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An Evaluation of Big Data Analytics Projects and The Project Predictive Analytics Approach

GABRIEL KABANDA

Atlantic International University 900 Fort Street Mall 40 Honolulu, Hawaii 96813, USA.

Abstract

Big Data is the process of managing large volumes of data obtained from several heterogeneous data types e.g. internal, external, structured and unstructured that can be used for collecting and analyzing enterprise data. The purpose of the paper is to conduct an evaluation of Big Data Analytics Projects which discusses why the projects fail and explain why and how the Project Predictive Analytics (PPA) approach may make a difference with respect to the future methods based on data mining, machine learning, and artificial intelligence. A qualitative research methodology was used. The research design was discourse analysis supported by document analysis. Laclau and Mouffe's discourse theory was the most thoroughly poststructuralist approach.

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Assignment Decisions;
Big Data;
Communication Methodology;
Project Manager.

Introduction

Big Data collects and stores huge volumes of data whose management and analysis are increasingly becoming more challenging. A majority of firms or companies are now investing in Big Data Analytics motivated by the potential benefits and competitive edge of this new technology. Big Data involves the processing and management of large volumes of data obtained from a variety of heterogeneous data used in the enterprise, whether structured or unstructured data. In Big Data Analytics, analytical methods and technologies are heavily utilized in the management and analysis of huge volumes of complex data sets for use by various applications that augment the performance of a business. The purpose of the paper is to conduct an evaluation of Big Data Analytics Projects which discusses why the projects fail and explains why and how the Project Predictive Analytics (PPA) approach may make a difference with respect to the future methods based on data mining, machine learning, and artificial intelligence.

Nikumbh and Pimplikar (2014) define a project as a unique and temporary task, with a specific start and finish dates, entail a commitment of resources, and

CONTACT Gabriel Kabanda gabrielkabanda@gmail.com Atlantic International University 900 Fort Street Mall 40 Honolulu, Hawaii 96813, USA.

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seeks to attain specified objectives. The success of projects requires sound management, which is done by project managers. Therefore, there is a need for the assignment of the appropriate managers to the projects. According to Patanakul *et al.,* (2003), the assignment of a project manager is a critical project decision that determines project success and organizational performance. Project management is the application of knowledge, skills, tools, and technology to project activities in order to meet or exceed stakeholder expectations and requirements (Harrington & McNellis, 2006). Project management is an organized control of a project that starts with project planning and ends with the project closure.

Many organizations in the contemporary world collect, store, and analyze huge volumes of data. Big Data is characterized by the volume of data, the velocity with which it arrives, and the variety of forms it takes. Big Data precipitates a new generation of decision support data management where the potential value of the data is now being realized by businesses and appropriate technologies, people, and processes are now extensively utilized to explore the unlimited opportunities available. In light of the significance of Big Data, this paper is an analysis of Big Data analytics projects, which embodies an elaboration of the reason for the failure of the interventions. Focus is also placed on discussing the reasons for the failure of Big Data analytics projects. To enhance the success of Big Data analytics projects, there could be the application of Project Predictive Analytics (PPA), which shall be interrogated further in this paper. There is also a discussion on other methods for enhancing the success of Big Data analytics projects, such as data mining, machine learning, and artificial intelligence.

Big Data may be conceived as more and different types of data than is usually handled by traditional relational database management systems (Su, 2013). In a similar vein (Ajah and Nweke, 2019) posit that Big Data describes the high volume, high-velocity data with high variety, uses new technologies and techniques to acquire and analyze it; enhances decision-making capabilities, and provides more insight and discovery, and support process optimisation. The Big Data is collected from a large assortment of sources, such as social networks, videos, digital images, and sensors. Tapping into data analytics creates a strategic advantage, leverages competitiveness and identifies new business opportunities. Some of the wide applications of data analytics include credit risk assessment, marketing, and fraud detection (Watson, 2014). Hemlata and Gulia (2016) argue that there are many types of analytics approaches that can be categorised into descriptive, predictive, diagnostic and prescriptive analytics. Big Data analytics is purposed to discover new patterns of knowledge and provides new insights (Weibl and Hess, 2018).

Singh *et al.,* (2015) stated that Big Data analytics uses systematic architecture of Big Data, Big Data mining, and software for analysis. The common examples of analytics methods include Bloom Filters, Hashing, Index, Triel, and Parallel Computing. There is also use of tools that may include R software, Excel spreadsheets, and Rapid Miner (Ajah and Nweke, 2019). Nevertheless, most of the Big Data analytics projects fail. Axryd (2019) argues that there are varying statistics on project failure rate, whilst Gartner (2013) estimated that 60% of Big Data projects fail. Nick Heudecker (2017), a Gartner analyst, believes that the failure was close to 85%. The next section discusses the reasons for failure of Big Data projects.

