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Textile and Apparel Sector Outlook in Peru

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Abstract

This research work is a strategic prospective that seeks to analyze, understand and establish planning guidelines for the Peruvian textile and apparel sector within five years. Its main objective is: "To predict the characteristics and determine the situation of the Peruvian textile sector in five years". Under a mixed approach, both qualitative and quantitative, it answers the question: Which strategic scenario has a more probable occurrence for the Peruvian textile and apparel sector at the national level? Michael Godet was used as a reference for the approach of the work. It was divided into three phases: the initial phase in which the variables and actors that characterize the sector were identified. The classification phase of variables and actors by means of the Cross Impacts Multiplication Matrix Applied to a Classification (MICMAC) and interviews with sector referents. And the final phase, where possible future scenarios were generated and validated using the SMIC method. This research resulted in six key variables and one key actor, which were analyzed and used for the development of predictive hypotheses that were formulated by a committee of experts. These hypotheses were subjected to the SMIC software, resulting in simple probabilities, conditional probabilities of realization and conditional probabilities of non-realization.

Keywords
Foresight, Textile and Apparel, Peru, Michael Godet, SMIC.

1. Introduction
According to the sectorial report of the National Society of Industries of Peru, "National production registered a 1.1% reduction in January 2023 compared to the same month of 2022, after 22 months of continuous growth, while in February its reduction was 0.6%, continuing with the decreasing trend of the previous month". At the beginning of 2023, domestic production was affected mainly by social conflicts. The percentage index of the textile and apparel sector was reduced by 0.5% in March 2023 due to the great deterioration of the apparel (-35.9%) and textile (-25.7%) subsector left by the pandemic and its slow recovery (Institute of Economic and Social Studies, 2021); this has caused great concern for the companies of the sector as it is reflected in a lower dispatch to the interior of the country or exports such as to the United States and Chile, putting them in a worrying economic and financial situation.

The appearance of the COVID-19 virus in 2020, the informality that increases year by year, social and political problems have affected this industry. According to the SNI sectoral report, between 2019 and 2020, the evolution of employment in the sector fell 16.7%, leaving approximately 67 thousand workers unemployed. In addition, the price of imports of textile inputs fell 11.3% in the last year 2023 with respect to last year, which has worried the authorities and has been forced to formulate a bill to boost the economic reactivation and employment of the textile and clothing sector before the Congress of the Republic of Peru, in the month of June 2023. (Instituto de Estudios Económicos y Sociales, 2021). The textile and apparel sector is one of the most important in the country since it is positioned as the third industry with the highest contribution to the manufacturing GDP, it is responsible for hiring 400 thousand direct annual jobs and approximately 900 thousand indirect jobs from the agricultural and livestock sector (Instituto de Estudios Económicos y Sociales, 2021). (Instituto de Estudios Económicos y Sociales, 2021).
With the information obtained, the problems encountered and the demand for information from the industry, we seek to predict the future of this industrial sector, determining its prosperity or decline within the next 5 years.

1.1 Objectives

The main objective of the prospective research is to predict the characteristics and determine the situation of the Peruvian textile sector in 5 years. And the specific objectives: To determine the current situation and the main problems that the textile and apparel sector is going through, as well as to forecast the participation of the textile and apparel sector's future environment and to determine the percentage variation of jobs generated in the textile and apparel sector.
Based on the problems encountered and the information gathered from primary and secondary sources, the following general hypothesis is proposed: "There will be a favorable scenario in the Peruvian textile industry by 2029". In addition, based on the specific problems and objectives, the following secondary hypothesis is proposed: "Bill N 5380/2022-PE will effectively promote economic reactivation and employment in the textile and apparel sector by 2029".

2. Literature review

This research work is carried out with the purpose of contributing to the existing knowledge on the importance of the textile and clothing sector; to reflect and analyze the different characteristics after the fall of the post pandemic production and to determine the sectorial advance to be able to predict the future situation, these results could be systematized in a proposal, to be incorporated as knowledge to the companies of the sector, since it would be demonstrating that the impulse of this industry improves the level of the PERU BRAND and generates employment opportunities. There is a need to recognize and analyze the characteristics of the low performance of the Peruvian textile and clothing industry in order to support businessmen, traders and future entrepreneurs to know the future of the sector. This prospective will provide an understanding of the sector's future in five years and its new trends.

The present work is an applied research, according to its purpose, since its purpose is to solve practical problems, seeking knowledge with the purpose of applying it to reality and modifying it. Also, according to its depth, it is a descriptive research since it is based on facts of reality, describing the data found, situation and population; it also applies surveys and must have an impact on the studied sector. A mixed research approach is proposed, that is to say, both qualitative and quantitative, since it presents a collection, analysis and interpretation of qualitative and quantitative data. This prospective study will delve into topics such as research, the industry and the textile and apparel sector; therefore, its prospective scope is especially for Peru, for the companies within the textile and apparel sector and for the people who work in the sector. While it will have a descriptive scope focused on exports within the sector.

