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Strategic planning of technological innovation and the competitiveness of small Mexican enterprises

Planejamento estratégico de inovação tecnológica e competitividade de pequenas empresas Mexicanas

Planeación estratégica de la innovación tecnológica y la competitividad de empresas Mexicanas pequeñas

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Abstract
The process of technological innovation and its strategic planning (TISP) is a complex subject that small enterprises must tackle to achieve effective competitiveness (BC). Both subjects have several factors and actions that more of the small Mexican enterprises do not consider so they have low competitiveness. The objective of this research was to determine the relationship between the TISP and the Competitiveness of SMEs (BC), through the hypothetic-deductive method with a correlation scope, with the analysis of some factors such as the definition and composition of its technological platform, actions of change in it; the generation of capacities, their investment capacity, the agile response to environmental changes, and the analysis of the market and competitors, for the study variables. Throw a research instrument applied to 40 businesses in empirical research we find a 0.904 correlation factor so we propose a model that exhibits the variables and dimensions selected in this research.
Keywords: Strategic planning; Technological innovation; Technological platform; Market agility; SMEs and Business Competitiveness.

Resumo
O processo de inovação tecnológica e seu planejamento estratégico (PEIT) é uma questão muito complexa que as pequenas empresas devem enfrentar para alcançar uma competitividade efetiva (EC). Ambos os objetos de estudo possuem fatores e ações que a maioria das pequenas empresas mexicanas não considera em sua operação, por isso apresentam baixa competitividade. O objetivo desta pesquisa foi determinar a relação entre o PEIT e o CE das PMEs, por meio do método hipotético dedutivo para o âmbito correlacional entre estas variáveis e através da análise de fatores como a definição e composição da plataforma tecnológica, ações de mudança nas mesmas, investimento e geração de capacidades para inovação, a resposta ágil às mudanças e a análise do mercado e dos concorrentes dessas empresas. Através de um instrumento de pesquisa, aplicado a 40 empresas em uma pesquisa empírica, foi encontrado um fator de correlação de 0,904, então é proposto um modelo que mostra as variáveis e suas dimensões correspondentes selecionadas nesta pesquisa.
Palavras-chave: Planejamento estratégico; Inovação tecnológica; Plataforma tecnológica; Competitividade empresarial.

Resumen
El proceso de innovación tecnológica y su planeación estratégica (PEIT) es un tema muy complejo que las pequeñas empresas deben enfrentar para lograr una competitividad efectiva (CE). Ambos objetos de estudio tienen factores y

acciones que la mayoría de las empresas pequeñas mexicanas no consideran en su operación por lo que tienen una baja competitividad. El objetivo de esta investigación fue determinar la relación que existe entre la PEIT y la CE de PyMES, mediante el método hipotético deductivo para el alcance correlacional entre dichas variables y a través del análisis de factores como la definición y composición de la plataforma tecnológica, acciones de cambio en ellas, inversión y generación de capacidades para la innovación, la respuesta ágil a los cambios, y el análisis del mercado y los competidores de dichas empresas. A través de un instrumento de investigación, aplicado a 40 empresas en una investigación empírica, se encontró un factor de correlación de 0.904, por lo que se propone un modelo que muestra las variables y sus correspondientes dimensiones seleccionados en esta investigación.
Palabras clave: Planeación estratégica; Innovación tecnológica; Plataforma tecnológica; Competitividad empresarial.

1. Introduction

Companies, in different stages of global industrialization, have managed to distinguish themselves in the economy of their country by their size, degree of development, and market participation, based on the use of available resources whether local, regional, national, or global (Ministry of Economy, 2012). This, considering their business objectives and their environment, faces the number of competitors and the capabilities developed in their sector (Torres-Barreto et. al. 2018; Fong, et. al.,2017), to enter, remain, or dominate in a certain market those that take better advantage of their resources and capabilities reach the established objective. Most of the time, large companies have more competitive advantages than small or medium-sized because they have greater structure, economic resources, or other capacities. However, small and medium-sized enterprises (SMEs) have a large participation both in the number of jobs they generate and the percentage they contribute to the economy of the countries (INEGI, 2020; Rodriguez, 2001).

The technological process development is a subject that small enterprises must attack through strategic planning to have great competitiveness in their merchant. Both subjects are the matter of this research where there are several factors and elements to be considered in the analysis of the components of Strategic Planning (SP) and Competitiveness (COM-C) studied and applied in business organizations in the macro, but the same in their divisions, functions, or areas in which the company is structured. Thus, it is done in the area of production, financial, marketing, or human resources; However, in general and particular, the same relationships of the elements or factors permeate at the level being studied, arriving at a model that contemplates the same elements and the relationships between them. The study subjects were productive companies of Mexican goods and services where very little propensity to SP has been observed, especially on IT, (TISP), which has had an impact on a low BC in the levels they operate. To do this, SMEs must take actions such as those detected in this research, based on the proposed model with actions such as those proposed here.

Since the first model of strategic management in the 50's with Steiner and the successive models, some elements are the same, sometimes named differently. Some of these are turn or activity, vision, mission, opportunities and threats, strengths and weaknesses, long-term objectives, strategies, plans, budgets, tactics, and policies. (Torres, 2014; Hitt et al. 2008; Steiner, 1988; Mintzberg et al; 1997). EP models coincide in 3 distinctive stages: formulation of the strategy, stage of implementation, stage of control, and evaluation, in the different commercial environments. Steiner, E. establishes in his model 3 main parts which are premises, formulation of plans, implementation, and review, while David (2013) calls them strategy formulation, strategy implementation, and strategy evaluation. So, the objective of this research was to determine the relationship between the TISP and the Competitiveness of SMEs (BC) through the analysis of some factors such as the definition and composition of its technological platform, actions of change in it; the generation of capacities, their investment capacity, the agile response to environmental changes, and the analysis of the market and competitors, for the study variables.

