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**Construction sector's analysis in the supply and
demand of residential buildings around the business
management of Stakeholders**

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Abstract.

The global market immersed in an environment of economic and political uncertainty, where trade and industrial production showed signs of marked weakness. However, in developing countries like Colombia, with a moderate expected economic growth, attributed to the implementation of strategies aimed at creating jobs, building public infrastructure and services to meet the needs of their rapidly expanding and urbanizing populations. Consequently, this research analyzed the external phenomena that have impacted the Colombian economy on the housing supply and demand behavior of the construction sector. All the above, through the analysis of economic indicators, public policies, and stakeholder management around the use of tools, approaches, and methodologies established by different standards in project management along with the analysis of a business sample located in the city of Tunja. As mentioned above, it allowed the establishment of susceptibility to external economic phenomena and government policies in the construction sector. Those would enable the increased demand and boosts other areas of the economy through the effect of stakeholders in the supply and business capacities concerning its management, recognizing the expectations in the formulation and elaboration of projects in the current context. Nevertheless, companies related to the construction sector don't have adequate tools and personnel for this integral development, allowing to identify factors when evaluating business capacities around stakeholder management, contributing to generate new methodologies and instruments that enable increasing the success in construction projects.

Keywords: Colombia, Housing, Indicator, Management, Market, Project

1. Introduction

The global market immersed in environments of economic and political uncertainty, volatility and reduced commercial growth, where the intensification of trade tensions together



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with a slowdown in global investment and a decline in confidence continue beyond the forecasts(International Monetary Fund (IMF), 2019b), (World Bank Group, 2019a). These tighter financial conditions and the weakening of fiscal stimulus are the main drivers of the slowdown in economic growth, with trade and manufacturing showing signs of marked weakness (World Bank Group, 2019a). Consequently, the fall in industrial production, especially capital goods, was widespread. Although, accentuated in the advanced economies except for the United States. Variations are also related to the loss of optimism in the markets caused in part by trade tensions, which are related to inefficiencies in public spending. Nevertheless, economic growth expects to be moderate in developing countries like Latin America, slowly approaching +2% and stabilizing at 5% on average (International Monetary Fund (IMF), 2019b)



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Part of this sustained growth indicates early signs of recovery, due to the payment of public expenditure arrears, which allows for an increase in investment capacity to cushion housing loans and the boosting of economies based on the extraction of raw materials. The construction and trade sectors have predicted to contribute to one percentage point to GDP and expected to grow at about 3,9 percent per annum until 2030 (World Bank Group, 2019b). Therefore the (International Monetary Fund (IMF), 2019a) predicts that low-income developing countries and some emerging market economies will need to create jobs and improve public infrastructure as services to meet the needs of their rapidly expanding and urbanizing populations. These suggestions implemented in conjunction with the labor muscle provided by the construction sector. Where over the last decade, most of the growth came from emerging markets, while developed markets have not fully recovered their pre-crisis volumes (Asociación Nacional de Empresarios de Colombia (ANDI), 2019), (Hatzius et al., 2018).

Consequently, the construction sector allows the improvement of the quality of life of citizens through the production of new or renovated infrastructure. However, its scope limited by the value of sufficient demand, determined by the number of fixed assets. Part of capital is allocated by the public sector like an investment, according to its social functions supported by the private sector. Therefore, state investments will restrict the amount and type of civil works carried out; accordingly, the anticipation and knowledge of the external or internal effects on the economy and the sector will clarify their impact on social development. However, the complexity of variables about problems and needs of their collective approach, where methods are applied to support solutions, recognized and accepted by the stakeholders. Based on the assessment of identifiable patterns and phenomena that are understood, determines the degrees of opportunity that will allow adaptation to changes in the future (Velásquez & Sepúlveda, 2015), (Kamenetskii, 2013). Nevertheless, delays in schedules, cost overruns, and shortfalls to stakeholder expectations are recurrent. Affecting negatively and exceeding the cost; this is related to technical inefficiencies, the combination of work methodologies and transfers to provide services to stakeholders, where differences between the estimated and the caused in the project are between 28% and 30% more in a larger public construction project in the world (Ellis & Mice, 2019).