3. Research methodology

The research methodology is presented in Table 1.

Table 1. Methodology to be applied

Approach	MIXED (qualitative and quantitative) with prospective strategy
Subject of study	Peruvian textile and clothing sector

Phase	1- Initial	2- Classification of variables	3- Generation of future scenarios
Scope	Descriptive/ exploratory	Descriptive	Descriptive
Target	Identify the variables that characterize the textile and apparel sector.	Characterize the variables identified in the textile and apparel sector by motor and dynamism.	Generate and validate proposed future scenarios
Technique	-Pestel, to identify environment variables. - Porter, to identify the variables within the industrial sector. -Primary sources such as interviews and surveys. - Documentary review and secondary information	- Interviews with industry leaders. Cross-impact matrix - Multiplication Applied to a Godet Classification (MICMAC)	- Tools for projecting. SMIC Analysis Expert questionnaire
Unit of analysis	-Research of: Godet, M. (January 2007) Prospectiva Estratégica: problemas y métodos. -Paper of: Mitma, J.I., Pinzas, A. C., & Contreras, C. C. (2009) Strategic foresight to the textile sector in the district of San Juan de Lurigancho. -Experts: The director of the National Society of Peruvian Industries; The Manager of the National Institute of Statistics for Textile Committee; the director of the ULima Textile Innovation Studies Center and two general managers of Peruvian textile companies with more than 30 years. - Research of: Ruiz, M. (2016) French Foresight as a University Planning Strategy. Evaluation of the Acceptability of its Application in the Faculty of Engineering.		

4. Data Collection

Peru stopped growing for the first time in 20 years, experiencing an unprecedented drop that will end with a GDP decrease of 11% in 2020. (National Society of Industries, 2020). The supply and demand shock generated by the measures against the spread of COVID-19 was not adequately managed, since the same measure was added to the closure of mines for the industrial export sector and for employment-intensive industries, which were not confined to other countries in the region.

The COVID-19 pandemic has revealed the current political situation and a reconversion of the industry is necessary to strengthen the economy. In order to achieve this growth it is important to delve into the history of industrial policies, so in June 2023 a bill was presented that proposed tax benefits for the sector, such as an additional income tax deduction as of 2024 and an annual percentage of machinery depreciation up to a maximum of 20%, for machinery acquired as of 2024.
Currently, public investment represents only 20% of total investment; therefore, private investment must be boosted in order to consolidate reactivating growth. One of the possible causes of the country's productive stagnation is a direct result of the lack of an industrial policy integrated to a process of productive diversification with strategic content.

Following the pandemic, national production recorded a 0.6% decrease in February 2023, continuing the downward trend of previous months. This result was mainly due to the lower activity of the sector, according to the new sectorial report prepared by the National Society of Industries. It is well known that post-pandemic Peru has had a

hard time coping with the economic downturn, not only because of the health crisis, but also due to political issues that contributed to the slow recovery.
In figures: 65,835 million dollars exported in the whole year 2022, 2,684 million dollars more than in 2021 and by the end of 2023 the sum of 2,700 million USD was already exceeded. According to Peru's foreign trade company (Comex) in 2022, exports of the textile and apparel industry totaled USD 1 882.5 million registering a growth of 19.79%, compared to USD 1 571.5 million in 2021 This is due to the increase in the manufacture of knitted and crocheted fabrics (59.9%).

Before the pandemic, the textile and apparel sector was in third place with a 6.4% share in the largest contribution to the manufacturing GDP. As for the imports, these have been persuading the recovery of the national production that was decreasing minimally (-2.5% per year), but as a result of the paralysis of activities and the reduction of the demand due to the pandemic, a fall of 32.1% was produced. The clothing (-35.9%) and textile (-25.7%) subsectors also declined. This after the 93.3% drop in the month of April 2020, the textile subsector was mostly affected by yarn, polyester fabrics and pique fabric; while flannels, French Terry, suede and plush surprisingly increased their production. Likewise, for the apparel subsector, which after a 35.9% drop in production, shirts, pants, swimwear and coats were affected; while jumpsuits, pajamas, polo shirts and underwear were less affected, but still with a negative rate (Table 2).
Companies and SMEs in the sector do not stop investing and will continue to invest in innovating processes and new machinery, so that in 2020 imports of machinery for washing, drying, ironing and finishing, preparation and spinning, flat fabrics and knitting, and the garment industry have totaled 176 million dollars. In order to reverse this situation, protective masks were being produced, which boosted exports within the category of other garments, had a volume growth of 463% and the main buyers were China, Hong Kong and the United States; although garments made by hand still concentrate more than 70% of the exported value mainly by sending cotton shirts and polo shirts.