To achieve sustained success, companies must consider the level of competitiveness (COM) where they are in the production system, goods and services produced to meet local, regional, national, or global needs (Varela, 2001; Galeana, et. al. 2019). In this paper, we consider two essential components or concepts: (1) competition and (2) COMPETITION, around

which (one small letter and the other with a capital letter) give a certain potential to companies, industries, and countries. The first refers to the number of competitors at different levels and the other to the capacities, skills, abilities, and knowledge possessed by productive organizations. To this concept are added different factors; for example, organizational performance whereby competitiveness is the ability of a country to produce a certain good or service in better conditions than other economies Haguenauer (1989), this being related to economic growth Medeiros et al. (2019).

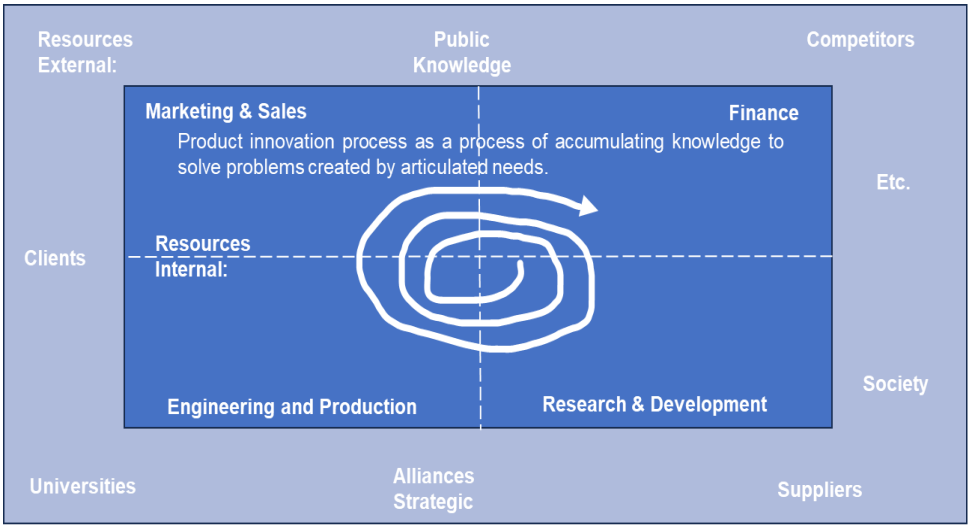
2. Frame of Reference

Within Strategic Planning (SP) and Competitiveness (COM) are elements and factors applied to the areas or divisions of an organization. In globalization, a determining factor is the knowledge of human talent creates competitive advantages for its survival or expansion. In SP, technology and its incorporation into the strategy of companies are key as it helps to be competitive, facilitating the creation of new products, services, processes, and systems, or improving existing ones. Therefore, it is necessary to identify the technologies that allow for achieving their objectives, carry out a detailed study on their status, and if it is necessary to acquire them or develop them with an adequate protection plan as one of their assets.

Innovation Technological concept (IT) is constantly evolving, the Organization for Economic Cooperation and Development (OECD, 1971) defines it as "the first application of science and technology in a new direction, followed by commercial success" (REDES, 1996). Hidalgo et. al. (2002) understands it as a process that should lead to the successful launch of new products or the commercial use of new technical processes; and for EUSTAT (2017) it is a new or improved good or service introduced to the market (product innovation) or the introduction of a new or improved process (EUSTAT, 2017). The progress of IT has occurred through its generations, from the first generation of technological push-through coupling to the fourth and fifth generation of research networks (Rotwell, 1994).

Currently, due to the complexity of developing products, a single company or corporation has to collaborate with others, through innovation systems and networks (Figure 1) where sophisticated electronic tools are used that increase the speed and efficiency of product development in an internal innovation system or from the outside through suppliers, customers and collaborators.

Figure 1 - Network Model Example.



Source: López et al. (2009, p.260).

Figure 1 shows that product development requires the interrelation of diverse areas as Marketing, Finance, Engineering and Production, Research and development, considering the internal resources of the organization. But also take in account the external medium actors as the competitors and clients, suppliers and others.

I.1 Strategic Planning for Technological Innovation (TISP)

Strategic Planning is fundamental in making decisions to carry out projects or activities in the present or future. One of the main keys to positioning oneself in the market and being competitive is innovation, not only focused on the development of a new product but also on market strategies, the acquisition of new technologies, knowledge of their use and application, as well as the analysis of potential customers who can be reached (BBVA, 2010). IT concept is related to organizational performance and their competitiveness requires a long-term vision in issues such as market behavior, its trend, or the technological, economic, or financial information generated that benefit the company. Therefore, the company must establish a strategic technological planning (TISP) integrated into the global strategy.

Figure 2 shows the global strategy must be articulated with the specific strategies of the organization; the technological strategy (SP) must be integrated with all areas to obtain the desired result. SP should extend to research and development, design, manufacturing, marketing, sales, distribution, customer service, information systems, human resources, finance, purchasing, customers, suppliers, public relations, and general administration, linked from abroad with technological development agents (Maya, 2012).

Figure 2 - Global and company-specific strategy.

Source: Hidalgo (1999).

TISP must consider the life cycle of the technology and its various stages that derive in the strategic plan to define in which parts of the processes it will be introduced and how it will impact product innovation, its impact on the market, customer response, and the profits they will produce (Ikujiro, 1990). On the other hand, it is necessary to carry out an internal analysis of the mission, the vision, and the strategic objectives. Also, it is essential the external analysis, defining both the operational and market strategy with a focus on innovation to establish the SP for, finally, have R&D projects to obtain new products according to the needs of customers (Sánchez & Alvarez, 2005).

The TI process is a series of phases that begins with the conception of an idea, either to create something new or generate some change, the creation of a prototype, then the experimentation (prototype testing) and its implementation in the

market. Likewise, it has two approaches: as a process with several phases for transforming one idea into a novel product in the market, a novel manufacturing process or new methods of organization or marketing are incorporated (Trott, 2005 in Aponte-Figueroa, 2016; Pineda & Torres, 2020).