These suggestions implemented, in conjunction with the labor muscle, provided by construction and tangible products translated as the quality of life where the last decade, most of the growth came from markets in emerging countries (Asociación Nacional de Empresarios de Colombia (ANDI), 2019), (Hatzius et al., 2018). Based on the above, this research evaluated the economic impact on the construction sector, the performance of the housing sub-sector in Colombia and public policies concerning capacities, tools, and stakeholder management by describing the organizations and perceptions of managers in housing construction projects in the city of Tunja in the Republic of Colombia, identifying the capacities, tools, and management of stakeholders to project management criteria.



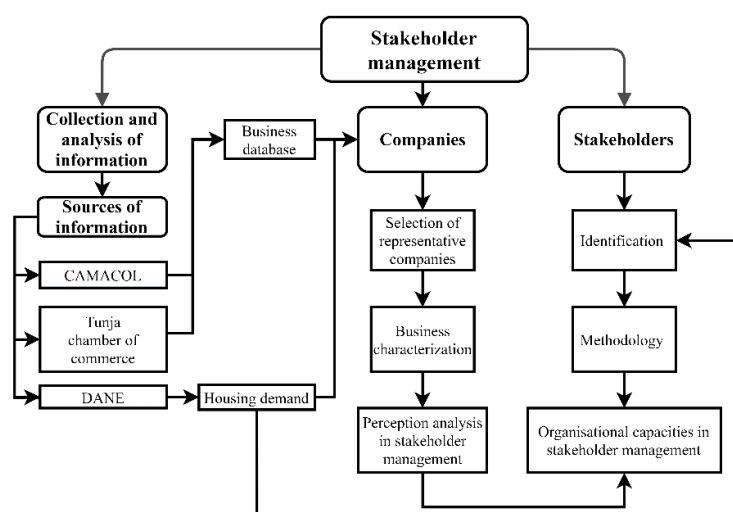
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2. Methodology

The demand for housing in the country and the city of Tunja was examined to carry out the identification and analysis of the impact on stakeholder management in construction projects. These to establish the overall effects of the economy and government policies, through information provided by the National Administrative Department of Statistics (DANE) and the National Planning Department (DNP); In parallel, the business characterization will be through the database of legally constituted companies provided by the Tunja Chamber of Commerce and the Colombian Chamber of Construction (CAMACOL), the latter as institutions in charge of exercising a public action in the commercial register of all companies and the construction sector respectively. Through descriptive statistical treatments, in summary, figure 1 presents the methodology used.

Figure 1: Diagram of the working methodology used



Source: Own elaboration

Jointly, a business sample dedicated to housing construction in the city of Tunja was evaluated employing a random selection and, subsequently, an evaluation of the business capacity and perceptions of instruments and management of stakeholders. The variables selected established through the research process carried out for the characterization of the construction sector in the city of Tunja by (Sarmiento-rojas, Medina Suárez, & Gutiérrez-junco, 2018) and the information obtained is ordered using descriptive statistical treatments.

3. Results and discussions

3.1 Analysis of the study area.

The study area corresponds to the city of Tunja, the capital of the department of Boyacá, located in the center of Colombia. It has a total area of 121.4 km² divided into rural and urban, concentrating in the last 92% of the population. It was evaluated by the community and housing



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census of 2018 by the DANE; it estimates 202.996 inhabitants in 2020. The population ages are reduced by less than ten years, an increase in the population over 40 years, and a concentration of the majority population between an age range of 18 and 30 years, who expects to drive the growing demand for housing. However, this growth may be relatively modest, given the particular characteristics of this population (Green & Lee, 2016).

