

Organizational change management in industrial SMEs in the optimization of decision making.

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Abstract

The research carried out in SMEs shows that to improve organizational processes, great developments have been achieved, but then, in an impact and follow-up study it was determined that there are high failure and retention rates of small and medium-sized enterprises, since, Improvements are not implemented or implemented with little effectiveness. Reason why, to solve this problem, organizational change must be studied and how these models are implemented or can be implemented in industrial SMEs.

For this, different models of organizational change that SMEs employ are studied and compared with the organizational management implemented, to achieve a diagnosis and define the criteria and sub-criteria necessary for an AHP analysis methodology, with the results obtained, it is intended to establish a method that achieves the real change in SMEs

Keywords

Organizational Management, Organizational Change, SMEs, multicriteria decision.

Introduction

Organizational management in industrial SMEs (Small and Medium Enterprises) and organizational change management has improved, but not making decisions for growth improves their productivity. In the last two decades, a working group has been brewing by a growing number of researchers who are interested in studying the processes of globalization from a value chain perspective (Gereffi, Humphrey, Kaplinsky and Sturgeon, 2001; Kaplinsky and Morris, 2001). Gereffi (1994), the term global value chains is used to refer to international links between companies with global production and distribution systems. In parallel, small industries have been experiencing continuous organizational economic growth and deep diversification, to be positioned as one of the key drivers of current global socioeconomic progress (Saavedra,2020).

The importance of the contribution of the tourism industry to global economic activity is completely unquestionable. The World Tourism Organization estimates its contribution to world GDP at around 5% (UNWTO, 2012). In terms of job creation, its impact would be slightly higher (6-7%), with more than 235 million jobs registered - direct and indirect - worldwide (ILO, 2010). However, the relevance of the role of tourism in achieving economic development is not an issue on which a consensus has still been reached by the international community, with conflicting positions.

On the other hand, the tourism industry is characterized by being one of the most diversified and fragmented (Hjalager, 2007; OMT, 2010), covering both large multinational companies and a high percentage of SMEs. This duality is a structural feature that traditionally presents the tourism sector worldwide, although more pronounced in certain countries (Morrison and Thomas, 2004; OECD, 2010). In a more in-depth analysis of tourism SMEs, its greater prevalence in the receiving areas, its small size and the family character of a high percentage of these stand out (Bastakis, Buhalis and Butler, 2004; Keller and Bieger, 2004; Wanhill, 2004). Therefore, these features give rise to certain strategic and functional weaknesses, which are what justify the recommendation from various international organizations (OECD, 2008; UNCTAD, 2007; UNIDO, 2001) towards their insertion and positioning in global value chains, such as an alternative of success in its integration to a progressively more globalized and competitive economic environment (Tejada, 2013).

In addition, Colombian SMEs in the last three years have been important for their growth and subject to study for academics especially those dedicated to tourism and ecotourism activities, due to the opportunity presented in the territories cleared by the peace agreements taking advantage the cultural ecosystem service that these territories provide, and from these resources contribute to the social development of the country, but the difficulties and challenges are very large (Olano, 2017) to be sustainable, The term sustainability has gained great importance as it shows (Bonil, 2013), showing concern in investigating the factors that involve the term and the conception as such of SMEs, as their code of ethics, (Romero. 2015) where they define the behavior of these organizations with respect to economic factors, social, cultural, political and ecological, additionally that the Ministry of Tourism designs the NTS standard 002 for tourism industries based on this concept.

Background

Organizational management

Aspects such as strategic management, leadership, organizational components, the adoption of integrated management systems, open innovation and finance that drive the growth of SMEs have been extensively studied and implemented, but the staggering to the other business level only reaches a maximum of 40% (Cardona, 2015) and the durability does not reach 70% to the second generation and only 10% reaches a third, most only last the first, but, as a conviction of its founder (Quintero, 2018). The lack of appropriation of management systems (Vásquez, 2018), the requirement of the implementation of sectoral technical standards such as the NTS-002 for SMEs as mentioned above for accommodation and lodging establishments to obtain the National Registry of Tourism has created obstacles that prevent the growth of these organizations (Gamez, 2018).

The last few years it has been important if we talk about advances and the need to study what we call today SMEs, as well as all the actors and actions that allow this type of organization to be maintained over time and therefore be sustainable. Recent research shows that the term has become very important at the global level, and many countries have been concerned with studying and researching many factors that involve the term and the conception of SMEs as such. Based on studies carried out in previous years, product of a preliminary research focused on the sustainability model for a country like Colombia, Garzón Castrillón, (2015).

