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Strategic factors in the context of project management: Management perspectives

Factores estratégicos en el contexto de la gestion de proyectos: Perspectivas gerenciales

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Content

ABSTRACT:
The objective of this study was to determine which factors are present in the efficient integral management of industrial projects, from the perspective of the management team. The research was developed as a case study of a private consulting firm for the public sector. The methodology was based on the qualitative and quantitative approach. It is concluded that the factors related to the category strategy, social security and prevention participate in the process of project management.
Keywords: company, management, strategy, processes, factors

RESUMEN:
El objetivo de este estudio fue determinar, cuáles factores estan presentes en la dirección integral eficiente de proyectos industriales, desde la perspectiva del equipo gerencia. La investigación se desarrolló como un caso de estudio de una empresa privada de consultoría para el sector público. La metodología se basó en el enfoque cualitativo y cuantitativo. Se concluye que los factores relacionados con la categoria estrategia, la seguridad social y los de prevención participan en el proceso de gestión de los proyectos.
Palabras clave: empresa, gestión, estrategia, procesos, factores.

1. Introduction

The global and local problems in the management of industrial projects are developed between the optimal execution of its internal processes and its connection with public and private scenarios. In this sense, project managers have focused on recognizing the complexity of the implementation of industrial projects in the public and private sectors (Cristóbal, 2017), in a context of crossed differences between decision making and the scope of their goals. Therefore, the elements of the design of the facilities and their implications for industrial safety must be managed in each design phase as a whole and

complex system (Aneziris, Nivolianitou, Konstandinidou, Mavridis, & Plot, 2016) and consider the inclusion of mechanisms of control to mitigate accidents (Chmiel, Laurent, & Hansez, 2017). In the context of project management, we find that in every phase of definition and implementation of an industrial project, the variables of organization, planning and control and financial variables are present in a connected way to achieve the goals and objectives defined (Radujković & Sjekavica, 2017). However, there are other factors, defined from the point of view of the manager and his team that are part of a complex network of information in the decision making process. A management team with the right skills and a broad vision that considers the impact of the factors associated with the operation will represent a guarantee for the successful closing of the projects.

In this sense, nowadays project management has shown extraordinary progress in the simplification of tasks, from small to large corporations (Diez Mauricio, 2015), from the delegation of responsibilities to a trained and motivated staff, which has led to the successful application of projects, in factors related to planning, management control, social security aspects, quality and the development of managerial skills (Lombana, Cabeza, Castrillón, & Zapata, 2014). Therefore, the general approach of each strategy will achieve the expected results and project management is responsible for articulating all these elements and transforming them into competitive advantages (Mir & Pinnington, 2014).

This situation has promoted Project Management systems and their approaches by processes and strategic intelligence to be increasingly more sequential and measurable in order to obtain successful results (Aguirre, 2015). Other conclusions describe how planning allows this strategic consolidation in the areas of general management (Mora-Riapira, Vera-Colina, & Melgarejo-Molina, 2015). Although business strategies have been projected within the execution of projects, as a means of achieving success within uncertainty; the decision making and the accomplishment of objectives of the managerial groups is decisive (Noguera Hidalgo, Barbosa Ramírez, & Castro Ríos, 2014).

In this sense, the management and project teams have adopted different methodologies to optimize the execution times of the projects and reach to their successful completion (Izmailov, Korneva, & Kozhemiakin, 2016). Certainly, the adoption of new methodologies and practices have notably improved the different gaps that delay the completion of industrial projects considered as complex (Wirkus, 2016) and, in this scenario, the active and integrated participation of the teams of managers and project leaders contribute to the achievement of the objectives (Demirkesen & Ozorhon, 2017) and, it is here where the setting of strategic factors differentiate from the setting of traditional ones, based on the contexts of the classical strategy, the social elements and safety guidelines, which have given result in increasing the performance of project management. These factors, elaborated from a managerial perspective, improve these goals of project management (Obradović, Kostić, & Mitrović, 2016).