3.2 Analysis of the demand in housing construction.

3.2.1 National analysis of demand in housing construction

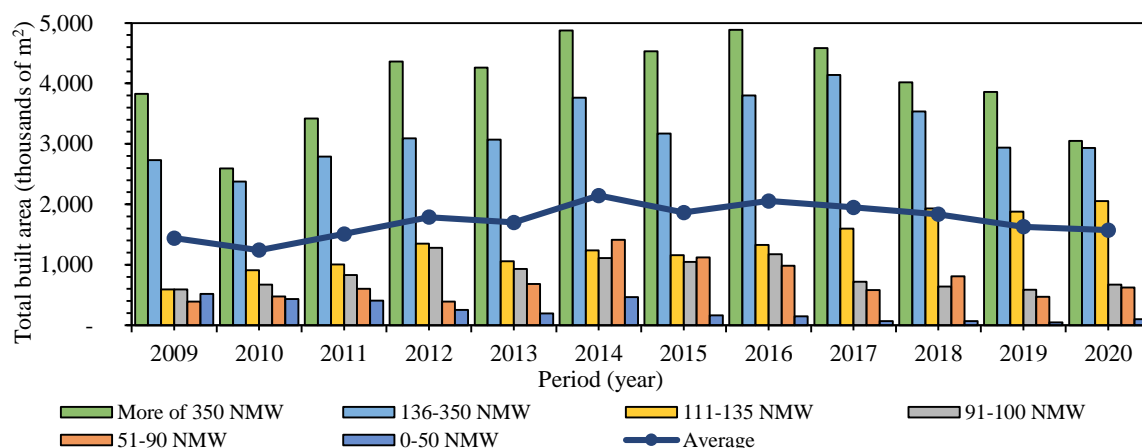
The adequate performance of the building construction sector is associated with the promotion of economic and social development, thanks to the capacity to generate employment, to the input of demand from other industrial sectors and to the construction of housing that improves the quality of life of citizens as a central activity in the social and economic development of the country, especially in countries such as Colombia, where there is a considerable housing deficit and it is common to generate policies that include budgetary allocations directly or through financial institutions (Córdova & Alberto, 2018), considering the economic exploitation by organizations; However, they should focus their efforts on the development and subsequent implementation of projects that involve the pressing needs of stakeholders (Project Management Institute, 2017), where the reduction in built area is consistent with the decline in demand for housing in the country, especially in those that do not receive state subsidies (No SIH) by 15% since 2016, which has dominated the market, reaching a share of 75% as shown in figure 2. The demand for non-SIH housing above 350 NMW and in the range of 136-350 NMW (National Minimum Wage, equivalent to US\$ 230) has decreased by 62% and 72%, respectively. However, the construction of Social Interest Housing (SIH) has grown by 55% in a price range of 111-135 NMW, and building permits for SIH reached an increase of 2,055,176 m², the highest growth in the last ten years. However, in SIH housing, with a price range between 91-110 NMW, its reduction has reached 50%. In the same way, with Priority Interest Housing (PIH), characterized by Law 1955 of 2019 with values below 90 NMW have reduced their market share in a range of 32% to 48% as a result of policies that seek to encourage supply in housing construction through Law 1607 of 2012. In this law, construction companies refund or compensation of the Value Added Tax (VAT) paid for the acquisition of materials for the construction of social and priority housing. Thus, generating market approaches in projects where companies and stakeholders find a higher remuneration of income and subsidy respectively by the State with the formulation and implementation of projects according to current market capacity.

Figure 2: Housing demand-built area discriminated by price range



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Source: Own elaboration with information of DANE.

The slowdown caused by macroeconomic events directly affects the housing market. Which has particular characteristics that differentiate it from most investment assets, considered as a mixed good that can be consumed and provide service flows for occupation and investment as a social purpose of the State and its preservation over time. Considering that these markets adjust through slow processes that involve considerable transaction costs in terms of search and negotiation (Duran Vanegas, 2016), (Glaeser & Nathanson, 2014), (Ortiz, Jiménez, & Cruz, 2019). Besides, housing concentrates most of the wealth of households. It has an essential impact on the growth of a large number of economies, and the performance of its market strongly linked to economic cycles. Therefore, the reduction of unsubsidized housing implicitly exposes the influence of investment demand on the market and the effect it can generate on the financial stability of the economy. Consequently, the reduction in demand for housing has an impact on global production in the construction sector, where public investment mitigated the decline in house by investing in social housing (SIH), differentiating the stakeholder approach to project formulation, which could be sustained and focused on SIH. Notwithstanding, despite the State investment, a decrease recorded in the area caused in housing construction, that explains almost in its entirety the behavior of the construction segment, presenting an annual reduction of 16.3%, where the demand in non-SIG housing causes 11%, that contrasts with the 12.5% growth in civil works (Investigaciones Económicas Corficolombiana, 2019). Notwithstanding, it stated that the growth rate of the Colombian economy is positively related to public expense in human capital and physical infrastructure (Ortiz et al., 2019).

