



Research Article

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Industry 4.0 - Reality and Perception in the Albanian Market

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Abstract

Statistics show that the average rate of GDP' increase in Albania for more than 25 years has been comparable to the average of European countries. Still, is this an increase in the right direction? Albanian businesses are investing in their digitalization. Are there elements of industry 4.0 in the Albanian market? How much are Albanian entrepreneurs affected by the changes that will bring the 4th industrial revolution in the world economy? All these questions essentially lead to the study of a primary matter: how different is the real development of digitalization and elements of industry 4.0 compared to the perception of entrepreneurs and administrators in some of the most developed businesses in the Albanian market. The main purpose of this study is to assess the readiness and maturity of the Albanian businesses related to the digitization of their activity and use of the elements of Industry 4.0.

Keywords: Digitalization, Industry 4.0, Smart Factory, Robotics, digital platforms

1. Introduction

The integration of the Albanian market in the world economy is an irreversible process that affects all its elements. Along with the integration, there is the process of production factors transformation, where new technologies and innovation become the key drivers of this development. If a market has the necessary monetary means and the stock of human capital to allow its innovative development, then it is fully open to the "Fourth Industrial Revolution".

The term Industry 4.0 was first used at the Hanover Fair in Germany, in 2011. In October 2012, a working group dedicated to Industry 4.0, chaired by Siegfried Dais, director of engineering and electronics at the multinational Robert Bosch GmbH together with prof. Henning Kagermann from Acatech (German Academy of Sciences and Engineering) did present a series of recommendations for the practical implementation of this concept (GTAI, 2014). The first definitive report of the working

group was published in 2013 and this theoretical concept did turn into a model for stimulating and restructuring major manufacturing businesses. Industry 4.0 became the current trend of automated technologies in industrial production, driven by the continuous developments of ICT. After Germany, many other countries considered it as a model to encourage development at the national level or in wider regions (Xu et al, 2018), (Fantoni et al, 2017), (PWC, 2016). In some countries, the efforts to implement I4.0 technologies, getting the expected benefits from this paradigm, are focused on those industries that constitute important sectors of their economies, such as the maritime sector in Croatia, Greece, Colombia, the enterprises of engineering field in the Czech Republic and Poland (Kubickova et al, 2021), (Wyrwicka & Mrugalska, 2017).

This concept, mostly in the theoretical aspect, did gradually enter Albania, becoming part of publications in the academic press and part of some EU-funded programs. Today, 10 years from its initial introduction, this paper will be an attempt to evidence the real extent of recognition and use of Industry 4.0 elements in most innovative Albanian enterprises. It also aims to measure the readiness and maturity of the large Albanian businesses concerning the digitization of their activity and use of specific elements of industry 4.0, through numerical indicators.

2. Literature Review and Frame of Reference

Coté (2017) in his book "The Business Bottleneck Breaking - Through the Last Barrier of Digital Transformation" points out the directions the entrepreneurs and top managers can follow to accelerate the processes of digital transformation in the era of the 4th industrial revolution. Even though there are digital platforms placed in the center of the digital transformation, he essentially argues that digitalization in business is not simply a technology problem, but above all, it's a problem of perceiving the phenomenon and defining the business model. Creating and supporting a culture of innovation in the company promotes the continued growth of competitiveness for it over time. Such perception notion is underlying our research work as well as the conclusions in this study.

Schuh et al (2017) have dedicated the work "Industry 4.0 Maturity Index - Managing the Digital Transformation of Companies" to measuring the level of maturity or readiness of companies to accept and implement the industry 4.0' paradigm. They point out that Industry 4.0 is not merely a matter of connecting machines and products via the Internet. They also highlight the relation of the digital capacity to structured communication as one of the indicators of digitization' degree. From one side this relation indicates the degree of use of the communication system between the means of production and other elements of entrepreneurial activity. On the other side, it highlights the role of suppliers and customers in transforming the economic activity and production due to the communication process. The development level of the elements of industry 4.0 is closely related to managerial decision making and it imposes necessary changes in the structure of companies and the relations between companies. The authors suggest a particular method for defining and implementing managerial correcting actions in real-time, to increase the effectiveness. Some elements of this relationship can be highlighted and analyzed in Albanian companies as well, despite their size, their general development level, or the overall development level of the Albanian market. Evaluation of these indicators in particular companies facilitate the assessment of the digitization level of the Albanian market, even in approximate terms.