This research was carried out in the consulting company responsible for managing the construction project of industrial plants in the public sector. The objective of this study was to determine which factors are present in the efficient integral management of industrial projects, from the perspective of the management team, made up of managers and project leaders.

The methodology and approach are qualitative and quantitative, of the exploratory and descriptive type. The results obtained are coded and doubly crossed from the analysis units with soft computing methodology and the 2- tuple techniques (Martínez & Herrera, 2012), to validate the linguistic result. It is concluded that the optimal direction of project management depends on the factors related to the strategy, the social support of employees and the prevention of accidents.

2. Methodology

2.1. Study design and type of participants

This research was developed in one of the contractor companies that executes its work and management in projects for the oil sector: Petroleo de Venezuela. The objective of the research was to provide information related to the factors present in the strategic management of the projects from the perspective of the management team. The investigation was classified as a case study, exploratory and descriptive. Intentional sampling was applied; the sample was 6 project managers with more than 15 years of experience, and 6 discipline leaders, who averaged more than 5 years of experience.

The information was gathered in three phases:

Phase 1, was based on the in-depth interview, and directed to the project managers. Interviews were carried out through a protocol and an interview guide. It was guaranteed to maintain the confidentiality of the information provided. The presentation of the evidence is shown directly in categories and their respective coding (Mays & Pope, 2000, Strauss & Corbin, 2002). These findings or key factors were used in the following phase.

Phase 2, all the codes (objects) found in phase one were selected and incorporated into a survey. The survey was applied to the group of project managers with the addition of a group of 6 discipline leaders selected from the following areas: Automation; Quality; Civil; Mechanics; Planning and Risks (safety). The survey was based on 13 and 12 questions respectively. The objective was to know the degree of preference of the codes found in phase 1, which were attributed to the object of the study.

Phase 3, the data was subjected to the techniques of word computing (CW) (Herrera, 2000) and the 2-tuple linguistic representation model (Martínez & Herrera, 2012). The BusinessMine software, module PROD Analysis, version 16.08, was used to calculate the data, see table 11-12, however the manual procedure is described below.

2.2. Reference of the model method of 2-tuple linguistic representation.

It is used when the uncertainty of the phenomenon studied is not probabilistic in nature. It uses linguistic information results in the modeling and management of uncertainty, eliminating ambiguities in the data and allowing precise results for decision making (Martínez & Herrera, 2012). It allows working with different preferences of the experts which represents a statistical robust model that allows modeling human tolerance to inaccuracies and vagueness to obtain reasonable and easy to manipulate solutions (Li, 2009). This computer model with words outperforms ordinal scale models and owner functions.