3.2.2 Analysis of demand for construction in the city of Tunja

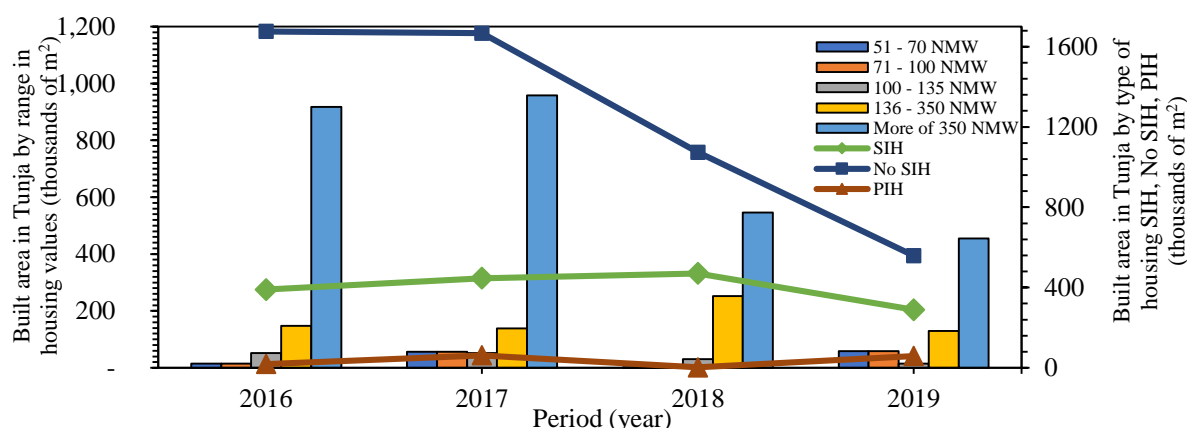
The demand for housing in the city of Tunja has reduced as a result of the macroeconomic effects, as it has the national territory. It was fluctuating according to the latest period of economic slowdown (Cámara Colombiana de la Construcción (CAMACOL), 2019). The phenomenon showed in Figure 3. The inbuilt reduction area since 2017 has been 57%, a gradual and almost constant decrease of approximately 57,000 m² per year, consistent with the decline in housing demand.



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Figure 3: Temporary analysis of the demand for housing construction in the city of Tunja



Source: Own elaboration with information of DANE.

SIH construction has grown by 14% at the municipal level and dominates the market in the department of Boyacá with 47%; likewise, at the national level, the SIH license of 1,757. 350 m² meant a growth of 25.4% in the total area approved for 2018, where the area approved for SIH was 33.7%, promoted mainly by the public sector; in contrast, non-SIH housing, despite dominating the market, has been reduced by 50% at the municipal level and 10% at the departmental level. Likewise, in the behavior of housing demand by ranges, a 32% reduction is observed in housing prices above 350 NMW and the range of 100-135 NMW up to 70.5% (2018); conversely, the demand for SIH in fields of (100-135 NMW) has increased by 48% mainly influenced by public policies.

3.3 Obtention and evaluation of business sample

Based on the number of companies related to the construction sector registered with the Chamber of Commerce of the city of Tunja corresponding to 202 companies (N) in the year 2018, using a confidence level of 95% (p) and a marginal error of 5% (q and e), the sample size calculated according to the following equation:

$$n = \frac{N \cdot Z_{\alpha}^2 \cdot p \cdot q}{e^2 \cdot (N - 1) + Z_{\alpha}^2 \cdot p \cdot q} \quad (1)$$

The result of the necessary representative sample with 96% confidence corresponds to 36 companies, chosen at random with the requirement to participate in at least one housing



