

**New Ideas Concerning Science
and Technology**
Vol. 10



B P International

Editor(s)

Dr. Manuel Alberto M. Ferreira

Professor, Department of Mathematics, ISTA-School of Technology and Architecture, Lisbon University, Portugal.

ISBN 978-93-90768-57-8 (Print)

ISBN 978-93-90768-71-4 (eBook)

DOI: [10.9734/bpi/nicst/v10](https://doi.org/10.9734/bpi/nicst/v10)

This book covers key areas of science and technology research. The contributions by the authors include reading function, computer-based teaching methodology, coincidence detection learning, artificial neural networks' modeling, artificial neural network modeling, reading brain performance, associative memory, self-organized learning, command and control, bounded rationality constraints, hierarchical, conditional probability density function, computational intelligence and information management, Randic index, sum-connectivity index, transformation graphs, compliment graph, innovative pedagogic approaches, pyrolysis, viscosity, hydrocarbon mixtures, predictive model, finite element method, Timoshenko beam theory, composite materials mechanics, static and dynamic analysis of beams, phase transitions, solar cell materials, structural properties, electronic properties, maximal visible polygon, gradient search, guardhouse problem, diagnosis and management competencies. This book contains various materials suitable for students, researchers and academicians in the field of science and technology.

Media Promotion:

- [Chapter 01](#)
- [Chapter 02](#)
- [Chapter 03](#)
- [Chapter 04](#)
- [Chapter 05](#)
- [Chapter 06](#)
- [Chapter 07](#)
- [Chapter 08](#)
- [Chapter 09](#)
- [Chapter 10](#)
- [Chapter 11](#)
- [Chapter 12](#)

Chapters

[Artificial Neural Networks' Application for Comparative Recognitional Study of Children Correctly Pronounced Reading Arabic Words Associated with Two Diversified Educational Methodologies](#)

Hassan M. H. Mustafa, Mohamed I. A. Ibrahim

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 1-16

<https://doi.org/10.9734/bpi/nicst/v10/6101D>

- [Abstract](#)
- [View Article](#)

[Performance Improvement of Reading Brain Function Considering Quantified Analysis of Highly Specialized Neurons: A Neural Networks Approach](#)

Hassan M. H. Mustafa

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 17-33
<https://doi.org/10.9734/bpi/nicst/v10/6135D>

- [Abstract](#)
- [View Article](#)

Recent Study on Optimal Distribution of N-Team Interacting Decision Makers with Hierarchical Command Inputs that are Predicated on Order Statistics

M. O. Oladejo, D. T. Chinyio, C. O. Uwa

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 34-45
<https://doi.org/10.9734/bpi/nicst/v10/7699D>

- [Abstract](#)
- [View Article](#)

Topological Indices of Transformation Graphs of a Compliment Graph: A Recent Study

Chandrakala Sogenahalli Boraiah, Roshini Gujar Ravichandra, Sooryanarayana Badekara

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 46-56
<https://doi.org/10.9734/bpi/nicst/v10/7655D>

- [Abstract](#)
- [View Article](#)

Service Design Thinking: A Case Study on Academic Lectures Addressed to Higher Education Students

Ivan Traina, Antonio Fracasso

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 57-67
<https://doi.org/10.9734/BPI/NICST/V10/7806D>

- [Abstract](#)
- [View Article](#)

Study on Performance and Emission Studies on Cashewnut Shell Liquid Bio-Oil Fuelled Diesel Engine with Acetone as Additive

P. P. Shantharaman, T. Pushparaj, M. Prabhakar

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 68-76
<https://doi.org/10.9734/bpi/nicst/v10/7868D>

- [Abstract](#)
- [View Article](#)

Performance of the Corresponding States Model of Dual-Reference on the Determination of Viscosity According to the Pressure of Hydrocarbon Mixtures in the Modeling Domain

Aziz Et-tahir

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 77-93
<https://doi.org/10.9734/bpi/nicst/v10/7243D>

- [Abstract](#)
- [View Article](#)

Finite-element Modeling for Analysis of Isotropic and Orthotropic Beams Using First Order Shear Deformation Theory

M. Adnan Elshafei

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 94-127

<https://doi.org/10.9734/bpi/nicst/v10/7261D>

- [Abstract](#)
- [View Article](#)

Ab-initio Calculations of Structure and Electronic Properties of the Ternary Halide perovskite CsSnBr₃ in Its Three Phases: Comparative Study

Karima Benyahia, Samira Bouchikh, Mohamed El Amine Souyah

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 128-134

<https://doi.org/10.9734/bpi/nicst/v10/2189E>

- [Abstract](#)
- [View Article](#)

Back Diagonal Reflex Algorithm for Finding the Maximal Visual Area Polygon

Helman I. Stern, Moshe Zofi

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 135-150

<https://doi.org/10.9734/bpi/nicst/v10/7244D>

- [Abstract](#)
- [View Article](#)

Comparision of Accuracy between Multi Implant Impressions While Using Different Splinting and Impression Materials: An In Vitro Study

Pragya Bali, Farhat Jabeen, Poonam Pathania, Harsh Bali, Shivangi Bali

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 151-161

<https://doi.org/10.9734/bpi/nicst/v10/1466A>

- [Abstract](#)
- [View Article](#)

Recent Study on Theoretical Foundation of a Human-Techno-Structural Model of Managerial Competencies for the Public Transport of Dry Cargo

Eduardo Cruz Aldana, Antonio Oswaldo Ortega Reyes, Jaime Garnica González, Eva Selene Hernández Gress, Carlos Robles Acosta, Octavio Castillo Acosta, Hector Rivera Gómez, Oscar Montaña Arango, José Ramon Corona Armenta, Mariana Marcelino Aranda

New Ideas Concerning Science and Technology Vol. 10, 17 March 2021, Page 162-182

<https://doi.org/10.9734/bpi/nicst/v10/6619D>

- [Abstract](#)
- [View Article](#)

Recent Study on Theoretical Foundation of a Human-Techno-Structural Model of Managerial Competencies for the Public Transport of Dry Cargo

Eduardo Cruz Aldana¹, Antonio Oswaldo Ortega Reyes^{2*},
Jaime Garnica González², Eva Selene Hernández Gress²,
Carlos Robles Acosta³, Octavio Castillo Acosta², Hector Rivera Gómez⁴,
Oscar Montaña Arango⁵, José Ramon Corona Armenta⁶
and Mariana Marcelino Aranda⁷

DOI: 10.9734/bpi/nicst/v10/6619D

ABSTRACT

This paper presents a proposal of the theoretical and contextual foundation of a human techno structural model (HTSM) of managerial competencies of dry cargo auto transportation (DPCAT) in Mexico. Firstly, the conceptualization of state of the art is shown through the analysis of the theoretical framework concerning management skills models and, as a second element, an analysis of the contextual framework of applied management skills certification models was shown currently in the DPCAT sector to integrate them into the decision making the process of managers in the metropolitan area of the state of Hidalgo, in 2016. This also shows the results obtained from the application of a questionnaire that relates the managerial competencies with the expected performances and the results of this, which was the base the techno structural approach and its relation to the individual needs of the manager, giving rise to a standardization proposal based on Leadership, Diagnostics of competencies, Installation of competencies, Development of competencies and Enhancement of competencies. This development establishes that personal changes (directive) and interference in group changes are accompanied by a cognitive and experiential process that ensures the self-sustaining of HTSM in the organization.

Keywords: Standardization; diagnosis; management competencies; performance.

1. INTRODUCTION

The present study arises from the current need of companies in the sector of Dry Cargo Public Auto transportation (DCPAT) in the Metropolitan Zone of the State of Hidalgo (ZMEH), since today they are managed through old habits, emanated empirically from the experience of managers or recommendations generated from parents to children. Therefore, it is necessary to establish a knowledge construct and expertise, under a methodological process, that links the contextual, referential, and empirical framework of the DCPAT with the theoretical basis of management competencies and their performance in the referred sector.