For Pavitt (2003), innovation is something integral that goes beyond technology and requires the collaboration of many areas to achieve success, where all people contribute to the application of new ideas. Three principles are necessary to foster innovation: 1. Hire for innovation, hiring people who can think logically and immediately; 2. create a culture of innovation that helps create, protect, and develop innovation through a critical role in human resources; 3. Ensure that operational strategies are developed through their interactions with employees, customers, partners, vendors, suppliers, and consultants. On the other hand, IT requires the implementation of knowledge, techniques, tools, and resources (economic, time, human, and infrastructure) that allow a successful exit to the market, having the necessary resources for the development of the idea, and technological innovation is accepted.

Determinants of the Technological Innovation Strategy (TISD)

Innovation is based on having a better quality of life, therefore, the integration of the various technologies that have emerged has come to modify the ways of working and force companies to have a greater willingness to change and introduce innovations in their production processes that allow them to maintain their competitiveness in the market and offer better quality products. SP must consider different factors that affect innovation, both favorably and those that restrict growth. Table 1 shows some of the impacts of different variables and factors that motivate or encourage innovation, or that condition it to carry it out (Foster, 1986).

Table 1 -Factors that motivate or inhibit technological innovation.

Variable	Motivating factor of innovation	Conditioning factor of Innovation
Economic	Costs of innovation Incentive systems Financing	High costs and low profitability Reduced incentives for IT Reduced financing by stock markets
Cultural & Education	Personal attitudes and beliefs Attitude towards innovation Company vision and policy Orientation towards science and technology Technical training of staff Access to information	Conditioning innovation by owners to growth No or under participation of qualified personnel or advisors Limited knowledge and experience in products and processes Limited staff education and training
Organizational	Organizational structure Business and administrative dynamism General communication channels	Limited organization inflexible for technology changes Command management and decision making only by managers or owners Limited internal and external communication
Infrastructure	Own technological infrastructure Use and quality of equipment Installed capacity Maintenance Programs and spare parts supply Technical support	Limited infrastructure of modern capital goods Low utilization of installed capacity Limited use of preventive and predictive maintenance Equipment that does not facilitate the work process

Source: Adapted from Foster (1986).

The factors that motivate or inhibit technological innovation are general for all companies, but depending on the product or process to change, replace, or modify, it will face particular factors. The principal factors considered in Table 1 are Economic, culture education, type of organization and infrastructure; in addition , there are others as the Government Policies with the Tax and Monetary incentives policies and Competitiveness with the innovation in the industrial sector and the dynamic national market.

Obstacles and Benefits since the TISP (OTISP and BTISP)

Technology innovation management (TIM) is a key component of strategic management (SM), which not only seeks to acquire technologies but also must manage them correctly to have the ability to apply and adapt them for the benefit of the company. A company that does not adapt to changes or variations in the market will surely become obsolete, lose market share and, in the worst case, disappear. In many companies, the elements of SM do not extend to all organizational activities and those externally linked to all agents of technological development (Fernandez et. al., 2019; Maya, 2012). TISP faces many obstacles to its achievement as organizational culture, lack of leadership, own talent, and financial resources (Pérez, 2021, Gijs van Wulfen en Sobejano, 2016) also mentions an unclear strategy that does not prioritize innovation, market needs, lack of resources, and fear of failure.

Barriers to TI include intrinsic and extrinsic factors such as lack of interest for the end users' customers not available at a fair price or they are unconvincing or under-perceived benefits. Others are the perceived irrelevance of the wide range of goods and services perceived by the consumer; and the value with acquisition costs (Monsalvez, 2017; Sepúlveda-Moreno et. al., 2021).

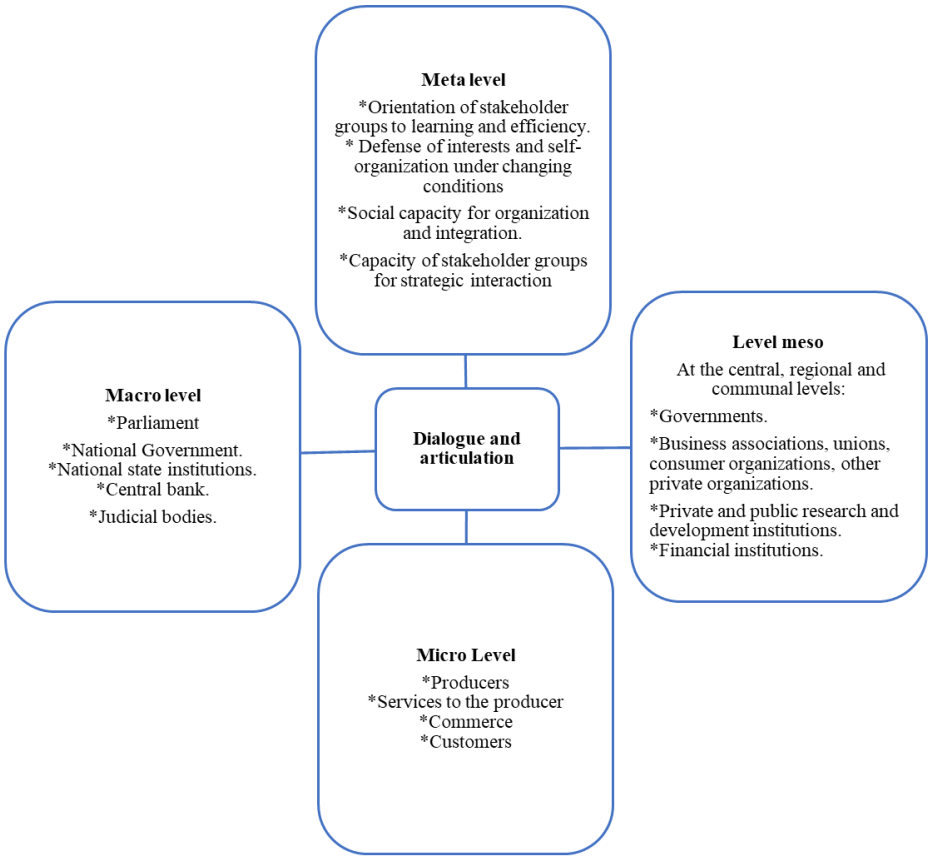
To achieve the benefits of TI within the organization, it is necessary to integrate strategic planning into technological planning since this is the most appropriate way to collect the feelings of an organization about its future development (Sánchez & Álvarez, 2005). On the other hand, TI is perceived as a fundamental determinant in creating or maintaining competitive advantages, its dynamics depend more on technological learning processes than on resources. They have a cumulative, systematic, and cultural character and it is recognized that technological accumulation is generated in companies, and knowledge is considered a fundamental resource, perfectly appropriable and transferable (Ramírez, 2000). It is necessary to consider several guidelines that can help the IT process obtain tangible benefits that go hand in hand with the strategic management process. This is contemplated from the ability to make effective decisions, the achievement of extraordinary capabilities, the development of new products with existing knowledge or increasing it, to the macro articulation at the national level for the own and national technological development (García, 1996). This would lead companies to improve production; increase financial results; generate greater knowledge; facilitate processes; and improve communication (MDC, 2020).