Table 2. PESTEL analysis of the textile and apparel sector

P	**E**	**S**	**T**	**E**	**L**
Politician	Economic	Social	Technological	Ecological	Legal
Little government support. Existence of regulations on foreign trade. Tax increase. New bills.	Economic crisis due to Covid-19. Increased unemployment due to budget cuts. Rising interest rates. Creation of borders, closing of the market.	Increased concern for people's image due to fashion. Increasing importance of intangible aspects such as branding and design. Homogenization of market trends due to globalization. Distancing due to the pandemic.	Speed of technology transfer. Consumer confidence in making more purchases over the Internet. Technological advances in machinery.	Increased environmental awareness. Emergence of eco-efficient companies through the use of recycled material and energy savings. Less pollution as a result of confinement.	Competition legislation. Respect for occupational health and safety laws. Increased product safety as a result of new laws created by the pandemic.

Figure 1. Porter's Five Forces Sector Analysis

Textile and Apparel Stakeholders

The state; proposed to establish the labor regime for exports, which allows the hiring of temporary personnel. To be eligible for this benefit, companies must export at least 40% of their annual production effectively sold. The indefinite renewal of temporary contracts favors a high turnover of personnel, provides security and stability to textile industry workers, and allows them to exercise union rights.

The main textile companies; According to the Ministry of Production, 69% of the companies are located in Lima, while the remaining 31% are distributed throughout the country. In addition, according to the 2021 SNI sectorial report, 30.6% of the manufacturing companies belong to the textile and apparel sector. In 2020, Michell y Cía. achieved a turnover of US$61 million from shipments of alpaca garments, combed sheep wool yarns, and wool or fine hair yarns. The leading companies are Michell y Cía, followed by Topy Top, Creditex (Val: US$36 million), Textile Sourcing Company, and Textil del Valle.

The main customers; of this industry are abroad due to the variety of natural fibers available in its territory. The United States remained the main destination market for textiles and apparel, accounting for more than 50% of the total value exported. Thanks to the regional integration initiative on which the most economically developed countries of the Latin American Pacific Rim are betting, Peru was able to position itself firmly and become one of the leading countries in textile exports at the Latin American level. In 2019, the sector generated 398 thousand direct jobs (26% of the manufacturing EAP). This figure was the lowest in the last five years prior to the pandemic (2015-2019), a period in which employment has decreased 2.8% per year. On the other hand, the informality rate obtained a 20% increase last year reaching more than 50% of the total, one of the most worrying aspects in the sector.

The suppliers; China, Bangladesh and India were the main suppliers of the Peruvian apparel market, concentrating around 90% of the total volume imported pre-pandemia. However, not only are ready-made products imported, but also raw materials such as cotton, which is used as an input in the manufacture of yarns and garments. The main suppliers of prepandemia cotton are the United States, Colombia and Egypt. According to PromPerú, the country's main fabric suppliers are: Algodones Orgánicos de la Selva SAC, Bergman Rivera SAC, CORTEXTIL EIRL, Creditex, Inca Tops SA and for alpaca fiber and its derivatives: ATP Alpacas Collection SAC and Cooperativa Agropecuaria de Servicios Valle del Cunas Ltda.

The most important unions in the sector are: Empresarios de Gamarra, Asociación Peruana de Industriales Confeccionistas, Asociación San Miguel de Gamarra, Asociación de confeccionistas de Gamarra, Federación de trabajadores de Tejidos del Perú. In addition, the following guilds participated in the elections of representatives in 2018: The National Front for the Defense of the Mype, the Civil Association Textile Cluster, the Association of Apparel Exporters of Peru, the Association of Industrial Knitters and Apparel Manufacturers of Huancayo and the Forum of Micro and Small Enterprises.

5. Results and Discussion

Initial phase; The variables that will be presented below are the result of the information gathered from different bibliographic sources, the PESTEL analysis and Porter's five forces, carried out previously. The list of variables was corroborated and expanded by some experts in the sector through interviews. On the other hand, the stakeholders that influence the sector were identified, a list was drawn up and a short title was given to each one in order to subsequently carry out the stakeholder qualification phase (Table 3 and 4).

