




## Efficient use of data and knowledge transfers in information systems

*Uso eficiente de datos y transferencias de conocimiento en los sistemas de información*

Uso eficiente de dados e transferências de conhecimento em sistemas de informação

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### KEYWORDS

business intelligence,  
organizational culture,  
information technology,  
politics.

**ABSTRACT.** Business intelligence under data treatment is consolidated in one of the differentiating factors between organizations. Business intelligence (BI) solutions are not only applicable for commercial purposes, they are also used to measure the performance and fulfillment of goals in organizations. The objective of this research is to apply an adaptive BI model in order to diagnose the real state of the organization and formulate from its improvement plans capable of raising the levels of performance and profits of the same. The application of the adaptive model resulted in the establishment of coordination between Information Technology solutions and the organizational culture of organizations. It was also established that private organizations have achieved a better position of maturity due to their horizontal operating policies. The exploratory method has the perspective of pointing out important aspects of the problem and of finding the fundamental stages in an investigation, the data collection technique is the survey, to be able to interview and know the opinions of the people who work with technology and to be able to establish the most important data.

### PALABRAS CLAVE

inteligencia de negocios,  
cultura organizacional,

**RESUMEN.** La inteligencia de negocios bajo el tratamiento de datos se consolida en uno de los factores diferenciadores entre organizaciones. Las soluciones de inteligencia de negocios (BI) no solo son aplicables para fines comerciales, también se utilizan para medir el rendimiento y cumplimiento de metas en las organizaciones. Esta investigación tiene como objetivo aplicar un modelo de BI adaptativo con el fin de diagnosticar el real estado de la organización y formular a

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tecnologías de información, política.

partir de ello planes de mejora capaces de elevar los niveles de rendimiento y utilidades de las mismas. La aplicación del modelo adaptativo trajo como consecuencia que se establecieron la coordinación entre soluciones de Tecnologías de información, y la cultura organizacional de las organizaciones. Se estableció asimismo que las organizaciones privadas han logrado un mejor posicionamiento de madurez debido a sus políticas horizontales de funcionamiento. El método exploratorio tiene la perspectiva de señalar aspectos importantes del problema y de encontrar las etapas fundamentales en una investigación, la técnica de recolección de datos es la encuesta, para poder entrevistar y saber las opiniones de las personas que trabajan con tecnología y poder establecer los datos más importantes.

#### PALAVRAS-CHAVE

inteligência de negócios, cultura organizacional, tecnologia da informação, política.

**RESUMO.** A inteligência de negócios sob tratamento de dados está consolidada em um dos fatores diferenciadores entre as organizações. As soluções de Business Intelligence (BI) não são aplicáveis apenas para fins comerciais, mas também são usadas para medir o desempenho e o cumprimento de metas nas organizações. O objetivo desta pesquisa é aplicar um modelo de BI adaptativo para diagnosticar o real estado da organização e formular a partir dele planos de melhoria capazes de elevar os níveis de desempenho e lucros da mesma. A aplicação do modelo adaptativo resultou no estabelecimento de uma articulação entre as soluções de Tecnologia da Informação e a cultura organizacional das organizações. Constatou-se também que as organizações privadas alcançaram uma melhor posição de maturidade devido às suas políticas operacionais horizontais. O método exploratório tem a perspectiva de apontar aspectos importantes do problema e de encontrar as etapas fundamentais em uma investigação, a técnica de coleta de dados é a survey, para poder entrevistar e conhecer as opiniões das pessoas que trabalham com tecnologia e ser capaz de estabelecer os dados mais importantes.

## 1. INTRODUCTION

Technological progress has prompted organizations to process data to generate more excellent value in their processes, and in this way, they have allowed them to establish better business strategies (Božič & Dimovski, 2019). Therefore, company trends are based on adopting technology for information processing and supporting systems to analyze data and thus make better decisions process management through Business Intelligence (BI) solutions.

Various BI concepts have been formalized. However, they have been synthesized into activities to collect, store, process, and analyze essential data for decision-making. This has brought that various organizations have established data registration as the main factor due to the integration of information systems capable of creating, collecting, and managing all the information (Lopes et al., 2020). Furthermore, the information collected must be categorized about its performance and importance, so KPI indicators (key performance indicators) are used. Therefore, KPIs are considered a fundamental part of a BI solution (Lukić et al., 2016).

