



Feasibility analysis in the production of orthopedic footwear for children in the Province of Tungurahua

Análisis de factibilidad en la producción de calzado ortopédico para niños en la Provincia de Tungurahua

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Abstract

The present study analyzes the feasibility of the production of orthopedic footwear in the province of Tungurahua for children between 0 and 4 years of age, in which pathologies of the feet can be evidenced, which, with proper treatment and footwear suitable, can be solved thanks to the use of the technology with which it proposes to cover a currently neglected market such as orthopedic footwear for early age. The research is of a descriptive, quantitative, non-experimental type with probabilistic sampling, based on the analysis of data obtained during a time horizon of 1 year, having as techniques of information collection direct observation chips and interviews with experts; And a survey using the products that were the subject of research and interpretation was through participatory discussions. In terms of results, the market for shoe production there is very little competition and dedication on the part of producers to develop orthopedic footwear since as indicated it is necessary to make additional investments in order to obtain a quality product. As the main findings of the investigation, it was verified that a great part of the respondents do not know the existence of pathologies, such as: flat foot, pronated foot and supinated foot. Likewise, there is a need to have a specialist in the treatment of foot problems in the manufacturing process of orthopedic footwear, which will verify the use of suitable materials to correct each problem.

Resumen

El presente trabajo analiza, la factibilidad en la producción de calzado ortopédico en Tungurahua para niños en edades comprendidas entre los 0 y 4 años, en los cuales se pueden evidenciar patologías de los pies, que, con el debido tratamiento y el calzado adecuado, se puede solucionar gracias al uso de la tecnología, con lo cual propone cubrir un mercado actualmente desatendido como es el calzado ortopédico para edad temprana. La investigación es de tipo descriptiva, cuantitativa, no experimental con muestreo probabilístico, basada en el análisis de datos obtenidos durante un horizonte de tiempo de 1 año, teniendo como técnicas de recopilación de información fichas de observación directa y entrevistas a expertos calzadistas; y la realización de una encuesta a quienes utilizan los productos motivo de la investigación. La interpretación fue mediante discusiones participativas. En lo referente a resultados, el mercado de la producción de calzado existe muy poca competencia y dedicación por parte los productores a elaborar calzado ortopédico ya que como se indica es necesario realizar inversiones adicionales con la finalidad de obtener un producto de calidad. Como principales hallazgos de la investigación, se comprobó que gran parte de los encuestados desconocen la existencia de patologías, tales como: pie plano, pie pronador y pie supinador. De igual manera, se verifica la necesidad de contar con un especialista en el tratamiento de problemas de los pies en el proceso de fabricación de calzado ortopédico, el cual vaya verificando el uso de los materiales adecuados para corregir cada problema.

Keywords | Palabras clave

Pathology, children's footwear, orthopedic footwear, marketing, footwear, Tungurahua.
Patología, calzado infantil, calzado ortopédico, comercialización, calzado, Tungurahua.

1. Introduction

Tungurahua's business environment offers the characteristics of the territorial proximity for the formation of strategic clusters¹, which affect competitiveness essentially through the growth of business productivity and technological progress, which contributes to the creation and improvement of products that social needs. Similarly, the collaboration between professionals of the same cluster² allows the professionalization of businessman within their economic activity.

The opening of markets to a broader context of trade has contributed to a growth of more competitive environments, where companies must develop their activities. This process of internationalization has affected mainly the most traditional productive sectors due to their inability to face the big global competitors, such as: access to technology, lack of training, limited knowledge of creation, illustration and design of footwear, etc.

Tungurahua has been differentiated from other productive areas of the country due to its business conglomeration, more precisely; it concentrates about 5% of Ecuadorian companies, mostly microenterprises, with a 92.25% share in the province (INEC, 2014).

The provincial economy depends mainly on the following clusters: leather and footwear, trade and repair of vehicles, textiles, wood and furniture, and handicrafts. However, companies no longer consider the cost relationship as an attribute of competitiveness, but they are increasingly aware that they must analyze different factors that help them to have new forms of competition in their productive sector, and that results in a greater investment in the process of design, patronage and modeling of the product and application of innovation, which contributes to improve aspects of valuation by the customers. In the case of the footwear sector, consumers will appreciate different aspects, such as comfort.

