data analytics as it extracts the knowledge from the data generated and stored in the hospital information systems to analyze the executed process [45].

The healthcare analytics is a process in which the clinical data is analyzed, and the patient's treatment is performed. The nature of treatment depends on the clinical data accumulated and stored digitally through Electronic Health Record(EHR), pharmaceuticals and Patient's traits [41]. In healthcare sectors there are various data mining methods, like clustering, classification techniques, statistical techniques, discriminant analysis, decision tree analysis, swarm intelligence, K- nearest neighbour, logistic regression, Bayesian classifier, support vector [27] which can be used for preparing the data from EHR to analytics

and to run the analytics and predict the outcomes, in order to treat patient well with the disease condition.

There is a lot of research done on healthcare analytics. Some research includes the big data analytics [48],[42],[8],[5],[7],[38],[46]while some does not include the big data analytics, however implications of that research are significant in niche, fine area [41],[25].

[25, 2019] have given the use of Artificial Intelligence (AI) that can be helpful for the radiologists in analyzing the medical images. US FDA (United States Food and Drug Administration) also approved IDx-DR artificial intelligence system, in which clinician involvement is not required to interpret the output of mild diabetic retinopathy in adults diagnosed with diabetes (USFDA Website). With this AI enabled services screening of a patient can be done, and if results are positive, then the patient is referred to the eye care professional and with the negative consequences, the patient is advised to visit again after 12 months.

With the help of the classification techniques, the prediction of lung cancer survivability can also be analyzed based on the Analysis & Prediction and Comparison of the algorithms [41]. With the increment in the usage of the wireless sensors, IoT, mobile technologies, cloud computing it is easy to monitor the system, which can be designed to measure and predict the heart failure, and keeps the data in an accumulated cloud in order to run the further analytics and learning from the data [33].

Analytics is directly linked with the quality of data, which is accumulated into the memory or reservoir of data. With the lousy quality of data analytics cannot be run and one cannot predict any future events with a high level of accuracy, and GIGO (Garbage in Garbage out) will occur. In the hospital set up, there are various points from which a data can be collected and accumulated like (EHRs, LIMS, Instruments for diagnostics and monitoring, Insurance Claims and Billings, Pharmacy, Real-time Local systems, etc.). All these data accumulated at one place and then the operations or analytics on these data can be run, which may help the physician to select the nature of the treatment, medicine and other things for the patient in a way, which is best suitable to the patient [54].

Apart from the healthcare analytics, which is run by the physician or other medical practitioners, healthcare set up also needs the internal operations analytics, which helps them to forecast and plan better for the future needs of medicine, surgical equipment, and other instruments. For managing infectious diseases, the analytics is essential, as with the help of the analytics, forecasting of such diseases can be done and an early warning was given to the affected regions [23]. However, early warning is not enough in such cases and healthcare organization must be prepared to handle the increased flow of patients, increases medicines, devices, and equipment. The exploitation of analytics will be helpful to hospitals in such cases.

C. Information Technology Adoption:

Many types of research are available on information technology and its adoption. Most of the study have used the theories like resource-based view [6], Dynamic Capabilities [49], and absorptive capacity [14].

As per the resourced-based view, IT adoption can enhance the performance and drives competitive advantage for the firm by path dependency as cumulative effects cannot be copied by the competitor as a resource will be valuable, rare, inimitable and organizational specific [6]. IT adoption follows the path dependency by knowledge, IT business experience, Relationship infrastructure [10]. On the other end, IT adoption can also increase the dynamic capabilities of the firm [10].

As per [9, 2000], IT adoption can follow the path dependency and performance of the firm can be improved by robust IT infrastructure, Human IT resources (which includes the relationship between business people and IT people) and Intangible IT (exploitation of IT resources). On a similar way as per Bhatt and Grover (2005), IT infrastructure quality, IT business experience and relationship infrastructure will lead to the competitive advantage of a firm which follows path dependency. On the other side, CIO,s interest in business strategy and CEO’s involvement in IT strategy will lead to competitive advantage as this relationship is valuable, rare, inimitable and organization-specific.

There is very little empirical research on the IT adoption in the hospital context. ICT based solutions are helpful in administration as well as improvement in quality and cost rationalization [20]. [52] (2002) have studied the integration of all the units of hospital-based on IT exploitation.

