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Unified Business Intelligence Ecosystem: A Project Management Approach to Address Business Intelligence Challenges

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Unified Business Intelligence Ecosystem: A Project Management Approach to Address Business Intelligence Challenges

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Abstract—The purpose of this paper is to explore a concept that improves the success rate of Business Intelligence projects by looking at it as an ecosystem rather than standalone project. This paper discusses the importance on Business Intelligence (BI) initiatives and today’s challenges in implementing them. The concentration is on using proven practices of project management to reduce the failure rates of the Business Intelligence projects by evaluating currently existing Information Technology (IT) project process, Business Intelligence frameworks and a Project Vulnerability process in order to adopt some of the best project management practices that works for Business Intelligence projects. The paper studies currently existing processes and introduces a new concept which henceforth will be termed as ‘Unified Business Intelligence Ecosystem’ framework (UBIE). This research is based on various project management frameworks, those are proven to increase the efficiency of projects, and far-ranging sources of research on nature of Business Intelligence projects, personal observations and real-world Business Intelligence consulting experience.

Research limitations/implications: Business Intelligence is a constantly developing field. Partial standardization and extensive availability and access to Business Intelligence resources has created many definitions and buzz words in the industry. The assumptions described in this research might seem arguable given the reader’s experience in this field.

Originality/value: The paper presents a different perspective to view and manage Business Intelligence projects. It encourages to interpret Business Intelligence projects as an ecosystem by combining technical, business and management aspect rather than separate, standalone entity. The aim of this research paper is to achieve Business Intelligence success by customizing Project Management (PM) practices to fit the unique need of Business Intelligence projects.

Acronyms:
Business Intelligence – BI
Project Management – PM
Data Science- DS
Information technology - IT
Unified Business Intelligence Ecosystem - UBIE
Responsibility, Accountability, Consulted, Informed - RACI

I. INTRODUCTION

A Business Intelligence Strategy is a roadmap that enables businesses to measure their performance and seek out competitive advantages and truly “listen to their customers” using data mining and statistics [1]. Recent Business Intelligence survey showed significant positive correlation between having a Business Intelligence strategic plan and the ability to create a data-informed decision making culture [2]. Most of the companies have realized the importance of grounding their decisions on data driven facts yet companies struggle to realize the potential of analytics to its full capacity. It is surprising to see that more than 70% of the big data and intelligence projects fail [3]. Data driven firms continue to face increased difficulties implementing data driven strategies. This research paper examines the over-all nature of the Business Intelligence projects and its implementation challenges and with the help of project management practices and governance discipline. This paper tries to bridge the gap in analytics strategy formulation and the slippages that occur in execution through the use of suggested framework to build more comprehensive and integrated plan for business. It is anticipated that the use of this framework can build a more comprehensive and integrated plan for Business Intelligence initiatives, and will yield better success rates in terms of an organization’s analytical success. Suggested approach will at a minimum, set a strong baseline to the project managers managing the Business Intelligence projects. This paper will also evaluate the benefits and the challenges that organizations face in implementing analytical solutions.

A. Business Intelligence definition

The difference between Business Intelligence (BI) and Business Analytics (BA) is very fluid in the current industry. The diversity of opinion reflects the fluidity of how we understand the defining language of the field. It also demonstrates that in business Intelligence term can mean different thing to different people depending on their business focus and perspective [4]. However, in general business analytics is pursued as a function of business Intelligence making it a wider umbrella for hosting analytics, systems and infrastructure. In this paper, business intelligence and business analytics are used interchangeably as both of these fields offer similar implementation and adoption challenges to the organizations.