Organizational Change Management

Organizational change is only achieved from the management of human talent and starting with the missionary supervision and control component of the company, since these, permeate their knowledge to the base of SMEs and can bring their ideas of change to the strategic components, so that a progressive and effective change is achieved in each of the areas of the company and this allows its economic growth and therefore the staggering to the next type of company (Torres, 2013), this integration of the areas and sustainability is reflected in type B companies, which claim to have a balance between economic, social and environmental developments, which although they can allow the growth of the company, emerges more as a model of strategic alliances than as an internalization of The needs of all stakeholders. (Correa, 2013)

As you can see, SMEs have been studied strongly in all academic and governmental instances around the world, but those dedicated to tourism and especially ecotourism, due to the boom in the orange economy and the activation of negotiation areas in Colombia , but it began with support in financial management, administrative training, supply chains (Avendaño, 2019), among others, for which reason, the management of change and human talent has been neglected and does not exist so far , studies or models that allow companies of this type to internalize their progress and grow in conjunction with their general needs, it becomes important to design such a methodology. (Fontalvo,2019)

Research in organizational management in the area of human talent and especially in the management of organizational change is justified in the importance of knowing the real experience of SMEs in the implementation of change management models, since those who have risked for a business idea, yearning for a better quality of life, generating employment and having financial freedom, but, they only reach an economic balance more by experience than by application of administrative or technological tools as found in the study of the use of ICTs in SMEs (Rojas, 2013), But many of the dreams, expectations and hopes that are deposited in that new business, fail to remain in time for various factors that are widely known today (poor administrative management, weak business structure, illiquidity, lack of planning, inappropriate use of resources, among others). In addition, it is identified that the management of organizational change is fundamental against the economic development of the country, since it directly affects future professionals for the management of industries and organizations must go hand in hand with entrepreneurship and globalization with the function to create economic, environmental and social value in the present and future (Avendaño,2014).

Therefore, it is pertinent to initiate a study around which it is intended to determine how SMEs, especially ecotourism with several years of activity, have managed to maintain minimum profits (Alderete, 2013), in addition, taking into account the constant changes to that the principles, norms and laws that regulate and promote ecotourism as a vital factor for general well-being are subject, the above, in the design of a methodology for implementing a change management model will be key, to identify the variables to apply in the study and also understand other vital concepts to enter the world of ecotourism SMEs to be more specific. Today the importance of: micro, small and medium enterprises is a fully accepted reality in Colombia, to which numerous studies that have been developing since the 1990s have contributed. According to the research carried out by Fundes, the Rosario and the School of Business Administration (EAN) one of the causes of failure of SMEs is the lack of long-term strategies oriented towards a global market. According to the Universidad del Rosario, this is reflected in discontinuous processes, in which measures are adopted, consultants are hired and an investment is made, without maintaining them until they give result, because the strategic objectives of the company are not internalized, nor they align with the personal objectives, nor professional of the advisor. Thus, soon, the SME changes again of strategic plan without the previous one has concluded. In addition, the informality of organizational management and the lack of clear procedures are added. This generates a mixture that leaves even more confusion in administrative and managerial processes (Hederich, 2015).

The situation described above, in SMEs, produces a mixture of the objectives that the company owes or manages, forcing a short-term management decision making without an adequate analysis of indicators and biased by the perception, emotion and confusion of the company. information provided by each of the areas that have different articulations in the established objectives; Thus; This way of making decisions generates negative financial results, not only financial losses, but prevents it from limiting the change, which hinders the proper management of the entity and prevents the development of the business capacity necessary for productivity, sustainability and competitiveness in international markets. In order to propose a change in the face of this, the situation requires not only the review of the processes but also the design and adoption of flexible and agile organizational management models. Based on tools such as a methodology for organizational change in small Colombian ecotourism companies, adaptable to other parts of the world, through manuals or procedures for the use of the methodology in the administrative process and training plans for entrepreneurs. Therefore, the deepening of how organizational change management is being implemented can lead to the solution of productivity problems in SMEs that have invested or can invest in other models of integral management.