Project Management Consultancy Value Adding Contributions

There is a need for planning and effective management so that projects can be successful. This brings the notion of project management consultancy (PMC) or project manager into the limelight. A project manager is empowered to plan, direct, organise and control the project from the start to finish (Project Management Institute, 2013). Such an individual should provide effective leadership given the project environment, which is typically dynamic and highly unpredictable. There is a need to enhance the possibility of project success taking into consideration the characteristics of the environment and coherence of management strategies. In addition to that, the project manager must use diplomacy, worker participation, and conflict resolution skills to be an effective leader. The ability to achieve teamwork becomes crucial to the achievement of project objectives. The argument is, over and above understanding that projects consist of a series of

interrelated activities, which are problem solving, time phased as well as being cost-bound, there are other intervening factors related to how the project is managed and the general environment uniqueness of that project.

Cristobal (2017) pointed out that the project manager performs basic management functions (planning, organising, leading, and controlling). A project manager is expected to motivate and inspire people working on the project. PMC is also responsible for time management. Time is a very important resource in project management and in some cases, it can be referred to as a constraint. Time is also a measure of project success. Kerzner (2013) contends that successful project management requires the accomplishment of the project objectives within time and cost, at the desired performance or technology level and while utilising assigned resources effectively and efficiently. Riahi (2017) supports this view by arguing that time is one of the three basic elements in a project. The other two basic elements are quality and cost. Kerzner (2013) further argues on the need for effective time management, as time is a critical resource.

PMC is critical in the entire life of a project, from identification to evaluation. During the project identification stage, PMC examines the rationale for project implementation. Projects are costly endeavours and the project manager ought to conduct a thorough examination pertaining to the significance of project implementation. After project identification, PMC plays an essential role in project design. According to Mazur and Pisarski (2015), the design stage utilises the data gathered, to specify the project objectives, activities, outputs, and inputs. Thus, this should be carried out to a sufficient level of detail to allow the estimation of technical, social, and institutional parameters, and the preparation of a feasibility study with an assessment of cost and benefits. The role of PMC to conduct the technical, financial and organisational designs of the project. The project manager is also responsible for coming up with the implementation plans. After the project design, PMC conducts project appraisal. Project appraisal is a critical review of every aspect of a project plan by an independent team of specialists to establish whether the proposed project is sound and appropriate for resources to be committed to it. It is apparent from the foregoing that project appraisal is an analytic, systematic integrated, and comprehensive exercise that seeks to determine whether or not the project is worth implementing based on decision criteria and is only worthwhile for long term projects. Project appraisal as a tool assesses proposals before the commitment of resources. At this stage of the PMC, projects can be accepted or rejected. The project manager is supposed to come up with technical appraisals, institutional appraisal (interrogating the institutional capacity to implement the project), and financial appraisal. The financial appraisal determines the financial viability for sound implementation and efficient operation. It aims at investigating the financial aspects of the project, financial soundness, efficient operation, cost of production, return on investment, prospects of marketing, profitability, effective, effective controls, budgeting, and pricing.

The project manager is also supposed to conduct a risk analysis. A risk is a potential and unforeseen trouble spot that may affect the project. Possible project risks include financial limitations, personnel constraints, budgetary constraints, and standard constraints. PMC has the task of managing specific project risks. Risk identification determines the specific risks that are likely to affect the project (Cristobal, 2017). Following risk identification, the project manager then develops the appropriate plan to mitigate against the risks. External risks are often beyond the control or influence of the project team (Shibani and Sukumar, 2016).

Implementation comes after project appraisal so that the project is completed on time, on budget and within specification. Project managers provide direction, coordination, and integration to the project team. Project managers also have direct responsibility over quality. According to Kerzner (2013), it is not worthy to complete a poor quality. A project manager ensures that the quality expectations of stakeholders are met through quality planning, quality assurance, and quality control (Riahi, 2017). After implementation, PMC conducts project evaluation. Evaluation is conducted to establish whether the project is attaining the intended objectives. Evaluation is the last stage in the project life cycle, but in practice, there is a need

for evaluation at each stage of the project life cycle (Project Management Institute, 2013).