I.2 Business Competitiveness (BC)

Companies are those that produce and compete at different levels, supported or regulated by the rules of competitiveness (Krugman, 1994 in Cabrera et. al. 2011). Here it is established that Competitiveness, in general, "***is the set of competencies that an organization possesses, including the knowledge, capabilities, abilities and skills that an organization develops to compete more advantageously against its competitors, with goods or services that meet the needs in local, regional, national and international or global markets"***.. Competitiveness is a relative and dynamic concept product of the ability of a company to achieve, maintain and increase an advantage against its rivals by its superior behavior in the market (Palomo & Pedroza, 2018).

Business competitiveness (BC) implies different factors or preponderant elements depending on the products (goods or services) with which companies compete in the markets. It includes the management of their capacities and resources, all of which produce one or more competitive advantages over their competition. It could derive from an effective physical or economic productivity (Porter, 1980 in Díaz et. al. 2021; Carrasco et. al., 2021). A company's capabilities to design, develop, produce, and place its products in the international market, produce an added value greater than that of the competition, and give it a competitive advantage (CA) through its production and organization methods in a specific market (Cabrera et. al. 2011; Abdel & Romo, 2004 in Ibarra et. al., 2017).

Figure 3 - Structure of Systemic Competitiveness.



Source: Esser et. al. (1994); Cabrera et. al. (2011).

Figure 3 shows different factors or elements to take into account in a systemic competitiveness model and the different levels of competition, that is, the meta, macro, meso, or micro level. For example, the capacity of stakeholder groups for strategic integration, at the target (Country); National state institutions, at the macro level (Region); business associations, trade unions, and consumer organizations, in the meso (Industry); and, consumers and commerce in the micro (Nelson, 2007).

Porter (1991) determines competitive elements as *the conditions of the factors*, such as skilled labor, or individual infrastructure; *the conditions of demand* where the nature of domestic demand for the goods or services of the sector, others are the related and support sectors that contemplate the presence or absence of suppliers or related sectors. Also, contemplate the *strategy, structure, and rivals of the company* that considers how they are organized and managed. Finally, *the events that affect the companies* of any level where there are those incident events that are not proper or exclusive to a nation; and, *government actions* that support their national companies, among others.

Table 2 shows other dimensions or endogenous aspects such as the micro level (business or BC) the basis of this work. Those factors and actions related to the strategies that have to do with aspects of productivity, research, and technological development, the target market, human resources, organizational development, and the financial aspect (Cabrera et. al. 2011; Ibarra et. al., 2017).

Table 2 - Dimensions of Corporate Competitiveness.

Strategic planning	• Objectives • Goals • Policies • Environment analysis • Contingency plans
Production and operations	• Manufacturing Process • Certifications • Production flexibility • New products and processes development • Scheduling of resources, materials, supplies, etc.
Quality assurance	• Regulation • Workgroups and feedback • Certification process
Commercialization	• Sales policies • Distribution • Customer-supplier relations • Customer satisfaction • Market research
Accounting and finance	• Cost structure • Financial administration • Fiscal strategies • Tax payments • Inventories
Human Resources	• Recruiting and selection process • Development and training • Turnover and work environment • Health and safety • Compensation
Environmental management	• Waste management program • Recycling policies • Regulations
Information systems	• Information systems • Information Technology • Contingency plans