Fantoni et al (2017) has made a detailed analysis of the driving factors, in response to the question: "Entrepreneurship 4.0: Are we ready for the fourth industrial revolution?". The researchers have observed four structural fields of the company: resources, information systems, organizational structure, and culture, which in essence constitute a business and allow it to compete for succeeding in a competitive market. These areas are observed by considering the influencing factors connected and positioned in two axes for each field:

- a. the digital capacity of the company and the structured communication,
- b. information processing and their integration in automatic decision-making,
- c. internal organization and organic cooperation according to the value-network system,

d. willingness and acceptance of change, and social collaboration.

The factors included in each of the areas do represent basic features of the way companies operate, in order to achieve their strategic objectives. At the same time, they serve as indicators to assess the level of organization, digitalization, and adaptation of technologies that enable the application of Industry 4.0 for companies. Consequently, some factors from the above areas have been considered to assess the situation in Albanian businesses, as explained in detail here below.

There are few observations and analyses about the level of digitalization in the Albanian business as a whole or certain branches of industry. This comes for several reasons:

- predominance of medium, small, and very small businesses (INSTAT, 2020),
- the structure of the economy where services predominate, while production occupies a smaller part of economic activities (INSTAT, 2020),
- management systems and leadership are not always advancing with the same speed and level as technologies in Albanian businesses do.

There has been increasing attention to innovation, digitalization, and the use of ICT in terms of economic benefits for business in recent years. Xhaja and Kordha (2017) have analyzed the role of ICT in the Albanian economy, proving that the use of technologies leads to increased productivity, both at the company level and at the country level. Expanding the use of ICT, which is directly related to Industry 4.0 technologies, and promoting innovative businesses would increase the chances for competitiveness and economic growth.

Gjika and Pano (2020) have observed the effects of ICT in the Albanian tourism business and assessed the degree of digitalization of Albanian tourism compared to the level of digitalization of the Albanian economy in general, using specific indicators. Comparison of digitalization indicators of Albanian businesses in general, according to INSTAT reports, and those in the tourism industry, do certify that tourism was amongst the most digitalized sectors in the Albanian economy. This announced perception of the Albanian tourism companies was proved to be a factual conclusion.

Based on this reference framework, the study here presented intends to contribute to further discuss the issue, by comparing the perception of senior managers of Albanian businesses on digitization, with its real level according to certain valuation methods.

3. Purpose of the Paper and Methodology

3.1 Research objectives

The basic research question is: how close is the perception on the level of digitalization of Albanian business with the real indicators of this process, according to the evaluation method used in this study?

There are built several ancillary questions to support the survey for answering to the main question. They could contribute to a thorough analysis, to enable the discussion and to offer suggestions to stakeholders for the adoption of information and communication technologies and industry 4.0. They are:

- ✓ How well do Albanian business leaders know the theoretical concepts of industry 4.0?
- ✓ Which factors promote elements of industry 4.0 in the main areas of activity in Albanian businesses?

The general intention of the work is to assess the level of digital maturity of Albanian companies and how much the Albanian market as a whole stimulates the introduction and development of elements of industry 4.0.

3.2 Methodology of the study

The methodology used in this paper is the empirical research based on a questionnaire and a structured interview about the perception of Albanian business digitization, done with the top

managers of the companies, which are the "strategists" of their businesses. The model of evaluating the reluctance of businesses to include elements of industry 4.0 in the partial or entire form, is based on the reference framework above and is similar to the certification system of type DIN SPEC 91345:2016 (Schuh 2017), (Fantoni 2017). This standard is known as the reference architecture paradigm for Industry 4.0 (Architecture Reference Model for Industry 4.0 RAMI), generally accepted as a standard key and used in analysis and assessments for I4.0 in many countries (GTAI 2014), (Xu, 2020). The model includes four structural areas with axes and constituent elements that practically describe and analyze the company as a whole. The application of the model in the conditions Albanian businesses operate, having a limited level of data processing in companies and the limited size of the market, has brought to the reduction of the number of indicators for each area, compared to what this system can provide in the standard format. Despite this, the level of representation of each structural area in the survey allows considering a significant number of elements from resources, structure, culture, and information systems in Albanian companies.

