

Understanding Big Data Analytics (BDA) and Business Intelligence (BI) Towards Establishing Organizational Performance Diagnostics Framework

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ABSTRACT: *We had observed the features of Big Data Analytics (BDA) and Business Intelligence (BI) in viewing the big picture of organizational performance diagnostics framework. BDA and BI are dynamic researches that had enabled organizations to capture and create better knowledge creation and decision making. The research goal is to provide a real world understanding of emerging knowledge derived from structuring big data and BI framework development. This framework relates the current BDA and BI stages with their analytic characteristics in designing the organizational performance framework. The outcome will be a design of a typical strategic application – the organizational dashboard.*

KEYWORDS: *Big Data Analytics, Business Intelligence, Dashboard, Information System and Knowledge Management.*

1. INTRODUCTION

Organizations need a lot of data and information to capture and process in order to make rapid and best decisions [6]. Big data phenomena as data science is about dealing with voluminous data that must be timely processed and available for making good decisions. Another approach in complimenting decision-making process is by adopting data analytical approach of Business Intelligence (BI). Strategically, BI is about using information to make smarter decisions.

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Tactically, it is about building applications for reporting and analysis. Operationally, BI is about addressing problems of scattered data in an organization [1]. Towards understanding the real world of knowledge and information use, organizations should deal with literacy and competency of BDA and BI [6]. In striving for excellence, an organization must be agile in gaining better organizational performance. There is a need to position BDA and BI initiatives for optimizing the organizational performance. We have initiated a research on observing a generic organizational excellent framework towards designing an executive performance diagnostics dashboard. This diagnostic dashboard is meant for a higher education institution - a university.

2. RESEARCH PROBLEMS

Many organizations are so keen on striving for excellence. However, these efforts are not easy. Some are still facing such operational difficulties and jeopardizing strategic issues. Many have experienced obstacles and risks of tremendous data silos - isolated information repositories. In addition, these organizations are experiencing data errors and redundancies as well as information bottleneck and overload. There is a phenomenal problematic data area of incompetent information management and analytics inability at strategic level; information 'blind spot' and uncertainty – not knowing what is going on. All these have resulted severe performance and losing competitiveness. We have signified these problematic scenarios as the bases of our research questions:

1. What is the suitable analytics and BI framework for generic organizational performance diagnostics modeling?
2. How to simulate an organizational Key Performance Indicators (KPIs) reporting using BDA and BI technology in order to improve the organizational performance?
3. What is the relevant information

architecture of the proposed model to be presented as a performance diagnostics tool or an executive dashboard for viewing the strategic achievement of a university?

3. RESEARCH OBJECTIVES

The existing information system or information technology of an organization typically its IS/IT implementation has to be brought up towards realizing gaps for excellence by engaging BDA and BI as mission-critical framework – in building an organizational data architecture and infrastructure. We have to investigate the existing data environment, processes, operations and practices in a respective organization. With respect to these intents, elements of organizational excellence and performance management have to be probed with certain approaches and intelligences.

The research objectives are to:

1. Compare a number of available excellence frameworks, BDA and BI approaches which are suitable for organizational performance diagnostics.
2. Propose relevant KPIs reporting model using BDA and BI technology.
3. Design an online real time organizational dashboard – a performance diagnostics for university’s executive.

In brief, we have started with some required frameworks for excellence by observing the potential approaches of BDA and BI. Finally, we would design an integrated application functioning as the organizational performance diagnostics tool.

4. LITERATURE REVIEW

One of the most challenging scenarios in many organizations facing nowadays is the sudden rise of big data. In other words, big data has attracted the attention of an organization by their unpredictable volume, velocity and variety of data exceed an organizations storage [5]. According to [3], BI is introduced as a platform of application for supporting business decisions by emphasizing the analytical process for complex, unstructured data and data sources. On the other hand, BI and BDA have emerged as architecture, analytical tools, applications and technique to aid in decision making [7].

4.1 A glance of the Organizational Excellence Framework

Initially, we have observed the general frameworks for excellence. This effort was an important approach of relating big data technology because there were so many

sources of data within an organization that could be critical to organizational excellence model [1]. Based upon the recent operational activities and processes, we have conceived a typical adaptation of frameworks that had signified six elements of:

1. Leadership system that consists of fundamental elements such as organizational sustainability, communication engagement and organizational performance review.
2. Strategic Planning system that signifies the strategic development processes, action plans development, strategic and risk assessments [8].
3. Customer Management system will include the product offering determination, customer and market segmentation and engagement-satisfaction determination.
4. Knowledge Management system refers to knowledge availability – sharing information, knowledge reliability and performance measures, selection and use.
5. Workforce Engagement system defines workforce engagement management and assessment, workforce capability-capacity and learning and development.
6. Operations Focus system has to deal with process improvement and innovation, process control and sustainability as well as process and system design.