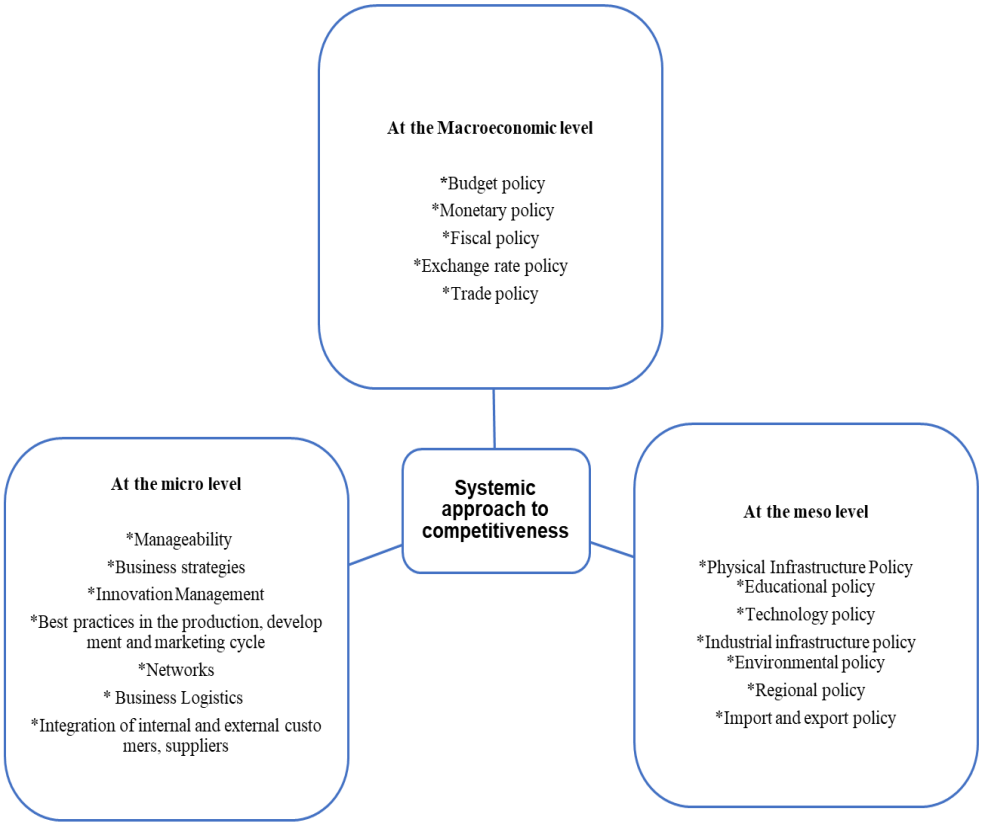
Source: Ibarra et. al. (2017).

For corporate competitiveness, as shows Table 2, you must consider all the elements of each dimension, for example, in planning strategic: objective, goals, policies, environment analysis, and contingency plans; for production and operations: manufacturing process, production flexibility, scheduling of resources, materials supplies, etc; for information systems: information technology, contingency plans; and so on for the others dimensions.

In a social approach, competitiveness must consider the benefits to the population, specifically to consumers, the standard of living of the population, growth, employment and income distribution, valuing productivity more (Krugman, 1994; Inter-American Development Bank, 2001) as well as investment in human capital, and improving the functioning of labor markets and tax systems (OECD, 2022).

Based on Figure 4, a more comprehensive analysis is performed, considering the aspects that Villareal & De Villareal (2002) and Sepúlveda-Moreno et. al. (2021) establish for the first 3 levels. Thus, at the macroeconomic level, budgetary, monetary, and fiscal policies are analyzed, as well as trade and exchange rate policy; At the meso level, it considers infrastructure, educational, technological, environmental, and regional policy issues, as well as those related to imports and exports.

Figure 4 -Systemic approach to competitiveness.



Source: Based on analysis (Canaleset. al. 2006) cited by (Hernández-Ramírez, 2012).

Endogenous and exogenous factors for enterprise competitiveness EEFBE

From the BC models, there are endogenous and exogenous factors that drive or hinder the operation and good management of resources and the Competencies that companies have to obtain goods or services to satisfy consumers with an advantage greater than those of their competitors. Fong et. al. (2017) established from the origin and development of the Theory of Resources and Capabilities (CRT), the vision of the firm based on its resources (Wernerfelt, 1984). These as internal factors that the company can control whereas external factors refer to those that it cannot control directly within its industrial structure, having a connection between both types of factors (Porter, 1980, in Fong et. al. 2017)

In the endogenous factors, there are two aspects, those that correspond to tangible or material resources and those that can be considered intangible or oriented to the entrepreneurial Capabilities that develop knowledge, skills, and abilities within the organization and that originate the "Competence (s)" to develop the products oriented to the target markets. Exogenous factors are the Demand that depends on the needs of consumers and the supply o00f products of their direct "competition" (Cabrera et. al. 2011).

At the endogenous level, raw materials and inputs that may or may not be in their supply chain are considered; its physical infrastructure, machinery, equipment and processes, and the productive system as such. An important part is its human resources, its information and communication system, and its administrative and managerial system (strategy development), all of which constitute the technological platform, hard technology, and soft technology (Pineda & Torres, 2007). Also, technological training in processes and products, organizational methods, investment skills, and marketing skills, among others (Medeiros et al., 2019; Díazet. al., 2021). It must have the ability to interact with other companies within its value chain, to establish networks of technological cooperation and interaction with users and other producers (OECD, 1992 in

Cabrera et. al., 2011; Ibarra et. al., 2017). In the assets of the company are the brand, the property right, patents, contracts, etc. that are, in some way, controlled by the company and that constitute the organizational capacities or organizational knowledge that give a Competitive Advantage (CA) to companies, as core competencies and that become their dynamic capacities (DC) (Acosta-Prado et. al., 2017; Torres-Barreto, et. al. 2018).

Key Success Factors for BC

From a strategic point of view, the CRT as CA can develop factors that are their own. Thus, a distinction must be made between physical productivity and financial productivity, that is, between the treatment given to tangible factors and that given to intangible factors, through the efficiency and effectiveness of that management. A key factor is the Profitability of the company derived from the added value in the production processes from its core and dynamic skills, the Capacity for Personalization (CP) as the ability to translate customer needs into differentiated goods or services, and the Reconfiguration Capacity (RC) as the ability to be flexible in an agile way and to reshape actions to achieve its competitive advantage through greater profitability (Acosta-Prado et. al., 2017; Apodaca del Ángel et. al., 2016). As a result of managing nuclear or dynamic resources and capabilities, the company will achieve a competitive advantage that will give it a BC to remain and develop in its market. Garcia (2015) identifies two types of competitive factors, internal and external; the first refers to the know-how of effectively manufacturing the attributes of the products, while the second is those that will allow you to be the CA before your competitors. We can distinguish, then, some indicators to consider in these Key Success Factors (KSF) related, also, with the strategies outlined of leadership in costs, differentiation, and approach, as competitive advantages (Porter & Millar, 1985) Some of them are:

KSF of low costs-low price: offer lower prices, reducing labor costs, capital costs, raw materials, greater efficiency in inputs such as energy, and packaging, greater efficiency in the handling of machinery and equipment, operating expenses, and inventories (Cabrera et. al. 2011; García, 2015).

