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# Integration of Business Intelligence Systems

**Advances in Business IT influence companies to become more data driven. Business Intelligence Systems provide insight into organizational performance. As Business Intelligence Systems evolve they are being integrated across entire organizations to provide real time analytics for operational support.**

## INTRODUCTION

Business IT best practices are moving past foundational ERP (Enterprise Resource Planning) system practices. Due to growing data processing needs the use of ERP systems amongst medium and large corporations is considered best practice. ERP systems provide a framework for the organization through their various modules (Material Resource Planning, Consumer Relationship Management, Supply Chain Management, etc.). Companies are heavily reliant on time sensitive operational support that only integrated IT systems can provide (Vasa, 2010).

## BUSINESS INTELLIGENCE SYSTEMS

The function of Business Intelligence (BI) systems is to provide actionable data analysis for time sensitive interventions and long term strategic planning. Where traditional systems struggle with the delay between the creation of data and analysis, BI systems allow for on time operational adjustments. Users interact with BI systems through graphical user interfaces called 'dashboards'. The 'dashboard' is highly customizable with various templates that select for the subject of analysis.

The major BI systems are SAP BusinessObjects, Oracle BI, IBM Cognos BI, Microsoft Power BI, SAS Visual Analytics, Tableau Server.

ERP systems are also capable of producing reports with various preprogrammed instructions, unfortunately these are hard to customize without the necessary technical skills. On the other hand BI templates are highly customizable and easy to use. Compared to ERP reporting tools it is much easier to prepare various templates. BI systems take data and structure it in an easy to understand and actionable format with minimal effort. They automate most of the background IT operations and automatically update from given datasets not requiring the constant involvement of employees at various operational levels.

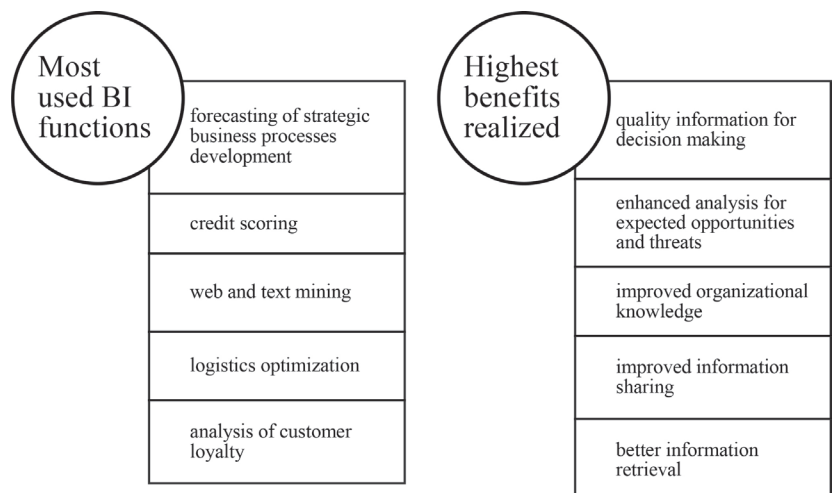
The core application of Business Intelligence is still mainly focused on organizational efficiency and is not integrated into core services. In a study

conducted on healthcare providers there was only a weak connection between the use of Business Intelligence Systems and patient health outcomes (Isazad et. al. 2019). This shows that most organizations don't take the integration of BI systems far enough. The systems are mainly considered administrative tools. The BI use cases in the manufacturing industry are lot more self-evident, but there are no technical limitation to pre-



**Figure 1 Microsoft Power BI dashboard example**

Source: <https://powerbi.microsoft.com/>



**Figure 2 BI goals and benefits**

Source: based on Ahmad et. al. 2020

vent BI system integration into services provided. Primary BI system use remain process management, data management and cost cutting (Isazad et. al. 2019)

### TRENDS IN BUSINESS INTELLIGENCE

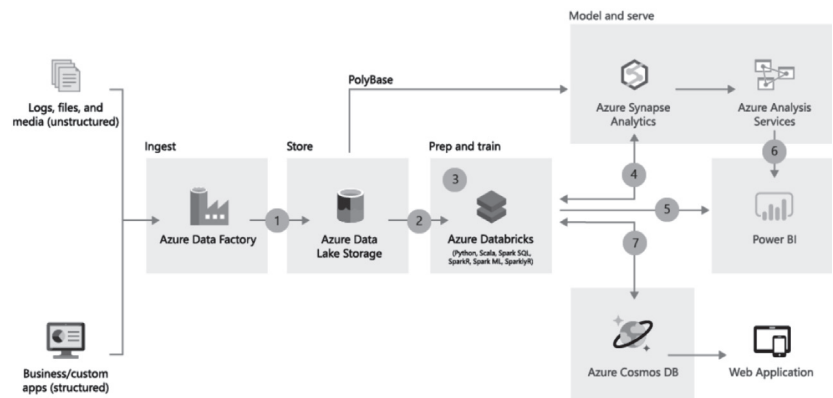
The integration of various systems from different software vendors is a challenging task for which most companies lack the necessary capabilities. Further integration of business IT infrastructure is necessary and various third-party tools are expected to bridge the gap to create a cohesive IT infrastructure. APIs (Application Programming Interface) are continuously improving allowing for greater customization and communications between various systems.

