

Using Analytics to Improve Healthcare in Public Hospitals in Asia

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Abstract- Big data analytics is advantageous for businesses but implementing BDA to leverage profitability is an essential problem facing practitioners. Even though previous studies have investigated the effect that BDA has on business development, there's an absence of investigation, which describes the whole intricacy of BDA implementations. Evaluation of how and under what conditions BDA achieve organizational performance from a holistic viewpoint is lacking in the current literature. To extend the theoretical viewpoint from the standard views to the configuration concept, we've created a conceptual design of BDA achievement, which seeks to explore how BDA features communicate with complementary organizational energy and organizational abilities in several configuration treatments, leading to better quality of treatment in healthcare organizations. To evaluate this particular unit, we use fuzzy set qualitative relative analysis to analyze multi source details acquired from a survey, as well as databases maintained by the Centres for Medicaid and Medicare Services. Our results suggest that BDA, when given by yourself, isn't enough to obtain the outcome, but is a synergy result where BDA features, analytical personnel's abilities combined with organizational energy, as well as helpful function, can boost readmission fees and patient satisfaction in healthcare organizations.

Keywords: Big data analytics, healthcare, public hospital, Asia

1. Introduction

Regularly increasing big volumes of information in different forms (along with other information options like pharmaceutical functions, insurance claims/billing, and RD laboratories) is challenging healthcare organizations' information management abilities [3]. The need for more effective data management isn't special to healthcare, though it's much more essential in healthcare, as it concerns patients' well-being, which is much more critical than the bottom line in some other industries [1]. Indeed, superb data management could facilitate reliable predictions of patient conduct, healthcare understanding creation, and clinical practice upgrades [2]. Nevertheless, many healthcare organizations are experiencing an absence of information requirements, integration, information overload problems, as well as barriers to high-quality information, which lead to billing mistakes, health-related errors, and unnecessary costs. Data quality depends not only on its own features, but also on the company environment through the information, which includes business processes and business users [4]. Just the data which conform to the appropriate uses and meet requirements may be considered qualified data. Big data analytics is frequently being endorsed for its likely essential role in dealing with these issues in healthcare sectors. Still, our consent about how BDA could be implemented

into training and how it affects organizational performance remains short.

Prior studies have investigated the effect that BDA has on business development with the lens of resource based concept, information processing view, and knowledge-based view. Many scholars have drawn upon RBT to conceptualize a BDA capability by orchestrating tangible as well as intangible big data as well as human resources to the business process, and to analyze the direct effects of its on strategic-level and operational results [5]. Proponents of KBV consider the BDA program a highly effective tool to get and harness information that allows companies to produce competitive advantage and organizational agility. Several scholars use IPV to explain how BDA can help firms control job complexity, as well as respond to green changes through the systems of info processing [6].

To address this issue, we initially suggest a conceptual design with a pair of BDA achievement components [9]. A pair of BDA capability, which is composed of BDA technical as well as human resources from the current literature, is identified. We then continue to examine different organizational components to be viewed as the possible effect of BDA on healthcare efficiency [7].

The study of ours can contribute in 3 ways to the

management literature. For starters, this particular analysis proposes a conceptual design with a configurational lens to explicate the intricacy of big data analytics implementation [10]. To the best of our knowledge, no prior research has yet regarded the intricate interactions between BDA, as well as the organizational components that guide the organizational functionality of the healthcare context. Next, the configurations we identified give proof about the reasons the various relational areas communicate to produce a high end of healthcare. This consequently extends and deepens our understanding of how big data analytics can be implemented into practice. It may be helpful for practitioners, outlining various paths which they can follow based on their specific circumstances. Lastly, this particular analysis contributes from a methodological standpoint, exemplifying complementarities of regression-based methods and fsQCA. The regression based technique is ideal for detailing the causal paths through which BDA affects organizational performance, while fsQCA gives a deeper understanding of the complex, synergistic and non-linear effects of organizational elements and BDA on organizational performance.