Table 3. Variables identified

Short Title	Long Title
VAR1	Quality of decisions and support by the state
VAR2	Legal framework for the control of imports from Asia specifically
VAR3	Supporting the development and preservation of Peruvian cotton
VAR4	Impact of the rigidity of labor legislation in the sector
VAR5	Production Capacity
VAR6	Generation of legal employment
VAR7	Formalization of companies in the sector
VAR8	Product quality
VAR9	Cost Optimization
VAR10	Technological development
VAR11	Impact of the need to be sustainable in the sector
VAR12	Compliance with environmental laws
VAR13	Respect for intellectual property laws and patents
VAR14	Brand Development
VAR15	Export Demand
VAR16	Lack of qualified technicians
VAR17	Financing
VAR18	Substitution of textile inputs

Table 4. Stakeholders identified

Short Title	Long Title
ACT1	Banking and financial institutions
ACT2	Ministry of Production
ACT3	Ministry of Labor
ACT4	Ministry of Environment

ACT5	Customers
ACT6	Employees dependent on the sector
ACT7	NGOs
ACT8	Universities
ACT9	Textile technology institutes
ACT10	Managers of textile companies in Peru
ACT11	Congress of the Republic of Peru
ACT12	Guilds

Variables classification and actors' qualification phase: The Variables Structural Matrix was made (all this in consensus with the 5 participating sector experts) for which it was necessary to assign an importance number from 0 to 3 (Null, weak, moderate and possible dependence respectively) to each variable so that it could be introduced into the LIPSOR software. Then, with the help of the MICMAC system, the variables were placed in 4 quadrants characterized by influence and dependence. In addition, the key variables were found with which the possible future scenarios will be generated in the next step. The table below shows the results of the LIPSOR software:

	1: VAR1	2: VAR2	3: VAR3	4: VAR4	5: VAR5	6: VAR6	7: VAR7	8: VAR8	9: VAR9	10: VAR10	11: VAR11	12: VAR12	13: VAR13	14: VAR14	15: VAR15	16: VAR16	17: VAR17	18: VAR18
1 : VAR1	0	1	1	1	0	2	1	1	0	2	2	2	1	1	1	1	0	0
2 : VAR2	3	0	2	0	1	0	1	2	2	2	1	1	0	1	0	1	1	0
3 : VAR3	2	2	0	1	0	1	1	2	2	2	2	2	1	1	2	1	2	2
4 : VAR4	3	0	0	0	0	1	2	0	1	1	2	0	0	1	0	1	0	0
5 : VAR5	0	1	0	1	0	1	1	1	1	2	2	1	0	0	2	3	3	1
6 : VAR6	2	0	1	3	1	0	3	1	1	1	0	0	1	2	2	3	2	1
7 : VAR7	2	1	0	1	1	2	0	1	1	1	2	2	1	1	2	2	2	0
8 : VAR8	1	1	2	2	1	2	2	0	3	3	2	1	0	1	1	3	2	1
9 : VAR9	0	2	1	1	2	1	1	2	0	3	2	1	0	0	1	2	3	2
10 : VAR10	1	0	1	0	1	2	2	2	2	0	1	2	2	2	1	2	2	0
11 : VAR11	2	2	1	1	1	2	1	2	2	2	0	1	0	2	2	2	1	1
12 : VAR12	1	0	1	1	0	2	3	1	2	2	1	0	0	0	1	2	2	1
13 : VAR13	1	1	0	1	0	2	2	0	0	2	2	0	0	3	2	2	1	1
14 : VAR14	2	2	1	1	0	2	2	2	2	2	3	1	3	0	2	2	3	1
15 : VAR15	1	0	2	0	0	1	1	2	1	2	1	1	1	2	0	2	1	1
16 : VAR16	1	0	1	2	0	2	0	0	0	0	0	0	0	1	1	0	2	1
17 : VAR17	2	0	0	0	1	0	1	1	1	1	1	1	1	1	1	0	0	1
18 : VAR18	1	1	3	0	1	1	0	0	1	2	1	2	0	1	1	1	2	0