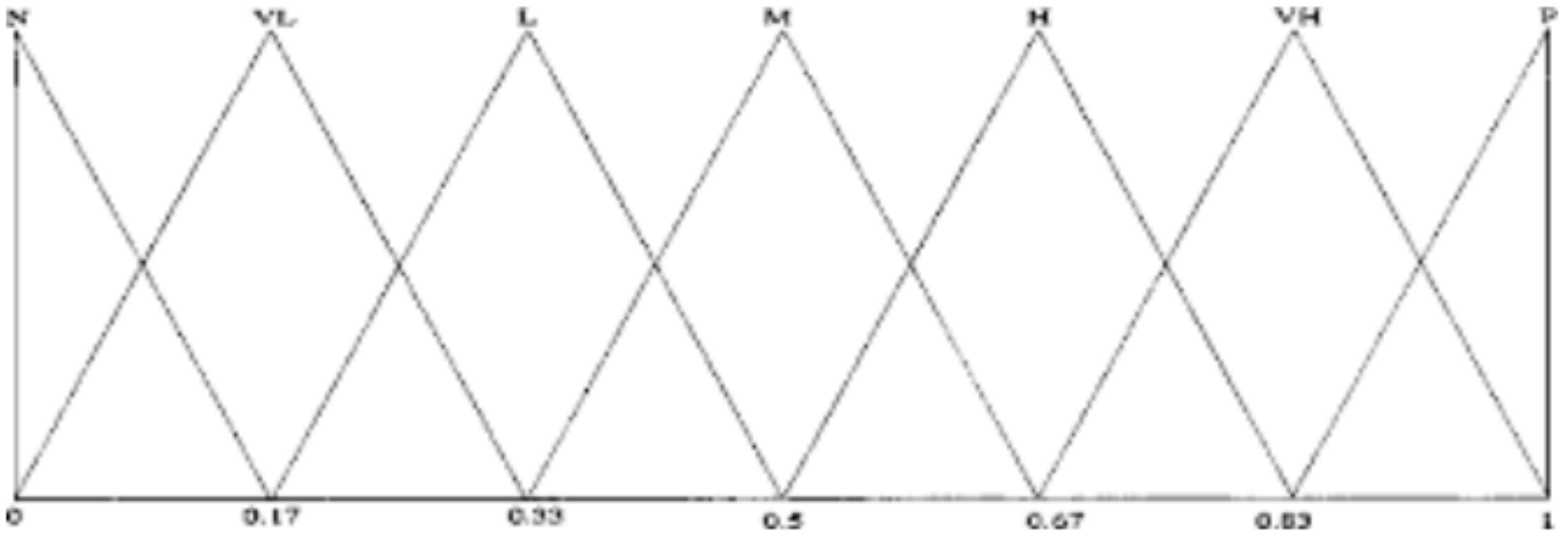
2.3. Data collection and analysis of results.

The findings of the interviews were subjected to a process of coding and triangulation of information (Mays & Pope, 2000). Findings were structured in tables of contents with two columns. Then we proceeded with the analysis of each code found. The quotes of the interviews and the data generated in the surveys were submitted to the application of the software. The results are presented in section four and they were translated from Spanish into English.

In this sense, in the application of the surveys, a set of linguistic terms was defined LBTL = {Very low, Low, Medium, High, Very high}, for the evaluation of the different factors by the experts (Carrasco, Blasco, & Herrera-Viedma, 2015). Note that these linguistic terms allow the respondent to express their preferences in natural language, bringing the instrument closer to their natural way of thinking and expressing themselves (Morente-Molinera, Pérez, Ureña, & Herrera-Viedma, 2015).

These terms will respond to the linguistic variable see fig. 1.

Figure 1
Linguistic variable for the evaluation of the preferences of the interested parties



The method is performed with the steps described below. However, the BusinessMine software, module PRODAnalysis, version 16.08 was used. We collected the preferences of the experts and we integrated them, using the 2-tuple method and based on the ordinal scale (Carrasco et al., 2015).

The mathematical notation that allowed the interpretation of the results of the model is briefly described.

Linguistic response will be formed by tuple (s, α) where s∈S is a linguistic term and α ∈[-0.5, 0.5) is a numerical value that represents a symbolic translation.

S = {s 0,..., sg} | S | = g + 1; set of ordinals which represent the fuzzy sets.

β= F (R) β ∈ [0, g], β result of an aggregation of terms

Equation 1. Operators that allow to convert the resulting value of the aggregation in response 2-tuples

$$\Delta : [0, g] \rightarrow S \times [-0.5, 0.5)$$

$$\Delta(\beta) = (s_i, \alpha), with \begin{cases} s_i & i = round(\beta) \\ \alpha = \beta - i & \alpha \in [-0.5, 0.5) \end{cases}$$

Equation 2. Inverse operator that allows recovering the value of β without loss of Information

$$\Delta^{-1} : S \times [-0.5, 0.5) \rightarrow [0, g]$$
$$\Delta^{-1}(s_i, \alpha) = i + \alpha = \beta$$

In this case it was decided to use the operator of the arithmetic mean of the ordinals as the following equation shows.