B. Business Intelligence trends

Business Intelligence can be defined in different ways. The Data-Warehousing Institute has defined business intelligence as “the tools, technologies and processes required to turn data into information and information into knowledge and plans that optimize business actions” [5]. The use of business intelligence is becoming universal within organizations at every level. According to a study by Gartner, the world’s leading research and advisory company, the technology category of “analytics
and Business Intelligence” is the top priority of chief information officers and comprises a $12.2B market [6]. It is seen as a higher priority than such categories as mobile technology, cloud computing, and collaboration technology [7]. In 2011 Business intelligence and analytics exceeded other competitiveness plans as mobility solutions (ranked 2nd at 74%), cloud computing (ranked 4th at 60%), and social networking (ranked 8th at 55%) [8]. IDC, a premier global provider of market intelligence and advisory services reported that the business analytics software market would grow by 13.8% during 2011 to $32B and predicted it to be at $50.7B in revenue by 2016 [9,10]. Across a set of ROI cases, Nucleus Research, a research company found a $10.66 payoff for every $1.00 spent on analytics applications – suggesting that such applications can be a very attractive investment route for chief financial officers [11]. Although business analytics is hardly all and everything for managers dealing with modern complexities, it is a big deal for them – becoming increasingly adopted in practice and emerging as an urgent challenge when it comes to improving business processes and outcomes [12,13].

C. Need for Business Intelligence in the organizations

According to Gartner, business intelligence applications have become among the highest-priority technology investments for most CIO’s as organizations see it as more than just measuring and understanding the past performance of an isolated business activity. The role of business intelligence is becoming more pervasive and is affecting the way information is used, analyzed and applied. As a result, organizations can lead, decide, measure, manage and optimize performance to achieve greater efficiency and financial benefits. Business intelligence is now becoming a key to better management of performance associated with the multiple dimensions of an organization and its business processes [14]. Some of the other advantages of having a business intelligence initiative are that it contributes to faster decision making, provides real-time performance measurement, brings greater insight into customer behavior and helps to identify new business opportunities.

D. Reason for Business Intelligence failure

Given the positive value that analytics can bring to organizations, there are also quite a few challenges as well. These challenges can be categorized into ‘business intelligence challenge’ and/or ‘business challenge’. Pyramid analytics [15], a leading business analytics company and Atre, a big data management and business intelligence service company [16] has identified the challenges as listed in the following table.

![Table 1. SUMMARY OF ORGANIZATIONAL AND ANALYTICS CHALLENGES, ATRE & PYRAMID](attachment:table1.png)

II. LITERATURE REVIEW

Business Intelligence projects have developed a reputation as being difficult, risky and expensive [17]. The term Business intelligence (BI) refers to technologies, applications and practices for the collection, integration, analysis, and presentation of business information [18] which makes Business intelligence project a blend on IT, Business and Analytics projects. According to study done by Atre group, a big data management and Business intelligence services company, there are many reasons for high failure rate, the biggest is that companies treat Business intelligence projects as another IT project however Business intelligence is neither a product nor a system, It is, rather, a constantly evolving strategy, vision and architecture that continuously seeks to align an organization’s operations and direction with its strategic business goals [16]. No one size fits all when it comes to Business intelligence project management methodologies.

A. Shortcomings of existing PM Methodology on Business intelligence projects.

Lot of projects fails because of the low project maturity level [1] so research shows that a well-defined and tailored PM methodology is needed for the enterprise success. [26]. When purchasing or building custom software products, companies basically have two choices: Waterfall Model and Agile Methodologies. The Waterfall model follows a linear path and sequential process and Agile methodologies advises
an incremental and iterative approach. Agile methodologies were born after the Waterfall model and in response to the shortcomings of the Waterfall model.

Waterfall model relies on initial requirements [27]. If the requirement is not understood well, the change requests at the later phase costs a lot in terms of time, cost and resources. Testing is not considered until the end of development [27] in waterfall model increasing the project risk. The above points make it harder to change directions of the project mid-way. Waterfall model fails to be a good fit in Business intelligence projects as business intelligence projects takes shape as the project progresses and it’s hard to sign off on the requirements. Also, business intelligence project evolves as business goals and strategies evolve in the company making waterfall model a wrong fit to manage business intelligence projects. Hence there is a need to have a workable framework to implement and execute Business Intelligence projects.

Agile methodology has many advantages like contract transparency, increased flexibility, prioritizing business values, better collaborative effort, foster communication and a great installment-based costing however the disadvantage are include having unrealistic and unviable iteration demands, frequent testing and numerous deliveries, ambiguous costing, hard to predict timeline, it demands participations from everyone at all time including clients taking up significate time from business. All of the above disadvantages asks for a practical and feasible framework to manage Business Intelligence projects.

