

Esteban Ismael Cordero-Naspud; Juan Carlos Erazo-Álvarez; Cecilia Ivonne Narváez-Zurita; Diego Marcelo Cordero-Guzmán

<http://dx.doi.org/10.35381/r.k.v5i10.703>

Soluciones corporativas de inteligencia de negocios en las pequeñas y medianas empresas

Corporate business intelligence solutions in small and medium enterprises

Esteban Ismael Cordero-Naspud
esteban.cordero@psg.ucacue.edu.ec
Universidad Católica de Cuenca, Cuenca
Ecuador
<https://orcid.org/0000-0002-3442-6996>

Juan Carlos Erazo-Álvarez
icerazo@ucacue.edu.ec
Universidad Católica de Cuenca, Cuenca
Ecuador
<https://orcid.org/0000-0001-6480-2270>

Cecilia Ivonne Narváez-Zurita
inarvaez@ucacue.edu.ec
Universidad Católica de Cuenca, Cuenca
Ecuador
<https://orcid.org/0000-0002-7437-9880>

Diego Marcelo Cordero-Guzmán
dcordero@ucacue.edu.ec
Universidad Católica de Cuenca, Cuenca
Ecuador
<https://orcid.org/0000-0003-2138-2522>

Recibido: 24 de marzo de 2020
Revisado: 09 de abril de 2020
Aprobado: 30 de abril de 2020
Publicado: 19 de mayo de 2020

Esteban Ismael Cordero-Naspud; Juan Carlos Erazo-Álvarez; Cecilia Ivonne Narváez-Zurita; Diego Marcelo Cordero-Guzmán

ABSTRACT

The objective was based on determining the intelligent system that adjusts to the operation of "Cordero" marketer, located in Azogues, Cañar province, Ecuador. The method is non-experimental and it is focused on a mixed approach. It was discovered that there is a small number of SMEs using the BI system, and most of them who apply this technology, choose the balanced scorecard tool, which is aligned in a greater percentage to the financial components, clients, internal processes and learning in organizations. The study on business intelligence shows the administration that this technological tool allows a better analysis of the information in a faster way; also, it significantly improved the quality of the information, making more reliable reports and providing support for decision making in companies.

Descriptors: Artificial intelligence; private enterprises; market economy; decision making. (Words taken from the UNESCO Thesaurus).

INTRODUCTION

In Ecuador, like all countries, the business intelligence system is a tool used by SMEs marketing goods, services and production with the aim of improving performance and efficiency in their care in accordance with the growing demand of users, because the competitive market requires suppliers to use information technology to make SMEs more technologically advanced. Authors such as (Muñoz-Hernández, Osorio-Mass & Zúñiga-Pérez, 2016); (Vanegas-Lago & Guerra-Cantera, 2013), point out that the technological revolution and computer data that organizations handle on a daily basis lead SMEs to intensify their storage and information processing capacities.

In the main cities such as Quito, Guayaquil, Cuenca, Ambato, etc., where the influx of users is greater, the introduction of computer systems that facilitate processing and service to users is observed; on the other hand, these systems help in the managerial decision-making, providing SMEs with a better image. The environment where businesses work in Azogues is critical for entrepreneurs to provide consumers with efficient service methods, so an information network is the right resource. For this reason, the information must be of quality to fulfill its objective according to (Guajardo-Cantú & Andrade-De-Guajardo, 2014).

Esteban Ismael Cordero-Naspud; Juan Carlos Erazo-Álvarez; Cecilia Ivonne Narváez-Zurita; Diego Marcelo Cordero-Guzmán

Cordero Distribuidor began its commercial activities in 2015 in Azogues, province of Cañar-Ecuador. The main activity of this business is the marketing of agri-food type merchandise; the suppliers belong to different producers in the canton and in the southern Ecuadorian region. Their main clients are commissariats, markets, school bars and stores. By having a large amount of product stocks, it is difficult to manage product lines such as: the identification of the acquisition of products, buyers, the rotation of inventories and, above all, the realization of the sale of goods, which restricts the business to competition from the local sector. In addition, it lacks fast and accurate analysis and processing of information; hence, the knowledge and use of technologies focused on the business environment generates competitive advantages, helping organizations add value and reinforce their stay in the commercial market.

METHOD

The methodology used was non-experimental, because no manipulation of variables was carried out. In addition, the mixed approach was used, where qualitative, quantitative, systemic, inductive, deductive, analytical and synthetic methods were used. The scope of this research was descriptive – explanatory. The interviews were applied to SMEs in Azogues, Cañar province, specifically, to each administrative representative of the 55 marketers identified in the city of Azogues.