The sector of DPCAT in Mexico has shown interest in professionalizing its managerial competencies [1]. In the World Economic Forum (2016), countries like the United States of America, China, Japan,

¹The Metropolitan Polytechnic University of Hidalgo, Tolcayuca, Mexico.

²Institute of Basic Sciences and Engineering, Engineering Academic Area, Autonomous University of Hidalgo, Pachuca, Mexico.

³Ecatepec University Center, Autonomous University of the State of Mexico, Ecatepec, Mexico.

⁴Academic Area of Engineering, Autonomous University of Hidalgo, Mexico.

⁵Autonomous University of the State of Hidalgo, Mexico.

⁶Universidad Autónoma del Estado de Hidalgo, Mexico.

⁷Instituto Politécnico Nacional- UPIICSA, Mexico.

*Corresponding author: E-mail: oswwaldao@yahoo.com.mx;

Germany, the United Kingdom, France, India, Italy, Brazil, and Canada have reported that training of the workforce, training services, and personal training, are key elements for the development of the industry. Nevertheless, the Mexican case is below the average of these ten most important economies, which is the ranking proposed as an adequate score in our research (Table 1).

Table 1. Training of Managers in Mexico with respect to the 10 largest economies in the world

Training of managers, media and labor force		
Items of educational quality	Average the 10 largest companies in the world	Percentage of achievement in Mexico
Workforce training	5.4	4
Training services	5.8	4.4
Personal training	5.4	4.3

Note. Adapted from World Economic Forum (2016) [2], The Global Competitiveness Report 2015-2016. Retrieved from: http://www3.weforum.org/docs/gcr/2015-2016/Global_Competitiveness_Report_2015-2016.pdf

Training must allow solving a set of specific problems in order to improve the characteristics inherent to the administration of companies of the DPCAT (Cruz, Ortega, and Figueroa, [3], pp. 22-42), comprehending regulations of the physical and mechanical conditions (Mexican NOM-061-SCT-2-2000); as well as transportation standards about weights and dimensions (NOM-012-SCT-2-2008); regulations that standardize safety in the supply chain (ISO 28000: 2009); or risk management (ISO 31000: 2009), to name a few.

The geographic proximity of Mexico with the United States of America is a crucial factor to develop competencies related to the certification of logistical processes inherent to the risk of cross-border transportation, such as Customs-Trade Partnership Against Terrorism (C-TPAT), Free and Secure Trade (FAST) and Business Alliance for Secure Commercial (BASC) among others (CONOCER, [4]; Cruz, Ortega, and Figueroa, [3]; Jiménez and Jiménez, [1]).

While there is a perceived lag in the management of competencies of the DPCAT sector in Mexico, on the other hand, the demand for proper standards of the contracting companies in the supply chain and the recipients of the mobilized goods grows. In this gap, the development and implementation of specific managerial competency models for the DPCAT is required since there is a lack of a managerial skills model that relates the development of such competencies with the expected performance of the organization (Cruz, Ortega, and Figueroa, [3]; Jiménez and Jiménez, [1]; OSCL, [5]; Ortega, [6]). This level of performance is more evident in the central zone of Mexico (states of Querétaro, Tlaxcala, Mexico, Hidalgo, Puebla, and Mexico City), which is listed as the most economically developed zone in the country since it contributes with 33.8% of the Gross Domestic Product, which makes a group of companies dedicated to DPCAT converge to move the goods to other regions.

Jiménez and Jiménez (2017), point out that the state of Hidalgo has the highest growth rate of the DPCAT fleet since 2014, due to the increase in the movement of goods generated in the municipalities of Pachuca, Tulancingo, and Tula de Allende. This increase results in the socioeconomic conformation of industrial parks of the zone and, also due to the interaction with the borders of other states (Tovar, [7]; Cruz, Ortega, and Figueroa, [3]). The metropolitan areas of Pachuca, Tulancingo, and Tula de Allende, are located in the state's borders, which turns them into industrial points, modifying regulations and activities related to transportation as shown in Fig. 1.

This context led to establishing the universe of research in this project as companies of the DPCAT located in the ZMEH municipalities (Metropolitan zone of the state of Hidalgo), as shown in Table 2.

2. THEORETICAL FRAMEWORK

The concept of managerial competencies by itself establishes a behavioral perspective and links knowledge and skills, as well as their orientation to the results obtained in each organization (Petrick, Scherer, Brodzinski, and Quinn, [8]; Parsons, 1949; Locke, [9]).

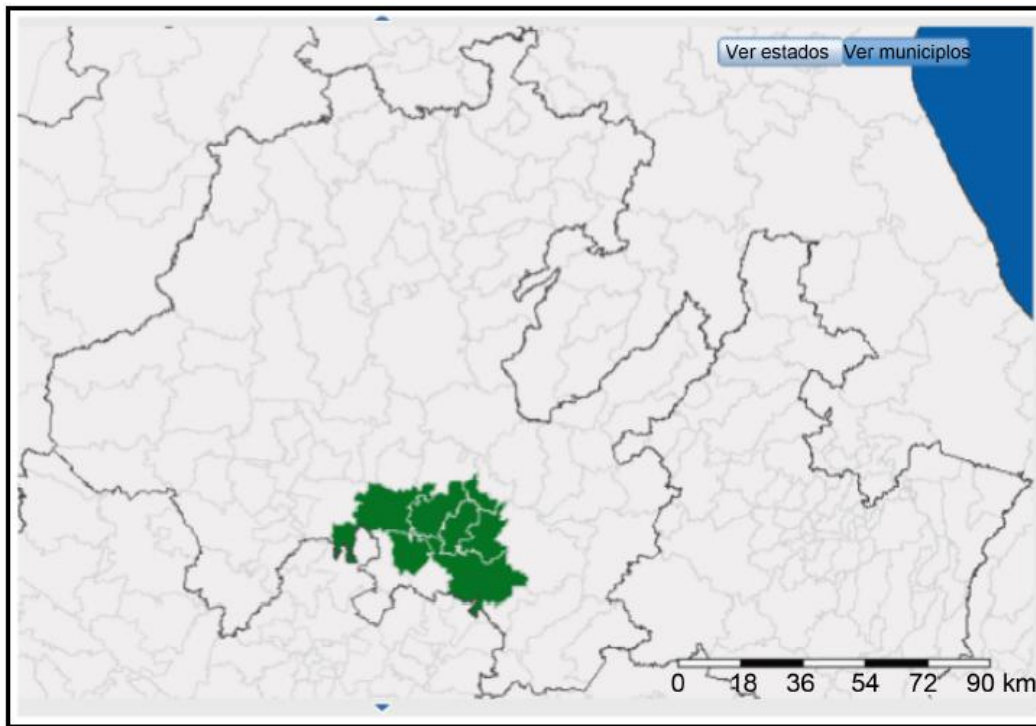


Fig. 1. Metropolitan zone of the state of Hidalgo. Note: Figure of the three metropolitan zones of the state of Hidalgo; Source: Adapted from metropolitan areas in the state of Hidalgo and inter-municipal cooperation; Tovar E., 2011

Table 2. Table of municipalities in the metropolitan area of the state of Hidalgo

Metropolitan area of Pachuca	Metropolitan area of Tulancingo	Metropolitan area of Tula
Pachuca de Soto	Tulancingo de Bravo,	Tula de Allende
Mineral de la Reforma	Cuautepec de Hinojosa	Atitalaquia
Epazoyucan	Santiago Tulantepec de Lugo Guerrero	Atotonilco de Tula
Mineral del Monte		Tlahuelilpan y
San Agustín Tlaxiaca		Tlaxcoapan
Zapotlán de Juárez		Tepeji del Rio
Zempoala		

Note. Adapted from "Diagnosis of air cargo transportation in Mexico", Herrera A, Bustos A., Martner C, Rico A., Acha J., Aguerrebere R, (2005).