D. Operational Performance

For a healthcare organization, operational performance is more important as patients’ health is associated with the same. As per the [34(2014)] and [32(2009)] reduction in the readmission rate and the mortality rate is leading indicators for the operational performance of the hospital. Hospitals or any other healthcare organizations should be able to treat the patient in a good manner up to the extent that patient should not have to admit again for the same disease or disorder in a concise time. Re-admission means a lot of pain for the patient, which incurred a cost to the patient. It will also cost the hospital, in terms of risk of not complying with the standard. Reduction in readmission rate will increase the value of the hospital in the view of the patient, on the other end, overcrowding of emergency room can also be avoided so that that hospital can accommodate and treat the more patients.

III. GAPS

- Based on the extant literature, measurement scales for the constructs of IT adoption, care analytics, operational performance are not available.
- Most of the research done in the area of care analytics and IT adoption in healthcare set up covers the in-depth technical perspective, but the essence of a managerial perspective of using IT adoption, care analytics and performance is missing.

IV. BUSINESS PROBLEM

In the cases of serious issues (communicable diseases/ non communicable issues), hospital can be overcrowded. [36],[26].Because of the congestion, patients are not treated efficiently. Doctors and paramedical staffs must treat a greater number of patients, and they are not able to deliver the right treatment as they are not able to extract the nature

of therapy crisply. The main business problem of the hospital is to maintain the inventory level of drugs and equipments and availability of infrastructure, doctors and paramedical staff so as to optimize the treatment time and optimally usage of drugs and equipment

V. RESEARCH QUESTION

Can by using the care analytics on the data captured by information technology adoption increases the operational performance of the hospital?

Can the operational performance of the hospital increase by adopting the information technology and link it with the care analytics to obtain the operational performance?

VI. OBJECTIVE

The objective of this study is to develop a scale with the relevant items to measure IT adoption, Care Analytics and Operational performance to create the parsimony for the large-scale empirical studies.

VII. RESEARCH METHODOLOGY

The initial pool of item generated through the extensive literature review process for the constructs of IT Adoption, Care Analytics, and Performance. [20], [2], [52], [24], [21], [51], [34], [53].

The initial pool of items was reviewed by two academicians to check the initial relevance with the construct and construct definition. Table 1 contains the details of the number of items falling into each of the constructs.

Construct Name	Initial No. of items
IT Adoption	10
Care Analytics	8
Operational Performance	6

Table 1- Number of items for each construct

A. Scale Development Q Sort Method

To pre-access the convergent and discriminant validity of an instrument, Q sort method can be used by examining the number of items sorted by an expert into the corresponding category. [47].

Three industry experts and three academicians were invited to take part in the Q sort method’s sorting process. Industry experts were holding the positions of Administrators and owners of the hospitals. The academicians who were involved were the professor in the institute and have an ample amount of research experience on similar topics. At the beginning of the process, all the 24 items were in the shared pool and definition, and proper understanding of each of the constructs was explained to each of the participants taking part in the Q Sort process. After the knowledge of the constructs and items, they were asked to sort these 24 items into four groups which include three constructs and one category of NA, which consists of the omitted or the deleted items, which the construct cannot hold as per the definition. On the other end, the NA category prevents the forced fit of the items into the constructs.



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The sorting results were evaluated using the hit ratio [37] and Cohen's kappa [13].

Inter judge raw agreement score was calculated by counting the items that both the judges agreed to place in one category. An item was treated as an item with the agreement if the items are in the same group by both the judges.

Item placement ratios were calculated by counting all the items that were correctly sorted theoretically by each of the judges [37].

At the end, Cohen's Kappa was calculated, and the nature of agreement found based on the values of Cohen's Kappa. The process was stopped when Cohen's kappa reached to the desired agreement level and for that three rounds were required.

Interpretation for Values of K (Adopted from, [13])

Kohen's Kappa Values (K)	Interpretation
<0	No Agreement
0-0.19	Poor Agreement
0.20-0.39	Fair Agreement
0.40-0.59	Moderate Agreement
0.60-0.79	Substantial Agreement
0.80-1.00	Almost Perfect Agreement

Table 2 - Interpretation based on Cohen's Kappa Value

VIII. RESULT AND ANALYSIS

With the intensive literature review and the proposed items for the scale development. The inter judge reliability and construct reliability was checked. Total three rounds were

performed in order to get the correct measurement scales for the constructs. Hit ratio, Raw agreement score and Cohen's kappa were found to be above 0.90 from the result.

The ideal value of Cohen's kappa should be between 0.81 - 1 for the perfect agreement [13]. A process of measuring the inter judge reliability for the purpose of scale development can be stopped when Cohen's kappa increases to 0.81, as the value shows the perfect agreement between the judges, and thus the measurement can be the reliable one.