1 They are defined as "industrial networks, industrial systems, technological systems, and resource areas, as meanings similar to cluster" (Almquist, Norgren and Strandell, 1998, p.14)

2 ... a set of similar geographically defined activities, with channels of commercial transactions, communication and dialogue, sharing specialized infrastructure, labor market and services, and facing common opportunities and threats. (Rosenfeld, 1996, quoted in Otero et al., 2004, p.7)

In this context, the objective of this work is to present how the successful production of orthopedic footwear in the province of Tungurahua at the present time, will benefit the creation of new products to be available in the market, in order to offer their customers and future consumers a product of quality, with a design that meets their needs, follow the trends and provide added value, which in this case would be the improvement of their posture when walking.

2. Theoretical Framework - State of the Issue

Tirado (2013, p.25) comments that:

The orientation to social marketing has been rebounding from previous times; in this approach, companies are interested not only in the individual consumer, but in society as a whole. Therefore, the needs of all market players (consumers, customers, suppliers, competitors, workers and society in general) are studied, seeking the creation, intensification and maintenance of lasting relationships with them.

It is important to emphasize that at present we see how the conception and application of marketing in the company has undergone a successive reinterpretation of the concept that has abandoned the mentality of past decades to focus on the production and the sale also called «passive marketing», to accommodate to an approach that is more concerned with the consumer, their needs and desires, with the ultimate objective of improving lasting relationships with them and other agents in the environment, these being the new strategies called «active marketing».

According to Vargas (2016) the footwear company *Lombardía*, believes that the impact of strategic planning focuses on increasing knowledge about how to optimize the manufacturing processes of footwear. In conjunction with the research carried out analyzing the probabilities of success and meeting objectives.

From this point of view, planning directly affects production, having an important factor within the lines that mainly handle the manufacturing companies; that is why we are looking for a feasibility analysis prior to the implementation of new production lines such as orthopedic footwear. With all these antecedents, it is proposed, thanks to the definition of Munuera (2011), the product portfolio, understand-

ing “the justified existence of different products in the company and the interrelationship between them” (p.149).

Within the production lines, the product portfolio seeks to be a strategy to balance the unproductive times and to cover with the installed capacity of the company. That is, shoe manufacturers do not neglect the traditional line of business, but also appreciate that the product portfolio can be increased. Thus, identifying opportunities is the ability of an entrepreneur or an entrepreneurial team to collect and consult international, national, regional and local information around the historical behavior of the market where it is intended to intervene in the project to be developed.

Determining the sector to which the project belongs, the segment or market segments of interest to the project, the potential market for product lines or services, and the participation of the main competitors, is fundamental as a baseline requirement, before starting the pre-feasibility or feasibility study (Méndez, 2010). Also, as part of the implementation of a new product line, it is important to carry out a feasibility study, a feasibility analysis and a market study that for Méndez (2010) is the detailed analysis of a project from the following perspectives: market, technical, legal, organizational, investment, sources of financing, income, costs and expenses, financial benefits and socio-economic impact.

However, the feasibility of a project not only covers financial aspects, it is understood as the possibility of developing a business plan in which technical, legal, financial and social feasibility will be taken into account (Méndez, 2010). According to Madorrán-Álvarez & Molins-Martin (2016, pp. 50-70), the market study tries to find out the market response to a product or service, in order to plan the most appropriate commercial strategy.

Before this, the question arises, Is it necessary to define what is a new product and the best appreciation has it, the new products are the blood that gives life to the company and maintains its growth? (Kerin, 2011). If a product differs from existing ones it can be defined as new.

«Product» is defined as a commodity capable of satisfying a need or desire and offered to an objective market for its observation, acquisition, use or consumption. A product is a complex totality of tangible attributes, representations and emotions based on the notoriety of the manufacturer or its brand, etc. (Kotler, 2012). Likewise Chaín (2011)

also considers the product as a set of attributes, which has at least three states that are: the product itself, its characteristics and uses; the added product which is valued by customer for its design, packaging, brand and quality; and the level of loyalty, which includes the installation of the product, delivery time, guarantees and after-sales service.