2. Theoretical Research and Background Model

2.1 Brief Review: Path to Big Data Analytics Success

Big data was initially defined in terminology of variety, velocity, and volume. Consequently, a fourth V was added, veracity that describes information accuracy which pertains to quality [1]. After which, it started to be easy to acquire much more advanced data analysis applications to fulfill the requirements of managing the info explosion based on the manner in which it's seen, searched, processed and managed [11]. While volume for big data doesn't possess a threshold for measurement, as it can differ based on the time design of the collection, it describes the dimensions, dimensions or maybe magnitude assessed in petabytes or terabytes [3]. Big data is described in terminology of range, which points out the structural heterogeneity in a dataset as structured when present in types of relational databases or spreadsheets; or maybe unstructured details in the type of videos, images, audios, tables or text [12]. Velocity in reference to big data mirrors the pace, cost or rate at which information is produced using smartphones or other technical advances, including biometric technologies being analyzed. Scholars as Demcheko et al. have widened the conventional 3Vs based characterization of big data to the value generation capacity of its from the evaluation based on variety and volume of information accessible to the analyst [13].

Veracity directly refers to data quality, as it describes the inherent biases, abnormality and noise of information. Veracity comes with data consistency and data trustworthiness. These data quality problems in turn influence data integrity and data accountability. This particular attribute of big data creates its challenges and importance, particularly in healthcare, in wanting a high amount of information analytical capability, since it influences the choices relating to patients' effectively beings [16].

The literature has suggested many conceptual frameworks to explain the way to apply BDA in organizations based on IPV, KBV, and RBT, as summarized in Table one and visualized with Figure one. Based on RBT, many research into BDA has discovered that various types of BDA energy can bring value to firms' operations [14]. These resources can develop BDA specific capabilities, which firms would use to gain significant insights and reshape organizational performance. For instance, Seddon, Dod and Constantinidis argue that the purposeful match of BDA programs being sold high quality information, and employees with excellent analytical skills, are predictors, which favorably affect the advantages obtained from constant BDA enhancement projects. A recently available study carried out by Wamba et al. suggested that BDA infrastructure capability, management capability, and personnel capability almost all have a powerful impact on tight efficiency [15].

To facilitate organizational info processing capability, prior studies have stressed that organizations must develop the organizational structure of theirs, mechanism and business tasks in conjunction with information analysis tasks, which could reduce green anxiety and ambiguity of the issue context. As regards supply chains, Trkman et al. statement which firms can analyze and use their information in the various phases of the supply chain, like an excellent supply chain effectiveness. In the same vein, Cao et al. have discovered that utilizing BDA influences info processing capability with the mediation of a data driven atmosphere, which has a good impact on decision making strength. These studies explore how business decisions are made, from the joint effects of BDA, as well as info processing mechanisms.

2.2 Research type of configurations creating organizational performance

Researchers have emphasized that numerous

complementarities, for example organizational culture, rules and policies, environmental conditions, organizational structure, must communicate with IT to generate exceptional organizational performance. Adding this particular framework to the BDA context, we identified 6 general groups of BDA features: information integration, analytical, information interpretation, predictive, and the complex and business skills of analytics personnel, as parts of human and technological IT materials from the extant literature; 2 complementary organizational energy: evidence based decision making tradition as well as information governance; and 2 organizational abilities lodged to the company process: planned improvisational and dynamic abilities. These factors could be combined in different likely configurations to determine which options lead to improved healthcare performance. Figure two illustrates the interactions with these 3 configuration components of BDA, with the intersecting orbits representing an alternative confluence, which will help improve quality of treatment in healthcare. The 10 elements contained in the configurational analysis of ours are described in the following section.

2.3 The Elements of Big Data Analytics Capabilities

BDA capability is the ability to obtain, store, process and analyze considerable amounts of health data in different forms, and deliver substantial info to users, which enables them to discover company values and insights promptly. We suggest 4 dimensions of BDA capability in healthcare: information integration capability, analytical capability, predictive capability, along with information interpretation capability, as discussed below in much more information. Table two summarizes the primary key applications and functionalities in healthcare for every BDA ability.