Indices	Round 1	Round 2	Round 3
Placement (Hit Ratio)	0.79	0.84	0.93
Raw agreement Score	0.79	0.84	0.93
Cohen's Kappa	0.65	0.74	0.90

Table 3 – Summary of the results

The final result of the scale development with the developed measurement scale (variables) for each of the contracts with the definition of the constructs are listed below in table 4. After the third and the final round, six items for IT Adoption, five items for care analytics and four items for operational performances are retained, which claims using these items as a measurement are reliable to measure the construct.

Construct	Definition	Variables	References
IT Adoption	IT adoption is defined as an extent to which information technology systems are implemented, integrated and captures the records.	<ol style="list-style-type: none"> We store patient's record in a digital form over the network. We update the record if the nature of treatment or medicine given to patients has been changed? *All units/divisions of our hospitals are integrated with each other. We keep record of inventories like medicine, surgical and equipments online over the network. *We trust the data recorded by the system. we have access to the system of patient's data electronically for use. My hospital staff finds the adopted IT system to be easy to use. ***For my hospital, using the IT is relevant. **In my profession, using this system is a prestige. Integrated data dashboards from adopted IT platform helps us to perform duties. 	<p>Gastaldi and Corso (2012)</p> <p>Adler-Milstein et al., (2014)</p> <p>Wan, Lin and Ma (2002)</p> <p>Hart and Saunders (1997)</p> <p>Goto et al., (2013)</p> <p>Wang, Kung and Byrd (2018)</p>

Care Analytics	Analytics use is an extent to which physicians are using the data obtained from IT systems and predict the healthcare outcome and administrator predicts the operational outcomes.	<ol style="list-style-type: none"> 11. My hospital forecasts the future need of patients in terms of for the medicines and surgical equipments. 12. My hospital forecasts the patient inflow from the prevalent disease patterns of communicable and non-communicable disease data. 13. My hospital can analyse large patient data in short period of time. 14. Before deciding the nature of treatment or prescribing the medicine, we check the medication history and past disease of a patient. 15. Using the analytics will improve my performance during the treatment of the patient. 16. **For my Job using the system is relevant. 17. *Having the knowledge of analytics is a status symbol. 18. *People who are using this knowledge are of a high prestige. 	<p>Gastaldi and Corso (2012)</p> <p>Venkatesh and Davis (2000)</p> <p>Liu (2014)</p> <p>Wang, Kung and Byrd (2018)</p>
Operational Performance	Operational Performance is an extent to which hospital is able to provide the quality services, and increases patient deliverables to deal with higher number of patients.	<p>Our hospital in comparison to competing hospitals with similar bed-number in vicinity:</p> <ol style="list-style-type: none"> 19. Experiences lower Readmission rate 20. *Offers better quality of patient care-service 21. Does not experience shortage of care-delivery related items (medicines and equipment) 22. **Higher patient admission figures. 23. Increased inflow of new patients 24. Reduced Mortality Rate 	<p>Liu (2014)</p> <p>Krumholz et al. (2009)</p>

TABLE – 4 (ITEMS)

- *Items eliminated during round 1.
- ** Items eliminated during round 2.
- *** Items eliminated during round 3.

IX. PROPOSITION DEVELOPMENT

Linking IT Adoption and Performance

Information technology increases the performance of an organization by following various approaches like RBV, Dynamic capability, etc. and evidence also proved that IT adoption provides the performance and competitive advantage by path dependency [9], [10].

Use of information technology can integrate the various departments of a healthcare organization through which an excellent performance in terms of operations can be observed [52]. For example, integration between pharmacy, equipment and laboratory data with the doctor’s input is useful in which doctor will prescribe some tests and some medicines against the unique code generated for the patients. This helps the patients as well as a hospital administrator to track all the records at one place.

On the other hand, adoption of IT also comes with similar formats for recording the data, user interface and improves the standardization, shared innovation and shared learning. As doctors can see the health status and nature of the treatment of the patient in real time, during the unavailability of one doctor other physicians can also treat

the patient in the cases of a medical emergency [31]. With the real-time tracking of the medicines and other equipment in the healthcare organization near real-time analytics can be run on the patient’s healthcare, availability of physicians, medication, surgical and equipment into the organization, which increases the efficiency in patient care.

Based on the discussions from the given literature, the following proposition can be proposed.

Proposition 1: with the increase in the technology adoption in a healthcare organization, the performance of the healthcare organization increases in terms of patient care.