In order to determine the originality of the topic, several organizational change management models are reviewed, resulting in the 4 most employed in the organizations so far, such as:

- Lewin's three steps model. (Codina, 2009)
- Kotter model of change management in 8 steps. (Kotter, 1996)
- Change Management Methodology for PLATEA projects. (Eusko, 2008)
- ADKAR model (Hiatt, 2006)

Multi-criteria decision analysis

Multicriteria Decision Analysis is a broad term that includes a collection of concepts, methods and techniques that seek to help individuals or groups make decisions involving different conflicting viewpoints and multiple stakeholders (Belton & Stewart, 2002)

Despite the existence of an important multi-criteria scientific literature, the tools, methods and even the multi-criteria reflection itself remain almost totally unknown to technicians and managers at all levels (Barba-Romero & Pomerol, 1997).

On the other hand, there are important implications to consider, since the models present dependence in the perception of the weights of the criteria provided by the decision makers and the generation of findings based on the models could be limited for some organizations. Indeed, in practice, developing a multi-criteria analysis methodology that results in a construct may support the decision-making process more adequately (Vásquez-Bernal and Cortés Aldana, 2014).

Methodology

This research has as its starting point, the Ecotourism Prospective in the Colombian post-conflict in the areas of influence of the Cooperative University of Colombia UCC, with an ecological marketing emphasis, which allowed establishing a series of failures in organizational management in the 35 ecotourism SMEs studied. The proposal has a descriptive scope, since it seeks to know the impact of knowledge management models, with a mixed approach (qualitative - quantitative) in order to describe the level of productivity of small ecotourism companies. In this sense, it is based on four criteria that encompass everything that must be considered in an organization to be sustainable and with which the impact can be measured such as: Economic, Social, Organizational, Regulatory. These criteria will be supported by several sub-criteria, for example, Direct economic impact, Indirect economic impact) and dimensions (for example, Clients, Suppliers, Employees, Investors, Public sector, in addition to, Competition, International market), which guarantees the relevance of the data that will be obtained through the instruments.

An integrated methodology will be adopted for the development of the project, since in order to develop the specific objective one will determine through the PROCOLOMBIA databases an analysis to determine that SMEs that comply with a specific ecotourism profile that guarantees sustainability and that has a basic organizational management, to the chosen ones a series of instruments (interview and survey) will be applied in order to determine both the type of organizational management they manage and the way in which this management permeates all areas of the company and They help increase productivity. With the results obtained, it will be possible to find the weaknesses and strengths that ecotourism SMEs have, which will be the basis for the criteria to be used in the other objectives.

The second objective will be worked through a systematic review of the literature, where, as a basic criterion, the essential phases of the previous models and their usefulness will be developed through a Likert-type survey based on a Reliable sample of SME managers, who will evaluate the most important factors for ecotourism companies, the results will reinforce the organizational change management criteria for the design of the methodology.

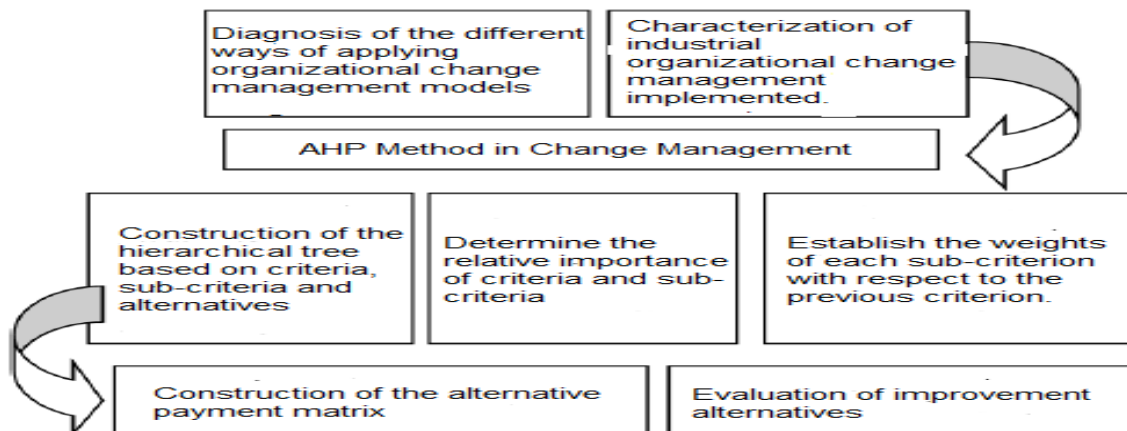


Figure 1. AHP methodology in organizational change management

The results of the comparison and the diagnosis will be analyzed through the multicriteria analysis methodology. Since once the decision structure is defined, a measurement scale must be introduced to rate or judge the performance of each alternative with respect to each of the criteria, and quantify the criteria (or determine their weights), then the Alternatives are classified using the scale. The method must be able to deal with the classification of tangible and intangible and with preservation of rank and reversal. The different priorities of the alternatives under each criterion

must be synthesized through the prioritization of alternatives and criteria (Saaty, 2015) in compliance with objectives three and four as shown in Figure 1.