RESULTS

The first two questions were tabulated independently, it was required to determine the number of SMEs that a business had and the type of tool with which they worked. Then the four components were classified with the subcomponents that were part of an intelligent system and under this information the responses were processed to determine the benefits that intelligent systems offered.

Esteban Ismael Cordero-Naspud; Juan Carlos Erazo-Álvarez; Cecilia Ivonne Narváez-Zurita; Diego Marcelo Cordero-Guzmán

At that moment, the city of Azogues registered 55 product marketing SMEs, that is, 22% did have an intelligent system, while 78% lacked this tool to help them make managerial decisions.

The system used by SMEs in this sector was the CMI with 42%, the Traditional Models with 33%, Data Mining 17% and EIS 8%, in relation to OLAP or other systems no company was mentioned; therefore, based on this information, the following variables were tabulated based on the information provided by 12 SMEs.

The marketers had a common factor, that is, to obtain profitability for shareholders, money was their priority and therefore, to get to this point it was necessary to know the level of income and costs that allowed generating the ISs that SMEs managed. In this respect, 69% used the CMI, 15% used the traditional model for accounting control, 8% Data Mining, 8% the Executive Information System (EIS).

The indicator related to customers had three subcomponents to value, the first related to the increase in customers, the second analyzed customer satisfaction, the third allowed examining the level of participation in the market and the fourth focused on the analysis of the image branded. According to the results, it was determined that the CMI and (EIS) were the ones that offered the greatest advantages. According to the results obtained, Balanced Scorecard CMI contributed with 69%, the EIF Executive Information System with 8%, Data Mining with 8% and the Traditional Model with 15%.

The internal processes perspective was intended to optimize the company's value chain, therefore, it must be structured according to the needs of each organization, under this conceptualization and according to the results. In relation to this, the CMI Balanced Scorecard contributes with the 69%, the EIF Executive Information System with 8%, Data Mining with 8% and the Traditional Model with 15%.

According to the training, knowledge and mastery of the IS, the expected effects would be achieved. Under this approach and with the results obtained, SMEs that had the Balanced Scorecard (CMI) received a contribution of 69% through training of personnel,

Esteban Ismael Cordero-Naspud; Juan Carlos Erazo-Álvarez; Cecilia Ivonne Narváez-Zurita; Diego Marcelo Cordero-Guzmán

infrastructure and use of the tool, the Information System Executive EIS with 8%, Data Mining with 8% and the Traditional Model with 15%.

In summary, with respect to the smart models used by SMEs and based on the descriptions, characteristics and indicators of some smart systems, the most widely used model or tool was the Balanced Scorecard (BSC).

PROPOSAL

In order to improve the internal management of Cordero Trading company, a BI System is proposed focused on the sales department where some queries are made using the Power BI and Microsoft Access programs, which display: Amount of accumulated sales in the period, sales amount for the first quarter, best-selling product represented in monetary value and month where there is more rotation of a certain product. It is worth mentioning that to carry out this BI prototype, the marketing of Cordero company provides sales data for the 2018 period; with this BI model, it is intended to demonstrate that it can improve competitiveness, quality of information and generate knowledge to allow making better decisions.

Facts and Dimensions

Before carrying out the BI procedure, the table of facts and dimensions is defined; this has been done following the star scheme. The star schema consists of a (central) fact table that contains the data for analysis, surrounded by the dimension tables. In this case, the facts are the sales and the dimensions are the customers, products and dates; then the information on the company's transactions is found in scattered spreadsheets, which will be loaded into a single database that can be in Microsoft Excel or in another program such as Microsoft SQL Server Management Studio for storage and later access to them in a fast and structured way.

Esteban Ismael Cordero-Naspud; Juan Carlos Erazo-Álvarez; Cecilia Ivonne Narváez-Zurita; Diego Marcelo Cordero-Guzmán

ETL process

The extraction and transformation process is carried out in Microsoft Excel with the purpose of standardizing the information, that is to say that the data must be saved with consistency of format, change of unit, operations, etc. In general, the raw transactions present data that are not interesting or are duplicates; such data is cleaned or filtered and finally, loaded as a consolidated database in the two programs Power BI and Access.

Data mart

For the design of the Data mart, it was carried out with Power BI and Microsoft Access tools. The data was loaded from the sales database to then design the star model and be able to generate reports or queries. It is worth mentioning that for the design of the data mart, only specific information from a department (sales area) is used and it is implemented through data cubes, which are similar to the table of facts and dimensions.

OLTP (online transactional processing) in Access and Power BI for visualization

The OLTP tool is a type of processing that facilitates and manages transactional applications, usually for data entry, recovery and transaction processing. It is consulted with the use of Software programs such as Access and Power BI, for later visualization of the results.