Figure 2. MICMAC Analysis - Direct Impact Matrix Result

	1 : VAR1	2 : VAR2	3 : VAR3	4 : VAR4	5 : VAR5	6 : VAR6	7 : VAR7	8 : VAR8	9 : VAR9	10 : VAR10	11 : VAR11	12 : VAR12	13 : VAR13	14 : VAR14	15 : VAR15	16 : VAR16	17 : VAR17	18 : VAR18
1 : VAR1	506	280	339	357	223	510	474	417	423	575	500	381	267	414	453	591	588	289
2 : VAR2	560	271	381	366	248	525	535	452	491	611	484	384	252	463	471	645	620	307
3 : VAR3	722	405	484	506	318	731	699	622	649	821	697	555	381	592	662	861	862	423
4 : VAR4	371	171	245	248	144	344	365	290	321	401	326	238	172	304	306	427	399	200
5 : VAR5	494	291	340	357	214	510	493	424	441	592	513	390	274	402	464	604	601	298
6 : VAR6	635	333	427	431	268	621	618	528	547	705	567	451	317	541	560	735	690	350
7 : VAR7	604	323	402	409	259	600	560	490	518	661	575	453	316	495	532	696	690	330
8 : VAR8	767	406	530	521	331	759	740	629	675	884	735	569	382	633	676	902	870	433
9 : VAR9	620	364	431	447	280	647	618	549	554	748	633	488	335	508	579	757	760	385
10 : VAR10	703	339	468	439	299	657	631	556	584	739	620	500	339	580	581	774	752	364
11 : VAR11	721	388	470	486	313	714	681	591	628	804	676	533	354	597	641	828	815	412
12 : VAR12	549	289	371	373	224	544	538	451	480	629	528	396	276	447	485	646	626	313
13 : VAR13	569	318	380	406	237	578	564	470	491	670	565	416	291	482	517	677	649	337
14 : VAR14	854	467	587	584	360	860	822	724	757	964	828	645	462	690	762	1011	1003	478
15 : VAR15	594	300	394	385	256	556	558	482	500	655	539	418	284	488	504	673	650	328
16 : VAR16	277	169	192	190	118	309	266	239	243	332	289	226	150	241	260	337	323	154
17 : VAR17	408	197	267	271	174	381	383	334	356	426	344	278	196	335	347	459	454	226
18 : VAR18	511	280	370	349	238	522	495	422	458	607	499	391	250	433	454	616	595	292

Figure 3. MICMAC Analysis - Indirect Impact Matrix Result

Figure 4. Location of the variables on the plane

Determining variables: VAR3; Regular variables: VAR7, VAR12, VAR13, VAR15; Environment variables: VAR5, VAR16; Autonomous variables: VAR2, VAR4, VAR18; Outcome variables: VAR1, VAR17. Key variables identified by the MICMAC software: Generation of legal employment, Product quality, Cost optimization, Technological development, Impact of the need to be sustainable in the sector and Brand development.

In the same way, the matrix of direct impacts of actors was carried out to analyze what has the greatest influence on another actor, in which: 3: actor Ai can question the existence and/or missions of actor Aj. 2: actor Ai can question the projects of actor Aj. 1: actor Ai can question, in a limited way (for some time or in some specific case) the operative of actor Aj. 0: actor Ai has no influence on actor Aj .

	1: ACT1	2: ACT2	3: ACT3	4: ACT4	5: ACT5	6: ACT6	7: ACT7	8: ACT8	9: ACT9	10: ACT10	11: ACT11	12: ACT12
1 : ACT1	0	0	0	0	3	0	0	0	0	1	2	0
2 : ACT2	0	0	0	0	1	3	1	0	2	0	1	0
3 : ACT3	0	1	0	0	1	3	1	0	2	0	1	0
4 : ACT4	0	1	1	0	1	2	1	0	1	0	1	0
5 : ACT5	3	1	1	1	0	1	2	1	0	2	0	1
6 : ACT6	2	2	3	1	3	0	1	1	2	3	2	2
7 : ACT7	2	0	0	0	0	0	0	1	1	1	1	0
8 : ACT8	2	1	1	1	0	1	0	0	0	1	1	0
9 : ACT9	2	2	2	1	1	1	0	2	0	1	1	1
10 : ACT10	1	2	2	1	2	3	0	2	3	0	1	0
11 : ACT11	0	1	1	1	1	1	1	1	1	1	0	0
12 : ACT12	1	1	3	1	1	1	0	1	2	2	3	0

Figure 5. Matrix of direct stakeholder impacts

The matrix results in another matrix of indirect impact between actors and also the plane of influences and dependencies between actors, which can be of three types of actors: dominant, linking and autonomous; both tables are shown below:

	1: ACT1	2: ACT2	3: ACT3	4: ACT4	5: ACT5	6: ACT6	7: ACT7	8: ACT8	9: ACT9	10: ACT10	11: ACT11	12: ACT12
1 : ACT1	79	70	77	36	99	98	37	50	89	69	93	25
2 : ACT2	116	116	123	67	147	188	71	86	147	102	138	28
3 : ACT3	131	128	138	74	159	192	77	96	155	117	147	37
4 : ACT4	113	106	117	61	130	141	61	82	121	102	117	38
5 : ACT5	163	154	162	93	168	175	102	117	141	151	127	69
6 : ACT6	285	268	291	151	323	312	165	192	276	270	266	123
7 : ACT7	68	63	65	38	71	86	49	43	65	62	56	26
8 : ACT8	117	99	108	60	97	108	69	78	92	103	79	50
9 : ACT9	177	166	181	95	192	186	107	127	169	168	151	79
10 : ACT10	220	210	233	120	269	283	134	157	250	211	234	81
11 : ACT11	115	110	122	62	143	134	66	80	120	113	121	48
12 : ACT12	219	197	217	111	229	236	127	141	207	202	197	94