It is also essential to note that, during the entire project life, PMC is responsible for stakeholder management. Mazur and Pisarski (2015) consider individuals or groups as important project stakeholders. From this conception, one can note that stakeholders are central to projects. Project success is defined by the extent to which stakeholders are satisfied. According to Riahi (2017), one has to ask how good the quality of the products or services is in order to satisfy the customer. Project failure or success is dependent on PMC.

The Significance of Project Manager Assignment Decisions

Section 1.2 elaborated on the important role of PMC or project manager. It explained that the success of projects is dependent on who manages it. Therefore, a sound project manager assignment is critical. A project manager is the leader of the human resources in any project. According to human resource management literature (Bartlett and Ghoshal, 2011; and Armstrong *et al*., 2016), people are the most valued assets in any organisation (project), and they are the sources of competitive advantage. Therefore, sound project manager assignment, a process that ensures that the right people are assigned to projects, is of paramount importance. Richardson *et al.,* (2015) argue that the project manager is expected to perform better than if there was no match with requirements that match his competencies.

It was highlighted earlier that three elements underpinning successful project management are time, cost and quality. The appointment of the right project manager will ensure that these three are achieved, thereby speaking to the success of the project. An inappropriate assignment could have devastating consequences not only for the project but for the organisation as a whole, as in many instances, projects have a direct link to the fulfilment of organisational goals. It could also lead to issues such as low morale amongst teams, cost overruns, and poor quality, etc. An appropriate project management assignment will ensure that milestones are not missed and there is adequate coordination of resources as well as efficient and sufficient communication with stakeholders.

Challenges Faced in Making Project Manager Assignment Decisions

There are several challenges faced when making a project manager assignment. One of the biggest challenges that have been faced especially in multi-project environments is the lack of managers that have appropriate competencies for the project (Patanakul, 2015). Projects by their very nature have a strategic fit to the overall performance and therefore a project manager with the right competencies will ensure that this strategic fit is maintained, and organisational goals are met.

Numerous psychology graduates are employed in human capital management business, and often get involved in recruitment, selection, and assessment tasks. Nevertheless, Salgado *et al.,* (2013), claim that despite the longstanding employee selection research and practice, the field is still full of controversies. Some of these controversies include exploring 'settled' questions, working on 'intractable' challenges, expanding into literatures and organisational levels far removed from those historically investigated, and constantly being pushed by practitioners, who continually are confronting questions to which researchers have not yet produced answers. The key point here is that as alluded to by Patanakul 2015, information on an effective assignment is still rather scarce in the literature.

It is essential to note that making a sound decision in project manager assignment is a difficult exercise. There is room for errors when assigning managers to the project. Some errors arise because it may be difficult to predict human behaviour. There could also be unforeseen circumstances, which can affect a manger's performance (Armstrong *et al.,* 2016). Moreover, Cristobal (2017) argues that projects are complex endeavours, which involve multiple stakeholders. There is a differentiation of functions in a project between clients, contractors, subcontractors, suppliers, and financiers, or the internal differentiation of the contractor's organisation (degree of manifoldness). Therefore, assigning the appropriate project manager is not

an easy exercise. Other challenges that have been identified, include the availability of project managers especially in multi-project environments where a project manager could be tied up on an assignment. There is also the risk of overloading project managers if the assignment process is not handled properly which could result in a failure of the project (Patanakul 2015).

The Criteria for Project Manager Assignment

According to Armstrong *et al.,* (2016), it is essential in project management to be clearly focused and measure the 'hole' so that 'square-shaped pegs are not put in round-shaped holes'. One of the most important reasons for validating the traits needed in a specific job is to ensure that the organisation avoids the costs of poor project assignments (Mazur and Pisarski, 2015). The criteria for project manager assignment stresses that a successful project assignment is one in which a project manager possesses competencies compatible with project requirements, that is, type of project, its size, complexity, and durations (Patanakul, 2015). The competencies that are correlated with project requirements should be the area of focus.