Recovered from: <http://imt.mx/archivos/Publicaciones/PublicacionTecnica/pt273.pdf>

McClelland [10] establishes the need to integrate, besides knowledge and skills, two relevant principles in the conception of competence; the first of them, oriented to identify individual needs and, the second one, determines the measurement of the results obtained in the organization. Thus, the conceptualization of individual needs creates the relationship of the manager with psychological and sociological aspects; proposes ordering the individual, group, and organizational competencies, which contemplate giving solution to specific problems and the fulfillment of the expectations of each organization (Prahalad, Bettis [11]; Porter, [12]).

In this way, competencies are put into practice contributing to the results, achieving as well as organizational objectives, and improving the effective management of personnel (Boyatzis, [13]; Quinn, [14]; Arnold and Mckenzie, [15]; and Olabarrieta, [16]; Cruz, Ortega, and Figueroa, [3]; Vargas, [17]; Valencia; [18]).

Concerning the measurement of results, it is necessary to align the performance to the strategic planning of the organization so that each effort made is channeled to the achievement of objectives within the existing technostructure that links different perspectives: Financial, client orientation, internal processes, human resources and leadership (Mercado, del Moral and Jiménez, [19], Kaplan and Norton [20], Cruz, Ortega, and Figueroa, [3]; Ballou, [21]; Bartunek, Balogun, Haga, [22]).

A conceptualization that relates individual aspects to group results in managerial competencies of the DPCAT is proposed in the following phases:

Phase 1: Diagnosis of managerial competencies; the training needs of each manager are determined, establishing a set of actions oriented to organizational alignment.

Phase 2: Implementation of managerial competencies; Characterized by carrying a chronological sequence of the establishment of managerial competencies, linking the techno-organizational structure with the individual needs of the manager.

Phase 3: Development of management skills; defines the link between the expected results and the chronological sequence of the establishment of managerial competencies through a review of the performance of the expected executive.

Phase 4: Enhancement of managerial competencies; It relates the performance review of the expected manager, with the training needs, to identify improvement areas about performance and managerial competencies [23].

Table 3. Methodological analysis of DPCAT competency models

Certification model	Phase 1 Diagnostic	Phase 2 Implementation	Phase 3 Development	Phase 4 Enhancement
American Production and Inventory Control Society (APICS).	Yes	Yes	Yes	No
Human Resources Professionals Association (HRPA).	Yes	Yes	Yes	No
Comisión Sistema Nacional de Certificación de Competencias Laborales (Chilevalora).	Yes	Yes	Yes	No
Inside Careers	Yes	Yes	Yes	No
Clasificación Brasileña de Ocupaciones CBO	Yes	Yes	Yes	No
Sistema Nacional de Competencias SNC, Conocimiento Competitividad y Crecimiento CONOCER	Yes	Yes	Yes	No

Note. Adapted from: CONOCER, 2016 [4]; Chile Valora, 2016 [27]; SENAI, 2016 [29]; Inside Careers, 2016 [28]; Blunt, Bennett, Clark, Taylor-Green & Singh, 2014 [25]; Katz R.L., 1974

These stages do not differ in models that allow certification of directive competencies in the DPCAT, such as the American Production and Inventory Control Society (APICS) [24] or the Human Resources Professionals Association [25]; the proposal of the National Labor Certification System (Chilevalora) [26]; Inside Careers (2016) [27]; the Brazilian Classification of Occupations (BCO) or the National Competency System (SNC) (Cruz, Ortega, and Figueroa, [3]). The comparison of models allows us to appreciate that the models of managerial competencies are coincident in applying the phases of diagnosis, implementation, and development, as well as a general absence of the phase of Enhancement (Table 3).

The absence of the application at the level of Enhancement led this work to relate the expected performance of the manager with the training needs related to managerial competencies that impact organizational results (Levy-Leboyer, [30]; Locke, [9]; Jensen, [31]; Spencer, L.M., and Spencer, [32]).

3. METHODOLOGY

We developed a quantitative empirical design to analyze the factors that allow modeling the DPCAT directive competences. It integrated a descriptive investigation and a correlational analysis of the interaction of the variables under study (Hernández et al. [33]; Torres and Navarro, [34]; Naghi, [35], Hamel, G. & Prahalad, [36]; Torres & Navarro, [34]), aimed to establish the incidence between managerial competencies, performance and their formal processes of standardization as shown in Table 4.

To this end, we identified three types of variables. Additionally, we defined that the interaction of management competencies through standardization impacts the performance of organizations in the DPCAT sector.

Therefore, this research's hypothesis established that "there is an interaction between managerial competencies and the performance through standardization processes, in the Dry Cargo Public Auto transport sector of the metropolitan area of the state of Hidalgo".

In this way, each performance perspective related to the construction of competencies (Schein, [37]; Mercado, del Moral and Jiménez, [19]; Kaplan and Norton [20]; Cruz, Ortega, and Figueroa, [3]; Valencia [18]; Barrow, [38]; McClelland, [39]; Whetten & Cameron [40], were defined as shown in Fig. 2.

Therefore, from the theoretical review conducted, we designed an instrument to evaluate each perspective's performance; batteries of questions were formed with four response options, which allowed identifying the managers' opinions (Table 5).

Table 4. Variables of the research model

Types of variables	Characteristics of the variable	Description
Dependent variable: Management skills	<ul style="list-style-type: none"> ➤ Knowledge. ➤ Skills and abilities. 	It is considered that managerial competencies have a positive inference regarding the performance.
Independent variable: Performance	<ul style="list-style-type: none"> ➤ Financial processes. ➤ Orientation towards the client. ➤ Internal processes. ➤ Human Resources. ➤ Leadership. 	It is considered that the performance generates causes and conditions to the managerial competencies.
Intervening variable: Standardization	<ul style="list-style-type: none"> ➤ Identification of competencies. ➤ Standardization of competencies. ➤ Competency-based training. ➤ Certification of competencies. 	It is considered that standardization influences the relationship: managerial competencies and performance, being an intervening variable between them.

Source: Authors' elaboration

Therefore, the main variables attain the different elements compound into the dynamic of operations in the dry cargo sector. Thus, under a systemic approach, this helped us integrate a holistic view of the research process.

Table 5. Characterization of the field survey for the DPCAT

Item	Perspective
<ul style="list-style-type: none"> ➤ Control of investment in assets. ➤ Decision-making in financial projects. ➤ Decision making in financing alternatives. ➤ Follow-up of financial and accounting plans. ➤ Analysis of the operating costs of your organization. ➤ When analyzing the income statement of your organization. ➤ Measuring the profitability of your organization. ➤ Perform accounting control. ➤ When analyzing the expiration of customer payments. 	Economic decisions
<ul style="list-style-type: none"> ➤ Decision-making oriented to monitoring and market growth. ➤ Proposal of alternatives for conflict resolution in the internal and external scope of the organization with the clients. ➤ Responsibility for making decisions focused on achieving sales objectives. ➤ Follow-up on customer complaints. ➤ Planning in the sales area. ➤ Analysis of the service provided. ➤ Measurement of the quality of the service provided. ➤ Retention of clients. ➤ Actions in the face of poor service attention. ➤ Flexibility that your organization has to deliver unexpected orders. 	Client orientation
<ul style="list-style-type: none"> ➤ Verbal communication (includes listening). ➤ Time and stress management. ➤ Management of individual decisions. ➤ Recognition, definition and resolution of problems. ➤ Motivation and influence on others. ➤ Delegation. ➤ Goal setting and vision creation. ➤ Management of work teams. ➤ Conflict management. ➤ Stress management. ➤ Self-knowledge. ➤ Motivation and influence in others. 	Leadership
<ul style="list-style-type: none"> ➤ Analysis of the performance of your internal processes. ➤ Assignment of tasks for the execution and fulfillment of the service itineraries. ➤ Programming of transport units assignment. ➤ Planning and estimation of routes and destinations. ➤ Assignment of alternative solutions for technical and organizational problems. ➤ Analysis of transport infrastructure. ➤ Use of Information and Communication Technologies (ICT). ➤ Promotion of systems and projects of internal processes. ➤ Comply with current safety rules and regulations regarding transportation. ➤ Planning and estimating routes and destinations. 	Internal process
<ul style="list-style-type: none"> ➤ Training, delegation and coordination of personnel. ➤ Development of programs aimed at increasing productivity in support staff. ➤ Supervision of the personnel in charge. ➤ Staff evaluation. ➤ Responsibility in making technical and organizational decisions. ➤ Assertive communication in the transmission of instructions. ➤ Promotion of work organization. ➤ Organizational culture. ➤ Promote the organization of work. ➤ Development of worker productivity. 	Human Resource