Figure 6. Matrix of indirect impact among stakeholders

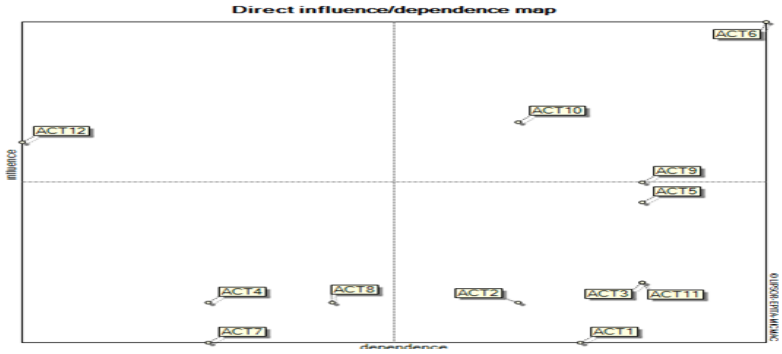

Figure 7. Map of influences and dependencies between stakeholders

This table identifies each actor according to their position. The employees dependent on the sector, the textile technology institutes (AITEX) and the managers of the textile companies are liaison actors, i.e. they are very influential on the others, but at the same time very dependent on them. The Ministry of the Environment, the NGOs and the universities respectively are qualified as autonomous authors, those who are not very influential and dependent on the others. The banking and financial entities, the Ministry of Production, the Ministry of Labor, the clients of the sector and the Congress of the Republic of Peru are identified as low power actors. Finally, in the upper left quadrant are the key actors: the textile and apparel guilds. In Peru, the textile and apparel committee of the National Society of Industries (SNI) stands out as the main guild in the sector.

Phase of generation and validation of future scenarios; We proceeded to generate possible future scenarios using the SMIC method (Systems and Matrices of Cross Impacts). For which our selection of experts in the sector has carried out the elaboration of the hypotheses according to the variables previously found (Table 5):

Table 5. Questionnaire table for the development of hypotheses.

Event	Key variable	Hypothesis
E1	Generation of legal employment	According to the recent labor situation, the following hypothesis is proposed: "By the year 2029, according to the political, economic and social situation, a growing trend of national informality is projected".
E2	Product quality	For the year 2029, less geopolitical tensions are expected at the Peruvian level and therefore, less than 5% of input shortages, also thanks to the Business Support Fund for the textile and clothing sector (FAE-TEXCO), the state is expected to provide economic support to textile companies and MYPES, reducing debts and providing an economic cushion to encourage innovation with synthetic cotton textile products and their good quality.
E3	Cost Optimization	It is expected that by 2029 it will have been possible to implement technological tools to reduce production costs by 10%, raising the value of prices by only 15%, in addition, through Bill No. 5380/2022-PE, deductions to the tax base and deductions in the quotas are expected.

E4	Technological development	Based on the above information, the following is proposed: By the year 2029, technological development will have a significant increase and this will be due to the changes and evolution of the industry, in conjunction with support projects by the State.
E5	Impact of the need to be sustainable in the industry	The proposals developed for a circular and sustainable economy will be implemented, with durable, reusable and repairable products so that 100% of the products that reach the end of their useful life are recycled, with greater concern for their ecological footprint by 2029.
E6	Brand Development	Based on the above analysis, the following hypothesis is planned: By the year 2029, there will be a medium development of Brands, driven by new consumption trends and projects by the State.

The objective is already defined, which is to predict the five-year characteristics of the textile sector under a national level environment after the post-pandemic drop in production. The characteristics are understood as all direct and indirect activities for the processing of textile fibers for the production of yarns, up to the manufacture of garments and other articles. For this, the key variables found in the previous subchapter and the key actors that could make a difference in the environment of the textile and clothing industry will be taken as a primary reference. A questionnaire was given to each of the experts which consists of six simple probability questions focused on each of the events previously dimensioned by the key variables. Thirty questions regarding positive conditional probabilities and another 30 questions regarding negative conditional probabilities. In total, 330 responses were gathered focused on the probabilities of occurrence of the six events (E1, E2, E3, E4, E5 and E6). The objective of the questionnaire is to obtain the opinion of the experts with respect to the hypotheses raised. The results obtained by the experts are compiled and entered into the SMIC software in order to calculate the probabilities of occurrence and thus have the most probable future scenario. Once the results of the questionnaires have been entered into the SMIC software, it performs the calculations of the net data, resulting in three types of probabilities.