B. Alternative approach

This paper aims at conceptualizing a framework that best fits Business Intelligence project needs and tackles the organizational and analytical challenges that is existing today listed in table 1. The core of Business Intelligence projects is the analytical engine designed to serve business needs. Such project calls for the disciplines of waterfall model and requires the flexibility, team collaboration and user centered approach that agile advocates. As Business Intelligence projects are risky and expensive, [17] project vulnerabilities needs to be identified and resolved timely increasing project success.

Integrating PM principles centering on analytics architecture and balancing project vulnerabilities focusing in systems thinking-based view to identify and respond to potential weakness and risks increases the success of the business intelligence project. And hence this paper presents a framework that integrates the three main aspects of business intelligence projects: IT Project Management, Analytics Framework and Project Vulnerability which in turn increases the success rate of business intelligence projects.

This new Business Intelligence ecosystem framework leverages on the following concepts to benefit from:

1. IT project lifecycle management from Steward
2. Advance analytics framework from Ranjith Bose
3. Project vulnerability management from Ludovi Alexandre Vidal and Franck Marle

1) IT project lifecycle management from Steward

Many organizations seem to approach the whole management of IT in an unstructured or ad hoc manner throughout its life cycle [19,20]. The effective management of IT needs to be viewed as a structured iterative business process, which offers organizational learning from each phase of the IT project life cycle [20]. According to Rodney A. Stewart [21], such an IT project life cycle framework should be comprised of three essential phases or modules: IT project selection, strategic IT implementation and monitoring and IT performance evaluation, as seen in figure 1 below.

IT project selection (SELECTIT) identifies benefits, risks and cost involved in the project. IT implementation (IMPLEMENTIT) and monitoring emphasis on technology diffusion by understanding markets, managing operations and monitoring action plans. And, IT evaluation (EVALUATEIT) identifies and measures performance by using tools like balance scorecards and project health reports.

Fig. 1. IT project life cycle management process, Rodney A. Stewart, September 2006.

SelectIT - There have been numerous examples where IT projects have failed to meet expectations [30,31]. This is sometimes due to a lack of prior assessment of risks and returns before management commitment is made and funding approval is provided [32]. Executives tend to lack the methods, skills and tools required for selecting a portfolio of IT projects and tools, which add the greatest value to their organization [21]. A well-structured IT project selection phase helps ensure that an organization selects those IT projects that will best support organizational needs and identifies and analyses an IT project’s risks and proposed benefits before a significant amount of funds and resources are allocated [21]. Business Intelligence project is hard to select due to lack of Business Intelligence skills as noted in table 1. Hence SelectIT concept can be used as a guide to selecting BUSINESS INTELLIGENCE projects.

Implement IT- Within most sectors of government and private industry, there are suggestions that IT investments are often accompanied by poor vision and implementation approaches, insufficient planning and coordination and are rarely linked to business strategies [28–29]. Implementing
BUSINESS INTELLIGENCE project have similar challenges which can be addressed through Stewarts' implement IT process that involves SWOT analysis, diffusion strategy, operational strategy and monitoring plan.

EvaluateIT – most of the times evaluation is difficult to quantify. Business Intelligence projects need to be evaluated upon completion to measure the actual benefits, learning path and ROI. Stweard suggests creating perspective-based indicators.

2) Framework for Business Intelligence using advance analytics by Bose

In identifying advanced analytics opportunities and challenges, Ranjith Bose [22] points to the characteristics of Business Intelligence both on an operational and analytical viewpoint. His framework brings out the data and processing capabilities needed for maximizing Business Intelligence decisions. The framework integrates data integration and advance analytics for intelligence delivery. His research shows a managerial approach to deploy advance analytics by packaged analytic applications (industry verticals); analytic application development platforms; and, customized application development.

Fig. 2. Framework for BI using advance analytics, Source: from [22]

Ranjith’s Framework for Business Intelligence using advance analytics identifies key data elements and analytics technologies from an integration and delivery point of view. This framework sets a structure for analytics and data science teams to implement Business Intelligence solutions. For an organization to really use data as a strategic asset, they need to put a long-term program in place by tying vision, strategy, goals, systems and continued learning. With this, we can ascertain the importance of business leaders in Business Intelligence projects.