Source: Author's own elaboration

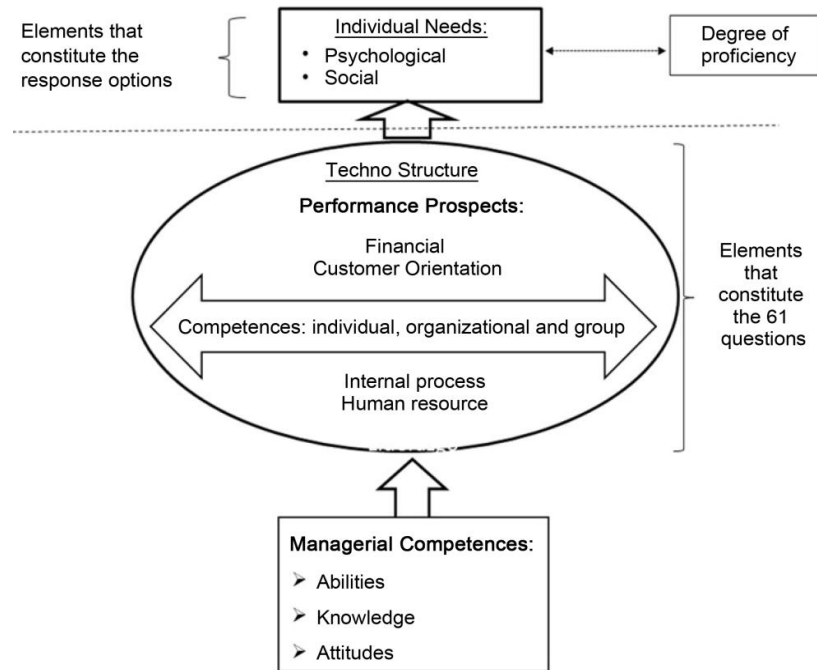


Fig. 2. Design of the field survey for the DPCAT
Author's own elaboration

The items were reviewed through the technique of consult with experts. In this case, we considered a group of three faculty researchers in the area of Industrial Engineering at the Autonomous University of the State of Hidalgo; six professors of the Logistics and Transportation Engineering area at the Metropolitan University of Pachuca; four DPCAT entrepreneurs in the metropolitan area of the state of Hidalgo, as well as ten specialists from the Scientific Committee of the International Congress in Logistics and Supply Chain (Congreso Internacional de Logística y Cadena de Suministro (CiLOG), [41]). After that, a pre-piloting of the questionnaire was carried out to validate the instrument in twelve companies in the zone of influence (Metropolitan Area of Hidalgo). After that, the reliability of the instrument was analyzed throughout the coefficient Cronbach's Alpha obtaining 0.873.

The limits of the study were set as the Metropolitan Zone of the State of Hidalgo (ZMEH), which is organized by the municipalities and zones surrounding Pachuca, Tulancingo, and Tula de Allende (Tovar, 2011, Cruz, Ortega and Figueroa, [3]).

Table 6. Number of companies per municipality in the metropolitan area of the state of Hidalgo

Municipality	Number of companies
Tulancingo De Bravo	19
Pachuca De Soto	15
Tizayuca	6
Atotonilco De Tula	6
Tepeji Del Río De Ocampo	5
Tula De Allende	4
Mineral De La Reforma	3
Tlahuelilpan	3
Atitalaquia	1

Note. Adapted from: INEGI (2016) Entidad Federativa, anual, Producto Interno Bruto por Entidad Federativa Variación porcentual anual, 2016. Retrieved from: <http://www.beta.inegi.org.mx/app/mapa/denu/default.aspx>

Sixty DPCAT organizations registered in the database of the National Institute of Statistics, Geography and Information Technology (INEGI) [42] were analyzed (Table 6).

4. RESULTS

The analysis of variance (ANOVA) was performed through the software MINITAB 15 to determine the hypothesis's decision-making tendency. According to the ANOVA analysis, DPCAT organizations showed a tendency to make decisions of 0.06 in the interaction with managerial competencies and organizational performance, which allowed the acceptance of the hypothesis with a 95% confidence level, as shown in Table 7.

Table 7. Comparative table between managerial competencies, performance and their interaction

Source	Degrees of freedom	Sum square	Mean value	Value	Table
Managerial competencies	1	0.00008	0.0000830	0.00	0.966
Performance	4	0.16741	0.0418536	0.94	0.447
Interaction of both variables	4	0.01104	0.0027599	0.06	0.993
Error	90	4.02711	0.0447456		
Total	99	4.20564			

Source: Author's own elaboration

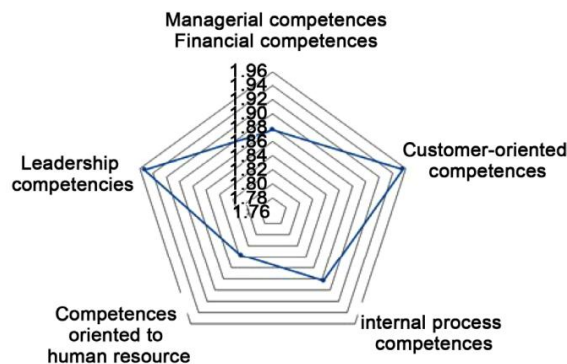
The analysis of the variables indicates a more significant development of the dimensions of leadership ($\bar{X} = 1.94$) and performance towards the client ($\bar{X} = 1.92$) in the managerial performance variable; while of the variable managerial competencies, the leadership competencies ($\bar{X} = 1.96$) and the competence of the client orientation ($\bar{X} = 1.96$) were higher. Thus, we corroborated the existence of an interaction between managerial competencies and performance (Fig. 3).

Among competencies and performance, we observed a Pearson's moderate correlation of 0.423; this is because each organization establishes a set of priorities and, this highlights that the techno organizational structure is not planned and is only built according to the needs and priorities of the moment, according to the intentions and will of the manager.

Thus, the link between competencies and performance is related to the context of each organization because the needs of customers (capacity requirements, rates, quotations, market management, cargo mobilization, guarantees, termination of contracts and orders of service) modify the objectives, ends, and organizational goals and, provoke structural redesigns from the content of positions to the communication, retro evaluation, and evaluation of their results (performance).

With the expected performance, we observed that this is not established based on the "Psychological" and "Sociological" approaches and does not allow the identification of individual needs of the managers and their interference in the techno-structural scheme of the organization.

The following graphics show the analysis among variables.



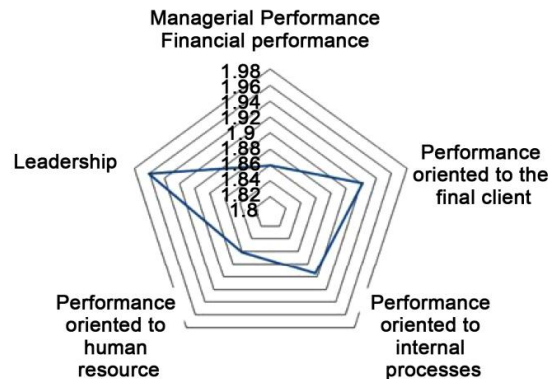


Fig. 3. Comparative analysis between managerial skills and performance
Source: Author's own elaboration

Thus, despite that the manager has a compendium of competencies and is the bearer of cognitive thinking, he/she does not design or develop the strategies that allow his team to achieve the delegated goals and objectives.

The results shown above allow reorienting the need to build an organizational redesign based on the human aspects (individual needs) and the existent organizational technostructure, which must be based on the organization's context and guide the installation of managerial competencies compliance with organizational goals and objectives.