The information technology (IT) area processes information and generates a competitive advantage while establishing better high-quality strategic solutions. BI solutions require initial and ongoing investment to maintain value for the business so that the return on investment is based (Larson & Chang, 2016).

Data is generated in the organization about productive activities. So, there is a growing need to transform data into information. Usually, the transformation process is carried out through statistics applied to clients. However, this way of obtaining information is usually not very reliable. An organization appreciates the technological contributions, tools, techniques, practices, methodologies, and applications offered by BI that are integrable with information architectures, databases, analytical tools, and applications that greatly help in decision-making processes (Vajirakachorn & Chongwatpol, 2017).

The research aims to synthesize business intelligence and analytics systems' implementation processes in organizations. In this way, the decision-making process was improved, which increased the organization's performance indexes. Furthermore, this research aims to provide information regarding data processing strategies and thus establish the best approach to overcome existing problems and inconveniences in the organization.

The research presents the relationship between business intelligence and strategic management so that the proper use of BI components can be a tremendous driving force for the organization.

## 2. METHOD

The method used in this research was the exploratory one, which answers questions such as how, why, and what (Bashin, 2020). The experimental research led to the understanding and analysis of the study problem. The research used a secondary method of exploratory research that promotes literature review. And it is based on the evaluation and analysis of published scientific articles.

The applicability of BI components corresponds to the adaptability that must be established to remain current in the face of the demand of internal and external clients. Over the years, administrators have been collecting information under the perception that it is valuable. However, it is perceivable that the actual value of the data will depend on the analysis capacity of the organization. From this perspective, it is essential to frame the data so that there is the ability to recover, treat, and interpret them and thus obtain new knowledge by formulating appropriate tables and graphs (Rikhardsson & Yigitbasioglu, 2018). In this research, activities were established.

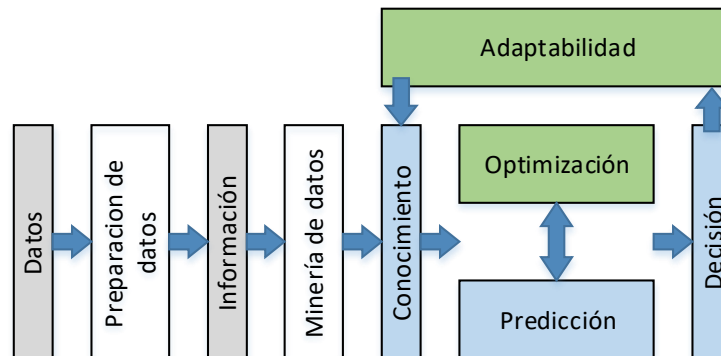
1. Access to data from various sources.
2. Transformation of data into information.
3. Formulation of forecast models developed based on Data Mining results.
4. Formulate optimization models to integrate forecasting models to achieve new and improved solutions.
5. Build adaptability modules integrated into optimization models.
6. Visualization of knowledge acquired through information architecture.

A business intelligence system has components that are categorized into three structures:

1. First level. Oriented to basic operations and aimed at standardizing and processing data.
2. Second level. The prediction establishes decisions adapted to the contextual factors that affect the organization.
3. Third level. Optimization shows decisions adapted to context factors and offers insights from the processed information.

Figure 1 presents the components of a business intelligence system.

Figure 1: Architecture of a business intelligence system



Note: Adapted from the article adaptive business intelligence: a new architectural approach (Lopes et al., 2020)

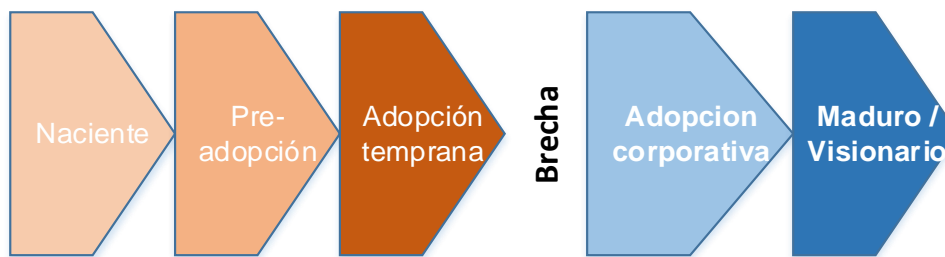
The treatment of information indicates that the data must be categorized in dimensions established by the organization. This research studies the information technology sector. One of the most significant difficulties that were appreciated was the participation of big data about the increase in the amount of information and speed in data processing (Božič & Dimovski, 2019). To evaluate the level of capacity and adaptation of BI solutions in organizations, a maturity model was used that considers current technological components such as big data, government, unstructured data, the culture of analysis, free software, cloud computing, portability of IT, agile methodologies, internet of things, among others (Combita et al., 2020).