For its part, the technical study, also called project engineering, starts with the organizational aspect, describing the legal figure of the organization, followed by the mission, vision and corporate values, structure, form of government, and shareholders. It is considered prudent to clarify the competencies of the collaborators or define the jobs (Hernández, 2010). The project's location at the micro and macro levels is then analyzed and it is convenient to analyze the environmental impact. To determine the infrastructure, it is necessary to describe the productive processes that carry the project, the indispensable assets and the investments to be made.

The technical study aims to verify the technical feasibility of product manufacturing, as well as to analyze and determine the optimal size, location, equipment, facilities and organization required for the production process (Urbina, 2013). This study is an integral part of the success of many companies and differs considerably from one industry to another (Jacobs, 2014). In the meantime, a company's key competency is what makes it better than its competitors; such competition can be anything from product design to the sustainable dedication of a company's employees. The process presents the basic sequence of steps or activities with which the company conceives, designs and carries a product to the market, that is, these are the phases of the generic process of product development.

3. Methodology

The present research is of descriptive scope, quantitative-non-experimental design with probabilistic sampling, based on the analysis of data obtained during a time horizon comprised of 1 year (2016). The techniques used for the collection of information were: the use of direct observation cards in the points of sale of the company «Calzado LIWI», an interview with a shoe expert and a survey applied to 112 clients, who use footwear products of the aforementioned wholesale company and who are currently producers of orthopedic footwear in the province of Tungurahua (Ecuador).

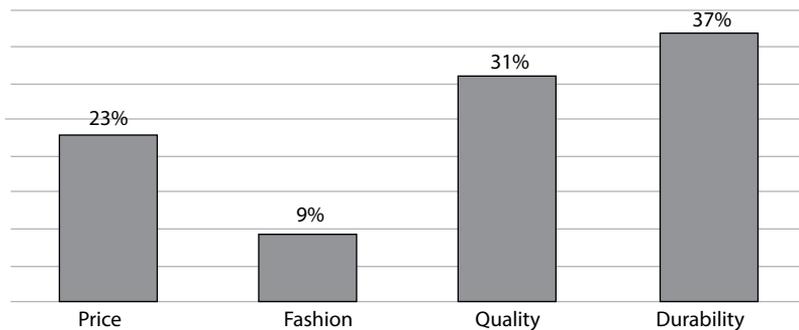
The survey, applied through a questionnaire consisting of 10 questions, was validated by the opinion of two professionals-experts in the footwear sector, who have a collaboration link to the Tungurahua Footwear Chamber. The data analysis was performed through the IBM SPSS® statistical instrument and its interpretation was through participatory discussions of the authors.

4. Results

By processing the results obtained in the survey, applied to the potential clients that would be the target public of the company, it was possible to obtain information about the level of acceptance of orthopedic footwear products aimed at infants aged 0 to 4 years of age. Thus, it was found that 84% of the population surveyed would be interested in purchasing orthopedic footwear for their children's feet, while 2% of those surveyed indicated that they were not interested in purchasing this type of product. It is noteworthy that the remaining 14% would be interested in purchasing the product if it were given information on additional aspects, such as: price, colors, design, among others.

In this respect, figure 1 show the factors customers value when buying a footwear product, most notably «durability» with 37% and «quality» with 31%.