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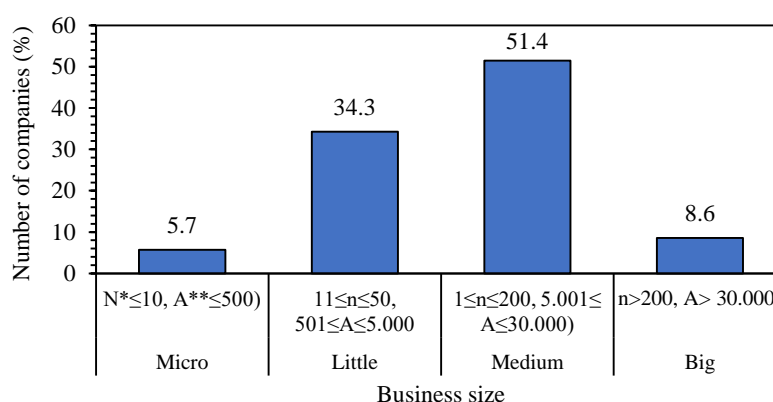
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construction project. The selected companies were then classified based on Law 905 of 2004, which establishes the size of the company according to the number of employees (n) and assets (A) in the current national minimum wage (SMN). Based on the above, the result of the necessary sample size with 96% confidence corresponds to 36 companies, chosen at random with the requirement to participate in at least one housing construction project. The selected companies were then classified based on Law 905 of 2004, which establishes the size of the company according to the number of employees (n) and assets (A) in the current national minimum wage (SMN). Figure 4 shows the percentage distribution of the sample of selected companies classified by size, where this classification by company is congruent with the Colombian business fabric, which is mostly of small and medium-sized companies, which represent 99.5% of the national business park (Franco Ángel, 2019).

Figure 4: Business classification by size



Source: Own elaboration

In the business characterization, small and medium-sized companies represent 83.4% of the companies analyzed in this research. Therefore, the role they play in this sector compared with the dynamics of other actors in the Colombian economy, which are critical to the development of the Colombian economy and are considered the mainstay of modern economics, it is vital to sustaining economic growth in the long term. This stimulates and stabilizes in times of recession, such as the one currently hitting the construction sector (Ardic, Mylenko, & Saltane, 2011), (Franco Ángel, 2019), (Varum & Rocha, 2013). This type of company has a flat structure, with less bureaucracy, procedures, and formal systems, which facilitates rapid decision making and responsiveness to the market (Usama, Fauziah, & Yusoff, 2018). However, these companies have weaknesses intrinsic to their size and scope. Principally due to the restricted management of capital, which reduces their competitiveness and limits their growth. This issue translates into limited access to financing sources, to new and more considerable resources and management capabilities; consequently, this type of company lacks many management skills in employees and stakeholders (Franco Ángel, 2019).



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3.4 Management capacities of the organizations. **ECONOMICS and ACCOUNTING**

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The complex and unstable nature of construction projects requires systematic approaches and appropriate skills in project managers, to get the best value from project outcomes. These include to stakeholders, considering a practical approach identifying needs and developing mutual relationships with the project, understanding the "invisible power" of stakeholders about organizational strategies to meet harmoniously with stakeholders (Srinivasan & Dhivya, 2019), (Mok, Shen, & Yang, 2015). Consequently, when assessing the quality of the manager and the work team, it will be possible to establish the performance in the management of the organization's stakeholders. Consequently, when assessing management capacities of the previously characterized business sample 77.7% of the respondents are managers or owners of the organization, declaring 75% to have transparent methodologies for staff selection. From them, 95% of the companies have a specific area to centralize the planning, execution, follow-up, and closing of the projects, facilitating and optimizing the planning and execution processes.

3.5 Management of organizations in collecting information

The construction sector is one of the most information-dependent industries (Senaratne & (Senaratne & Ruwanpura, 2016). Therefore, it is necessary to create management mechanisms with stakeholders to establish direct relationships with the organization; consequently, it is essential to address the interests and welfare of stakeholders under the objectives of the organization (Phillips, Freeman, & Wicks, 2016). Therefore, the collection of information allows mitigating the risks involved in the high number of change controls in conjunction with empirical processes, in conjunction with communication (Arteaga Ceballos, Barrera Pineda, & Chaparro Pedraza, 2013). Consequently, the organizations evaluated stated that they incorporated stakeholder information and project planning and initiation with investors in 94.4%, with suppliers 83.3%, with potential customers 97.2% and government agencies (100%); the latter are mandatory following the provisions of the country's internal laws. Having information from stakeholders mitigates the risks associated with uncertainties and the ability to process the data to establish a systematization in the use of requirements during project formulation and implementation (Fewings & Henjeweje, 2019), (Van Gunsteren, Binnekamp, & de Graaf, 2011); in contrast to the increased uncertainty, there is a more significant potential for deviations in project timing, budgets, and scope (Joslin & Müller, 2015), (Project Management Institute, 2017).