Figure 2 establishes the stages of the proposed adaptability model:

- *Nascent phase*. Organizations use spreadsheets, and a BI culture is lacking.
- *Pre-adoption*. Investments are made in data mining or data mart. The staff is trained in BI solutions.
- *Early adoption*. The organization generates an understanding of the importance of data in improving its production areas.
- *Adoption*. The organization initiates the participation of analytical tools. Alignment between IT tools and business processes is encouraged.
- *Gap*. Difficulties are observed when adopting BI tools in the business units.
- *Corporate adoption*. The organization establishes the importance of using BI solutions to improve the organization's operational and managerial processes.

- *Mature/Visionary*. BI solutions are continuously used as an engine for continuous and innovative improvement.

Figure 2: BI Maturity Model Stages

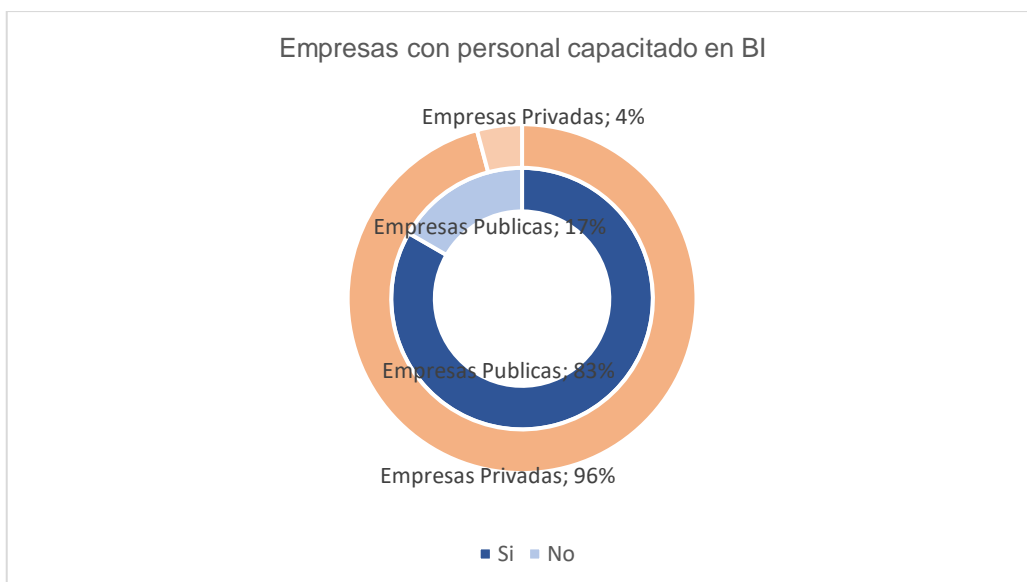


Note: Adapted from the article Business intelligence governance framework in a university: Universidad de la Costa case study (Combita et al., 2020).

### 3. RESULTS

When surveying 36 organizations in the central region of Peru, it was established that private companies have personnel trained in BI. Figure 3 presents a summary of the presence of trained personnel, where it is stated that 66.67% of trained personnel are concentrated in the private sector.