With this series of consultations, we demonstrate that Business Intelligence oriented to sales provides adequate support for decision-making, allows quality information, reduces costs and automates processes with the necessary speed that an administrator requires. In this sense, it is evident that when using either of these two Power BI or Access programs, they offer a very intuitive interface that is easy to use for business administrators.

Esteban Ismael Cordero-Naspud; Juan Carlos Erazo-Álvarez; Cecilia Ivonne Narváez-Zurita; Diego Marcelo Cordero-Guzmán

Scheme of a Dashboard for the Data mart - sales

KPI and graphical interface design

Key Performance Indicator or Performance Meter is a key element within businesses. They are used and applicable in any productive sector. Their purpose is to support by making better decisions for defining a future line of action that takes into account the current state of a process, project, and strategy. Based on this, the following indicators are proposed to implement a BI system in the organization.

Indicators: Below, there are several financial indicators that will allow SMEs to make timely decisions:

- Gross Profit Indicator
- Monthly billing increase
- Inventory rotation
- Volume of purchases per customer

CONCLUSIONS

Business intelligence offers benefits such as the ability to learn different facets of consumers and prospective customers, reduces expenses, accelerates study speed, helps create practical goals, and works in reality. Therefore, the use of an Intelligent Business System is important, so that the management control may be optimized to have an easy access to the data allowing the managers of the organization to build predictions based on the collected knowledge and, therefore, determine possible strategies that allow the growth of the company.

With the aforementioned, the organization does not have an intelligent system that helps to make business decisions, due to the data is scattered in different spreadsheets and in turn does not offer quality information, generating a false knowing in the business environment. That is why a BI prototype was proposed in the sales area to demonstrate the benefits of this business tool; in this sense, consultations and management

Esteban Ismael Cordero-Naspud; Juan Carlos Erazo-Álvarez; Cecilia Ivonne Narváez-Zurita; Diego Marcelo Cordero-Guzmán

indicators were carried out for the company's sales process from different perspectives in order to significantly improve the quality of the information and provide support for decision-making in the company. At the same time, KPI's management indicators were proposed for the company's sales process, since the idea is to improve decision-making to achieve the profitability of a company.

Regarding the use of the BI system in other SMEs, the results project that several SMEs do not have an intelligent system; and those that have it, have chosen to use the comprehensive scorecard tool. For this reason, the high number of organizations that do not use BI in their organizations leads us to believe that SMEs are not yet ready to use this valuable tool, due to the fear of risking to handle new technologies and the high cost and time it takes without knowing the high benefits that it can generate to the companies today and in the future.

FINANCING

Non- monetary.

ACKNOWLEDGEMENTS

We thank the SME Board of Azogues, Cañar province for supporting the development of this research.

REFERENCES

- Abrego-Almazán, D., Sánchez-Tovar, Y., & Medina-Quintero, J. (2017). Influence of information systems on organizational results. *Accounting and administration*, 62(2), 303-320. <https://dx.doi.org/10.1016/j.cya.2016.07.005>
- Camargo-Vega, J. J., Joyanes-Aguilar, L., & Giraldo-Marín, L. M. (2016). Business intelligence as a tool in academic management. *Scientific Journal*, 1(24), 110-120. <https://doi.org/10.14483/10.14483/udistrital.jour.RC.2016.24.a11>

Esteban Ismael Cordero-Naspud; Juan Carlos Erazo-Álvarez; Cecilia Ivonne Narváez-Zurita; Diego Marcelo Cordero-Guzmán

- Cordero-Guzmán, D. M., & Rodríguez López, G. (2017). Business intelligence: a strategy for the management of productive enterprises. *UNEMI SCIENCE*, 10(23), 40-48. <https://doi.org/10.29076/issn.2528-7737vol10iss23.2017pp40-48p>
- Coronel, C., Morris, S., & Rob, P. (2011). *Database systems: Design, implementation and management*. Available from <https://n9.cl/i9a58>
- Da Silva, J., Pastor, A. & Pastor, J. (2014). Using the balanced scorecard as a measurement tool for comparing models of excellence in management. *Ibero-American Journal of Strategic Management*, 13(4), 18-32.
- González, J., Palacios, J. & Perea, J. (2017). Business Intelligence and its role in organizational agility. *Free Criterion*, 15(26), 239-258. Available from <https://n9.cl/n9wj>
- Guajardo-Cantú, G., & Andrade-De-Guajardo, N. (2014). Financial Accounting. Sixth edition ed.). Mexico D.F.: Mac Graw- Hill Interamericana. Available from <https://n9.cl/sxal>
- Gutiérrez-Camelo, A. A., Devia-Llanos, M. A., & Tarazona-Bermúdez, G. M. (2016). *Research Business Intelligence: Case Study Colombian Technology Sector/Research. Engineering Networks*, 7(2), 156-169. <https://doi.org/10.14483/udistrital.jour.redes.2016.2.a05>
- Herazo, J. (2018). Benefits of business intelligence (BI - Business Intelligence) in your company. Available from <https://n9.cl/p91j>
- National Institute of Statistics and Censuses (2019). Business survey. Available from <https://n9.cl/0zz7>
- Kaplan, R. S. & Norton, D. P. (2009). Balanced scorecard. Barcelona, Management 2000.
- Koontz, H., Weihrich, H., & Cannice, M. (2012). Administration, a global and business perspective. Mexico D.F.: McGraw-Hill Education. Available from <https://n9.cl/zxnh4>
- Laudon, K. & Laudon, J. (2012). Management information systems. PEARSON. Available from <https://n9.cl/gpgn>