To this end, the need to develop the theoretical foundation of a Human Techno Structural Model (HTSM) of managerial competencies is established, which has as purpose, to make changes from techno-structural modifications with a human approach and, whose purpose is the achievement of the objectives, through the linking of managerial competencies and performance.

5. PROPOSAL

The theoretical foundation of the Human-Techno-Structural Model (HTSM) relies on the need to standardize the adjustments and readjustments of each DPCAT organization's managerial competencies based on the performance needs (Fig. 4).

The HTSM displays a core formed by five fundamental pillars that constitute the model's central infrastructure (standardization), which are: 1). Leadership, 2). Diagnosis of competencies, 3). Installation of competencies, 4) Development of competencies and, 5) Enhancement of competencies.

Phase 1. Leadership

The reason for a change of each organization requires exercising leadership based on the contextualization of the environment, due to the direct interference it has with the types of managerial skills in relation to the actions of the manager through the performance arranged in the target group and goals to be made. The development of three skill groups is proposed:

- **Conceptual skill:** Once the need of the DPCAT organization has been defined; it must identify the group of skills that will allow the vision to be accomplished; for this purpose, it must determine the type of techno organizational structure that favors the integration and capacity of the organization, integrating a vision group and organizational through cognitive vision.
- **Human Skill:** Links individual needs, which encourage the own motivations of the manager; oriented as well to psychological and sociological factors, through interpersonal and self-management styles.

- **Technical Skill:** It is oriented to cover the expectations and needs related to the regulations of the client through the technical knowledge of transportation, types of cargo, units, local, state, and national regulations, among others.

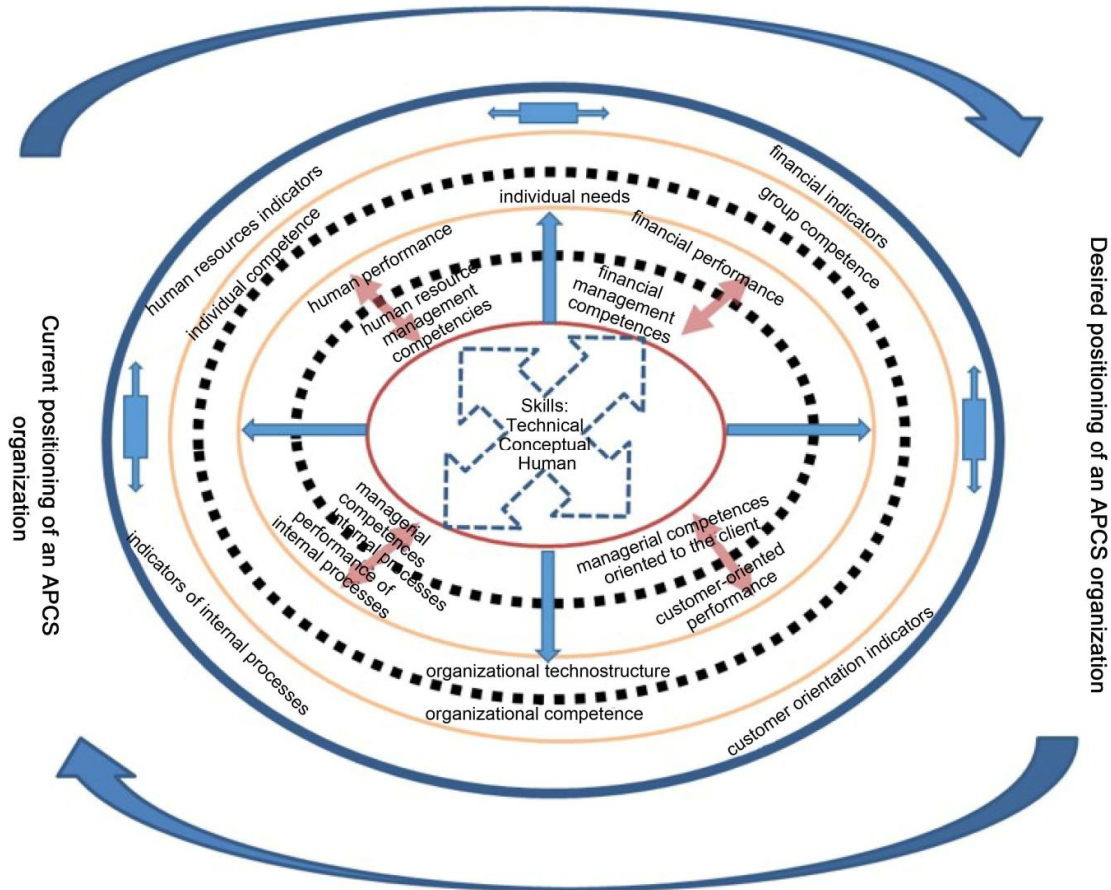


Fig. 4. Human techno-structural model of managerial competencies
Source: Author's own elaboration

Phase 2. Diagnostic for the development of competencies

The development and analysis of the diagnosis are located in a contextual, technical, and human framework, coming out from, first of all, the skills that respond to the needs of managerial competencies; they are adhered to by reason of the strategic planning of each organization, giving rise as a second element to the expected performance, thus establishing that the type of expected performance will be the one that guides the characterization of managerial competencies. The following points are suggested as the minimums to work in its preparation:

- 1) Develop strategic planning oriented to the competencies of the DPCAT sector and aligned with the mission, vision, and organizational values.
- 2) Develop a diagnostic process of environmental analysis, which allows identifying the reality of the organization of the DPCAT through internal and external analysis, emphasizing economic, social, political, and technological issues as well as competition, customers, market niche, value chain, among others.
- 3) Preparation of the management skills needs to be installed; through a ranking matrix that identifies the types and times planned to install the group of managerial competencies and the way to measure and feedback the expected performance.

- 4) Prepare a strategic map that describes the type of managerial competence to be installed; installation time, mediation f results, feedback, enhancement, and corrective actions.

Thus, a minimum of processes oriented to the development of managerial competencies in the diagnostic phase that respond to the type of expected performance must also be established as follows:

- 1) Develop strategic objectives related to strategic organizational planning with the needs of management skills to be installed under the financial items, internal processes, client orientation, and human resources.
- 2) Establish the scope of the objectives, the resources allocated and the performance planned in the HTSM, as well as the assignment of a responsible person and the scheduling of the activities, considering the position profile of the manager, in relation to the expected performance.
- 3) Implement actions to identify, install, develop and evaluate the performance of the manager to increase the probability of achieving the objectives.
- 4) Design the training processes sequenced, measurable and coherent to the objectives described above, thereby allowing the compliance of the services offered.

Phase 3. Installation for the development of competencies

The installation of managerial competencies establishes a process in which the individual needs of the manager and the techno-structural context are integrated through the reconditioning of the psychological and sociological aspects in relation to the individual, group, and organizational competencies.

For this activity, the installation phase groups and guides the managerial competencies related to the technical knowledge of the DPCAT, with the individual needs and the organizational behavior; under a process of techno-structural reconditioning, by installing the grouping of managerial competencies foreseen in the diagnostic phase and, which is oriented towards the "human behavior system," in relation to both levels: sociological (groups and relationships among them) and psychological, (individuals and relationships between individuals), which are established as the individual, group and organizational competencies.

This provision establishes the way to install the set of managerial competencies, as well as the necessary arrangements and the possible readjustments to the HTSM after the diagnostic plan.

The essential requirements for the installation process of managerial competencies, which must be considered:

- 1) Establish a position profile that allows to approve the attitudes and aptitudes of the manager towards the fulfillment of the performance of his work team and that of his organization.
- 2) Install an evaluable induction process based on the attitude and aptitude shown in that period of time.
- 3) Develop the internal rules applicable to the evaluation process of the set of managerial competencies through their performance.
- 4) Install the managerial competencies to be developed through a diagnosis of needs, observing "the human behavior system", under the technical, sociological and psychological approaches.
- 5) Install a program for the development of individual, group and organizational competencies, in order to sensitize the manager based on his individual needs and the techno-structural plan.
- 6) Install an incentive system in relation to compliance with performance in the financial perspective, internal process, client orientation and human resources.