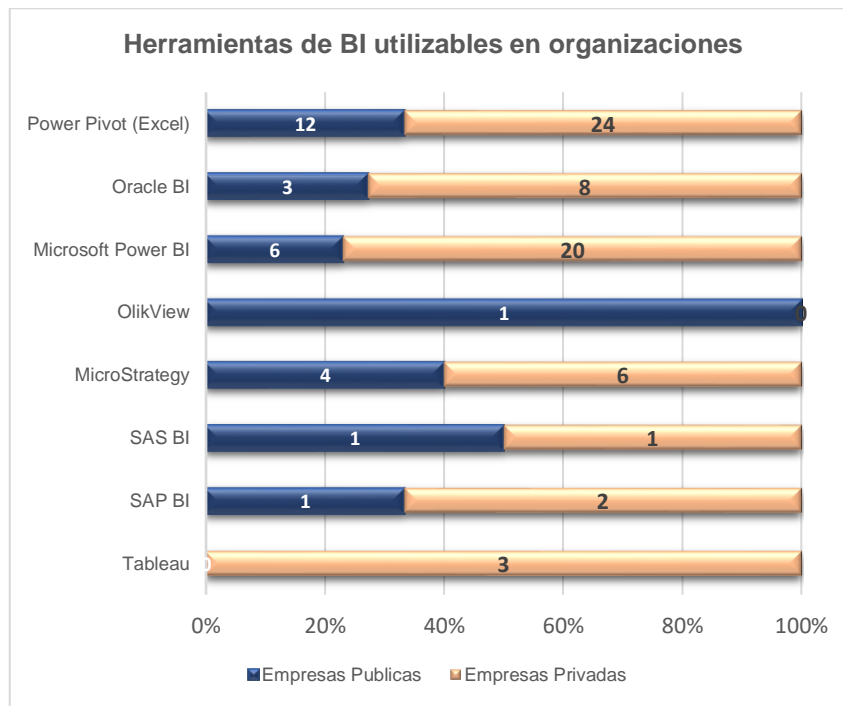
Figure 3: BI-trained staff



Source: self-made.

For the application of BI solutions, the capacity of the personnel for their development was identified. Interviews were conducted via a virtual link with the staff of the IT Area. Figure 4 summarizes the potential of IT personnel in the use of BI tools. It was established that staff has training and can use various BI tools on multiple occasions. During the virtual interview process, it was found that there is a domain of spreadsheets. This characteristic reaches both private and public companies.

Figure 4: Capacity in BI Tools



Source: self-made.

By applying the maturity model established in Figure 2. Improvement strategies in organizations are denoted.

- *Organizational.* The evaluation established that there is a difference of 1.2 out of 10, which shows that there is better support in private companies to implement BI solutions. One of the most committed projects by the organizations was to formalize and define BI as an essential component in achieving institutional plans.
- *Infrastructure.* It is observed that there is a difference of 1.8 out of 10. It is appreciated that the first difference between the organizations. However, both organizations are determined to be in the Initial stage of the maturity model. This stage has in common the incorporation of external data in the information architectures and data processing platform.

- Data management. Data management is one of the capabilities and strengths of organizations, where many of them are already incorporating data processing activities to achieve results of management indicators, performance, and goals. The maturity level is an early adopter for both types of organizations. Therefore, the implementation of IT solutions capable of managing information in large quantities was proposed at this level.
- Analytics. An average of 5.6 out of 10 was obtained, so it was determined that the organizations are in an *Initial* stage. For this reason, it is established that the strategies and decisions are not integrated from the analytical point of view. Therefore, it was recommended to define processes for this level's management, design, and implementation of BI solutions.
- Government. A significant difference was obtained between the types of the organization under study. The evaluation average was well below the standard established by the scale of 10. Due to this, it was recommended to start the improvement activities with the BI governance framework design projects in all the organizations.

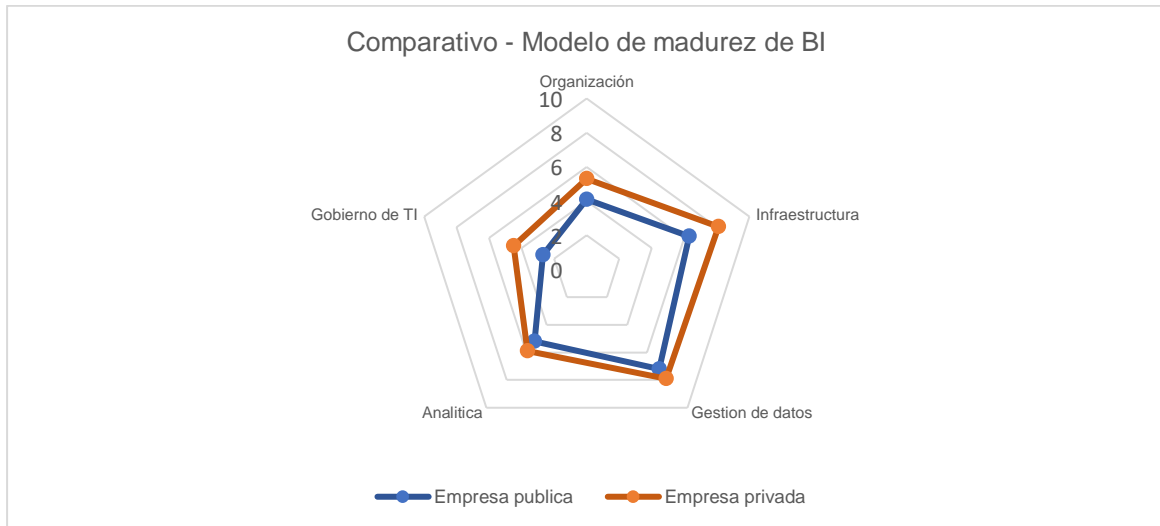
Table 1. Results of the application of the maturity model