2.3.1 Analytical capability

Analytical capability describes the ability to get actions and decisions with the considerable use of information and various analytical methods, depending on the particular mechanisms employed for analytics, thus dealing with the different requirements of other stakeholders and users [18]. In healthcare, analytical methods that can support core medical processes and operations are crucial to boosting the quality of care [20]. Healthcare analytical methods allow people to find patterns of attention and find associations from substantial collections of healthcare records, providing a wider perspective for evidence-based medical procedures. This type of analysis can find previously unnoticed patterns in individuals

related to clinic readmissions, and support a much better balance between cost and capacity [19]. For instance, one powerful analytical method, descriptive analytics, is popular in BDA methods. In a clinic environment, this particular method allows users to understand previous patient behaviors and how these behaviors may impact results, depending on the info kept in their database [15]. Above all, the ability to analyze patient tastes helps hospitals understand the utility of clinical trials and determine new likely market segments. Data analysis can therefore help raise the effectiveness of healthcare delivery, leading us to add analytical capability, like a vital dimension of BDA ability [13].

2.3.2 Predictive capability

Predictive capability is "the procedure for using advanced tools to develop estimations and models of what the earth will make in the future". It's the ability to use varied statistical evaluation techniques, modeling, machine learning, as well as data mining to both unstructured and structured data to figure out future results [11]. Predictive analysis makes it easy to cross reference current and historic data to produce context aware suggestions, which allow supervisors to make predictions about future events trends. This particular capability depends on predictive analytical engines, which add a data warehouse, a predictive platform with predictive algorithms, and a predictive screen, which provides recommendations and feedback to users [18].

2.4 The components of complementary organizational resources

Companies wanting to implement BDA to create company value must undergo adjustments or perhaps remarkable changes in their daily operations, organizational culture and data policies. Complementary organizational resources are needed for a profitable BDA implementation. Particularly in healthcare, such resources help organizations face the difficulties of standardizing numerous types of data across different healthcare systems and information. BDA-enabled complementary organizational assets are viewed as a certain kind of organizational aid with the help of BDA, which usually are deeply idiosyncratic, and tacit embedded in the business [16]. Crucial complementary organizational sources in the context of BDA, like enterprise wide analytics orientation and fact-based decision making society, are key drivers of outstanding organizational performance. In this particular study, we select an evidence-based decision making culture as well as

information governance as the main complementary organizational energy, and describe them in the following portion.

3. Research Methods

3.1 Data Collection

The healthcare business was selected as re-search context because of this research for two reasons: The study and BDA implementation of the effects of its in healthcare industries are far behind other industries, such as retail and banking, and concentrating on one business can mitigate any likely confounding consequences because of market nature and variation. We tested our item using a multi source dataset acquired from a survey, as well as databases maintained by the Centres for Medicaid and Medicare Services.

An original public set of 4668 senior IT professionals in US hospitals, listing the facility name, job title, telephone number, as well as e-mail address for every, was obtained from the Healthcare Information as well as Management Systems Society website. Following data cleaning to eliminate incomplete info and duplicates, 3307 senior info system executives remained. An internet survey was particularly created for this study. The first round of 3307 questionnaires resulted in 511 email messages being hindered by their organizations' firewall, as well as 1589 messages never opened; alight reminder was sent a week later. Of the 1207 invitations found by possible respondents, sixty five responses have been returned, sixty three of which were usable and complete for the information analysis, displaying a response rate of 5.39 %. Based on Overton and Armstrong, non response bias was evaluated by comparing the late and early respondents for each measurement that uses combined test t-tests. The results showed no statistically significant distinction between these two groups, indicating that non response bias didn't present a concern because of this research.