The reliability and validity of the work indicators should be determined and provided when the performance of the managerial competencies is monitored to verify the conformity of the services.

The organization must have an instrument that develops managerial competencies, which must:

- 1) Install feedback circles to reference the expected performance in relation to installed competencies.
- 2) Develop the rules that allow follow-up of corrective actions.
- 3) Install a process of information, communication, evaluation and feedback of the manager's performance.
- 4) Install a process for redesigning organizational structures and content of workloads.

Regarding the protection of information for the development of competencies, it is suggested that the organization safeguards the applicable documented information as:

- 1) The accreditation and certification of installed management skills.
- 2) The update and/or modification of the performance indicators.
- 3) Diagnosis of training needs programmed for each manager.
- 4) The records of the results obtained from the performance and the relation of the competencies installed and that are about to be installed through a chronogram.
- 5) The reliability and validity of the work indicators, when the performance of the managerial competencies is monitored or verifies the conformity of the products and/or services.

As well, the training entities for the development of management skills should be based on:

- 1) Internal providers (knowledge acquired through experience, lessons learned from failures and success stories), endorsed by the organization.
- 2) External providers (international and national certifiers, official standards).

Phase 4. Development for managerial competencies

The development phase allows linking the idealist vision of "where the organization wants to be" in relation to the "realistic vision" of the perception and understanding of current conditions and limitations in order to minimize the risk of developing actions aimed at not established performance. This strategy allows to follow up on the efforts and actions for the completion of the established performances through the implementation of sequential and results-oriented tactics.

This development establishes that personal changes (directive) and interference in group changes (organization) are accompanied by a cognitive and experiential process that ensures the self-sustaining of the HTSM in the organization. Therefore, the organization must use tools that control the design and development of the HTSM to ensure:

- 1) Analyze the planned results.
- 2) Evaluate the design and development of the HTSM.
- 3) Implement activities that develop the performance of managers and that these are consistent with the evaluation processes and with the fulfillment of the position profile of the manager.
- 4) Evaluate the planned operations oriented to solve the problems detected of non-compliance with HTSM.

Phase 5. Enhancement for the development of managerial competencies

This phase allows generating systemic reconditioning through planned changes, identifying the external and internal changes originated by the environment that surrounds the organization, thus consolidating the competency standardization process.

One of its functions is to develop a process that allows modifying and feedback the future projections of organizational planning, in a new diagnostic phase, through corrections, replacement of indicators, as well as the alignment of executive position profiles. So, there is a need for documentation of the managerial competencies in order to generate evidence of:

- 1) Deviations, nonconformities and indicators not reached, presented during the evaluation process of the immediate HTSM to the new strategic planning.
- 2) Structure a set of corrective actions to restructure the new HTSM.

In case of deviations, nonconformities, and indicators not reached in the empowerment phase, the organization must make decisions and actions, such as:

- 1) Analyze and determine the possible causes to eliminate the deviation, non-conformity, and indicators not reached that may affect the organization.
- 2) Take the necessary actions to resolve the deviation, disagreement, and indicator not reached.
- 3) Evaluate these decisions to corroborate their effectiveness.
- 4) Assess the risks and opportunities to keep management skills up to date
- 5) Implement the necessary changes for the improvement of management skills, the organization, and its managers.

The organization must establish and select opportunities for improvement and, in order to carry out the tasks necessary to achieve the objectives of the new HTSM, it must:

- 1) Identify through a systemic reconditioning compliance and performance satisfaction projected by the immediate previous HTSM and, as well as consider future needs, and perspectives.
- 2) Implement actions that help to prevent, correct and reduce negative impacts.

So, the organization may generate the following changes, if the result shown in the previous HTSM by the manager is not as expected:

- 1) Reformulate the performance measurement criteria (indicators).
- 2) Exclusion or suspension of work of the manager.

The company must carry out a measurement and analysis of its executives based on the development of their competencies, which should include:

- 1) The degree of satisfaction of the final customer.
- 2) The conformity of the products and/or services.
- 3) The effectiveness of competencies in the process.
- 4) The degree of satisfaction of the goal.
- 5) The effectiveness of the actions to face the risks and opportunities of the organization.
- 6) The degree of satisfaction of the individual needs of the manager.

Also, the organization must carry out internal audits in periods agreed by the organization itself, in order to obtain information on the executive's performance in accordance with:

- 1) The indicators of strategic planning.
- 2) The requirements of the certifications to which the organization has been submitted.
- 3) Degree of satisfaction of the performance indicators.
- 4) Degree of installation of managerial competencies based on job profile.
- 5) Degree of job satisfaction of the manager.

6. LIMITS OF THE PROPOSED MODEL

The limits to the proposed model are structured from the identification of the purpose of strategic planning in each organization because the organization itself establishes the relevance of environmental topics of an endogenous and exogenous nature that are relevant to its organizational purpose and aligned through the phases of leadership, diagnosis, installation, development, and enhancement. All of them are at the level of competencies and managerial performances.

The points that denote the limits to the proposed model are the following:

- 1) The skills and managerial competencies are delimited by reason of the orientation to the expected result.
- 2) The “how” and “must” of the HTSM establish limits because they are set up by a set of minimums to be established, respecting the orientation of each organization based on its organizational purpose.
- 3) The requirements of managerial skills to be installed within the HTSM of a manager (in functions and/or new incomer) are oriented to the characterization of the competencies to work by reason of the classification of its area of influence.
- 4) The readjustments and reinstallations of competencies and managerial performances are guided by the organization itself in order to achieve the strategic planning.
- 5) Expected performances should be established on the basis of the “Psychological” and “Sociological” approaches in order to sensitize the installation process (human nature in the model) and facilitate the establishment of managerial competencies aimed at the expected performance.
- 6) These how and must can establish features desirable or specific to each organization, which are defined by the characteristics of the performances identified by each organization. Another element that detonates limits to the proposed model is established by developing the processes that allow modifying and feedback on future projections in organizational strategic planning, through the HTSM cycles, in the enhancement phase.

Likewise, the HTSM is limited by the understanding of the external and internal context when identifying the contextual skills of the leadership phase, due to the ambiguity that may exist for each organization, delimiting the desirable characteristics, which are linked to the limitations each organization could have, at the time of carrying out the proposed HTSM.

7. CONCLUSIONS

The diagnosis made to the managerial competencies of the DPCAT sector allowed us to identify that managerial competencies impact performance positively. However, the degree of inference is in accordance with the degree of standardization under a methodological process that reorients managerial competencies according to the desired performance in an organization.

It was also identified that each organization grouped a set of competencies for the needs of the organizations and individual managers. However, although managerial skills are part of management skills, these opinions are oriented to organizational needs based on a vision of the organization. The integration of the theoretical foundation of a human-techno-structural model is based on systemic modifications oriented to the integration of managerial competencies and their performance. This implies structuring the changes through planning and reconditioning of the HTSM, through adjustments and readjustments made to the managerial competencies, turning the manager into the carrier of cognitive thinking orienting to the achievement of the delegated goals and objectives.

However, the requirements of management competencies within the HTSM of a manager (in functions and/or a new one) are oriented to the characteristic of the competencies to work, a reason for the classification of the zone of influence of the same organization.

In this way, the approach of standardization allows monitoring the results obtained, readjustments, and reinstallations of managerial competencies and their performance, in order to achieve the strategic planning of an organization.

This development establishes that personal changes (directive) and interference in group changes are accompanied by a cognitive and experiential process that ensures the self-sustaining of HTSM in the organization.