3. Results

The results and their discussion are shown in tables of content, see 1 to 9, and table 10 shows a summary of the codes obtained in each studied category.

3.1. Phase 1: Interviews directed to project managers.

3.1.1. Findings found in the category: Strategic Factors

The findings found in this category focus on strategies for organizational productivity, based on the need of establishing interconnected plans among contractors. This vision must be aligned with business productivity objectives (Ozguler, 2016). This answers the need for a complex management of the project and the management of big data (Franková, Drahošová, & Balco, 2016). It also highlights the formulation of strategies for

the optimization of long-term resources, project management expresses the generation of strategies that improve the profitability of the project (Izmailov et al., 2016), see table 1.

Table 1
Summary and selection of quotes exposed by the manager related to the defined category: Strategic factors.

SA Nº	Quotes exposed by social actor (SA 4-6)	Axial category/ Code
4	Project management must carry out an action plan with the contractor and subcontractors, in order to achieve the objectives set and evaluate the techniques and methods to be efficient (...)	Strategies for organizational productivity. coded as: SOP, SF-SA4
5	The strategies and controls must be established to achieve the project's progress plans and to manage the big data with technology (...)	Strategies for organizational productivity. coded as: SOP, SF-SA5
6	The profitability of the project will depend on a group with a high level of competence in each technical area and a group of managers that can integrate all the resources (...)	Strategies for organizational productivity. coded as: SOP, SF-SA6

A second finding focuses on understanding the difficulties and complexity that arise in the strategic direction of projects (Cristóbal, 2017), which is crucial for the execution and evaluation of an efficient strategic model that considers the financial components. It also highlights management commitments, aimed at achieving the objectives set (Pacheco, 2010), see Table 2.

Table 2
Summary and selection of quotes exposed by the manager (social actor 1, 2) related to the defined category: Strategic factors.

SA Nº	**Quotes exposed by social actor (SA 1-2)**	**Axial category/ Code**
1	It is the responsibility of the management or senior management, we must establish the operation and financial control policies in all phases of the project (...)	Strategic direction with deficiencies. coded as: SDD, SF-SA1
2	The managers must assume and evaluate the plans and, consider the complexity for the execution, due to adversed factors (...)	Strategic direction with deficiencies. coded: SDD, SF-SA1

A third important element, although less frequent in the response of the interviewees, is the Diversification of projects (Cristóbal et al., 2016). Project management considers diversification as an element to increase the company's financial benefits, defined by public policies, see table 3.

Table 3
Summary and selection of quote exposed by the manager (social actor 3) related to the defined category: Strategy factors.

SA Nº	Quote exposed by social actor (SA 3)	Axial category/ Code

3	The diversification of projects allows to improve the delivery of varied products, not only fuels, but also other derived products, but in an organized way, increasing the profits of the operation (...)	Diversity of Projects, codified as: DP, SF-SA3

3.1.2. Findings in the category: Social Factors.

The first important finding is related to the quality of life of the employee, from an integral context, which reduces adverse factors such as psychosocial risks (Leitão & Greiner, 2017), work accidents (Zwetsloot et al., 2017) and consider the benefits of labor law. These improve employees´ delivery time efficiency of the engineering products, see table 4

Table 4
Summary and selection of quotes exposed by the managers (social actors 1-3) related to the defined category: Social Factors.