KSF of Quality: the quality of the products is focused on the actions of improvement of the quality to cover the expectations of the client in terms of design, performance, and durability that are expected, the after-sales service, among other external indicators (Bernasconi, 2015; Garcia, 2015).

KSF for Flexibility. adapt to consumer requirements and changes with flexibility, both for modifications to products and adaptations of processes to obtain them, from design to after-sales service; the volume of production at competitive prices, the mixture of equal, similar, or substitute products, that is, flexible processes, accompanied by flexible technology to transform the company into a flexible business (García, 2015; Hernández, 2015).

KSF for Delivery Time. The actions are focused on reducing the delivery time of products to the market and customer service, through manufacturing strategies to get a new or improved product without compromising the necessary price (García, 2015).

KSF Customer Service. Differencing between customer service and customer satisfaction, the former is implicit in the latter; attention and assistance are focused on the solution of problems identified by the client, while customer service foresees the presentation of them and their anticipated solution, from the design, manufacture, and operation of the products (QuestionPro, 2022), having an effective and close relationship with customers, adapting to their needs and personalized treatment (Rondón, 2020; Chaparro, 2022).

Benefits of TI in the Measurement of Business Competitiveness

Technology Innovation results in a company's competitiveness, not only because of its ability to generate new products, new processes, and new forms of organization but also because these new ways of innovating generate

competitiveness based on the increase in profitability and impact on society (Peñaloza, 2007). Therefore, a company that carries out innovations expands its markets, diversifies its products and services; and strengthens intellectual capital, that is, the company becomes more competitive (Benítez-Gutiérrez et. al. 2020). With this, alliances and collaborations can be strengthened through various communication tools to share discoveries and add ideas that are materialized in new products and services, including collaboration strategies between suppliers and customers (Álvarez-Aros et. al., 2022).

It is concluded that TI brings benefits for the competitiveness of companies, in their growth, in their economic benefits, for which investment in new technologies is required. (Bonilla-Jurado et. al., 2018). A country and its companies are recognized as competitive when in a systemic approach of innovation not only in products and services, the productive activities that are developed are taken into account. Also where organizations and the population, in general, have an entrepreneurial, creative, and innovative attitude, considering their infrastructure, equipment, and human capital, as indicators to measure business competitiveness (Cazallo-Antúnez et.al, 2020).

3. Materials and Methods

A hypothetical deductive method (Costa, 2000) was considered due to the several problems related to the strategic planning of technological innovation and the business competitiveness of Mexican enterprises (Costa, 2000); the problem was defined from a problematic situation perceived (Tamayo y Tamayo, 1997) between the TISP and BC variables, V1 and V2 the theoretical framework considered (Bunge, 2007). This is for a descriptive and correlational scope of the research (Kerlinger, 1979) to determine the relation between the variables and their dimensions of each of variables.

From these, some dimensions were deduced during the development of the Research. From there, the indicators of duty to be known must apply the result, with which the operationalization of variables and the elaboration of the empirical research instrument applied to 40 companies of different activities or lines that produce goods or services (products), within the Mexican national economy, were carried out. With the data collected in this research, the descriptive statistics and the correlation table between the variables and corresponding dimensions were determined; Likewise, an ex post facto model (Figure 5) and an action plan were developed for those indicators of low practice in the TISP to obtain better results in the BC.

In the operationalization of the variables (Table 3), for V1 (TISP) the dimensions selected were: the basic elements of strategic planning (D1.1-EBPE- Spanish Initials) that must be applied in the areas or functions of the organization; the TI process and its models (D1.2-ITyM), which must be known; (D1.3- PEIT), the elements aligned in the research and development function of companies in this TI practice and its SP; (D1.4-FDEIT) determining factors to be considered in the TI process; (D1.5-OPEIT) obstacles that are presented to the organization to carry out the TI process; and (D1.6-BPEIT), benefits for those companies that carry out the TI process. For V2 (BC), the selected dimensions are (D2.1-CEMR -Spanish Initials) as the general conceptualization, the elements to be considered in the particular of the companies and their representative models; (D2.2- FEECE) as endogenous and exogenous factors that promote or affect BC; (2.3-FCE) factors to be considered to achieve an effective BC; (D2.4-BS) as goods or services developed by enterprises as products resulting from the process of technological innovation and what becomes the BC; (D2.5- BMCE) as BC measurement benefits based on the IT of goods or services.

4. Results and Discussion

Based on the operationalization of the Variables and their theoretical frame of reference (TF), the Research Instrument was developed with the corresponding indicators and items that were applied to 40 Mexican companies from different industrial sectors manufacturing goods or services of the ZMCDM. From the application of the instrument, the data established

by the companies were obtained and the totals of each Dimension and the total of each Variable (the Real Values) were determined with the reference of ideal values for each of them that are shown in Table 3.

Table 4 shows the congruence of the dimensions selected for each variable since the weights of each of them are balanced concerning the development of the TF. Here, then, an ante facto model of the relationship between variables is established and serves as a guide for this research. Once the previous descriptive statistics have been made, Table 3 presents the correlation values between variables, between variables and their dimensions, as well as the correlations of one variable and its dimensions against those of the other variable.

Table 3 - Data Relationship of Variables and Their Dimensions.

Variable/Dimensions	Vi	% Vi	Vr	% Vr	%V/Vtot
D1.1 (EBPE)	1435	21%	1230	21%	
D1.2 (ITyM)	1025	15%	872	15%	
D1.3 (PEIT)	1230	18%	1195	20%	
D1.4 (IT – FDEIT)	1230	18%	1050	18%	
D1.5 (OPEIT)(RCHD)	1025	15%	649	11%	
D1.6 (BPEIT)	1025	15%	861	15%	
Subtotal HD	6970	100%	5857	100%	53%
D2.1 (CEMR)	1025	17%	864	17%	
D2.2 (FEECE)	1435	23%	1181	23%	
D2.3 (FCE)	1640	27%	1464	28%	
D2.4 (B.S.)	1025	17%	853	16%	
D2.5 (B.M.C.E)	1025	17%	840	16%	
Subtotal SGC	6150	100%	5202	100%	47%
TOTALES	13120	200%	11059	200%	100%

Source: Own elaboration based on the theoretical framework of the research.