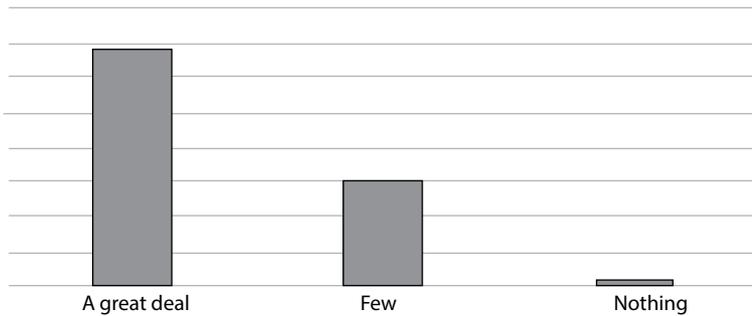
Figure 1. Factors that the clients surveyed value when acquiring a footwear product



In turn, and as detailed in figure 2, respondents consider that the use of orthopedic footwear will improve the quality of life of their chil-

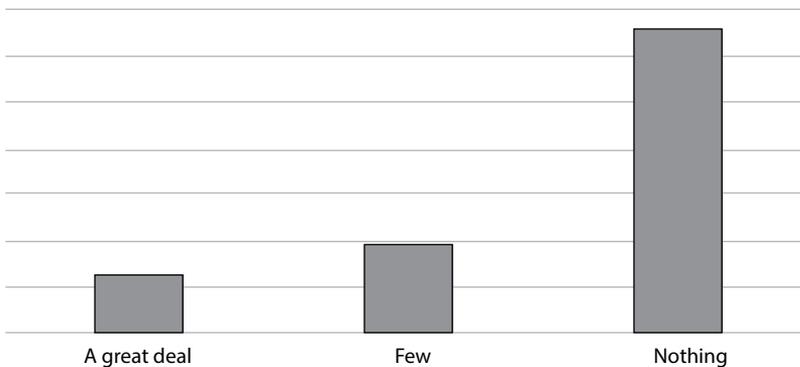
dren, because they can walk with a shoe that will not hurt their walk, but rather will help to correct the detected problems.

Figure 2. Perception of the respondents on the improvement of the quality of life of their children with the use of orthopedic footwear



The survey also provided information on how poorly informed the population is about pathologies, showing that 67% of those surveyed had never heard of the pronator³ or supinator⁴ foot (Figure 3), a problem that affects children in the first years of life and that if it is not treated properly it can leave sequels for the future.

Figure 3. Respondents' knowledge of existing orthopedic pathologies



3 It is understood by pronation to the footprint whose medial rotation on the axis of the bone, the foot “sinks” inwards into itself.

4 It is understood by pronation to the footprint whose medial rotation on the axis of the bone, the foot “sinks” outwards.

Another of the pathologies unknown to the respondents is that 55% do not know what flatfoot⁵ is, so it is understood that there may be a percentage of the population suffering from flat feet without knowing it, and without knowing also that there are products for its treatment.

Regarding competition, the survey shows that customers do know companies that produce orthopedic products and that offer solutions for foot problems. Footwear from the company “Calzado LIWI” and “Centro Ortopédico Freire” are the best known in the province of Tungurahua.

Figure 4, for its part, details that 94% of the respondents would be willing to buy orthopedic footwear for children if footwear companies increased their supply. This shows that there is an unaccustomed public regarding this type of product.

Figure 4. Intention to buy of the respondents



The prices that the parents of the children would be willing to pay are: USD 39.90 for 79% of the respondents, while the remaining 21% would be willing to pay a price of up to USD 59.90; depending on the benefits that the orthopedic footwear provides (Figure 5). In this sense, 46% of the respondents mentioned having little knowledge about the benefits of using orthopedic footwear and 19% do not fully know.

5 It is defined as the deformation characterized by the disappearance of the foot bridge, so that to walk the whole plant rests on the ground.