SA Nº	Quotes exposed by social actor (SA 1-3)	Axial category/ Code
1	The implementation of industrial projects, generate in the selected spaces, greater social progress and indirect benefits to the inhabitants of the communities (...)	Social Benefits, coded as: SB, SF-SA1
2	The workers or employees benefit from the health protection plans together with their families, according to the current law, this improves the working environment and makes it a factor of influence in the execution of the project tasks (...)	Social Benefits coded as: SB, SF-SA2
3	The complexity of the projects: the success factors of support the successful development of project management are related to the quality of life, based on low psychosocial risk, few accidents, and medical insurance (...)	Social Benefits coded as: SB, SF-SA3

The second point related to social factors, expresses the importance of considering primary care groups to improve care in case of emergencies at work (Moyo, Zungu, Kgalamono, & Mwila, 2015). Another factor is formulated by industrial safety plans, which can be socialized with employees (Segarra Cañamares, Villena Escribano, González García, Romero Barriuso, & Rodríguez Sáiz, 2017) this will provide a greater probability of reducing work accidents in the phase of implementation. (See summary of the quotes presented by the interviewees, table 5.)

Table 5
Summary and selection of quotes exposed by the managers (social actor 5-6) related to the defined category: Social Factors.

SA Nº	Quotes exposed by social actor (SA 5-6)	Axial category/ Code
5	Industrial safety is a primary element that must be adopted in each phase of project management, managers must be responsible for directing their strategies considering the formation of primary care groups and safety plans (...)	Industrial Safety, codified as: IS, SF - S5
6	Project management and its managers must take the decision to incorporate industrial safety plans and establish socialization with all employees (...)	Industrial Safety, codified as: IS, SF - S5

Another result obtained for this category, and with the lowest frequency in the responses, is represented by the participation of employees, leaving evidence that management is in the search of agreements in consensus and friendly terms, see table 6.

Table 6
Summary and selection of quotes exposed by the manager (social actor 4) related to the defined category: Social Factors.

SA Nº	Quotes exposed by social actor (SA 4)	Axial category/ Code
4	The participation of employees in labor contract agreements, with the managers responsible of approving salary and other social benefits, must be done in consensus among all those involved (...)	Employees participation, codified as: EP, SF -AS4

3.1.3. Findings in the category: Prevention factors

The discussion considers how Risk Engineering focuses on on-site verification of safety conditions established with the application of safe construction methods and innovation processes (Lopes, Scavarda, Hofmeister, Thomé, & Vaccaro, 2017), and the application of verification methods and control of standardized procedures to reduce accidents (Forteza, Carretero-Gómez, & Sesé, 2017), see table 7.

Table 7
Summary and selection of quotes exposed by the manager (social actor 1-2) related to the defined category: Prevention factors.

SA Nº	Quotes exposed by social actor (SA 1-2)	Axial category/ Code
1	In industrial projects, risk engineering and safe design have an acceptance, in the verification of engineering designs, according to international standards (...)	Risk engineering, coded as: RE, PF-SA1
2	The implementation of checklists, allow to keep a control of the requirements for each discipline of design engineering, improving the economy by avoiding accidents (...)	Risk engineering coded as: RE, PF-SA2

The second result considered by the managers in this category, is focused on the systematic control in each phase of the project, with direct responsibility in the managers and their team (Díaz-De-Mera-Sanchez, Gónzalez-Gaya, Morales, & Rosales, 2015), see table 8.

Table 8
Summary and selection of quotes exposed by the manager (social actor 3-4) related to the defined category: Prevention factors.

SA Nº	Quotes exposed by social actor (SA 3-4)	Axial category/ Code
3	The prevention of industrial accidents must be implemented in all project phases, project management must establish control mechanisms (...)	Control Phase coded as: CP, PF -SA3
4	Each employee is responsible for developing their engineering discipline within	Control Phase coded

	the framework of industrial design standards and manuals (...)	as: CP, PF -SA4

Another result is focused on the training of the work groups, with technological tools applied to the management of risks, which allow reducing industrial risks (Perlman, Sacks, & Barak, 2014). This justifies the risk management process knowing the accident patterns (Moura, Beer, Patelli, Lewis, & Knoll, 2017), see table 9.

Table 09
Summary and selection of quotes exposed by the manager (social actor 5-6) related to the defined category: Prevention factors.