With the results of the previous analysis, the fifth objective will be met to design a knowledge management methodology to apply in ecotourism SMEs that accept the invitation to research and the analysis of the improvement of their productivity. Also, it is important to clarify that the data collection will be done at a specific time and to a single sample so its design is: non-experimental, transversal. Thus, by analyzing the data we will achieve the familiarization of the topic under study in this case the management of organizational change in ecotourism SMEs located in Cundinamarca and Boyacá.

Expected results

As a result of this research, a method will be promoted to efficiently implement organizational change management models in small and medium-sized enterprises in Cundinamarca Colombia with the purpose of improving productivity, and thereby implementing strategies for improving organizational management that adapt these organizations to be more efficient in the use of their resources, the development and improvement of their production processes. To this end, the results of the investigation will be considered to strengthen the support and advice services provided to SMEs in the study.

On the other hand, the development of research products to generate new knowledge and social appropriation is contemplated, which will help disseminate the findings in the academic and business fields.

References

- Avendaño Prieto, G., Reyes Guzmán, M., Rodríguez Cantor, D. A., Mura, I., García Pérez, A., Velosa García, J. D., ... & Díaz Pulido, J. M. (2015). Cuaderno de Casos de Ingeniería 4.
- Avendaño-Prieto, G., Mosquera-Laverde, W. E., & Vásquez-Bernal, O. A.(2019). Analysis of organizational management and supply chains in ecotourism companies of Lejanías, Uribe and Mesetas (Meta-Colombia). IEOM meeting. Chek Republic.
- Alderete, M., & Gutiérrez, L. (2013). TIC y productividad en las industrias de servicios en Colombia. *Lecturas de Economía*, (77), 163-188.
- Angel, M. F., & Pulido, D. U. (2010). El éxito de las pymes en Colombia: un estudio de casos en el sector salud. *Estudios gerenciales*, 77-96.
- Barba-Romero, S., & Pomerol, J.-C. (1997). Decisiones Multicriterio. Fundamentos Teóricos y Utilización Práctica. Alcalá, España: Universidad de Alcalá de Henares.
- Bastakis, C., Buhalis, D. y Butler, R. (2004): "The Perception of Small and Medium Sized Tourism Accommodation Providers on the Impacts of the Tour Operator's Power in Easter Mediterranean", *Tourism Management*, 25(2), 151–170.
- Belton, V., & Stewart, T. (2002). Multiple Criteria Decision Analysis. An Integrated Approach. Kluwer Academic Publisher.
- Berrío, J. G. R. (2006). ¿Gestión del conocimiento o gestión de la información? *Tecnológicas*, (16), 59-82.
- Beltrán A. Torres E. (2004) Pymes. Un reto a la competitividad. Universidad Externado. Bogotá.
- Bermúdez T. González P. (2008). *Una aproximación al modelo de toma de decisiones usado por los gerentes de las micro, pequeñas y medianas empresas ubicadas en Cali, Colombia desde un enfoque de modelos de decisión e indicadores financieros y no financieros*. Revista de Contaduría Universidad de Antioquia No. 52 páginas 131 a 154. Universidad de Antioquia. Medellín.
- Bonil, J., Junyent, M., & Pujol, R. M. (2010). [3] Educación para la Sostenibilidad desde la perspectiva de la complejidad. *Revista Eureka sobre Enseñanza y Divulgación de las Ciencias*, 198-215.
- Cámara de comercio de Bogotá (2015). Balance de la economía Bogotana, 2010-2014 y primer semestre del 2015. Recuperado de http://camara.ccb.org.co/documentos/4737_Balance_de_la_economia_bogotana_Parte_1.pdf
- Cardona, C., & Bonilla, E. (2015). Los factores limitantes de la internacionalización de las pymes textil, cuero, calzado e industria marroquinera colombianas. *Revista Caribeña de Ciencias Sociales*, (2015_11).
- Codina, A. (1996). El "modelo" o teoría del cambio. http://www.degerencia.com/articulo/el_modelo_o_teor%C3%ADa_del_cambio.