Figure 5. Willingness to pay for orthopedic footwear for your child's feet

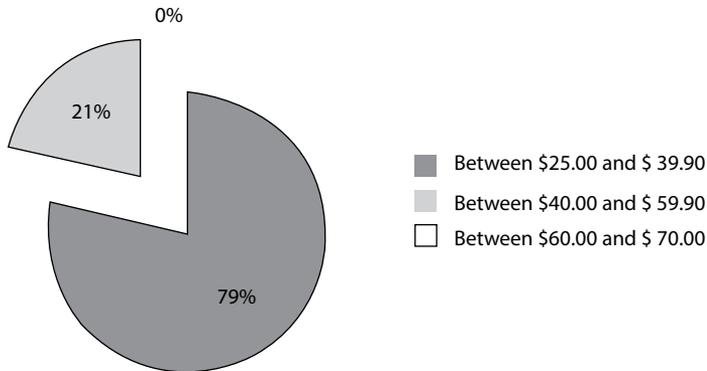
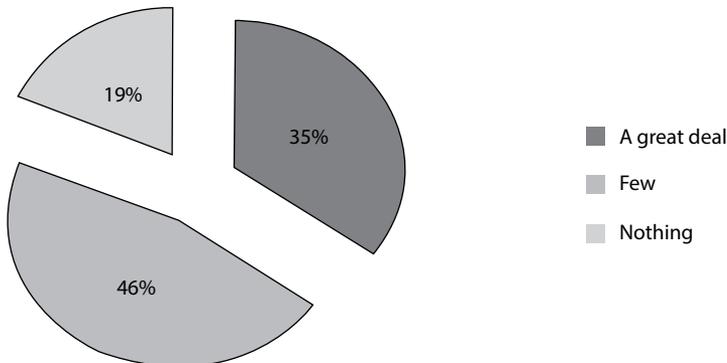


Figure 6. Degree of knowledge about the benefits of orthopedic footwear



The observation sheet in this case helped to determine the feasibility and viability at the pathological level to be able to develop the footwear that will be produced and marketed for the children of Tungurahua. For the study, 112 observation cards, corresponding to each of the children that comprised the sample, were performed between 0 and 4 years old (Chart 1). At these early ages it is essential to identify problems in the infant's support, balance and walk (Chico, 2008).

Chart 1. Results of Observation sheet

Criteria of the March	Number of Observations
Flatfoot	31
Supination	15
Pronation	66

The analysis of the demand within the footwear production sector is now part of the governmental situation that forces each of the producers to offer to the market differentiated products, not only in their materials but also in their functionality, a situation that forces the businessman/producer to carry out an in-depth analysis of the target market it wants to reach, as well as the interpretation of consumer preferences and trends of the new era.

According to the Anthropometric study carried out in 2013 by the National Chamber of Footwear in conjunction with Plasticaucho Industrial, in Ecuador more than 50% of the population presents flat feet, as well as a high rate of obesity, reasons why they are presented the main orthopedic problems such as pronation and supination of the feet (explained above supra in footnote 3 and 4). These pathologies can be corrected in children up to 12 years of age, so it is recommended to use appropriate footwear since childhood.

Taking as reference the last population census of 2010, it is determined that in the province of Tungurahua the infant population (0 to 4 years of age) corresponds to 9% of the population, while in the fascicle of the projection of growth of Ecuador published by the INEC, it is determined that the population of the province of Tungurahua reached a total population of 557,563 inhabitants, of which 9% corresponds to infants from 0 to 4 years of age. Thus, the calculation yields a total of 50,181 infants as a study population; while according to the anthropometric study 50% of the population - that is, approximately 25,090 infants - would suffer from the flatfoot pathology. When using the survey - an exploratory non-inferential character - it is determined that 55% of the population does not know this pathology, so the infant can suffer from it without their parents noticing it.

After analyzing the participation of each of the competing companies, including the company object of the present study, unsatisfied

demand can be determined based on the infant population of the province of Tungurahua (50,181 inhabitants) (see chart 2).

Chart 2. Estimated per capita consumption of shoes

HABITANTS	P/C CON-SUMPTION	TOTAL, CONSUMPTION PER YEAR	% PER. FLATFOOT	TOTAL
50.181	3	150.543	50%	75.272

The unsatisfied demand can be calculated from two different perspectives, such as: Within the applied surveys, one of the relevant aspects is that 45% of the consumers surveyed do not know about the problem, so if this percentage is applied to the population of infants the following is obtained:

Table 3. Consumption of pairs based on ignorance of the orthopedic condition

Total	% Does not know	Total, consumption shoes per year
75 272	45%	33 872

While taken from the point of view of the problem, consumers surveyed indicated that 33% of the population has a relative with this problem (see table 4).