3) Project Vulnerability Management Process by Ludovic-Alexandre Vidal and Franck Marle

The third process that plays a key role in Business Intelligence project success is project vulnerability management. Business Intelligence projects are high risk projects due to changing scope, and the little amount of control on the outcome that makes projects non-resilient to uncertain events. Also, the static and the dynamic vision for Business Intelligence projects can build in system vulnerabilities. A methodology for managing project vulnerability was devised by Ludovic-Alexandre Vidal and Franck Marle [23], and as seen in the figure below illustrates the project vulnerability management process. The four steps involved in vulnerability management are:

- Identification
- Analysis
- Creating response plan and
- Monitoring and controlling

Fig. 3. Project Vulnerability Management Process, Ludovic-Alexandre Vidal, Franck Marle, 2012

Vulnerability, risk and change management are a necessary evil in Business Intelligence projects. Poor adoption, hyped Business Intelligence tools, resistance to accountability, change, and poor data quality can increase project risks[24]. Identifying risks and managing vulnerabilities become extremely challenging. Project vulnerability guidelines created by Ludovic-Alexandre Vidal and Franck Marle can help Business Intelligence projects to identify and manage risk to a larger extent.

Unified Business Intelligence ecosystem, a framework for Business Intelligence projects that is conceptualized in this paper uses the concepts of from the above 3 project management processes at the different phases of Business Intelligence project lifecycle.

III. UNIFIED BUSINESS INTELLIGENCE ECOSYSTEM-AN ALTERNATIVE APPROACH TO SOLVE BI CHALLENGES

The intent of this research paper is to build an alternative framework for driving Business Intelligence projects based the concepts adopted from the 3 processes described above. Without strong business drivers their alignment with the strategic business goals, the Business Intelligence decision-support initiative may falter [25]. To fill this gap, this paper provides an alternative approach to manage Business Intelligence projects. This approach is beneficial as it addresses all the challenges listed in table 1.

This framework considers Business Intelligence project not as a standalone IT project but as an ecosystem of complex network and interconnected teams.
Unified Business Intelligence Ecosystem cube in figure 4 depicts the Business Intelligence world in any organizations. The four indispensable teams on Business Intelligence projects is represented by the sides of the cube.

Key elements of Business Intelligence ecosystem—

A. The Business Unit comprises of decision makers, leaders, sponsors and the senior management. ROI and benefit realization from Business Intelligence projects is the main focus of business units. This unit is responsible for mapping the company’s vision and mission to the project goals through a thorough market research. The Business unit builds Business Intelligence strategy and roadmap.

B. The Data science team are essentially the analytics personals involving developers, data modelers, statisticians, analysts, visualization experts and database managers. The primary responsibility of this team is to collect, clean and integrate data, generate advance analytics and deliver an intelligent solution to improve business. Based on project goals, data is modelled to either predict (i.e., forecast) and/or prescribe solution (i.e., recommend) to the business. Creating the visual narrative completes the cycle of Business Intelligence project.

C. The IT team comprise of application specialists, tools specialists, configuration managers, security and server professionals, network administrators or anyone who support the IT needs of Data science team.

D. Project management is managed by the project manager or the PMO based of organizations structure and PM/PMO is responsible for project success.

Project management in Business Intelligence projects has 5 phases.

- Initiation
- Planning
- Executing
- Monitor and Control
- Business Intelligence Implementation

A. Initiation

The Unified business intelligence ecosystem is built on the standard 5 stages of project management.

The first phase is project initiation. In this phase, the project idea undergoes the feasibility study. In this stage, Business leaders are responsible for selecting the BI project that identifies ROI and business benefit. Project selection can be done with series of brainstorming sessions, market needs analysis, organizations strategy roadmap and ROI realization. As this is a critical phase in which the project undergoes go/nogo decision, representation from all the cross-functional team is highly recommended.

Steward’s SelectIT module works best in selecting the most beneficial BI project as SelectIT concept not only provides a way to qualify projects but also quantifies the benefits, risks and costs. This also makes business units drive the BI project instead of IT driving it. With a detailed feasibility study completed in the initiation phase, the business units get a clear understanding of risks and benefits involved in undertaking the project.

In case of no-go decision, PM documents the reasons for no go for future use. Creating and visiting these documents on a regular basis is an extremely important step towards continued organizational learning and Business Intelligence maturity.