Furthermore, we have tabulated the assimilation of elements and components of organizational excellence frameworks as shown below:

Table1: The assimilation of elements and components of Organizational Excellence

Malcolm Baldrige National	European Foundation for Quality Management (EFQM) Excellence	Union of Japanese Scientists and Engineers (JUSE) –
Leadership, Organization and its management		
Strategic Planning	Strategies	Organizational Planning
Information and Analysis	Resources	Education, Quality Information
Process management	Products and Services	Analysis, Standardization, Control, Quality Assurance
Human resources	People	
Customer and Market	Partnerships	
Business, Customer, People, Organizational and Society Results		

4.2 Big Data and Business Intelligence (BI)

BDA is about analyzing voluminous data sets to discover hidden patterns, unknown correlations, situations and trends, preferences and other useful information. Meanwhile, BI is now moving toward a more predictive model - showing what will happen in businesses [9]. New BI systems are beginning to show how all the various parts of your organization work together to produce an outcome, and business leaders can finally see the big picture and make faster, better-informed decisions [1]. According to [4], BI systems functioned to combine data gathering, data storage, and knowledge management with analytical tools to present complex and competitive information to planners and decision makers. [2] stated that BI represents the tools, technologies and processes required to turn data into information and information [10] into knowledge and plans that optimize business actions. In understanding the required mashup called infographic, we had started with observing and adapting framework of ecosystem that consists four distinct intelligences [2]:

1. **Business Intelligence** addresses the requirements of data warehousing, delivering reports, monitoring dashboards and scorecards.
2. **Analytics Intelligence** is meant for one level higher people like business analysts and analytical modelers to have an ad-hoc access for exploring unforeseen business questions.
3. **Continuous Intelligence** streams the compilation, monitoring and analysis of huge volumes of rapid changing data and providing the analytical platform, tools and techniques.
4. **Content Intelligence** gives business users the facility to search access and scrutinize the unstructured data and semi-structured data that include emails, web pages and many more.

5. FRAMEWORK ANALYSIS AND DESIGN

In order to develop generic framework, we have addressed a fundamental work based upon the ideal thinking of framework for excellence and being analytics – the main reason for adapting and integrating the components of Baldrige and BI frameworks [2]. To signify the components, we had formed respective matrices as shown below:

Table2: Matrices of Baldrige Framework and Generic STO components

	Baldrige Excellence	Generic STO Components
1	Leadership	Strategic Management System: Strategic Planning Process, Development and Risk Assessment.
2	Strategic Planning	
3	Customer Management	Academic Accreditation Management System: Program Educational Standards & Accreditation.
4	Knowledge Management	
5	Workforce Engagement	Human Resource Management System: Competency, Talent, Integrity Evaluation and Appreciation.
6	Operations Focus	Quality Management System: Quality Strategies, Capabilities and Culture, Processes and Structures

Therefore, in designing the relevant framework, we started viewing integrated frameworks in comparison to generic strategic, tactical and operational (STO) components of an organization's operation. We had concluded that there are similar elements of Baldrige framework and the generic STO components. Derived from the above, we have come up with an adapted organizational excellence framework by adopting the knowledge (KM) management and BI framework with specific design of KPI parameters.

Table3: The KM and BI Frameworks Integration

KM Framework Component	Focus of BI Framework Component + BACCI	
Quality Management	Operations	<i>Adaptation of Business, Analytics, Continuous & Content Intelligence</i>
Human Resource Management	Human Resource	
Academic Quality Accreditation	Customer Management	
Strategic Management	Leadership & Strategic Planning	

This is an integrating the potential KPIs for organizational BI Framework with typical elements of business excellence model with the existing KPIs of an organization that Leadership system and Strategic Planning system, Knowledge Management to be mapped with the organization balance scorecard and merging the knowledge and information blueprint strategies as KPIs for measurements. Customer Management system to be

mapped with academic or professional quality, accreditation management policies and standards as KPIs for measurements. Workforce Engagement system to be mapped with human development blueprint and framework as KPIs for measurements. Finally, the Operations Focus system to be mapped with quality objectives, standards and features of critical success factors as KPIs for measurements. As of the possible engine of organizational dashboard elements, we have adapted the four intelligences (Business, Content, Analytics and Continuous) of BIs. This is an approach of designing the structural application of the organizational dashboard with certain KPIs to be incorporated with the four intelligences (Business, Content, Analytics, and Continuous) as the organizational dashboard conceptual engine. This will be the basic template for the requirement of a specific dashboard application as an infographic mechanism.

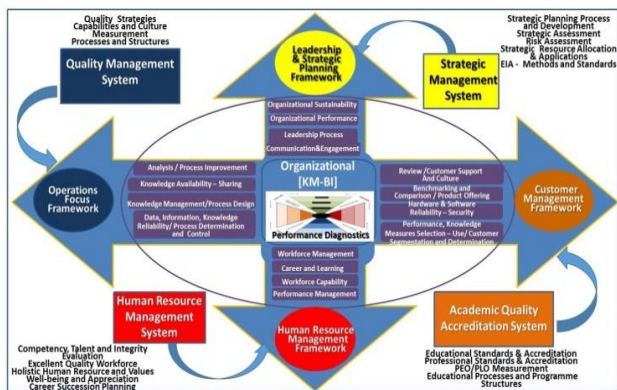


Figure1: The Finalized View of an Organizational KM-BI design for Organizational Performance Diagnostics – a dashboard

We have derived the view by having the preliminary study on organizational excellence, big data and BI models. And next, we will design and develop the details and KPIs of the organizational dashboard – a mashup conceptual design.