Thus, the systemic reconditioning is based on planned changes, consolidating the process of standardization of competencies, allowing modifications and feedback in future reconditioning from a

new phase of diagnosis and/or through corrections, the substitution of indicators, as well as an alignment of executive position profiles, giving it a dynamic characterization.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Jiménez JE, Jiménez J. Logística del autotransporte de carga: Estrategias de gestión, (en línea) Querétaro, México; 2016.
Available:<http://imt.mx/archivos/Publicaciones/PublicacionTecnica/pt483.pdf>
2. World Economic Forum. The Global Competitiveness Report 2015-2016; 2016.
Available:http://www3.weforum.org/docs/gcr/2015-2016/Global_Competitiveness_Report_2015-2016.pdf
3. Cruz E, Ortega RAO, Figueroa H. Marco contextual de un modelo humano tecno-estructural de competencias directas para el autotransporte de carga. Universidad Politécnica de Guanajuato. 2015;22-42.
4. CONOCER. Estándares de competencia; 2016.
Available:<http://www.conocer.gob.mx/>
5. OSCL. Habilidades y competencias del siglo XXI para los aprendices del nuevo milenio en los países de la OCDE; 2016.
Available:http://recursostic.educacion.es/blogs/europa/media/blogs/europa/informes/Habilidades_y_competencias_siglo21_OCDE.pdf
6. Ortega RAO. Inteligencia Directiva. Aplicaciones prácticas en la función de dirección organizacional. Grupo Editorial Patria, México. 2012;21-36.
7. Tovar E. Zonas metropolitanas en el estado de Hidalgo y cooperación intermunicipal. Argumentos. 2011;24:155-177.
Available:http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0187-57952011000200007
8. Petrick J, Scherer R, Brodzinski J, Quinn A. Global leadership skills and reputational capital: Intangible resources for sustainable competitive advantage; 1999.
9. Locke E. The ideas of Frederick W. Taylor: An evaluation. University of Maryland, College Park; 1982.
10. McClelland DC. Testing for competence rather than intelligence. American Psychologist. 1973;28:1-14.
DOI: <https://doi.org/10.1037/h0034092>
11. Prahalad CK, Bettis R. The dominant logic: Retrospective and extensión. Strategic Management Journal. 1995;16:5-14.
DOI: <https://doi.org/10.1002/smj.4250160104>
12. Porter M. Estrategia Competitiva. Técnicas para el análisis de los sectores. Industriales y de competencia. México D.F., México; 1999.
13. Boyatzis R. The competent manager. Wiley & Sons, New York; 2002.
14. Quinn RE, Faerman SR, Thompson MP, Mcgrath MR. Becoming a master manager. Wiley & Sons, New York; 1990.
15. Arnold J, MckenzieDavey K. Self-ratings and supervisor-ratings of graduate employee's competencies during early career. Journal of Occupational and Organizational Psychology. 1992;65:235-250.
16. Olabarrieta JC. Vino viejo en nuevo envase? Training & Development Digest. 1998;10:92-95.
17. Vargas F. Aplicación del enfoque de competencia laboral en la Fábrica Nacional de Papel de Uruguay; 2000.
Available:http://www.oitinterfor.org/sites/default/files/file_articulo/fanap.pdf
18. Valencia. La importancia del talento en la Gestión Logística; 2012.
Available:<http://www.logisticamx.enfasis.com/articulos/63565-la-importancia-del-talento-la-gestion-logistica>

19. Mercado J, del Moral E, Jiménez J. Diseño de cuadro de mando integral aplicado a la integración del transporte en la cadena de suministros (la quinta Perspectiva del balance scorecard); 2011.
20. Kaplan R, Norton D. Cuadro de Mando Integral. Edición Gestión 2000 S.A., Barcelona. 2001;213-305.
21. Ballou HR. Logística. Administración de la cadena de suministro. Quinta edición, Pearson Educación, México. 2004;250-350.
22. Bartunek JM, Balogun J, Haga B. Teniendo en cuenta el cambio planificado de nuevo: Estirar las intervenciones de grupos grandes estratégicamente, emocionalmente, y de manera significativa. *The Academy of Management*, Briar-cliff Manor. 2011;67-89.
23. Mertens L. Competencia laboral: Sistemas, surgimiento y modelos. Cinterfor/Oit, Montevideo; 1997.
Available:<http://www.cinterfor.org.uy/publicMcClelland>
24. APICS. Administra el riesgo dentro de una cadena de suministro; 2016.
Available:<http://apics.org.mx/wp-content/uploads/2016/05/RIESGO-5.pdf>
25. Blunt A, Bennett D, Clark B, Taylor-Green L, Singh P. Human resources professional competency framework; 2014.
Available:<https://www.hrpa.ca/>
26. ONET Online. Summary Report for: 11-307.01 Transportation Management; 2016.
Available:<http://www.onetonline.org/link/summary/11-3071.01>
27. ChileValora. Comisión Sistema Nacional de Certificación de Competencias Laborales; 2016.
Available:<http://www.chilevalora.cl/>
28. Inside Careers. Skills & training: Skills required for logistic & transport; 2016.
Available:<http://www.insidecareers.co.uk/career-advice/skills-required-for-logistics-transport/#sthash.DiiOMXqe.dpuf>
29. Servicio Nacional de la Industria SENAI. Portal da Industria; 2016.
Available:<http://www.portaldaindustria.com.br/senai/>
30. Levy-Leboyer C. Evaluación del Personal. Díaz de Santos, Madrid; 1997.
31. Jensen B. Simplicity—The new comparative advantage. Perseus Publishing, Cambridge. 2000;117.
32. Spencer LM, Spencer S. Competence at work: Models for superior performance. John Wiley and Sons, Nueva York; 1993.
33. Hernández R. Metodología de la investigación. 4ta Edición, McGraw-Hill, México; 2005.
34. Torres Z, Navarro J. Conceptos y principios fundamentales de Epistemología y de Metodología. IIEE, Universidad Michoacana de San Nicolás de Hidalgo, México; 2007.
35. Naghi M. Metodología de la investigación. Limusa, México. 2010;250-289.
36. Hamel G, Prahalad CK. Compitiendo por el futuro. Estrategia comercial para crear los mercados del mañana. Editorial Ariel, S.A., Barcelona; 1995.
37. Schein EH. Career dynamics: Matching individual and organizational needs. Addison-Wesley Publishing Company, Boston; 1978.
38. Barrow JC. Las variables de Liderazgo: Una revisión conceptual, *the Academy of Management*. AOM, *The Academy of Management Review*. 1977;231-251.
39. McClelland DC. Introduction. In: Spencer, L.M. and Spencer, S.M., Eds., *Competence at Work: Models for Superior Performance*, John Wiley and Sons, New York. 1993;11.
40. Whetten, Cameron. Desarrollo de habilidades directivas. University of Michigan, Editorial Pearson, México DF, México; 2005.
41. Congreso Internacional de Logística y Cadena de Suministro (CiLOG). CILOG 2015 para promover la reflexión e intercambio de ideas sobre nuevos modelos de operación logística, SCT; 2015.
Available:<http://www.sct.gob.mx/despliega-noticias/articulo/cilog-2015-para-promover-la-reflexion-e-intercambio-de-ideas-sobre-nuevos-modelos-de-operacion-log/>
42. INEGI. Entidad Federativa, Anual, Producto Interno Bruto por Entidad Federativa Variación Porcentual Anual; 2016.
Available:<http://www.beta.inegi.org.mx/app/mapa/denue/default.aspx>

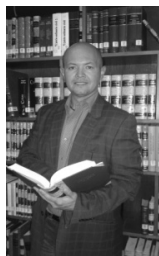
Biography of author(s)



Eduardo Cruz Aidana

The Metropolitan Polytechnic University of Hidalgo, Tolcayuca, Mexico.

He achieved degree Doctor of Industrial Engineering Sciences from the Autonomous University of the State of Hidalgo. He studied the master's degree in Quality and Productivity Systems from the Monterrey Institute of Technology and Higher Education, he is an Industrial Engineer from the Technological Institute of Pachuca, He has experience in the development of managerial skills in the area of project management and change management through the development and implementation of a quality and production system, as well as in developing skills for decision-making and knowledge about problems and pressures faced by a company in the operational area, as well as its interdependence with the other areas of the organization and development of communication and negotiation skills with clients, suppliers, the workforce and other administrative areas. He Published 5 research paper in reputed Journal. He has been a professor for more than 11 at the Universidad Politécnica Metropolitana de Hidalgo, has held managerial positions in national and transnational companies, has the desirable profile of the Faculty Improvement Program granted by the SEP, has been an administrative consultant registered with the STPS for more than 6 years, is a graduate teacher registered with the Secretary of Public Education in Hidalgo, has the certification of Significant Learning in Higher and Higher Education by CONOCER.