Table 1: Aspects to Consider in Project Assignment

Category	Selection Criteria	
Organisational Factors	Organisational Objectives or Goals	Innovation; Business Expansion; and High Profit Margins
Required Competencies	Technical Competencies	Technical Expertise; and Problem Analysis
	Administrative Competencies	Planning and Scheduling; Monitoring and Control; Team Building and Management
	Human Competencies	Leadership; and Communication
	Business/Strategic Competencies	Strategic Thinking; Stakeholder Coordination; and Business Sense
	Additional Competencies	Experience; Inter-Project Planning; Inter-Project Resource Allocation; and Multi-Tasking
Project Requirements	Project Type	Size; Duration; and Complexity
Organisational Constraints	The capacity of Project Managers	The Effective Capacity; The Current Workload; and The Availability

Source: Patanakul *et al.,* (2003)

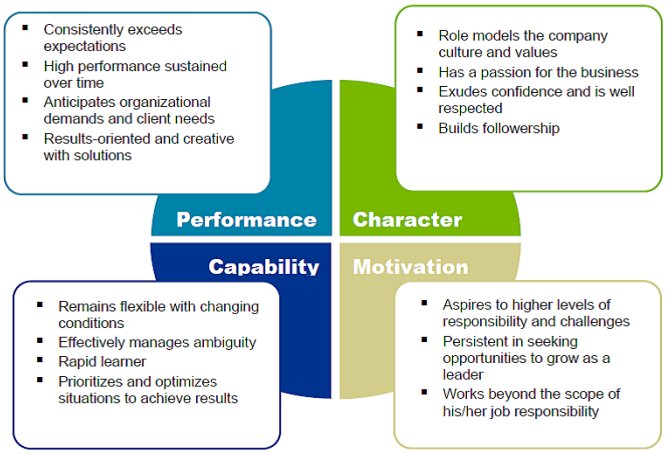

Fig.1: The Elements of Potential incumbents

We first analyse the important competencies such as technical knowledge, administrative skills, and leadership ability including communication, problem-solving, conflict resolution, integration, and analysis (Project Management Institute, 2013). Additional competencies required may include problem-solving techniques, administration, supervision, project team management, interpersonal relations, and some other personal qualities for selecting project managers (Riahi, 2017). Table 1 shows the aspects that are considered in the project assignment.

Moreover, the project manager assignment ought to assess the potential of incumbents, as shown in the Figure 1 below.

In addition, there are many studies to determine what makes someone a high potential for project management (Garavan *et al.,* 2012, Swailes, 2013). Consider, for example, someone who could be promoted two vertical levels in five years is high potential (Bartlett and Ghoshal, 2011). Ambition entails that any project or business success comes with a price including personal time, hard work, emotional dedication, and perseverance. High-potentials can demonstrate the required personal drive and ambition to pay the price for success.

Consequently, there are seven steps followed in the criteria for the project manager assignment (Patanakul, 2015). The steps involved are the identification of:

- Potential projects to be assigned;
- The strategic elements of the organisation and prioritisation of projects with respect to their contribution to those strategic elements;
- The project requirements and translation into the level of project manager competencies that a project requires;
- Project manager candidates and their level of competencies;
- The fit between a project and a project manager with respect to the level of competencies that the project requires and the level that the project manager possesses;
- The organisational/personal limitations regarding the project assignments;
- Assignment criteria for a project to a manager based on the priorities, the fit between project and project manager, and the organisational/ personal limitations (Patanakul, 2015).

The introduction, adoption or implementation of Big Data analytics poses benefits as well as challenges, threats, and problems that need to be well managed to fully leverage on its potential. As a result of these challenges, 65-100% of data analytics adoption or implementation projects failed and are concluded as incomplete, overbudget and out of time (Axryd, 2019).

Materials And Methods

A qualitative research methodology was used. The research design was discourse analysis supported by document analysis. Laclau and Mouffe's discourse theory was the most thoroughly poststructuralist approach.

Discourse analysis can be used as a framework for analysis of national or institutional identity to explore the significance of national identity for interaction between people in an organisational context such as a workplace. All discourse analytical approaches converge with respect to their views of language and the subject (Jorgensen and Phillips, 2002). Discourse theory aims at an understanding of the social as a discursive construction whereby, in principle, all social phenomena can be analysed using discourse analytical tools. A discourse is understood as a fixation of meaning within a particular domain (the knots in the fishing-net). A nodal point is a privileged sign around which the other signs are ordered; the other signs acquire their meaning from their relationship to the nodal point (Jorgensen and Phillips, 2002). A nodal point in political discourses is "democracy" and in national discourses a nodal point is "the people". In medical discourses, for example, "the body" is a nodal point around which many other meanings are crystallised. Signs such as "symptoms", "tissue" and "scalpel" acquire their meaning by being related to "the body" in particular ways.