6. ANALYSIS ON THE KPI PERFORMANCE DATA

As mentioned earlier, we have gathered a number of critical issues and elements associated with the key components that flexibly needed consideration when designing the organizational KM-BI performance diagnostics dashboard. We now implement and deploy these key aspects or elements based on the prototype dashboard, which we have developed for a university as a case study, let's define the university as University A. The partial data obtained from the university were used as a data extraction into the performance diagnostics tool and loaded for BDA. To signify the components, we had formed respective

matrix interfaces that consist of four themes with seventeen (17) sub-themes as the intended KPI scorecards as shown below:

Table4: Components of KPI Performance Reputation University A (2016)

Themes	Sub-Themes Component	(%)	KPI Achieved (%)	Achieved
Quality Management	Quality Services	70.22%	64.71%	
	Quality Infrastructures	62.00%		
	ISO/QMS	74.52%		
	Mass Communication	52.11%		
Human Resource Management	Quality Human Resources	70.00%	72.67%	
	People and Leadership	78.00%		
	Staff Competency Development	70.00%		
	Enrollment Trends	81.94%		
Strategic Management	Stakeholder Value	75.14%	78.82%	71.70%
	Leadership Images	74.52%		
	Economics Stability	83.67%		
	Academic development	75.02%		
Academic Quality Accreditation	MQA standards	81.25%	71.13%	
	Academic Achievement	65.22%		
	Accreditation	83.67%		
	Learner Value	61.26%		
	Academic Resources	60.36%		

We illustrated the centrality of these respective KPI achievements in the use of BDA in the University A and foster the university achievement from the analysis data of the year 2016 for better decision making. The data achieved is an understandable form of KPI indicator context and eventually wisdom of the university. The implementations of the themes are based on the four elements of KM-BI framework itself. To start the analysis, we state the criteria of the KPI achievement as below:

Table5: Sub-Components of KPI Performance Reputation

Above Average	Achieved (%)	Below Average	Achieved (%)
1.Economics	83.67%	1.Quality	70.22%
2.Accreditation	83.67%	2.Quality	70.00%
3.Enrollment	81.94%	3.Staff	70.00%
4.MQA	81.25%	4.Academic	65.22%
6.Stakeholder	75.14%	6.Learner	61.26%
7.Academic	75.02%	7.Academic	60.36%
8.ISO/QMS	74.52%	8.Mass	52.11%
9.Leadership Images	74.52%		

Based on our observations, the University A's KPI benchmark percentage is 71.70%. Towards understanding and representing these achievements, we have divided the scorecard according to this



benchmark. The significant analysis shows that nine (9) sub-component scorecards – 53%, are above the average benchmark of the university. Meanwhile eight (8) sub-component scorecards – 47%, are below the average benchmark of the university. In addition, criteria and the relationships between them are expanded as shown below:

Table6: Criteria of the KPI Achievement




KPI INDICAT	SCORE NUMBE	KPI ACHIEVED	SCORE CARD
Weak	0 - 50		0
Moderate	51 - 74		10 (59%)
Good	75 - 100		7 (41%)

Table 5 demonstrates the nature and quality of the KPI generated for this scenario, where seven (7) sub-themes – 41%, had achieved the good ranking. The other ten (10) sub-themes – 59%, had yet ranked as moderate. We observe the role of BDA in identifying the gaps occurs on these sub-themes. Perhaps, we observe further that those performance below 65% and provides key determinants underlying gaps or issues. We had concluded that there was a growing amount of data available to be inaccurate and inconsistent. These gaps are due to phenomenal data silo, data usability, experiencing human error, performance or system downtime and data validity. Therefore, we indicate that key enabler from this big data picture must be aligning with infographic mechanism and providing the important insights that can be applied to boost up the KPIs achievement by triggering certain mechanism of alerts for monitoring these themes, checking elements for data validity, tracking human interaction for communication and behavioral dimension and yet, predicting and prescribing on new strategies towards achieving their targeting KPIs.

7. CONCLUSION

The work has emphasized on a simulation and optimization of BDA and BI – multiple intelligences. The challenge ahead is to perceive the knowledge emergence in a form of BI framework that is suitable for specific an organization such a university performance diagnostics tool. We had defined the BI framework model of its KPIs reporting using BI and big data technology by creating suitable information architecture of the proposed model of performance management. This research will provide a conceptual model for BDA and BI maps, as a representation of knowledge repository and data architecture in a form of performance diagnostics dashboard. Further work had

forwarded to an effort of designing and developing specific and real executive performance diagnostics tool for a university as another case study – yet it is for a CEO Dashboard.

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