3.6 Tools for project management.

In the management of projects and organizations it is necessary to adopt and implement methodologies that generate greater dynamics between the areas of knowledge and the systematization of skills of tools and techniques to meet strategic objectives (Carvalho, 2014), (Pinzón & Remolina, 2017); consequently, the use of these tools was evaluated in the business sample, management and its combined use in project management as shown in Figure 5.

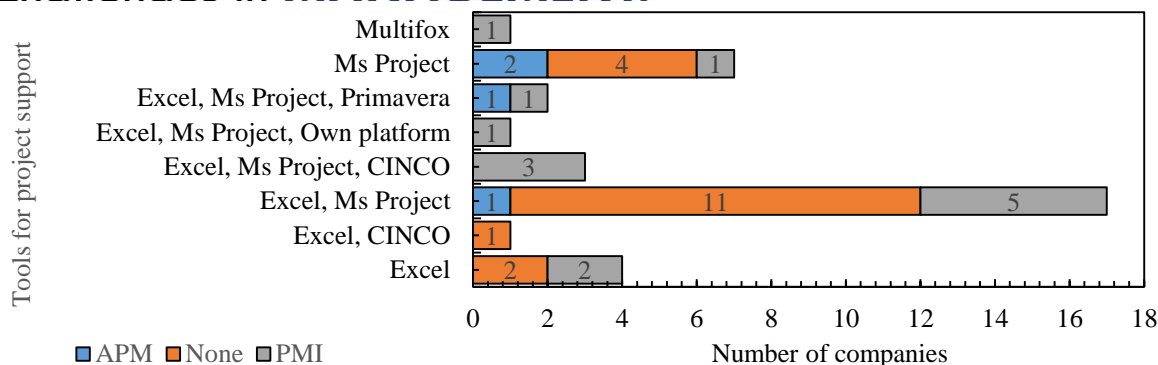
Figure 5: Business classification by size



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Source: Own elaboration

In the last decades, companies have increased the use of this type of tools together with project management to improve competitiveness, control complexity and reduce costs. Therefore, there is a relationship between optimization in project management, the formulation of computer tools and standards with the intention of formalizing methodologies, patterns or models; some, developed and disseminated by the Project Management Institute (PMI), Association for Project Management (APM), among others. The results express that half of the surveyed companies do not have processes or procedures aligned with any standard or methodology of project management. 39% use the guide PMBOK of the PMI and the minority with 11% with the standard APM. In conjunction, with the combination of technology platforms designed specifically for the follow-up and control of projects using combined generic software (78%), like Microsoft Excel and Project, useful in projects of low complexity, related to the size and scope of the small and medium companies. However, some tools of enormous range, as Primavera, CINCO, Multifox, and Proprietary Platforms, are used by a small number of companies (22%). A small number of organizations have database tools that allow you to collect and sort the documentation and information generated by projects (5%).

3.7 Socialization and communication of projects.

Communication in the project generation is not only conceived as an exchange of information because it is a determining factor in the success of projects (Petter & Nils, 2015). Therefore, poor communication encourages project failure and causes lower performance and more significant staff turnover, generating unnecessary costs and affecting the progress and quality of the project. In essence, effective communication builds a bridge between the various stakeholders involved in a project, connecting cultural and organizational backgrounds, levels of expertise, and multiple perspectives and interests in the implementation or outcome (Project Management Institute, 2017), (Senaratne & Ruwanpura, 2016). Consequently, in the project's development the progress and disposition of communication channels; the effectiveness in the transmission of information, and the mechanisms that allow the involvement and establishment gathering greater clarity the expectations of the stakeholders promote and reflect the performance and satisfaction that the organizations; as their stakeholders obtain from the