- Correa, M. E., Abramovay, R., Gatica, S., & Van Hoof, B. (2013). Nuevas empresas, nuevas economías: Empresas B en Sur América.
- Eusko, J. (2008). Gobierno Vasco. Euskadi. [En línea]. [Citado el: 29 de Mayo de 2012.] http://www.ogasun.ejgv.euskadi.net/r51-341/es/contenidos/informacion/guia_estandares_tecnologicos/es_6876/adjuntos/4.%20Anexo%20Metodolog%C3%ADa%20de%20Gesti%C3%B3n%20del%20Cambio%20para%20proyectos%20PLATEA.pdf.
- Fernández, E. O. (2015). SEO: Clave para el crecimiento de las Pymes. *Opción*, 31(6), 652-675.
- Gamez, A., Morales, M. y Ramirez, C. (2018). Estado del arte sobre problemáticas financieras de las pymes en Bogotá, Colombia y América Latina. *Económicas CUC*, 39(2). 77-94. DOI: <http://dx.doi.org/10.17981/econcu.39.2.2018.05>
- Gaskill, L., Van Auken, H. y Manning, R. (1993): “A factor analytic study of the perceived causes of small business failure”. *Journal of Small Business Management*, vol. 34, n. 4, pp. 18-31.
- Gereffi, G. (1994): “The Organization of Buyer-driven Global Commodity Chains: How U.S. Retailers Shape Overseas Production Networks”, in G. Gereffi, & M. Korzeniewicz (Eds.), *Commodity Chains and Global Capitalism* (pp. 95-122), London, Praeger.
- Gereffi, G., Humphrey, J., Kaplinsky, R. y Sturgeon, T.J. (2001): “Introduction: Globalisation, Value Chains and Development”, *IDS Bulletin*, 32(3), 1–8
- Hederich.C.A.(2015). Situación y necesidades de la pequeña y mediana empresa. *Civilizar Revista electrónica de difusión científica*. Universidad Sergio Arboleda Bogotá. Recuperado de <http://www.usergioarboleda.edu.co/civilizar>
- Hernández S. R, Fernández C. (2015). Metodología de la investigación. Mac Graw Hill. Colombia.
- Hernández, A., Marulanda, C. E., & López, M. (2014). Análisis de Capacidades de Gestión del Conocimiento para la Competitividad de PYMES en Colombia. *Información tecnológica*, 25(2), 111-122.
- Hjalager, A-M. (2007): “Stages in the Economic Globalization of Tourism”, *Annals of Tourism Research*, 34 (2), 437–457
- Hiatt, J. (2006). A Model for Change in Business, Government and our Community : How to Implement Successful Change in our Personal Lives and Professional Careers. Colorado : Prosci Research. 978-1-930885-50-9.
- Issa Fontalvo, S. M., Robles Panetta, E. J., & González Castillo, F. D. J. (2019). Cultura de innovación turística: una apuesta para el cierre de brechas sociales y tecnológicas.
- Ilo (2010): *Developments and Challenges in the Hospitality and Tourism Sector*, Global Dialogue Forum for the Hotels, Catering, Tourism Sector, Geneva.
- Jeston, J. y NESLIS, J. (2008). *Business Process Management (Practical Guidelines to Successful Implementations)*. 2da. Burlington : Elsevier Ltd, 978-0-75-068656-3.
- Kotter, J. P. (1996). *Leading Change*. [ed.] Harvard Business Review Press. 1st edition . ISBN-10: 0875847471 • ISBN-13: 978-0875847474.
- Leyva López, Juan Carlos (2011) *Análisis multicriterio para la toma de decisiones métodos y aplicaciones* Editorial: Plaza y Valdés, S.A. de C.V.
- Méndez, C. (2009). *Tecnologías y herramientas de gestión. Caso Grandes, medianas y pequeñas empresas en Bogotá*. Editorial Universidad del Rosario. Bogotá.
- Morrison, A. y Thomas, R. (2004): *SMEs in Tourism: an Tnternational Review*, Arnhem, ATLAS
- OCDE (2008): *Enhancing the role of SMEs in the global value chains*, Paris, OECD.
- Olano, E. B. (2017). El postconflicto una oportunidad para impulsar el comercio justo en Colombia. *Observatorio de la Economía Latinoamericana*, (227).
- OMT (2012): *Panorama OMT del turismo internacional*, Edición 2012, Madrid, OMT.
- Porter, M.E. (1980). *Competitive strategy*. New York, NY: Free Press/Simon and Schuster.
- Quintero Reatiga, J. S. (2018). *Las PYMES en Colombia y las Barreras para su Desarrollo y Perdurabilidad*. Bogotá, Colombia: Universidad Militar Nueva Granada.
- Rivera, H. y Malaver, M. (2011 a). *La investigación en la Facultad de Administración de la Universidad del Rosario: Pasado, presente y futuro*. Documento de Investigación N° 100. Bogotá, Colombia: Facultad de Administración, Universidad del Rosario
- Romero, L. A. P., Castrillon, M. A. G., & Mares, A. I. (2015). Código de ética empresarial para las Pymes: marco de referencia para la sostenibilidad y responsabilidad social empresarial (RSE). *Revista ESPACIOS| Vol. 36 (N° 02)*.
- Rojas, A. Grillo C.y Mosquera W. (2013)., *Estudio exploratorio sobre el manejo de la información y la aplicación de las TICS para la toma de decisiones en las pequeñas empresas de Bogotá*. Universidad Cooperativa de Colombia. Bogotá. 2013.