SA Nº	Quotes exposed by social actor (SA 5-6)	Axial category/ Code
5	The main factor in project management mentioned by managers and responsible leaders is to present a training plan in the different technical and technological areas (...)	Employees training, coded as: ET, PF - SA5
6	The technical areas are subjected to the rules of safe design and if we have employees and a team of coordinators or leaders of trained discipline, this will be a guarantee of success and prevention of accidents (...)	Employees training, coded as: ET, PF - SA6

Table 10
Summary of the codes formulated in the defined categories.

Category	Axial category/ Code	Code frequency, with n = 6
Strategic factors.	Strategies for organizational productivity.	03
	Strategic direction with deficiencies.	02
	Diversity of Projects.	01
Social factors.		
	Social benefits for the workers.	03
	Industrial Security.	02
	Participation of employees.	01
Prevention Factors		
	Risk engineering	02
	Control phase of safety regulations.	02
	Training of employees	02

3.2. Phase 2. Result and analysis of surveys

3.2.1. Processing: Survey of Project Managers

The results show the factors in order of importance and which are implicit in management and decision making, from the perspective of the project manager. We see five main factors with an added value of preference defined as "High" consensus among the respondents and an added value of preference defined as "High". These factors are: "Strategy for Organizational Productivity"; "Social benefits for the worker"; Industrial Safety (safety) "; "Phase of control of safety regulations (safety)", and "Employee training according to their discipline". This means that there is a high priority of these

factors to their implementation (they are the first option) in the general administration of the industrial project.

In second order of priority, with an added value of preference, defined as "Medium" consensus among the respondents and an added value of preference defined as "High", the factors obtained are: "Strategic management with deficiencies"; Application of risk engineering in all phases of the project "; "Contribution to the social and economic development of the country"; "Implications of environmental impact", and "Implementation of ISO quality system".

The "Medium" consensus is in the third place of preferences. Among the respondents and an added value of preference defined as: "Medium", are grouped other factors that, to a lesser extent, can be taken in the management of projects. These are: "Project Diversity"; "Participation of the employee in decision-making", and "Modernization of the road system close to work", see details in table 11.

Table 11

Code and its priority according to consensus and added value in project management: Perspectives of managers.

Codes	Very low	Low	Medium	High	Very high	Value added preference.	Consensus.
Strategies for organizational productivity.			1	2	3	High, 0.33	High, -0.12
Strategic direction with deficiencies.			2	2	2	High, 0	Medium, 0.091
Diversity of Projects.		1	2	2	1	Medium o, 0.5	Medium, 0.021
Social benefits for the workers.			1	2	3	High, 0.33	High, -0.12
Industrial Safety (safety).			1	3	2	High, 0.17	High,-0.093
Employees' participation in decision making.		1	2	2	1	Medium, 0.5	Medium, 0.021
Applications of risk engineering in all phases of the project.			2	2	2	High, 0	Medium, 0.091
Phase of control of safety regulations (safety)			1	3	2	High, 0.17	High, -0.093
Employees' training according to their discipline.			1	3	2	High, 0.17	High,-0.093

Contribution to the social and economic development of the country.		1	1	2	2	High, -0.17	Medium,-0.03
Implications of the environmental impact.			2	2	2	High, 0	Medium,0.09
Modernization of the road system close to the work.		1	2	2	1	Medium, 0.5	Medium, 0.021
Implementation of an ISO quality system.			2	2	2	High, 0	Medium, 0.091

3.2.2. Processing: Survey of Area Leaders (management team)

It is observed that there are factors of first order of importance, these will be those that are cataloged as: "Very High" consensus among the respondents and an added value of preference defined as "Very High". Particularly, the highly evaluated ones were: "Industrial Safety (safety)"; "Application of Risk Engineering in all phases of the project"; "Phase of control of safety regulations (safety)" and "Implications of environmental impact". These factors represent the main option considered for the strategic and operational management of the projects.