Linking IT adoption and Care Analytics

With the help of sophisticated IT instrumentation in the organization, a higher level of integration and coordination can be achieved. On the other side, IT adoption can also create an alignment between the systems [55]. With the more sophisticated instrumentation in IT, devices can seamlessly be connected [9] which makes patient’s data transfer and data sharing easier in real time also. It is essential to have a real-time data and analyze it in real time only as a day old data does not give the practical insight of a patient’s health status correctly and does not implicate any proper use.

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With the sophisticated instrumentation and seamlessly connected devices, hospital administration and physician both can forecast the future patient inflow and future need for medicines and equipment. Further real-time information of patient's about to discharge, availability of beds, current status of inventories like medicine and kits can be known by integrating several departments on to one platform.

Based on the literature, the following proposition can be proposed.

Proposition 2: with the increase in the technology adoption in a healthcare organization, use of care analytics will also increase.

Linking Care Analytics to performance

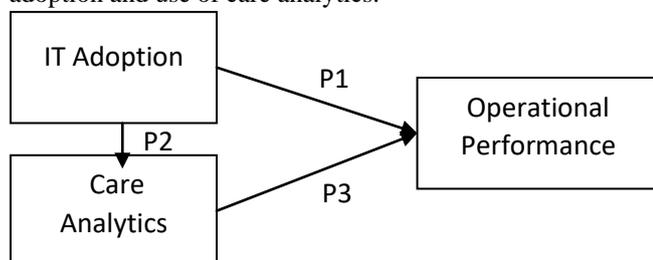
With the implementation of care analytics deficiency in the process can be surfaced and efficient operation can be made, which prevents the crowding of emergency room and length of stay of the patients also decreases by 8 hours in the emergency room [29], and more patients can be treated efficiently. On the other side, care analytics helps physicians to decide the nature of treatment and medicines given to the patient, which helps in the process of fast recovery of the patient.

With the real-time monitoring of patient's health status, bed occupancy rate, and type of disease (communicable or not) administrator can predict the future patient flow and can manage the inventory level of medicine and equipment to fulfill the demand of increased patient's discharge. With this, a higher number of the patient can be attained.

Care analytics can also be used for the improved quality of process and quality of life. Predictive analytics model determines that what brings patients back into the emergency room (readmission) as care analytics can use patients' history, medications, treatments, and outcomes data to distinguish the patients based on the standards and give special care to them and decreases the readmission and mortality rate (Liu, 2014). Based on the literature the following proposition can be made.

Proposition 3: with the increase in the care analytics, the performance of a healthcare organization also increases.

Based on the literature and the propositions the following framework can be suggested, in order to increase the operational performance of hospital with the help of IT adoption and use of care analytics.



The framework proposed is based on the extant literature and the following case study developed based on a Government Hospital in Gujarat.

X. CASE STUDY

A government hospital in Gujarat has sophisticated IT instruments, and the whole hospital is integrated with the single system. Patient does not get reports, prescription or

anything else as a hard copy. When patient admits into the hospital, a unique number is generated. Patient past medication history is scanned into the computer and analytics run. A doctor can observe all health-related records of the patients who are under his/her treatment by entering the unique number of the patient.

When a physician prescribes any kind of a lab test, a paramedical staff comes and takes the sample of patients blood, urine, saliva as prescribed by the doctor and sent to the laboratory for the testing by using the pneumatic tube system, from which without man power the samples can be sent directly to laboratory. After the test in the laboratory, the report is sent to the patient via email and the doctor can see the records by putting the patient's credentials into the system.

Prescription of the medicines also follows the same order. A doctor updates a prescription against the unique number generated, and a relative of the patient gets the drug from the pharmacy just by the unique number. For some medicines which are used frequently pneumatic tube system is used.

Every detailing of the treatment is updated in the system like time of changing the drip of NS/PS, time of injecting the medicine intravenously or intra muscular, etc are noted and updated into the system. Based on which a physician can see the actual impact of medication or treatment given on the health status of patients. If a doctor needs the help of another doctor, then doctors can share the unique ID of the patient, and another doctor can guide the physician to obtain good health status of the patient.

XI. IMPLICATIONS

A. Managerial Implication:

Hospital administrator and chairperson of the trust which runs the hospital must think about the digitalization of the hospitals. IT adoption with the sophisticated instrumentation helps to enhance the process of patients' health record capturing and sharing the information with other departments of the organization as well, which all are affiliated with the patient care. It is essential for an administrator to look after the coordination and integration between the various departments of hospitals, to enable the high level of patient care.