- Rubio, C. P. (2012). Gestión estratégica organizacional aplicada a las pymes constructoras en Colombia.
- Ruiz M, J., RUIZ S, C. MARTÍNEZ L, I., PELÁEZ I, (199). Modelo para la gestión del cambio organizacional en las Pymes. En: Congreso Nacional de la Asociación Científica de Economía y Dirección de la Empresa (ACEDE) (9º: 1999: Burgos). Empresa y Mercado: Nuevas Tendencias, IX Congreso Nacional de la Asociación Científica de Economía y Dirección de la Empresa (ACEDE), Burgos 1999.
- Saavedra, O. E. S., Laverde, W. E. M., Castro, C. H. C., & Rodriguez, J. C. B. (2020). Difficulties in the Supply Chain in Post-conflict Zones in Colombia. In Proceedings of the Seventh International Forum on Decision Sciences (pp. 143-149). Springer, Singapore.
- Saaty, T. L., & Ergu, D. (2015). When is a decision-making method trustworthy? Criteria for evaluating multi-criteria decision-making methods. *International Journal of Information Technology & Decision Making*, 14(06), 1171-1187.
- Spillman, J. y J. Parnell (2006). "Marketing Resources and Firm Performance Among SMEs." *European Management Journal* Vol. 24, Nos. 2-3, pp. 236-245. Elsevier.
- Stokes, D. (1998): Small business management. A case study approach, Letts Educational ed., London. 3 edición.
- Tejada G. P; Moreno, P. (2013). Contribución de las pymes turísticas al desarrollo. [Revista de economía mundial](#), págs. 103-119
- Torres, M. H., & Robaina, D. A. (2013). Enfoques para la gestión del cambio organizacional. *Alta dirección*, 47(279), 11-17.
- Vásquez-Bernal, O. A., & Cortés-Aldana, F. (2014). La certificación de los profesionales de ingeniería: Un análisis multicriterio innovador. En J. Saravia Arenas, P. R. Herrera Capdevilla, & P. Amar Sepulveda (Edits.), *Experiencias internacionales emergentes en gestión tecnológica y de la innovación para el desarrollo territorial* (págs. 1-18). Barranquilla, Atlantico, Colombia: Universidad Simon Bolivar.
- Vásquez-Bernal, O. A., & Mosquera-Laverde, W. E. (2018). Impact of integrated management systems on organisations and the impact of road projects on biodiversity in Colombia. *World Trans. on Engng. and Technol. Educ*, 16(1), 47-53.
- Vega, R. (2011). Pymes: reflexiones para la pequeña y mediana empresa en Colombia. *Editorial Politécnico Grancolombiano, Bogotá*.
- Velasco M. 2006. Caracterización de las pymes de Bogotá mediante el uso de información secundaria. Universidad Santo Tomas. Bogotá.
- Vásquez-Bernal, O. A., & Cortés-Aldana, F. (2014). La certificación de los profesionales de ingeniería: Un análisis multicriterio innovador. En J. Saravia Arenas, P. R. Herrera Capdevilla, & P. Amar Sepulveda (Edits.), *Experiencias internacionales emergentes en gestión tecnológica y de la innovación para el desarrollo territorial* (págs. 1-18). Barranquilla, Atlantico, Colombia: Universidad Simon Bolivar.

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