Table 4 - Correlation of study variables V1-V2.

Variable/ Dimension	D 1.1 Basic Elements of Strategic Planning (EBPE)	D1.2 Technological innovation (IT) and its models (ITyM)	D 1.3 The strategic planning of technological innovation (PEIT)	D1.4 Determining factors of the IT - FDEIT strategy	D 1.5 Obstacles of the Peit (Opeit) (RCHD)	D 1.6 Benefits of the PEIT (BPEIT)	V1. THE STRATEGIC PLANNING OF TECHNOLOGICAL INNOVATION(PEIT)	D 2.1 Business competitiveness and representative models (CEMR)	D 2.2 Endogenous and exogenous Factors for Business Competitiveness (FEECE)	D 2.3 Key success factors for CE (FCE)	D 2.4 Assets or services as a product of IT in the CE (B.S.)	D 2.5 Benefits of IT in the measurement of Business Competitiveness (B.M.C.E)	V2. BUSINESS COMPETITIVENESS (CE)
D 1.1 Basic Elements of Strategic Planning (EBPE)	1.000	0.706	0.799	0.710	0.106	0.808	0.936	0.854	0.828	0.725	0.773	0.601	0.838
D1.2 Technological innovation (IT) and its models (ITyM)	0.706	1.000	0.578	0.329	-0.102	0.546	0.685	0.492	0.589	0.138	0.022	-0.097	-0.174
D 1.3 The strategic planning of technological innovation (PEIT)	0.799	0.578	1.000	0.751	0.046	0.784	0.902	0.682	0.743	0.667	0.643	0.636	0.746
D1.4 Determining factors of the IT - FDEIT strategy	0.710	0.329	0.751	1.000	0.143	0.646	0.808	0.754	0.690	0.677	0.716	0.504	0.737
D 1.5 Obstacles of the Peit (Opeit) (RCHD)	0.106	-0.102	0.046	0.143	1.000	0.249	0.232	0.283	0.284	0.395	0.449	0.332	0.378
D 1.6 Benefits of the PEIT (BPEIT)	0.808	0.546	0.902	0.646	0.249	1.000	0.900	0.804	0.849	0.724	0.760	0.841	0.876
V1. THE STRATEGIC PLANNING OF TECHNOLOGICAL INNOVATION(PEIT)	0.936	0.686	0.902	0.821	0.232	0.900	1.000	0.863	0.884	0.782	0.830	0.728	0.904
D 2.1 Business competitiveness and representative models (CEMR)	0.854	0.492	0.682	0.754	0.283	0.804	0.863	1.000	0.794	0.780	0.855	0.701	0.900
D 2.2 Endogenous and exogenous Factors for Business Competitiveness (FEECE)	0.828	0.589	0.743	0.690	0.284	0.849	0.884	0.794	1.000	0.774	0.891	0.794	0.953
D 2.3 Key success factors for CE (FCE)	0.725	0.371	0.667	0.677	0.395	0.724	0.782	0.780	0.774	1.000	0.794	0.716	0.886
D 2.4 Assets or services as a product of IT in the CE (B.S.)	0.773	0.465	0.643	0.716	0.449	0.760	0.830	0.855	0.891	0.794	1.000	0.694	0.940
D 2.5 Benefits of IT in the measurement of Business Competitiveness (B.M.C.E)	0.601	0.414	0.636	0.504	0.332	0.841	0.728	0.701	0.794	0.716	0.694	1.000	0.852
V2. BUSINESS COMPETITIVENESS (CE)	0.838	0.526	0.746	0.737	0.378	0.876	0.904	0.900	0.953	0.886	0.940	0.852	1.000

Source: Own elaboration.

Table 4 shows the correlation between the variable and its dimensions in column 7, in the case of (TISP); and in column 13 for the variable (BC) with their respective dimensions. To establish the assessment scale between variables and dimensions, the following ranges are considered: Very Low 0.1 – 0.29, Low 0.3 – 0.4, Regular 0.41 – 0.59, High 0.6 – 0.79, Very High 0.8 – 1. Table 4 highlights the high correlation values considered by the respondents, both for the PEIT and the factors to be considered within the same companies in the face of the challenges of Business Competitiveness or BE for the Dimensions selected in the TF, except for D1.5. This resulted in a very high correlation range of 0.904 between the variables. However, somewhat low dimensions correlation data are observed between those of one variable with those of the other variable. At the end of this statistical work, Figure 5 presents an ex post facto model between variables and between variables and their Dimensions developed in the Theoretical Framework of this research.

Figure 5 - Correlation values between variables TISP & BC and their dimensions.

Source: Own elaboration with data from Table 4.

Figure 5 shows schematically the very high correlation between variable 1 and its dimensions that predominate with values higher than 0.800 except for dimensions D 1.2 and D 1.5. In the C variable, it can be noted that all have a very high correlation with values above 0.85

Based on the problem perceived and the general objective of this research, the high relationship between the TISP and the BC study variables was determined, from the application of the corresponding research instrument and the distance between the daily and real work that was described and what would be in an ideal situation established by the Theoretical Framework. Considering what Mexican companies do or do not do. The results show that companies that have good practice in the basic elements of the general PE and, perhaps, what becomes for TI, achieve good competitiveness with the goods or services they offer in their market of influence, while those that do not develop a TISP have meager results in their regional competitiveness, national or international. This is due to the high correlation between these variables and their dimensions, however, in particular, there are no great differences between the total data between dimensions and between variables.