To answer the main and auxiliary research question, contacts were made with the senior management of a number of Albanian businesses (administrators/ CEO, owners, and division managers/finance, sales, etc.). The selection of these companies was conducted considering several criteria, in order to have a representative sample of businesses, that are – at least theoretically – more tend toward digitization in their activities and more easily adaptable to the I4.0 technologies. Businesses included in the survey should:

- be classified by the Tax Directorate as large businesses, which have a significant contribution to the tax system, according to data at <https://www.tatime.gov.al/>.
- have more than 50 employees and a yearly turnover of over 2 million euro, which is easily verified from the National Business Center at <https://qkb.gov.al/>
- be profitable in the last three years of their activity which is evidenced in the financial statements in the NBC.
- be part of those branches of the Albanian economy that give the main contribution to the structure of GDP and are characterized by high levels of innovation and investment (INSTAT, 2020). Agriculture and the banking sector were excluded from the selection.

There were selected 96 businesses fulfilling the criteria, of which 18 companies do agree to collaborate in the realization of this study, filling in the questionnaire and making the interviews. They belong to the light and food industry, construction, trade and production of construction materials, telecommunication, energy, fuel trade, and importing enterprises for wide distribution.

The questionnaire was formulated to permit the evaluation of the digitalization of economic activity and the identification of elements of industry 4.0 in the following directions:

Field 1- Digital capacity in means of production, distribution system, the fleet of transport, and storage.

Field 2 - Information systems for collection and analysis of data produced.

Field 3 - Dissemination of information based mainly on the use of integrated activity evaluation platforms.

Field 4 - Decision-making systems and the role of management protocols for the forecast, implementation, and changing in real-time the business objectives.

The structured survey highlights the current level of digitalization and evaluates the elements of industry 4.0 with five questions for each area. Each question has four possible alternatives, of which only one can be chosen. The alternative representing the minimum level of the element gets 10 points, while the one that estimates the maximum level of the assessed element gets 40 points. The intermediate responses are 20 and 30 points respectively, applying a 10-point scale. The evaluation of the entire field is done by the average of the points obtained from the answers to 5 questions. This is done for all fields and for all companies to get evaluations by area. Hence the total rating is an average for all companies.

There was a feature regarding field 1. The companies participating in the survey were of two

types: manufacturing companies having production, storage, distribution activities, etc., as well as trade and service companies, that don't have manufacturing activity. This brought to an approach of dividing the first field of the survey into two parts to accurately evaluate all the elements abovementioned. For the manufacturing companies, it was possible to observe the digitization level of production, storage, distribution, etc., while for the others storage and distribution digitalization was observed. In both cases, the evaluation is done based on the average of the simple points for the answers of both parts.

The assessment described above is a numerical assessment determined by a method equally applied to all companies and it indicates the real level of digitalization and readiness for I4.0. To get the perception that administrators and owners of companies have about the digitalization level of their enterprises, how much aware they are about their technological progress, and the possibility of implementing elements of industry 4.0, we went through the following steps.

1. All persons were informed before the interview about the fields and questions of the survey. It was theoretically explained the purpose of every question and it was requested from them before answering the question to consider the relevant documentation they could provide for proving it.
2. At the start of each field, they were asked to make an average overall evaluation on the degree of digitization and elements of industry 4.0 their company has in that field. Evaluation is done in points, from 10 to 40, but in contrast to the evaluation of specific queries, where the scale is 10 points, the evaluation of "perceptions" could use a narrower scale, by 5 points (except the values 10, 20, 30, 40 they could also use values 15, 25 and 35). The more options available, the more careful and accurate the assessment can be.
3. Assessing the level of perception was done by the average for each company and the average of the 18 companies included in the study. We do call this number the 'perceptive' degree of digitization of a business by the senior executives.