Use of care analytics also helps the hospitals in predict the future and based on that; inventory back up can be generated. So, every patient can be adequately attained. Moreover, using care analytics, treatment time optimization can be done with the proper nature of treatment and medicines used. This will impact the patient's health and crowding of hospitals can be avoided.

B. Future Scope:

The study developed only the scale and at the conceptual stage. Based on the arguments presented from the literature and hence, given a list of rationally reduced propositions for hospital to refer to and update the resources so as to optimize the treatment time.

The remaining scope is to convert the propositions into workable hypotheses and empirically validating them for establishing a more robust linked framework. There is also a scope for a large-scale empirical validation using EFA followed by CFA & SEM to establish the path relationship and understanding the contributing factors in detail.

XII. CONCLUSION

The paper describes the theoretical understanding between the IT adoption, Care Analytics and Operational performance of a healthcare organization with the scale development using the Q Sort method. With the help of the literature review and a case study of a hospital, the relationship between IT Adoption and Operational Performance, IT adoption and Care Analytics and IT adoption and Operational Performance has been established.

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Annexure

Inter judge Agreement Score

Round 1	Judge 1					
	Constructs	IT Adoption	Care Analytics	Operational Performance	N/A	Total
Judge 2	IT Adoption	8			2	10
	Care Analytics		6		2	8
	Operational Performance			5	1	6
	N/A	2	2	1		
	Total	10	8	6		
	Total Items Placed: 24	Number of Matched Agreements:19		Agreement Ratio:		79.2 i.e. 0.79

Exp. Here, (Total Item Placed * Matched Agreements) – (Sum of Row Totals * Column Totals) / (Total Item Placed)² - (Sum of Row Totals * Column Totals)
 = (24*19) – ((10*10)+(8*8)+(6*6)+(5*5)) / (24*24) - ((10*10)+(8*8)+(6*6)+(5*5))
 = 0.65

Item Placement ratio

Round 1	Actual Categories						
	Constructs	IT Adoption	Care Analytics	Operat ion	N/A	Total	%

Theoret ical Categori es				al Per for mance			
IT Adoption	16			4	20	80	
Care Analytics		12		4	16	75	
Operatio nal Perform ance			10	2	12	83	
N/A	4	4	2				
Total	20	16	12				
Total Items Placed: 48	Number of Hits:38		Hit Ratio :	79.2 i.e. 0.79			

Inter judge Agreement Score

Round 2	Judge 1					
	Constructs	IT Adoption	Care Analytics	Operatio nal Perform ance	N/A	Total
Judge 2	IT Adoption	7			1	8
	Care Analytics		5		1	6
	Operatio nal Perform ance			4	1	5
	N/A	1	1	1		
	Total	8	6	5		
	Total Items Placed: 19	Number of Matched Agreements: 16		Agreement Ratio:		84.2 i.e. 0.84

Item Placement ratio

Round 2	Actual Categories						
	Constructs	IT Adoption	Care Analytics	Operati onal Perform ance	N/A	T otal	%
Theoret ical Categori es	IT Adoption	14			2	16	
	Care Analyti cs		10		2	12	
	Operati onal Perform ance			8	2	10	
	N/A	2	2	2			
	Total	16	12	10			
	Total Items Placed: 38	Number of Hits:32		Hit Ratio:	0.84		

Inter judge Agreement Score

Round 3	Judge 1					
	Constructs	IT Ad opti on	Care Analy tics	Operatio nal Perform ance	N/A	Total
Judge 2	IT Adoption	6			1	7

Care Analytics		5		0	5
Operational Performance			4	0	4
N/A	1	0	0		
Total	7	5	4		
Total Items Placed: 16	Number of Matched Agreements: 15		Agreement Ratio:	93.7 i.e. 0.93	

Item Placement ratio

International and national Conferences and Journals, including Benchmarking, SCFIJ, Business Theory and Practice, IJAER, IJBI, etc. His areas of teaching and research interest includes, Information Systems, Business Analytics, Operations Management, Supply chain Management, Healthcare Analytics and Project Management. At IBS Hyderabad, IFHE university he currently teaches at different academic levels BBA, MBA, PhD and Executive-MBA.

Round 3	Actual Categories					Total	%
Theoretical Categories	Constructs	IT Adoption	Care Analytics	Operational Performance	N/A		
	IT Adoption	12			2	14	
	Care Analytics		10		0	10	
	Operational Performance			8	0	8	
	N/A	2	0	0			
	Total	14	10	8			
	Total Items Placed: 38	Number of Hits:32		Hit Ratio:	0.93		

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