Most of the companies surveyed establish that they carry out a Strategic Planning of Technological Innovation (PEIT) of 84% of the ideal value, according to the data indicated in Table 3. Thus, for example, for the recognition of the basic elements of PE (D1.1), it is determined that up to 86% of this practice is carried out, based on what they recognize in the basic elements of Strategic Planning (EBPE), as indicated by David, 2013; Torres, 2014; Steiner, 1988, Sachse, 2009, among others; however, there are some companies within the 14%, which do not have a good PE practice as they barely achieve 54% of the

ideal value. As for the D1.2 dimensions, the recognition of the technological innovation process and development models (ITyM) is also achieved in general, but in companies that have a lower value (15%), companies achieve up to 68% of the ideal that can be understood as good practice, considering what the OECD (1971) points out. REDES (1996), EUSTAT (2017) and Rotwel (1994), as well as what is indicated by López, et. al. (2009). The same happens with dimension D1.4, where they recognize the Key Success Factors for IT (FDEIT) with a value a little higher than 70% for companies that on average comprises that general 15%, according to what was established by Cabrera, et. al. (2011), García (2015), Bermasconi (2015) and Hernández (2015), as well as Rondón (2020). For dimension D1.3, with the highest value of 97%, in the case of companies with low IT Technology Planning (PEIT) practices, they also achieve about 68% of the ideal value, compared to what Ikujiro (1990), Pineda and Torres (2020), OECD (2015) and Pavit (2003), among others, establish. Both the Obstacles to establishing an IT PE (OPEIT) and the recognition of Benefits (BPEIT), which are achieved by having a good practice of PEIT - dimensions D1.5 and D1.6 respectively, in companies with poor practice have values considered as low (60%), emphasizing that OPEITs as those with the lowest perception, respect to what Pérez (2021), Sepúlveda-Moreno, et. al. (2021), Monsalvez (2017), and Galeano (2021).

Regarding Business Competitiveness (CE), although most consider that they achieve a good level, above 82% respect to the ideal, those companies with low achievements (18%) barely have a regular competitiveness (65%) and only in dimension D2.2, which refers to considering the endogenous and exogenous factors (FEECE) established by Fong, et. al. (2017), Cabrera, et. al. (2011), Madeiros, et. al. (2019), among others; of great incidence in this EC, they achieve good business competitiveness (71% of the ideal). Therefore, companies with lower achievement in the EC (18%) should have more recognition in the D2.1 dimensions of competitiveness levels (Palomo & Pedroza, 2018; Cabrero, et. at., 2011), its conceptualization, the elements of the dimensions of competitiveness (Ibarra et. al., 2017); of D2.3 corresponding to the key success factors (FCE), established by Cabrera, et. al. (2011) and García (2015); and considering the barriers and benefits of clearly measuring EC, as indicated by Peñaloza (2017), Benitez-Gutiérrez et. al., (2020) and Álvarez-Aros et. al. (2023). This is because in these dimensions they barely reach regular values of 65% of the ideal.

So, as a result of this research, a Model is formulated that relates the Variables of Strategic Planning of Technological Innovation (TISP) with Business Competitiveness (BC) and their corresponding Dimensions in Figure 5. Based on the high correlation of variables, an Action Plan is established to carry out pertinent actions in those companies that have a low practice in the indicators of the PEIT and, therefore, do not achieve effective competitiveness. These results are subject to dissemination and dissemination in specific documents for this purpose.

5. Conclusions

This research verifies the great relationship that exists between Strategic Planning of Technological Innovation (TISP) and Business Competitiveness (BC) (0.904), as well as the congruence of the Dimensions of each of the Variables (Table 4), by obtaining proportional values between them and the total of each variable; Deviation between the actual values of operations in enterprises, from the indicators extracted from the TF do not deviate by more than 20% from the values that can be considered as an ideal operation.

Based on the section on the differentiation of Mexican companies and their contribution to the national economy, companies are distinguished from those that take technological innovation (TI) as something decisive that allows for sustained growth and development in the country. In these companies, the TI process shows the contrast between those that carry out good strategic planning (SP) practices and those that do not to face events such as the Pandemic produced by COVID-19 or supply problems of materials and supplies due to a war between countries that affected everyone.

For technological changes, it is essential to do so from the alignment of the SP of this process attached to the basic elements of the general (the Mission, the Objective, the Strategy, the Plan, etc.,) as it is used, also, in the other functions within the structure of the companies. The TISP can be carried out using the different models developed based on an initial practice until arriving at the most current model such as the development of global or R&D networks. In this development of the TISP, those factors and elements necessary to consider to carry out the TI have to be visualized, such as financing, flexibility of the structure or organizational change, the market, and State policies; This is considered endogenous factors and exogenous factors. In addition, the Key Success Factors (KSF) that start, precisely, from considering them closely related to TI must be considered. Here it is important to consider the obstacles that arise to carry out this process and that they must be solved by the benefits they produce in the development of companies.

As in the first variable, Business Competitiveness (BC) is deduced or derived from the object of the general study of Competitiveness (COM) where three levels of operation are recognized, and to which the micro level corresponds. At this level that corresponds to companies, it is important to distinguish the term or concept of "competence" and that of "Competence", one with a lowercase and the other with a capital letter, the first referring to the number of competitors they face and the second to the knowledge, skills, and abilities that they develop or must develop and that derive from the TI process. For this, the model of Resources and Capabilities and that of Porter's 5 Forces are decisive since they are or give rise to the KSF. This is because the good management of resources and organizational capabilities can face competitors in the production of goods or services offered by companies in general, to meet the needs of society and markets. In this study variable, also, endogenous and exogenous factors that influence the BC intervention, of which the first can be handled by companies, while the second are usually beyond their control, but from TI to develop new or improved products can have a better performance against these factors.

However, for all the notes given by the enterprises in this research, it will be necessary to look into the way the enterprises evaluate each type of technology, hard and soft, and how affects their competitiveness. Also, you can abound about the strategy they follow, specially, when they develop technology in association with others in an open model.

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