Secondly, is the "High" consensus among the respondents and an added value of preference defined as: "Very High", where the factors of "Strategic management with deficiencies" are grouped: "Diversity of Projects", and "Social benefits for the worker".

In third place of preference will be the "High" consensus among the respondents and an added value of preference defined as "High", other factors are grouped to a lesser degree, such as: "Strategy for Organizational Productivity"; "Employee training according to their discipline"; "Contribution to the social and economic development of the country", and "Modernization of the road system close to the work".

Fourth, preferably, the "Medium" consensus among the respondents and an added value of preference defined as: "High, is the last level of preference to be considered as a factor of influence in the management of the projects, that is," Participation of the employees in the decision making process", see table 12.

Table 12
Code and its priority according to consensus and added value in project management: Perspectives of the leaders of the management team.

Codes	Very low	Low	Medium	High	Very high	Value added preference.	Consensus.
Strategy for organizational productivity				4	2	High, 0.33	High, 0.14
Strategic direction with deficiencies.				1	5	Very high, -0.17	High, 0.063
Diversity of Projects.				2	4	Very high, -0.33	High, 0.014

Social benefits for the workers.				2	4	Very high, -0.33	High, 0.014
Industrial Safety (safety).					6	Very high, 0	Very high, 0
Participation of the employees in the decision making process.			2	1	3	High, 0.17	Medium,0.051
Application of risk engineering in all phases of the project.					6	Very high, 0	Very high,0
Phase of control of safety regulations (safety)					6	Very high, 0	Very high, 0
Employees training according to their discipline.				3	3	High, 0.5	High, 0
Contribution to the social and economic development of the country.			1	4	1	High, 0	High, -0.038
Implications of the environmental impact.					6	Very high, 0	Very high, 0
Modernization of the road system close to the work.				5	1	High, 0.17	High, 0.063

4. Limitations

This research is considered a case of business study, located at the managerial level, of the exploratory and descriptive type. This paper has been developed under a mixed methodological approach, with the support of the computing with words method (Herrera, 2000; Martínez & Herrera, 2012) to reduce the ambiguity of the answers. However, the results presented cannot be generalized as a standardized response for all the management teams that administer or manage projects. In this sense, these findings can serve as a reference for future investigations involved in the determination of key determinant factors that intervene in the integral strategic management of industrial projects, from the perspectives of the management teams.

5. Conclusions

This research allows the approach to the management of industrial projects, considering the dynamic environment, and the uncertainties, which are presented in their levels of strategy and operation. The complexity of the project requires the implementation of key factors to achieve optimal performance, measured by deadlines and the fulfillment of the

goals of the organization. Therefore, the adoption of management methods and a team of managers with high competences are adding other factors to the management of the project. This investigation, considered a case study of a company dedicated to the execution of projects with the participation and the integral action of the project managers, based on the consideration of key factors.

This research considers the seven key factors of greater consensus and value of preference correlated from the perspective of the management team: "Strategy for Organizational Productivity"; "Social benefits for the worker"; Industrial Safety (safety) "; "Phase of control of safety regulations (safety)"; "Employee training according to their discipline"; "Application of Risk Engineering in all phases of the project"; and "Implications of environmental impact". These factors are present in, at least, one category, defined as Strategic Factors; Social and Prevention and adjustment to the management process of the team of managers and leaders who want to fulfill their goals within the organization.

In this sense, it is concluded, based on the findings, that there is a correlated relationship in the answers obtained from the managers and leaders participating in the study. An important group of similar factors is highlighted in the managers and leaders or area coordinators and, from their perspective; they are a priority and form part of their context for decision making. Additionally, these factors are a complementary part in the execution of the project management model.

Finally, it leaves the formal basis for future research in the area of industrial project management, which is related to the implementation of factors that lead to the success of operations, from a complex context and the perspectives of the responsible managers.