Discourse, then, can be understood as a type of structure in a Saussurian sense – a fixation of signs in a relational net. Thus the discourse is a temporary closure: it fixes meaning in a particular way, but it does not dictate that meaning is to be fixed exactly

in that way forever. Discourse theory suggests that we focus on the specific expressions in their capacity as articulations: what meanings do they establish by positioning elements in particular relationships with one other, and what meaning potentials do they exclude? Individuals are interpellated or placed in certain positions by particular ways of talking. In discourse theoretical terms, the subjects become positions in discourses (Jorgensen and Phillips, 2002). Discourses always designate positions for people to occupy as subjects. For instance, at a medical consultation the positions of "doctor" and "patient" are specified. In this research the positions of "project management" and "PPA" were used. Corresponding to these positions, there are certain expectations about how to act, what to say and what not to say. The understanding of identity in Laclau and Mouffe"s discourse theory can be summarised as follows (Jorgensen and Phillips, 2002:43):

- The subject is fundamentally split, it never quite becomes "itself".
- It acquires its identity by being represented discursively.
- Identity is thus identification with a subject position in a discursive structure.
- Identity is discursively constituted through chains of equivalence where signs are sorted and linked together in chains in opposition to other chains which thus define how the subject is, and how it is not.
- Identity is always relationally organised; the subject is something because it is contrasted with something that it is not.
- Identity is changeable just as discourses are.
- The subject is fragmented or decentred; it has different identities according to those discourses of which it forms part.
- The subject is overdetermined; in principle, it always has the possibility to identify differently in specific situations.

Therefore, a given identity is contingent – that is, possible but not necessary. In summary, some of Laclau and Mouffe"s concepts of discourse theory are useful as tools for empirical analysis in this research from this context:

- Nodal points, master signifiers and myths, which can be collectively labelled key signifiers in the organisation of discourse;
- The concept of chains of equivalence which refers to the investment of key signifiers with meaning;
- Concepts concerning identity: group formation, identity and representation; and
- Concepts for conflict analysis: floating signifiers, antagonism and Hegemony.

Discursive practices – through which texts are produced (created) and consumed (received and interpreted) – are viewed as an important form of social practice which contributes to the constitution of the social world including social identities and social relations. It is partly through discursive practices in everyday life (processes of text production and consumption) that social and cultural reproduction and change take place. It follows that some societal phenomena are not of a linguistic-discursive character. The aim of critical discourse analysis is to shed light on the linguistics-discursive dimension of social and cultural phenomena and processes of change at the university. Discourse encompasses not only written and spoken language but also visual images. Document analysis is a form of qualitative research in which documents are interpreted by the researcher to give voice and meaning around an assessment topic. Analyzing documents incorporates coding content into themes similar to how focus group or interview transcripts are analyzed. In this case publications and research papers on project management and project predictive approach (PPA) were analysed.

Evaluation of and Why Big Data Analytics Projects Fail

Project failure is when the project objectives have not been met in terms of project scope, schedule, or cost. Generally, IT project implementation is commonly associated with low levels of success (Mpingajira, 2013). Big Data analytics projects are complex and difficult. They involve fundamental changes to business processes, there is the implementation of new and unproven technologies. More so, there is the requirement for urgent short-term specialist resources, the constant pressure to deliver more quickly and cheaply, the project risks are difficult to control, and the non-routine projects are becoming more prevalent (Hussain and Manhas, 2016). A large number of e-government

implementation projects in Africa have failed to live to their expectations (Mutula and Mostert, 2010). In Britain, the government is believed to be wasting billions of pounds every year on unsuccessful IT projects. The literature points to a whole host of reasons for the failure of Big Data analytics project, we will focus on just but a few of the very major ones for this paper as follows:

Misalignment of Technical and Business Goals and Expectations

According to Patanakul (2015), projects should be selected with their ability to meet the strategic fit to ensure proper strategic alignment. Most data science projects are undertaken to provide important insights to the business team. However, often a project starts without clear alignment between the business and data science teams on the expectations and goals of the project, resulting in that the data science team is focused mainly on model accuracy, while the business team is more interested in metrics such as the financial benefits, business insights, or model interpretability. In the end, the business team does not accept the outcomes from the data science team (Preimesberger, 2019).

Lack of Proactive Risk Management

Proactive risk management requires improvement in managing both existing and emerging risks and adaptability to near crisis situations. A deeper understanding is required to measure and manage emerging risks and their impact on the project. Risks should be proactively assessed, reported and mitigated.