	Probabilidades
1 : E1	0.642
2 : E2	0.636
3 : E3	0.492
4 : E4	0.542
5 : E5	0.467
6 : E6	0.489

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Figure 8. Simple Probabilities (Set of experts)

	E1	E2	E3	E4	E5	E6
1 : E1	0.642	0.711	0.606	0.654	0.572	0.54
2 : E2	0.704	0.636	0.664	0.866	0.807	0.768
3 : E3	0.464	0.514	0.492	0.552	0.494	0.475
4 : E4	0.552	0.738	0.609	0.542	0.662	0.717
5 : E5	0.415	0.592	0.468	0.57	0.467	0.532
6 : E6	0.411	0.59	0.472	0.646	0.557	0.489

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Figure 9. Conditional probabilities if realization (Set of experts)

	E1	E2	E3	E4	E5	E6
1 : E1	0	0.522	0.678	0.628	0.704	0.74
2 : E2	0.514	0	0.609	0.364	0.487	0.51
3 : E3	0.542	0.454	0	0.42	0.49	0.508
4 : E4	0.524	0.2	0.478	0	0.437	0.376
5 : E5	0.558	0.248	0.465	0.344	0	0.404
6 : E6	0.629	0.312	0.505	0.302	0.429	0

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Figure 10. Conditional probabilities if NO realization (Set of experts)

Once the net probabilities of the scenarios have been analyzed, various combinations could be constructed with respect to the realization or non-realization of the hypotheses. This generates multiple future scenarios with a unique realization probability for each scenario. In total, sixty-four (64) combinations are generated as possible future scenarios. To summarize and for better understanding, the number 1 means the realization of the hypothesis and the number 0 means the non-realization of the hypothesis. The following is the matrix of the probability of scenarios in order from highest to lowest probability of occurrence, and a column of cumulative probability is also shown.

Table 6. Probability matrix of ordered scenarios.

STAGES	PROB INDIV.	PROB %	ACUM (%)
64 - 000000	0.059	5.9	5.9
41 - 010111	0.056	5.6	11.5
11 - 110101	0.054	5.4	16.9
02 - 111110	0.05	5	21.9
32 - 100000	0.05	5	26.9
09 - 110111	0.046	4.6	31.5
04 - 111100	0.045	4.5	36
24 - 101000	0.045	4.5	40.5
01 - 111111	0.044	4.4	44.9
33 - 011111	0.042	4.2	49.1
14 - 110010	0.035	3.5	52.6
03 - 111101	0.033	3.3	55.9
10 - 110110	0.03	3	58.9
35 - 011101	0.025	2.5	61.4
56 - 001000	0.025	2.5	63.9
08 - 111000	0.021	2.1	66
12 - 110100	0.021	2.1	68.1
15 - 110001	0.021	2.1	70.2
16 - 110000	0.021	2.1	72.3
34 - 011110	0.02	2	74.3
51 - 001101	0.019	1.9	76.2
STAGES	**PROB INDIV.**	**PROB %**	**ACUM (%)**
30 - 100010	0.017	1.7	77.9
36 - 011100	0.016	1.6	79.5
07 - 111001	0.015	1.5	81

22 - 101010	0.014	1.4	82.4
45 - 010011	0.014	1.4	83.8
31 - 100001	0.012	1.2	85
54 - 001010	0.012	1.2	86.2
27 - 100101	0.011	1.1	87.3
53 - 001011	0.011	1.1	88.4
63 - 000001	0.011	1.1	89.5
06 - 111010	0.01	1	90.5
20 - 101100	0.01	1	91.5
23 - 101001	0.01	1	92.5
13 - 110011	0.008	0.8	93.3
29 - 100011	0.007	0.7	94
49 - 001111	0.007	0.7	94.7
55 - 001001	0.007	0.7	95.4
59 - 000101	0.006	0.6	96
62 - 000010	0.005	0.5	96.5
26 - 100110	0.004	0.4	96.9
28 - 100100	0.004	0.4	97.3
38 - 011010	0.004	0.4	97.7
57 - 000111	0.004	0.4	98.1
61 - 000011	0.004	0.4	98.5
39 - 011001	0.003	0.3	98.8
42 - 010110	0.003	0.3	99.1
19 - 101101	0.002	0.2	99.3
25 - 100111	0.002	0.2	99.5
52 - 001100	0.002	0.2	99.7
36 - 011100	0.001	0.1	99.8
43 - 010101	0.001	0.1	99.9
50 - 001110	0.001	0.1	100
05 - 111011	0	0	100
17 - 101111	0	0	100
18 - 101110	0	0	100
21 - 101011	0	0	100
40 - 011000	0	0	100
44 - 010100	0	0	100
46 - 010010	0	0	100
47 - 010001	0	0	100
48 - 010000	0	0	100
58 - 000110	0	0	100
60 - 000100	0	0	100

This Table 6 indicates that the most probable scenario with a probability of 5.9% is scenario 64, which indicates that none of the hypotheses proposed are fulfilled; this type of scenario is called "total extermination". Although being

less pessimistic, there is a probability of 5.6% that scenario 41 occurs, which indicates that only hypotheses E2, E4, E5 and E6 are fulfilled; or that scenario 11 occurs, which indicates that only hypotheses E1, E2, E4 and E6 are fulfilled, with a probability of 5.4%.