B. Planning

The second phase in the UBIE is the planning. Planning involves creating a detailed plan for BI execution and implementation. Planning for BI project can be tricky as the requirements might change and the project might take a different direction with scoping. An acceptable amount of flexibility should be considered in scheduling and scope. Communication, risk and mitigations planning needs to be done extensively and BI projects are perceived as high-risk projects.

Introducing project vulnerability framework in this phase helps identifying vulnerable process and elements in the system which in later phases becomes an unseen risk. Vulnerability emphasis on project weakness”, creates a
response plan, analysis’s it resistance and resilience’s and prevents it from possible damage. Project vulnerability process begins in the planning phase and extends until implementation phase.

Other general activities involve creating WBS, getting estimated from data science and IT teams, planning the budgeting, scheduling, set up milestones, assess risks, communication and stakeholder management plans. It is important to notice that as the number of cross-functional teams and stakeholder increase, the complexity of planning and managing project also increases. Setting right expectations for teams and planning communications are critical at this phase. Business leaders are primary stakeholders in this phase and are informed about the project plans. Business units are engaged in each phase of project management and are expected to participate and made aware of every risk involved.

Some of the unique and Business Intelligence specific risks that can be planned and managed in planning phase are availability of skilled team members, The business and technical skills required to implement a Business Intelligence project are quite different than other IT projects as Business Intelligence project integrates, analyzes and delivers information derived from almost every area of the business as a whole and with this the required technical expertise varies as well. Having mandatory skills and IT/BI tools identified prepares the organization to execute the project without delays and over expenditure.

C. Execution, Monitor & Control

Execution is the core of the project lifecycle where the project is actually built. Based on the project goal data science team gathers data, build models and deriving intelligent solutions. Framework for Business Intelligence using advanced analytics by Ranjit Bose can set a base for architect Business Intelligence projects. Data comes in many forms, structure, unstructured, in form of pictures, texts, voice and videos. From the DS point of view, Taking data and converting it into meaningful insight to drive business is the key goal of execution. Various analytical processing is designed to derive meaningful insights.

This phase is the longest of all the phases. Due to the very nature of Business Intelligence projects there is a high possibilities of scope changes which puts project planning off the track planning. Providing flexibility to scope changes and yet managing the project is challenging. Scope changes are especially hard to deal when cross-functional teams are impacted.

PM can refer to Project vulnerability model explained by Ludovic-Alexandre Vidal and Franck Marle that helps PM to be sensitive to project events. As a part of monitoring and controlling, creating timely audits, generating project metrics dashboards help PM identify risks and communicate it to the stakeholders.

As UBIE framework emphasis on holistic approach for Business Intelligence projects, aiming for Business Intelligence standardization and practicing it is the key for long-term Business Intelligence sustainability and this phase sets a foundation to do so. Data scrutiny and standardization methods should be evaluated and documented by data science teams to set up practices that works for the organization which in later projects can be used as the standards. This in turn contributes to Business Intelligence maturity.

D. Implementation

The insights developed by DS team is implemented through business rules in the implementation phase. Business units evaluate the project goals with that of the insights to make business sense.
Fig. 9. Transactions between cross functional teams in the BI ecosystem
Introducing Stewards implementIT module in this phase helps the project better implement the insights. By understanding the SWOT factors and aligning insights derived in the execution phase, the insight diffusion can be planned and monitored.

E. Business Intelligence Maturity

The Business Intelligence ecosystem is constantly growing in maturity with constant feedback between teams. The results of Business Intelligence solution implementation act as input for newer projects. Lessons learnt, and any kind of explicit knowledge should be maintained and shared. And thus, the organization can learn, implement, optimize and innovate in the Business Intelligence space. The model or flowchart in Figure 10 below shows transactions between cross-functional teams in the Business Intelligence ecosystem. This framework underlines on project management best practices to ensure Business Intelligence success.

IV. RACI MATRIX FOR BUSINESS INTELLIGENCE ECOSYSTEM

More often than not, projects like Business Intelligence that involves cross functional teams are in formless state of confusion where people do not recognize a boss to whom they feel responsible. This can possibly mislead teams regarding the authority and power they hold toward Business Intelligence project. In such conditions decision making becomes extremely hard and so defining RACI matrix for Business Intelligence ecosystem is extremely important. Table 2 provides the guideline to design RACI matrix for Business Intelligence project.