Lack of a Skilled and Efficient Project Team

Axryd (2019) suggests that 30% of the failure is attributed to the lack of skills in organisations. The effects can be felt at the executive level, line managers and the rest of the organisation. Neijt (2017) postulates that a very skilled and efficient project team is required to implement Big Data projects effectively and successfully.

Poor Project Communication Methodology

Project management communication is pivotal in initiating and mobilising a project effectively. Industry practice recommends that a project manager should spend 90 percent of their time communicating. Poor communication contributes to project failure. A project organizational culture where there is a free flow of communication is one of the critical success factors in project management.

Lack of an Experienced and Visionary Data Scientist

A modern organisation requires a Data Scientist to provide strategic direction and guidance on new ways of looking at the data and realising its potential value. Hence, the Data Scientist is expected to be efficient, experienced and visionary.

Poor Data Integration

The major technological problem behind Big Data failures is the integration of siloed data. Old legacy systems face tremendous difficulties in connecting with the stored data, struggle with acceptable formats, and incur huge expenses in data cleansing. Consequently, Big Data projects become time-consuming and often exceed the given timelines leading to customer dissatisfaction. However, here are tools used for data management such as Hadoop which handles different data formats and also used in Big Data analytics projects (https://www.flydata.com/the-6-challenges-of-big-data-integration/)

Change Management

This is a huge challenge encountered when implementing a Big Data analytics project. The top management must be comfortable with going through dashboards and getting high-level views generated by analytics. Most functional heads who should be participating in the project are threatened by the way analytics can affect their work and fiefdoms. This creates fear amongst management, and they will resist change for fear of their job security. The project will then lack the support of the top management or is sabotaged. There is often very little appreciation by executive management on the potential value of Big Data projects because of the challenges associated with time consumption, waste of resources, and huge funding requirements. Management fear data driven decisions and they thought they are valueless if all decisions are now based on data.

Lack of Infrastructure

Project failure is more certain when companies solve Big Data problems using traditional data technologies. The major impediments in achieving high success rates with Big Data projects are the

inadequacy of the budget and the use of inappropriate technology. Big Data analytics is an interdisciplinary approach that involves mathematicians, statisticians, data engineering, software engineers, business analysts, etc and importantly, subject matter experts. Depending on the size and scope of the project, companies might deploy numerous data engineers, a solution architect, a domain expert, a data scientist (or several), business analysts and perhaps additional resources. Many companies do not have and/or cannot afford to deploy sufficient resources because hiring such talents is becoming increasingly challenging and also because companies often have many data science projects to execute, all of which take months to complete.

Lack of Clear Business Objectives

Big Data has been hyped and its growth of implementation has been exponential at an enormous rate. It is very easy for many organisations to be caught up in the hype. Most organisations enter the Big Data environment with a me-too attitude since the barriers to entry into this space have been reduced especially with the availability of cloud or proprietor hardware and commodity. There is a need for a clear understanding of why the organisation should invest so many resources and time into the project and reasonable or expected outcomes are established. Lack of clarity of objectives may lead to poor planning which leads to project failure. Project predictive analytics can improve the success of Big Data project analytics.

Other Factors

Deloitte suggests that other factors that contribute to project failure which include the inherent complexity of a project, the capability level of the project team, and the management of governance issues. Other factors that have been highlighted include lack of effective leadership as well as ineffective project scope definition. Furthermore, Big Data projects fail because of the impossibility of accurately capturing requirements before a project begins. In addition, organizations change over time, requirements are subject to constant change, a phenomenon called requirements drift (Qassim, 2012). The more recent work by Axryd (2019) shows some reasons why Big Data projects fail (Figure 2).

Axyrd (2019) also proposes the following reasons:

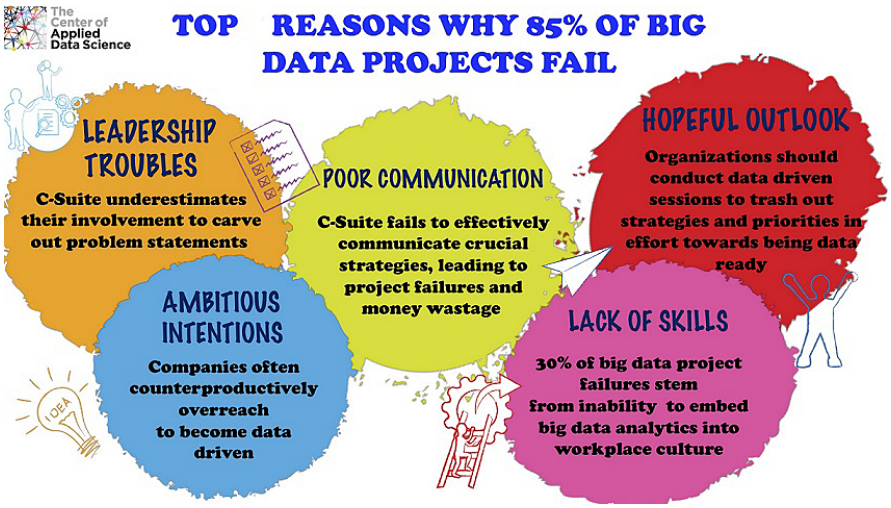

Fig. 2: Reasons for Failure

Project Predictive Analytics (PPA)

Predictive Project Analytics (PPA), as a project risk assessment methodology, offers the foresight to predict potential risks at any stage of the project and identify areas where fixes for projects, transactions, and programs are needed to mitigate risk (Ajah and Nweke, 2019). PPA is a quantitative, fact-based analysis of common attributes to determine the likelihood of project success (Schmidthuysen, F. and Scheffold, P., 2017).

Predictive Project Analytics is an analytical project risk assessment and management methodology that examines a project's characteristics and assesses whether it has the appropriate level of oversight and governance linking complexity to project execution. Identification of challenges in project controls allows adjustments to be recommended to improve performance and probability of success, lessen the likelihood of unforeseen setbacks that lead to cost overruns, and preserve project schedules improving on time to delivery. It is an analytical project assessment capability that examines project characteristics correlating complexity factors and the likelihood of success using a probability distribution. Using a proprietary database of thousands of successfully completed projects, PPA provides clear insights as to the specific level of governance required throughout planning and execution to achieve project objectives through using of a proprietary database of thousand successfully completed. With PPA, one can forecast the possible outcome of the project under various and different scenarios through the use of machine learning techniques.

According to Su Management fear data driven decisions and they thought they are valueless if all decisions are now based on data.(2013), PPA is based upon the premise that all projects can be measured against standard complexity characteristics as highlighted in the table below:

Context	Technical
• Number of stakeholder groups • Power of stakeholder • Stakeholder Alignment	• Impact on Infrastructure • Integration Complexity • System Development Complexity
Social Factors	**Project Management**
• Breadth of Change across the organization • Cross Discipline Familiarity • Multi-Disciplinary • Paradigm Shift	• Contracting Mechanism • Financial Cost • Flexibility • Level of Accountability • Project Journey • Project Structure • Project Team Experience • Project Team Size • Resources • Rollout • Schedule Complexity • Timeframes • Variation
Ambiguity	
• Approach Uncertainty • Assumption/Decision Uncertainty • Breadth of Assumptions • Cost Estimation • Level of conceptual complexity and abstraction • Risk	

Adapted: Su (2013)

PPA was developed by Deloitte in partnership with Helmsman Institute in Australia (Fauser Schmidthuysen & Scheffold 2017).

The 5 stages of the PPA assessment are summarised by the following schema shown on Figure 3:

Fig. 3: PPA (Adapted from Schmidthuysen, F, and Scheffold, P., 2017)

Why PPA Can Make A Difference

A lot of project management research has been conducted with the Helmsman institute over many years, which has led to the enhancement of the database as well as there being a lot of industry expert input. Effectively this means that your project will be benchmarked against a huge number of established scenarios. Quantitative methods are

combined with a database of empirical project data in order to derive an objective assessment of the inherent complexity and specific management characteristics of the project. The basis of what has formed the attributes and complexity scale has come from a wide range of project types, thereby providing a robustness in the underlying engine. This effectively means that the analytics are based on a wide range of scenarios that algorithms have had to learn from.

How PPA Can Make A Difference

There are a number of ways in which PPA can make a difference to project management success. The fact that the PPA database contains over 2,000 projects of varying complexity means that your project can be benchmarked against across many different scenarios and best practice. The complexity engine plays a critical role, in that Deloitte postulate that there is a direct relationship between project complexity and project success. PPA therefore allows you to identify all these issues and therefore put the right people in key places to ensure project success. PPA allows one to mitigate project risk and thereby reducing the incidence of project failure. PPA can also compare the current levels of performance against predicted expected levels.

Results prioritisation can be achieved through PPA through an analysis of the project characteristics, and how these may be improved for the sake of project success.Using PPA, one can realise cost efficiency as the foresights provide potential pitfalls. The organisation is accordingly guided through the project life cyle stages by using the PPA methodology in mitigating against potential risks and failures.