Interviews with administrators and, in some cases, with the owners of companies, were oriented toward analytical discussion of questions, allowing us to better understand their level of knowledge on digitization, elements of industry 4.0, as well as their objectives for the near future.

At the end of the interviews and the completion of the questionnaires, the interviewees were given the opportunity to make changes in the perceived assessment, if they deemed necessary. Only one from 18 companies in the study wanted to change the first overall evaluation, "perception" value, at the end of this procedure. All the others did remain with the same impression as at the beginning of the evaluation. Consequently, we are of the opinion that the evaluation that is done before detailed answering does express the internal belief or sensation of top managers on the level of digitalization or elements of the industry 4.0.

The study method is similar to the one used in other studies for several countries, as presented in the literature review above. However, the structure of markets where these studies are done and the level of businesses they have observed, vary from those in Albanian market and businesses. This is the main reason why the results obtained from these studies are not easily comparable and leads to specific conclusions about our business environment.

4. Results and Findings

The processing of the questionnaires enabled the calculation of indicators for each field and the differences between them. The following table summarizes the differences by areas in the average level of perception and the average level factually measured.

FIELDS		Perceived level	Measured level	Difference
Field 1	Digital capacity in means of production, distribution system, the fleet of transport and storage	32.11	29.83	2.28

FIELDS		Perceived level	Measured level	Difference
Field 2	Information systems for collection and analysis of data produced	32.67	28.56	4.11
Field 3	Dissemination of information based mainly on the use of integrated activity evaluation platforms	29.11	24.44	4.67
Field 4	Decision-making systems and the role of management protocols for the forecast, implementation, and changing the business objectives in real-time	27.56	21.78	5.78

All the interviewees are acquainted with and have knowledge about specific elements of industry 4.0. The amount of knowledge is different according to individual experiences, type of business, and cooperation with foreign suppliers. This became evident from the fact that all those businesses which have introduced or want to introduce one or more specific elements of industry 4.0 were stimulated by external factors.

Based on the survey data, only in two of the 18 companies, the level of digitalization perception is lower than its measured level. Senior executives of these companies were very interested in increasing the degree of digitization and using elements of industry 4.0 in their businesses. They were aware of the unused elements of industry 4.0 and were looking for the appropriate economic solution to implement them in all areas of observation.

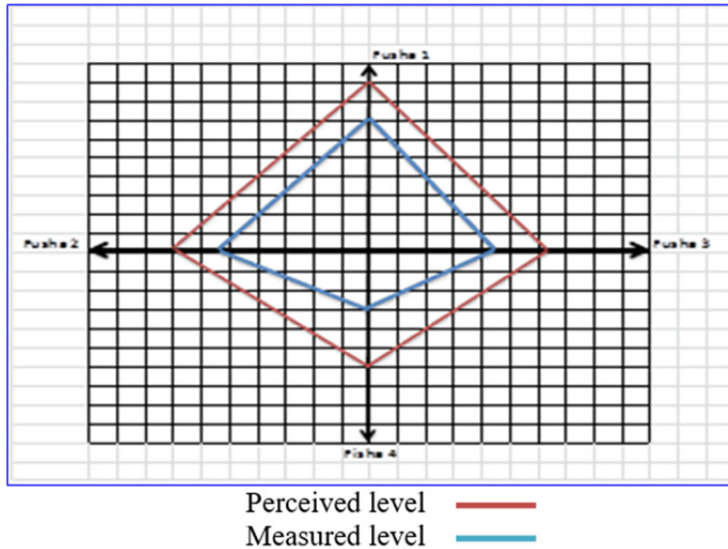
Both companies with a lower level of perception than the measured one are companies with foreign capital. Consequently, the forms of their organization are directly affected by the parent companies they represent in the Albanian market. The rest of the companies where the perception of digitalization is higher than the measured one, are mostly Albanian companies or have a limited amount of foreign capital. Although they have strong relations with foreign companies for the import of finished products or raw materials, they slightly benefit from their partners in terms of digitalization. This reaffirms the opinion that the level of digitalization and I4.0 in Albania is an “imported element” because of the country’s economic integration in the world market.