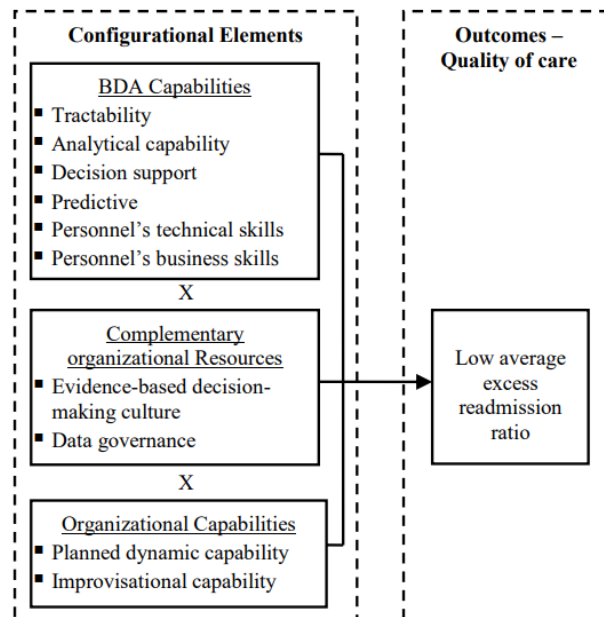


Figure 1: Research model

3.2 Measurement Validity and Reliability

The definitions of key measurements and constructs used in the present study are presented. Many measurement things have been used out of the literature and improved to suit the context of the research. The items and measurements of constructs are presented. Apart from the outcome variables, a seven point Likert type scale was used for all constructs.

The reliability and validity of measurements have been assessed from the sample information set collected because of this research. Every one of the reliability coefficients is previously 0.70, confirming the measurements are reliable. 3 criteria evaluated convergent validity: thing loading, composite reliability, along with typical variance extracted. The loadings tend to be within appropriate ranges, and all but one thing for information governance has loadings above the threshold of 0.7. The one product that drops under this particular level features a loading of 0.650, which surpasses the appropriate threshold of 0.6 recommended by various other scholars.

4. Discussion

Our finding reveals that most remedies attaining a lot of quality of care have many analytical and information interpretation abilities, coupled with information integration capability, predictive analytics and capability personnel's technical abilities. Put

simply, when a healthcare business lacks high organizational resources and organizational capabilities, the combination of BDA features can continue to provide it with a low readmission pace. This particular locating reaffirms the end result of research by Akter et al., in that the use of BDA may immediately boost tight efficiency. As previously mentioned, data analytical and interpretation are the most crucial parts of the BDA process for healthcare organizations. They will include the capabilities to analyze many medical details to recognize current state and the past for particular target variables, and to produce a medical summary in real time or even near real time for role based decision making. Certainly, our results go along with all those found by Wang et al., which suggested that these 2 BDA features play important roles in enhancing the significant use of the efficiency and other practices of evidence-based medication habits, as well as significance, which often helps with quality of treatment in healthcare.

Surprisingly, the evidence-based decision-making culture isn't present in most solutions. Contrary to the results found by earlier reports, the fsQCA result shows that evidence-based decision-making way of life is lacking in most of the treatments considered, being provided just in Solution O1S5 and O2S4. A likely explanation.

For this conclusion, doctors healing individuals tend to rely on their professional experience in making decisions, instead of holding a method output that they might not be familiar with or even taught to work with [13].

It's well worth noting that the benefits of improvisational and dynamic abilities are highlighted in many remedies, especially in developing powerful capabilities to enhance patient satisfaction. This particular find confirms the findings of numerous scientific studies, who claim that dynamic capability plays a vital role in directing BDA results. Although organizational abilities are considered significant predictors of company value development in various contexts, these organizational abilities are sometimes difficult to develop or even need much more long-term planning, therefore a short-term outcome is difficult to uncover [15].

Lastly, but many notably, one particular capability, which is facilitated by BDA methods, information interpretation capability, will be the common core causal component of both the desired results considered. As previously mentioned, data interpretation capability can produce significant medical summaries in real-time or even near present, and real-time them in an effortlessly viewed format. It

uses graphic dashboards/systems to yield sharable info as well as understanding, like historic accounts, drill-down queries, executive summaries, statistical analyses, as well as precious time sequence comparisons to various decision makers. As indicated by Byrd and Wang, the ready accessibility of this info helps healthcare analysts understand emerging healthcare problems, like medical mistakes, prospective patient safety problems, or maybe inappropriate medication use [21]. This allows them to alert patients and professionals to medical prompt remedial actions. As incorrect interpretation of the medical reports created can lead to severe mistakes of questionable decisions and judgment, it's crucial for healthcare companies to have interpretation by supplying analytical training programs to those staff members, who'll play a crucial role in the brand new information rich work environment in the earlier phases of BDA adoption.