The following are the elements of Project Predictive Analytics:

- Inherent risk and complexity assessment
- Interviews and structured content
- Project predictive analytic review
- Analysis and synthesis
- Reporting

Future Project Management Methods – Data Mining, ML and AI

The real world of projects is increasingly getting complex due to the advances in Science and Technology. The project to launch a satellite uses Big Data and generates huge volumes of data, which data is generated as the project progresses (Ertek, *et al.,* 2017).

Data Mining

One of the methodologies for enhancing success of Big Data analytics projects such as these is data mining. Hemlata and Gulia (2016) define data mining as a process which finds useful patterns from large amounts of data. The steps in data mining include exploration, pattern identification, and deployment. One of the data mining techniques commonly used is called association mining, driven by a popular algorithm often called Apriori.

To this data, can then one apply various data mining techniques such as:

- Predictive Data Mining - the prediction of unknown data values based on patterns discovered in historic data. Under predictive data mining you have algorithms that can perform classification, regression and time series analysis.
- Descriptive Data Mining - identification of patterns and relationships within the examined data. Under descriptive data mining, you can deploy algorithms that can perform clustering, anomaly detection, association rules (e.g. Apriori), process mining and retrieval (Pospieszny, 2017).

All these techniques can provide invaluable insights which reduce project risk and improve project performance, thereby minimising project failure.

Machine Learning and Artificial Intelligence

Other approaches are Machine Learning (ML) and Artficial Intelligence (AI). Machine learning is a branch of AI that allows computer systems to learn directly from examples, data, and experience. In a nutshell, the process of applying machine learning to project management includes ingestion of data, application of ML algorithms, and, hopefully, delivering results such as predicting probability of a certain event or discovering a pattern. In the case of project management ML will be able to learn from previous project experiences, whether this is

in scheduling, lessons learnt, budgeting, etc., and apply these lessons on new projects. Increasing data availability especially in project management where organisation hold large amounts of historical project data, machine learning systems can on that historical data.

There are many branches to ML & AI which lend themselves well to project managements and these can be divided into supervised and unsupervised learning. These techniques can be deployed to project management activities such as estimation, scheduling, cost management, lessons learnt and associated solutions. ML through supervised and unsupervised learning can help project managers sort out priorities, re-plan instantly across multiple projects, and predict future bottlenecks based on metadata. To understand other impacts that ML can have on project management, one needs to focus on one of the critical challenges faced by project managers, which is achieving project goals within the given constraints. According to ClickUp (2019) a company focusing on ML software for project management, project management software with ML will have the ability to:

- Predict and assign tasks to the rightful team members
- Automatically tag users in comments that are relevant to them
- Visualize notifications and updates based on their relevancy to a particular user
- Predict and determine when deadlines aren't going to be met
- Correct task time estimates

AI can also be used to address some of the traditional challenges that project managers have always faced and algorithms have been developed to deal with the challenges of for example:

- Prioritisation
- Prediction &
- Re-Planning

The success of data mining, machine learning, and AI is dependent on a number of factors. Firstly, there is a need to identify a clear need and value for Big Data (Watson, 2014). For ML and AI models to be effective, one would need a lot of data to get trained on - and data from different projects might not be comparable to be classified in the same. There is also the issue of how to collect data from across different projects to train models.

Artificial Intelligence and Machine Learning in Project Management

The following are the benefits of Artificial intelligence, Machine learning and data Mining in project management:

- Risk Predictions
- Eliminating repetitive tasks
- Better project analysis
- Improved productivity and efficiency

Artificial intelligence is the future of project management as using AI combines the information of the past projects to see what will work and want will not work.

Conclusion

Project management has increasingly become pivotal to organisational success as project management remains the major conduit for achieving organisational goals. With the advancement of technology and science, Big Data Analytics projects have become more and more complex and to avoid project failure is important to critically analyse the reasons for Big Data Analytics Project Failure in order to address for better execution of projects.

The world of Big Data has ushered in exciting new tools in the form of Machine Learning and Artificial Intelligence, which when harnessed promise to deliver great transformation to the success of Big Data Analytics projects. The highly competitive business environment faces tremendous challenges. The pressure to find the 'right' personalities to enhance project success and customer service and working teams has made project manager assignment decisions critical for organisations. It is absolutely critical for projects to be managed and staffed by the right people, with the right skills, right knowledge, right attributes, at the right time, for the

right job. The project manager assignment process has become a key determinant to the success of projects.

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