Esteban Ismael Cordero-Naspud; Juan Carlos Erazo-Álvarez; Cecilia Ivonne Narváez-Zurita; Diego Marcelo Cordero-Guzmán

- Medina-Chicaiza, R., Chiliquinga-Vejar, L., & Ortiz-Barba, A. (2016). Approach to business intelligence in SMEs. *Domain of Sciences*, 2(4), 370-382. Available from <https://n9.cl/8f72>
- Muñoz, D. (2014). Balanced Scorecard for the Bolivian Food and Salt Industrializing Plant. Available from <https://n9.cl/bioej>. *Perspectives Journal* (33), 151-175. Obtenido de <http://www.redalyc.org/pdf/4259/425941263005.pdf>
- Muñoz-Hernández, H., Osorio-Mass, R. C., & Zúñiga-Pérez, L. M. (2016). Business Intelligence: Key to Success in the Information Age. *Clío América*, 10(20), 194-211. <https://doi.org/10.21676/23897848.1877>
- Ramírez, J, & Vega, O (2015). Management Information Systems and Innovation for the Development of Organizations. *Télématique*, 14(2),201-213. Available from <https://n9.cl/i138>
- Reyes-Dixson, Y., & Nuñez-Maturel, L. (2015). Business Intelligence as decision making support system in academic environment. *GECONTEC: International Journal of Knowledge Management and Technology*, 3(2), 63-73. Available from <https://n9.cl/u02b>
- Rifai, F. (2015). La brecha entre el saber hacer y el papel de la universidad emprendedora en el desarrollo de la economía del conocimiento. *European Journal of Business and Innovation Research*, 4(1), 1-17. Available from <https://n9.cl/b7u20>
- Roo-Huerta, A. & Boscán-Romero, N. (2012). Business Intelligence in the National Bank: An Approach Based on Analytical Tools. *Venezuelan Management Journal*, 17(59), 548-563. Available form <https://n9.cl/jqxm>
- Saquicela-Rodas, V., Erazo-Álvarez, J., & Narváez-Zurita, C. (2019). Strategic Management Model for MSMEs that form the Azuayo Artisanal Passage. *Koinonía Interdisciplinary peer-reviewed journal*, 4(1), 206-230. <http://dx.doi.org/10.35381/r.k.v4i1.456>
- Sherman, R. (2014). Business Intelligence Guidebook: From Data Integration to Analytics. (Edición Kindle ed.).
- Teruel, S. (2019). The 8 stages in the company's decision-making process. Recuperado Available from <https://n9.cl/45y0>

Esteban Ismael Cordero-Naspud; Juan Carlos Erazo-Álvarez; Cecilia Ivonne Narváez-Zurita; Diego Marcelo Cordero-Guzmán

Turban, E., Volonino, L. & Wood, R. (2013). *Information technology for management: Advancing in the sustainable and profitable business growth*. (Ninth edition ed.). USA: John Wiley & Sons. Available from <https://n9.cl/daj34>

Uvidia-Fassler, M., Cisneros-Barahona, A., Méndez-Naranjo, P., & Villa-Yáñez, H. (2019). Data mining for decision-making in the ecuadorian university leveling and admission unit. *Summit*, 4(2), 55-67. Available from <https://n9.cl/fh7e9>

Vanegas-Lago, E. & Guerra-Cantera, L. (2013). Business intelligence system to support the decision-making process. *Engineering Journal UC*, 20(3), 25-34. Available from <https://n9.cl/60ej>

Vásquez, E. (2015). Data mining for business intelligence. Available from <https://n9.cl/s0n5>

Vercellis, C. (2009). *Business Intelligence: Data Mining and Optimization for Decision Making*. John Wiley & Sons Ltd.