	Solution				
	1	2	3	4	5
BDA Capabilities					
Traceability	○	⊗	○	○	○
Analytical capability	●	●	●	●	●
Decision support capability	●	●	●	●	●
Predictive capability	○	●	○	○	○
Analytics Personnel's Technical skills	○	⊗	○	○	○
Analytics Personnel's business skills	○	⊗	⊗	⊗	○
Complementary organizational resources					
Evidence-based decision-making culture		⊗	⊗	⊗	○
Data governance	⊗	⊗	⊗	○	○
Organizational capabilities					
Planned dynamic capability	⊗	⊗	○	⊗	○
Improvisational capabilities	○	⊗	⊗	⊗	○
Consistency	0.803	0.967	0.827	0.897	0.921
Raw Coverage	0.387	0.153	0.212	0.225	0.241
Unique Coverage	0.159	0.036	0.022	0.032	0.053
Overall Solution Consistency	0.832				
Overall Solution Coverage	0.569				

Table 1: Configuration low average excess readmission ration

4.1 Managerial implications

From a practical viewpoint, our research develops an understanding of the "black box" between firm performance and BDA by checking out the complicated causality between BDA features, complementary organizational energy and organizational abilities. Our findings not only expose the synergy result of BDA features and BDA human resources in obtaining enhanced readmission rates and patient satisfaction, but also show that BDA can't do this in isolation from many other components, as organizational energy abilities have a supporting role. These fsQCA results offer the "secret recipes"

required to achieve healthcare performance by thinking about the presence or maybe absence of the different "ingredients". These secret dishes may be the practical ways for healthcare practitioners to use BDA to enhance healthcare efficiency. By looking at the similarities and differences between several equifinal configurations, we acquire patterns that make the preferred degree of healthcare quality in terminology of enhanced readmission rates and patient satisfaction. Based on the patterns identified, healthcare group supervisors can adopt answers tailored to their own situations or characteristics to attain higher medical quality and stay away from the luxurious pitfalls of misplaced BDA investments.

In training, many businesses consistently struggle to make progress on their BDA initiatives, because employing a BDA product could be a risky and expensive undertaking. It usually costs a huge information challenge, roughly 1 dollar 9.3 million, to construct and keep a Hadoop system with a 5 year period. The fsQCA results of ours provide valuable configurational fixes to achieve good quality of proper care, to ensure it allows healthcare companies to produce a clear path to BDA results.

5. Limitations as well as Future Research

While we think the fsQCA method can contribute to our research, this particular method suffers from many limitations. Foremost and first, fsQCA depends on previous understanding or maybe extensive literature about the subject to choose appropriate conditions, as well as results, and minimize the quantity of configurations to a manageable fitness level. The configurations are hypersensitive to the assortment of conditions included - removing or adding conditions could lead to different solutions.

6. Conclusion

To sum up, instead of just checking out the immediate impact of BDA on healthcare functionality with a regular linear causal evaluation - as it tends to become the situation in present BDA analysis - we've focused on checking out the systemic, discontinuous and equifinal interactions among BDA components along with other organizational components [11]. Applying fsQCA and configuration theory for this particular study has allowed us to find out not only individual drivers, but also sets of disorders that determine the quality of care caused by BDA in healthcare [19]. These results from fsQCA advance the understanding of how BDA enabled IT abilities combine with other

organizational components to obtain company worth in healthcare [22]. Above all, we provide proof that various solutions leading to an equivalent healthcare functionality due to the real use of IT, along with other organizational components, exist. This demonstrates that fsQCA is an appropriate and useful instrument for evaluating the company worth of BDA, which can provide fresh insights to enhance our understanding of the factors contributing to the company value of BDA. As the use of fsQCA remains in the infancy of its in many company domains, much more substantive considerations of the scenarios opened up by this brand new strategy are essential when we reap the whole advantage of applying fsQCA to investigations of the effect of technology that is new on tight efficiency.

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