The integration of Artificial Intelligence will allow for more exhaustive metrics. AI supported BI systems can provide on demand actionable analysis. AI integration on its own can't circumvent the need for operational management and strategic planning, but it can lead to the better utilization of data metrics. It can highlight KPIs that help avoid operational failure such as long lead times, operational exhaustion, bottlenecks and redundancies.

BI systems are reliant on data. The more data the company has available for the system to process the better analysis it can produce. With larger datasets the processing requirements also increase. It is important to filter data points that generate noise. These are mostly faulty data with loose connection, but is often lumped together with everything else. With Machine Learning Algorithms it is not only possible to process a lot of data, but we can also extract valuable information, we previously didn't have access to (Kietzmann – Pitt, 2019). New information that allows for the creation of completely new directions of analysis. Machine Learning can not only extract the necessary data points, but can also find previously unexpected connections (Gál et al. 2013).

Developments in Native Language Processing will allow users to ask BI systems questions similarly to Apple's Siri, Microsoft's Cortana and Google's Assistant. The increasing flexibility and ease of use will see the widespread accessibility of BI systems. Currently BI systems are tied to premade templates such as distribution of sales across various products, cost breakdown of production, marketing performance, lead times, and cycle times. Once the users can ask specific questions from the BI system the accessibility of BI will greatly increase. For example users will be able to make complex inquiries in seconds such as the distribution of faulty products at a given interval, the employees that worked on the product, the suppliers of the materials and the expected effect on revenue without any necessary technical skills or lengthy setup time. The widespread integration of BI Machine Learning and Language Processing modules will allow for predictive analysis. The system will show analysts what they need to see based on query, usage, or declared KPIs.

Business Intelligence systems are heavily reliant on the IT infrastructure to do the heavy lifting. Due to their heavy setup costs



**Figure 3 Microsoft's Advanced Analytics Architecture**

Source: <https://azure.microsoft.com>

BI systems are mostly restricted to large corporations, but studies show that their use can have positive impact even amongst startup companies, due to network learning effects that can be achieved (Caseiro – Coelho, 2019). BI systems bring focus to crucial metrics that ensure efficient day to day operations.

Where organizations store their data is always a sensitive question. The growing focus on the value of data will force companies to shift from current SaaS, PaaS and IaaS providers (Software as a Service, Platform as a Service, and Infrastructure as a Service). These services allowed companies to host their software off site with various levels of support. As sufficient network capacities become more affordable and manageable at scale, companies will be more willing to heavily invest into their own infrastructure. Businesses have never liked to store or process their data off site, but due to convenience and lack of in house technical expertise most medium sized corporations heavily rely on cloud solutions for their IT needs.

As BI integration grows operational data will no longer be under the sole purview of management. It will be more widely accessible on operational levels. This is a big shift from the current 'command center' BI approach where the information is only accessible by a few managers. This change will have a significant impact on corporate culture. It will select for employees that can work with data better. As BI systems improve and organizations integrate them for operational support, we can expect shifts in organizational culture to become more data driven. Roles that support data analysis will be essential.

Business Intelligence is a widow to organizational performance. The current trends in BI are the result of increased accessibility of Big Data solutions, improvements in Machine Learning integration and the advancement of data mining techniques. Big Data requires heavy investment in infrastructure, and not every organization is capable of supporting the amount of necessary data. The improvements in Big Data Management had a positive impact in highlighting the importance of organizational data. Due to their scalability Business Intelligence Systems provide an efficient starting point for organizations wanting to be more data driven. Machine Learning and

data-mining (the process to discover patterns on large data sets) allow for automated data processing with minimal oversight, thus IT systems are becoming more intelligent, intuitive and easier to maintain.

#### CHALLENGES OF BI INTEGRATION PROJECTS

Most companies lack the necessary technical skills for IT integration projects, this capability is necessary to be first developed before management can commit to a complete system overhaul (Ahmad et. al. 2020). The project must be initiated and supported by top management, then maintained by empowered key employees that see the whole process through. The organization cannot be completely reliant on third party software vendors. Since each industry and organization requires a customized setup it is better to acquire key IT personnel to support the implementation projects (Ahmad et. al. 2020). It is best to avoid being too reliant on outside consultants and software vendors. Once projects are up and running the integration of existing systems will be a challenge. An integrated BI system won't deliver the desired results without it having access to the complete organizational infrastructure. Organizations shouldn't be too attached to their legacy software and should be ready to rebuild everything from the ground up. This will not be possible without proper change management practices. Change management will allow for systems and employees to change simultaneously helping to avoid operational collapse.

The main organizational barriers of Business Intelligence integration are task uncertainty, workflow uncertainty, environmental uncertainty (Weiler et. al. 2019). The lack of proper change management and know how leads to users not understanding the fundamental functions of the system. As the products of various BI system vendors vastly differ it is important to tailor organizational training to the specific system and not generally towards BI software. The lack of technical knowledge, change in work routines, intra-organizational standards, and the lack of transparency all contribute to unsuccessful BI integration projects (Weiler et. al. 2019).

#### CONCLUSIONS

The landscape of BI use is rapidly expanding and companies need to prepare to properly integrate emerging capabilities.

As systems and organizations become more integrated, companies can develop new capabilities to better utilize data. The transition will be challenging and it is important for leadership to balance organizational change with proper change management practices. Companies shouldn't underestimate the importance of data analysts who can help realize the maximum benefits from the expanding organizational IT infrastructure.

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