Antonio Oswaldo Ortega Reyes

Institute of Basic Sciences and Engineering, Engineering Academic Area, Autonomous University of Hidalgo, Pachuca, Mexico.

Research and Academic Experience: Organizational systems. Organization development, managerial intelligence, organization diagnosis, work diseases, organizational culture, scientific consulting.

Research Area: Organization development and managerial strategies

Number of Published papers: 53

Special Award: Best PhD. Research Project al Polytechnic National Institute, Mexico (2010). Best oral presentation IEEE 17th.Conference. Best paper in Systems Division 14th. ACACIA Conference. Best presentation 5th. International Conference on Innovation. Universidad de Valencia, España.

Any other remarkable point(s): Member of the Mexican Research and Innovation System (SNI).



Jaime Garnica González

Institute of Basic Sciences and Engineering, Engineering Academic Area, Autonomous University of Hidalgo, Pachuca, Mexico.

Research and Academic Experience: Research professor

Research Area: Analysis, design and optimization of sociotechnical systems

Number of Published papers: 130

Special Award: Three times recognized by the World Hosin Kwonbub Federation for technological contributions made

Any other remarkable point(s): Member of the National Research System (SNI) in Mexico



Eva Selene Hernández Gress

Institute of Basic Sciences and Engineering, Engineering Academic Area, Autonomous University of Hidalgo, Pachuca, Mexico.

Research and Academic Experience:

- a) Director of Bachelor, MsC and PhD Thesis
- b) Guidance to more than 100 students
- c) Research Professor at Tec de Monterrey Campus Hidalgo- August 2020 to the date
- d) Responsible for the Teaching Function of the Institute of Basic Sciences and Engineering Autonomous University of Hidalgo – (June 2018 -December 2019)
- e) Coordinator of MSc in Industrial Engineering Autonomous University of Hidalgo (2011-2013)
- f) Research Professor Autonomous University of the State of Hidalgo- (2009-2019)

Research Area: 10+ years of experience assisting and *overseeing research projects involving classic combinatorial industrial engineering problems.*

Number of Published papers: More than 40 articles published solving Industrial Engineering combinatorial problems such as Facility Layout Problem, Replacement Problem, Job shop Scheduling Problem, Traveling Salesmen Problem with Mathematical Programming. Cases of study in industries using simulations and data sciences.

Special Award:

- a) Best average of graduate students (Tec de Monterrey, State of Mexico Campus September-2005).
- b) Desirable Profile PRODEP (Teacher Improvement Program, Ministry of Public Education, 2009-2019)
- c) Designation as a National Researcher: Candidate (National Council of Science and Technology: 2014-2018)
- d) Designation National Researcher: Level I (National Council of Science and Technology: 2018-2020).
- e) Designation as a National Researcher: Level II (National Council of Science and Technology: 2020-2024)
- f) Excellent Oral Presentation (2017 6th International Conference on Industrial Technology and Management, Clare College, Cambridge United Kingdom)

Any other remarkable point(s):

Paper Reviewer:

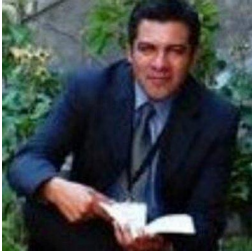
Dyna, España, 2015,201,2020

Academic Peer Evaluator:

- a) PRODEP strengthening program evaluator (Teacher Improvement Program, Ministry of Public Education, 2012, 2013, 2019)
- b) Posgraduate program evaluator Candidate (National Council of Science and Technology: 2016, 2019, 2020)

Projects:

Development of the Bamboowall Product, C, National Council of Science and Technology registration number 230740, \$50,000.00 USD, 2016-2017.



Carlos Robles Acosta

Ecatepec University Center, Autonomous University of the State of Mexico, Ecatepec, Mexico.

Research and Academic Experience: Organizational culture, family enterprises, change and organization development

Research Area: Family business

Number of Published papers: 32

Special Award: Best paper at Management Conference UNAM 2014

Any other remarkable point(s): Member of the Mexican System of Research and Innovation (SNI)



Octavio Castillo Acosta

Institute of Basic Sciences and Engineering, Engineering Academic Area, Autonomous University of Hidalgo, Pachuca, Mexico.

Research and Academic Experience: Planning systems, systems thinking, systems engineering.

Research Area: Organization structures

Number of Published papers: 9



Hector Rivera Gómez

Academic Area of Engineering, Autonomous University of Hidalgo, Mexico.

Research and Academic Experience: Professor in the Autonomous University of Hidalgo since 2014 in the area of Industrial Engineering

Research Area: His research interest includes performance analysis, simulation and control of production systems, and dynamic programming in hybrid (discrete and continuous state)

Number of Published papers: 49 papers, considering publications in journals and international conferences

Special Award: Scholarship for Ph.D. studies in Canada

Any other remarkable point(s): He is a member of SNI, the National System of Researchers of Mexico, researcher level 1 and also he is member of the SMIO, the Mexican Society of Operational Research



Oscar Montaña Arango
Autonomous University of the State of Hidalgo, Mexico.

Research and Academic Experience:

Doctor of Engineering in the area of Planning Systems from the National Autonomous University of Mexico.
With experience in the industry in national and transnational companies, in areas of quality, planning, projects and operation.
In consulting advising companies and projects in areas of strategic planning and quality.
In the academy as a professor in bachelor's, master's and doctorate, in subjects of the following areas: systems approach, planning, quality, projects and supply chains.
In the research I have participated in the development of projects, articles, book chapters and books, at the international and national levels related to planning, supply chains and application of the systems approach, as well as a lecturer in different forums. I currently belong to the National System of Researchers in my country.

Research Area: Systems approach, analysis and diagnosis.

Number of Published papers: 30

Special Award: National Research System



José Ramon Corona Armenta
Universidad Autónoma del Estado de Hidalgo, Mexico.

He did Civil Engineering from Instituto Tecnológico de Pachuca, (Mexico, 1993), Master on Engineering, in Operations Research, from Universidad Nacional Autónoma de México (U.N.A.M., Mexico (1996) and a PhD on Industrial Systems Engineering, from Institut National Polytechnique de Lorraine (I.N.P.L., France, 2005). Presently, He is a Professor and Researcher in Universidad Autónoma del Estado de Hidalgo, Mexico, since 2005. He has published More than 50 papers. He is member of the National System of Researchers of Mexico (S.N.I.), and PRODEP Professor-researcher, since 2007. Previous Job: He worked like a Specialist on Hydraulic (Water resources) in Comisión Nacional del Agua, Mexico (1993-2001). His research Interest include Technological Innovation, Planning, Feasibility of Projects, Simulation, Sustainable Development, Foresight. Domains of Research: Technological Innovation, Systems Science, Multicriteria Decision Analysis He associated with these Scientific Societies: Asociación Mexicana de Hidráulica (AMH), Academia Mexicana de la Ciencia de Sistemas (AMCS), Red Internacional de Investigadores en Competitividad (RIICO).



Mariana Marcelino Aranda

Instituto Politécnico Nacional- UPIICSA, Mexico.

Research and Academic Experience: Research professor at the Unidad Profesional Interdisciplinaria de Ingeniería y Ciencias Sociales y Administrativas, Instituto Politécnico Nacional

Research Area: Family Business Management, Sustainability, Business Ecosystems and Educative Technology

Number of Published papers: 27

Special Award:

Lazaro Cardenas Medal, Doctoral Level, in Social Sciences Area - IPN.
Member of *Research National System* of Mexico, Level 1st - CONACYT

© Copyright (2021): Author(s). The licensee is the publisher (B P International).

DISCLAIMER

This chapter is an extended version of the article published by the same author(s) in the following journal.
American Journal of Industrial and Business Management, 8: 1073-1092, 2018.