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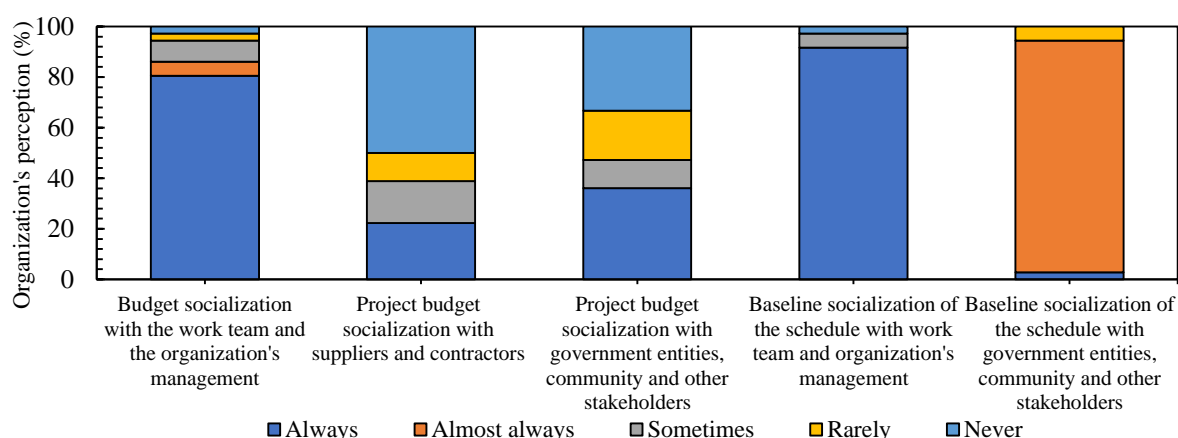
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execution of the projects (Jiang, Klein, Wu, & Liang, 2009), (Sarmiento-rojas et al., 2018), (Tengan & Aligabaca, 2017; Zafarani, 2014). Consequently, the result of evaluating this factor in the surveyed companies presented in Figure 6.

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The results show companies have difficulties in communication since 50% never socialize budgets with suppliers and contractors. Likewise, 33.3% never socialize the budget with the work team and management, and 19.4% rarely socialize this type of document, preventing greater efficiency in the development of the work schedule and dynamic communication channels with contractors and suppliers that allow management processes carried out under the activities developed in the project, (Project Management Institute, 2016).

Figure 6: Socialization of projects with stakeholders.



Source: Own elaboration

On the other hand, 91% of the companies carry out processes to socialize the schedule with the work team and the organization's management, and 59% with the project's suppliers and contractors; however, these tasks are mandatory and inherent to construction projects. The above exposes weaknesses in communication with stakeholders; in this, approaches address to identify the management relationships between team members, of this way, emphasizing mutual and harmonious cooperation of work between stakeholders and the contractor (Aichouni, Messaoudene, Al-Ghonamy, & Touahmia, 2014), (Srinivasan & Dhivya, 2019). Due to the inherent influence on the implementation of construction projects along with their expectations (Oppong, Chan, & Dansoh, 2017), which allows establishing the success of the project as a complement to the traditional determinants (cost, quality, and time).



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4. Conclusion **ECONOMICS and ACCOUNTING**

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The construction sector, by its versatile, rapidly volatile nature and susceptible to external economic phenomena and a nation's internal policies, especially in countries like Colombia, is subtilized as an economic indicator.

It also drives social development in times of crisis through the construction of housing as a social purpose of the State, generating employment, and promoting other sectors of the economy. Consequently, by identifying and linking stakeholders in the face of the restrictions of some housing markets and generational change, it makes it possible to formulate a differential approach to demand and supply, showing its effect on the housing market and affecting entrepreneurial capacities to its management. Therefore, stakeholders must be identified in the formulation and elaboration of projects, through the collection of information, inherent to construction projects, which allows for clarity and precision with the project's objectives, promoting the execution of resources and higher value for the organization. However, the companies related to the construction sector in the city of Tunja, do not have a set of tools and personnel suitable for the development and implementation of differential treatment of stakeholders together with difficulties to systematize and develop skills and abilities needed in an environment increasingly limited, wild, uncertain and competitive. Consequently, the identification of these factors allows the assessment of business capacities to provide adequate management concerning economic changes and demand, together with the capabilities of the construction sector.

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