Table 4. Consumption of shoes based on the suffering of the orthopedic condition

Total	% Suffer the disease	Total, consumption pairs per year
75 272	33%	24 840

That said, for the calculation of unsatisfied demand, the following formula is taken as reference: Unsatisfied Demand (DI) = Supply - Demand, as well as data from the perspective of those who have relatives who suffer from the disease.

$$DI=9288-24840$$

$$DI=- 15552 \text{ Shoes}$$

Resulting in 13,085 pairs of unsatisfied demand per year, which account for 1,090 monthly pairs, which means a considerable opportunity for an additional product line to provide consumers with all the benefits of biomechanical construction.

It should be noted that this unsatisfied demand can be covered within the company, since the installed capacity of the machinery and equipment is suitable for the production of 3,000 pairs per month, giving a footwear production of 36,000 pairs per year.

5. Qualitative study

From the interview made to the shoemaker specialist through a questionnaire made up of 15 questions, the following information emerged that complements what was obtained with the help of the surveys analyzed *ut supra*, reason that may have to:

- The most common pathologies in the feet of children between the ages of 0 and 4 years are: flat feet footprints, pronator footprints and supinator footprints.
- It has been investigated and it is determined the non-existence of a previous study that investigates the types of pathologies that suffer the Ecuadorian children, and especially those of the province of Tungurahua (Ecuador).
- The lack of awareness and lack of concern on the part of the parents regarding the pathologies that their children can suffer in their feet cause that in some occasions the use of an extremely rigid footwear and inadequate for the first months of life. Parents are generally unaware that not all footwear products are suitable for children's feet.
- Parents should choose to go to an orthopedic specialist who will adequately address the orthopedic conditions of children. Treatments to correct pathologies or deformities in children are up to a maximum of 12 years of age, so it is important to recognize the problem in early.
- There is no orthopedic footwear in the Tungurahua market that helps to correct or alleviate the problems in the infants of the province. The materials with which orthopedic footwear is designed and elaborated, such as: capella, lining, insole and sole, must be given great importance.
- Orthopedic footwear must contain basic anatomical elements that provide the final product with a biomechanical structure. To achieve all this, we must work on a feasibility and viability investigation

that allows us to present a product according to the market of the province with national projection.

- Infants' daily footwear provides information about the child's footing and the position of the foot during the walk, which helps to see the client's specific requirement.
- During treatment it is important that consultations with the specialist are carried out on a continuous basis with periods of no more than 3 months. The duration of treatment depends on the type of pathology. However, there are cases of rehabilitation of up to 3 years.
- Only in special cases, that is, depending on the pathology, children will need additional devices to correct the recognized problem. For the correct treatment of the pathologies it is necessary that the specialists update their knowledge frequently.
- In the footwear manufacturing process, it is important to have an orthopedic specialist for foot problems advised during this process and a professional patronist to help design a pleasant product that catches the attention of both customers and consumers of footwear.

6. Conclusions

Ignorance of the pathologies that can be suffered by children aged 0 to 4 years can produce problems in their feet that can last for up to 3 years. In some cases, parents ignore the existence of problems such as flat feet, pronator's foot and supinator foot; in other cases, the use of appropriate footwear, guided more by fashion and market preferences, can also lead to problems in the correct walk of the infant.

In Tungurahua, there are currently no foot health professionals who have footwear products suitable for each treatment identified for the feet of children. In turn, the parents surveyed expressed their interest in purchasing orthopedic footwear for their children if there were a greater supply of these in the market, giving importance to factors such as quality and durability, rather than price or fashion.

It is of vital importance that the pathologies are recognized by the specialist in the first years of life because, depending on the identified problem, the treatment can last up to a period of 3 years, being the maximum age to correct the disease 12 years of age.. The observation sheets showed that improper use of footwear can cause poor foot placement and may give rise to a future problem.

For a correct manufacture of orthopedic footwear aimed at children at an early age it is necessary to have the advice of a specialist to ensure that the product is being developed in the right way and with the appropriate materials.

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