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<tr>
<th>TABLE 2. CROSS-FUNCTIONAL TEAM AND RACI FOR BI ECOSYSTEM</th>
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<td><strong>PM Phases</strong></td>
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<td><strong>Monitor and control</strong></td>
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<td><strong>BI Implementation</strong></td>
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V. UNIFIED BUSINESS INTELLIGENCE ECOSYSTEM (UBIE) 
FRAMEWORK ADDRESSING BUSINESS INTELLIGENCE 
CHALLENGES

Research shows various challenges involved in implementing Business Intelligence projects. Challenges can be classified into organizational challenges and analytical challenges. Organizational challenges are the once caused due to the structure, processes, administration, organizational culture and management. Analytical challenges are more technical, skills and talent associated. Adapting to unified Business Intelligence ecosystem enables the organizations to reap benefits and the benefits can be summarized in following points.

A. This framework is designed to build a tight coupling mechanism between cross-functional teams and is driven by open communication and engaging and accounting all the teams at every phase of the project. The RACI matrix provides clear distinction regarding the responsibility and accountability amongst cross-functional teams and resolves confusions concerning power and authority.

B. Unified Business Intelligence framework involves business leaders and sponsor at all phases which imposes the sponsor to engage in the project life cycle. Major business decisions can happen in a faster when leaders are constantly involved in the projects.

C. Lack of skills, talent, tools- Having cross functional teams involved at planning stages helps teams to identify and plan project resources. Such teams can also work on resource sharing approaches. As there are too many Business Intelligence tools available in market, identification and prototyping of a right tool that suits organizational Business Intelligence need is time consuming. Providing heads up to the IT to take care of prototyping, licensing, security and server needs at the initiation phase can save a lot of time in the planning and execution phases.

D. Business Intelligence projects performance are hard to measure. Post implementation of intelligence, it takes a time to see results. Lack of standardization in Business Intelligence field make it harder to choose the KPI’s to measure the performance. However, an organization can build its own Business Intelligence standards through constantly learning and optimizing the solutions. Unified Business Intelligence ecosystem framework completes the cycle of the Business Intelligence project by considering the project results as an input for next Business Intelligence initiatives. By doing so, the tacit knowledge and the explicit knowledge has lesser chance of getting lost in the project path.

VI. CONCLUSION

This paper studies the current state of art of Business Intelligence projects. It lists various organizational and analytical challenges that companies face in implementing intelligence. Dealing with BI project seems to be uniquely challenging when organizations follows either sequential or iterative project management models.

This paper aims at conceptualizing a framework that best fits BI project needs and tackles the organizational and analytical challenges. BI projects are highly risky and vulnerable with low maturity index. This paper integrates IT Project Management, Analytics Framework and Project Vulnerability frameworks creating a unified ecosystem and increases the success rate of BI projects.

A holistic approach to manage Business Intelligence project is a key to overcome challenges rather than seeing Business Intelligence project implementation as an IT project. This paper identifies three best frameworks that’s exists today and amalgamates those processes into unified framework that can serve BI projects and increase the success rate.

Business Intelligence projects are fast paced with changing scope and involving various functional teams making Business Intelligence project vulnerable to failures. Availability and affordability of Business Intelligence knowledge and tools are ever growing making it harder to manage talent, experience and opinions of people involved in Business Intelligence functions.

The exponential growth and parallel knowledge creation is making it harder to standardize. Given this situation, organizations should create and follow internal Business Intelligence standardization that works best for itself.

The Unified Business Intelligence Ecosystem (UBIE) framework in figure 9 is created to help organizations to overcome challenges and improve project success by creating timely transitions and coordination between cross-functional teams. It also shows learning and maturity path for Business Intelligent organization. Detailed project implementation steps is described through phases that can be used as a guideline by business intelligence organization to implement their BI projects.

RACI matrices described in table 2 helps Business Intelligence organization define roles and responsibilities for Business Intelligence projects.

This framework is recommended in a Business Intelligence environment as it is easy to implement and can fit into most of the Business Intelligence environment and on a longer run, leads organizations towards Business Intelligence maturity. Viewing Business Intelligence project as a complex interconnected network of activities performed by various teams will help build a larger perspective than considering it as an IT project.

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