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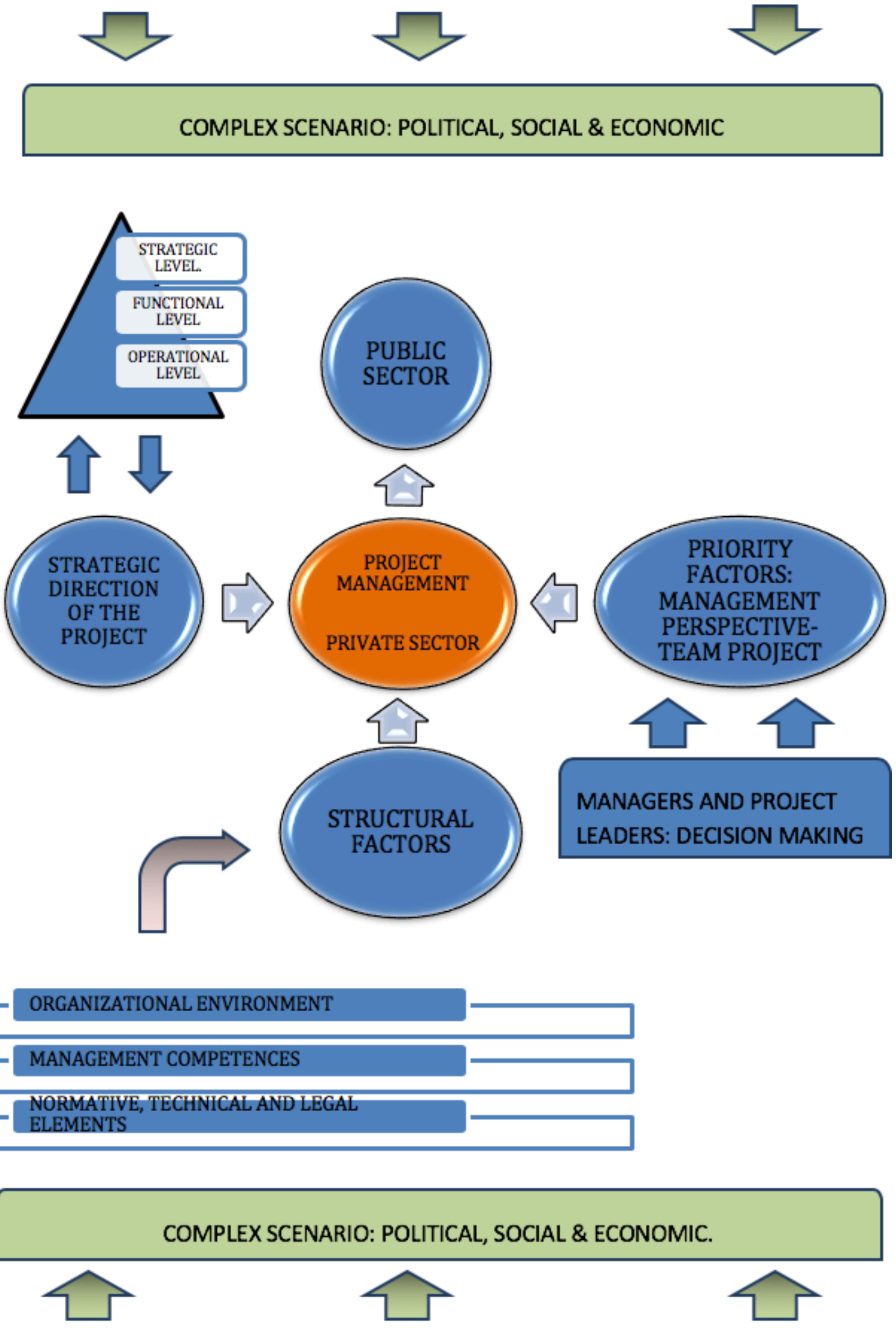
Annexes

Annexe 1

Abstract model. Interaction cycle of project management with key factors from the managerial perspective.



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