For Godet, we must take into account those scenarios that do not exceed 80% of the cumulative total, so for our study the first 23 scenarios will be taken into account for analysis.

A summary table was also prepared by type of trend which indicates the probability of each independent hypothesis and as a result it was obtained that hypotheses E3, E5 and E6 are very unlikely to occur because they have a simple probability of less than 50%, while hypotheses E1 and E2 have a WEAK probability trend, since they have a simple probability of occurrence of no more than 70%. This summary Table 7 is shown below:

EVENT		P*	TREND TYPE						
			VERY STRONG (>90)	STRONG (>80<90)	MODERATE (>70<80)	WEAK (>60<70)	VERY WEAK (>50<60)	DOUBT (50)	UNLIKELY (<50)
E1	Generation of legal employment	0.642				X			
E2	Product quality	0.636				X			
E3	Cost Optimization	0.492							X
E4	Technological development	0.542					X		
E5	Impact of the need to be sustainable in the industry	0.467							X
E6	Brand Development	0.489							X

Table 7. Summary table of simple hypotheses by type of trend

6. Conclusion

According to the results obtained, 18 variables were identified, of which, thanks to the MICMAC analysis, 6 key variables were found, which were used to generate possible future scenarios. As with the variables, 12 actors were identified, of which only 1 remained as a key actor. Having the key variables, the key actor and the current information on the sector, we proceeded to generate the 6 possible scenarios with the help of the SMIC method. This method was of great help since it allows us to have a more objective result about the consensus of the opinions of the experts and at the same time a more accurate result since all the operations are based on statistical tools, taking into account not only the probabilities of simple occurrence but also the conditional probabilities. As a result of all the conglomeration of simple and conditional probabilities, 64 scenarios were obtained, resulting in the scenario 64 - 000000 with 5.9%, which indicates a total extermination.
Therefore, this research concludes by stating that the hypothesis proposed at the beginning does not agree with the results obtained due to the different factors and problems that arose when determining the current state of the sector. Possible scenarios were generated according to the opinion of the selected experts and the current data.

Bill N 5380/2022-PE will not significantly boost the economic reactivation of the textile and apparel sector by 2029 given the high price competition and the increase in raw material costs. With respect to job creation, it is concluded that the progressive increase in informality will not favor companies that wish to invest in innovation. It is recommended that the textile guilds meet together and impose rapid measures to avoid informality and promote the technological development of garments to make them sustainable and the production of quality inputs such as alpaca fabrics, poly cotton and new textile fibers such as nettle, coffee or hemp, thus developing the "PERU BRAND".
It is suggested that large companies and businessmen should buy state-of-the-art machinery and sell depreciated machinery before the end of its useful life to the state so that it can be auctioned off to new emerging SMEs or foreign businessmen who wish to invest in Peru. Finally is proposed to the Peruvian state; create new bills like the one already created in 2023, to boost the sector that just one is not enough.

It is suggested that possible future studies focus on the small companies located in the emporium of Gamarra, a huge commercial center of the textile sector lacated in the center of Lima, because they represent a large informal labor force at the national level and for which there is still not much information, which would have been very beneficial to contrast the reality of national production with local destination and national production with export destination. In addition to using the Delphi method as the main scenario generator, since it proposes a mixed approach, combining expert opinions and objective data proposed by the experts. It is advisable to have a broad portfolio of experts to consult, taking into account their experience in the sector, the positions they currently hold and, above all, that they are actively participating in the analysis and proposals for improvement. The interviews should be

structured with objective and subjective questions about the future, present and past of the sector in order to have a more complete approach.

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Biography

Piero Fabrizio Arditto Xavier was born in Lima, Peru. On July 27, 1998, he was the only son of Mr. Luis Eduardo Arditto Diaz, professor at the business school of the University of Lima and Ms. Olga Patricia Xavier Ampuero, a teacher specializing in language and learning. Also of Italian nationality, he studied at the Colegio de la Inmaculada Jesuitas-Lima where he stood out for his sports skills. He was Peruvian pole vault champion in 2017 and 2018. He studied Industrial Engineering at the University of Lima where he graduated in 2022. He has a bachelor's degree in industrial engineering and two partial certifications in finance and business strategies. Specialist in commercial strategic management with two years of experience in the B2B field. Passionate about the textile industry, he currently works in a Peruvian textile company called NAZCATEX SAC as a commercial and planning engineer. In his free time he trains athletics and do surfing.