Category	Public company	Private company
Organization	4.1	5.3
Infrastructure	6.3	8.1
Llave (2018) Data management	7.2	7.9
Analytics	5.2	5.9
IT Governance	2.7	4.5

Source: self-made.

Figure 5 synthesizes the information between the maturity models of the organizations under study. Although it is appreciated that the organizations have similar behavior, it is established that the maturity levels are usually a little high in private organizations.

Figure 5: Comparison of maturity levels between public and private organizations



Source: self-made.

Figure 5 also establishes that the infrastructure component is the most developed. Where the only limitation is the financial capital and the selection of the most suitable equipment that adapts to the needs of the organizations.

#### 4. DISCUSSION

The participation of BI components promotes the development of better solutions based on data processing. One of the main limitations is the organizational culture. BI solutions must incorporate structured and unstructured information to improve information processing throughout the value chain (Radenković et al., 2018). The research concludes that the data processing process should be started through data source analysis, the use of a data analytics platform, and the alignment of IT solutions with the organization's goals.

Data management, business analysis, business performance management to develop strategies for decision making and gain insights are generated by BI (Vajirakachorn & Chongwatpol, 2017).

Business intelligence under a model based on maturity levels allows the generation of organized indicators to promote the formulation of improvement plans. Likewise, business intelligence supports the monitoring of



indicators and allows the forecasting of future trends in the integration of homogeneous and heterogeneous data sources (Khatibi et al., 2020).

This approach indicates the ability to produce value; therefore, knowledge and management become critical factors for innovation and the consolidation of an organization in the global business environment (Araya & Orero, 2004).

The research establishes that business intelligence generates a transformation of knowledge to increase organizational Agility (Cheng et al., 2020).

BI has a vital role in integrating indicator data from heterogeneous and relevant data sources. Moreover, BI can provide decision-makers (Khatibi et al., 2020).

The business intelligence processes that are part of knowledge management are analyzed to determine their influence on the performance of the companies that are part of the sector (Ahumada et al., 2018).

The Big Data phenomenon, the volume, variety, and speed of data, has impacted business intelligence and the use of information. As a result, new trends such as rapid analytics and data science have emerged as business intelligence. This document addresses how agile principles and practices have evolved with business intelligence and its challenges and future directions (Larson & Chang, 2016). However, our findings indicate that the commercialization of knowledge transformed through the ability to exploit data and requires a continuous search for information analysis (Božič & Dimovski, 2019).

The investigation brings as a consequence, establishes soft activities that get as a consequence that the culture of data treatment is consolidated in the organizations. This brings the incorporation of indicators based on quantitative data from organizational sources (Rikhardsson & Yigitbasioglu, 2018).

## 5. CONCLUSIONS

Business intelligence manages to streamline strategic, operational, and support processes with a view to business continuity.

Incorporating the organizational culture is vital so that the data treatment strategy (BI) is quickly accepted and put into operation in the organizations.

The application of BI solutions based on a sustainable model generates a more effective operational and strategic treatment in social network environments, with the ability to adapt to changes established by the demanding market.

**Conflicto de intereses / Competing interests:**

Los autores declaran que no incurrir en conflictos de intereses.

**Rol de los autores / Authors Roles:**

María Tasa-Catanzaro: conceptualización, curación de datos, análisis formal, adquisición de fondos, investigación, metodología, administración del proyecto, recursos, software, supervisión, validación, visualización, escritura - preparación del borrador original, escritura - revisar & edición.

Ronny Lagos: conceptualización, análisis formal, investigación, metodología, administración del proyecto, recursos, software, supervisión, validación, visualización, escritura - preparación del borrador original, escritura - revisar & edición.

Wilson Sucari: conceptualización, análisis formal, investigación, metodología, administración del proyecto, recursos, software, supervisión, validación, visualización, escritura - preparación del borrador original, escritura - revisar & edición.

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Los autores declaran no haber incurrido en aspectos antiéticos, ni haber omitido aspectos legales en la realización de la investigación.

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