The administrators and owners in the rest of the businesses are self-satisfied with the situation they have in companies. The perception of the level of digitalization in their business was higher than the measured one, which in fact might be an obstacle to stimulating the elements of I 4.0. and digitizing their business.

The main factor expected to incite the digitalization and entry of elements of industry 4.0 in the Albanian market is the fiscalization process, recently imposed by the Albanian Government, which will change the amount and method of data declaration by businesses to the tax authorities. Another inciting factor is the progress of the digitalization of the country itself through platforms that eliminate state bureaucracy and ensure the generation of data in electronic form. If achieved, the electoral promise that by the end of the year 2025 in Albania 80% of interactions between citizens and public institutions carry out on a digital platform, will significantly affect Albanian business digitization.

Economic factors that drive elements of industry 4.0. and digitalization of Albanian business, in the four areas observed are:

- investment in machinery and means of production, especially to increase work efficiency, reduce costs, etc.
- policies used in the field of marketing and sales, especially in trying to link the payment with the target objectives.
- the least performing element of digitalization is the decision-making system based on data.
- Graphical presentation of the average perceived and measured levels in four areas is as follows (in radar form)



5. Discussion

A general analysis of the survey results and the accompanying interviews allows the discussion of the following issues.

1. Assessment of digitalization in the companies regarding their production activity (*the first part to the first field*), with a focus on the means of production and labor is the most encouraging part of the study. The difference of perceived and measured digitalization levels here is smaller than in other parts. Data processing brings to a level of digitalization perceived of 32.78 points, while the measured level based on specific questions in the field is 29.83 points.

The machines are on average of the last 15 years but very few of them are equipped with systems and indicators that provide automatic digital information. There was no case that the machines were programmed and supervised by a single center. None of the companies had fully automated processes to yield the necessary information in real-time for all other divisions or sectors within it. It should be noted that many machines had the capabilities to provide more information if production would be in communication with the storage and sales in real-time. It is a pessimistic fact that very few Albanian businesses had a medium or long-term investment plan oriented to digital technologies, generating automatic data helpful to decision making.

While assessing the degree of digitalization of companies in terms of storage/ warehouse activity (*the second part in the first field*) it is noticed that both the perceived level (31.44) and the measured one (28.78) here are lower than those in the first part of the 1-st field (respectively 32.78 and 30.00). Even the difference between perceived and measured levels is lower than in the first part.

Manufacturing and trade companies in Albania generally do organize the storage of products in designated shelves and partitions. Only four of the interviewed companies, three of which are importers, have real-time digital footprints for the stored products. There is no sufficient concern to use the data resulting from the flow of products in the warehouse. Even in cases when there are data in digital form for several years, they can't be used automatically in real-time. The lack of functional digital archives is another handicap in Albanian companies.

The data resulting from the entry-exit of goods in the warehouse in Albanian businesses are mostly used for annual or shorter time analysis within the year, and rarely at certain intervals to see the trend of economic phenomena. The option of real-time automatic data processing for storage activity by the interested parties is very rare in our companies.

In practical terms, the purpose of analyzing warehouse data is either to avoid goods shortages/excess stocks or for fiscal effects. The storage data is even less used for financial analysis, operational control, or strategic planning. Only one of the businesses has a storage management platform that uses the barcodes, generates the invoice, and is related to other managerial features.

2. According to the survey, the degree of digitalization regarding the organization of purchases of raw materials, materials, or finished products (*second field*) is a laggard in terms of enabling technologies and elements of industry 4.0. This is evidenced in the manner they decide on production scope, as well as how they collect and utilize information about markets and competition. The companies and their executives provide the market information from personal experience or based on suppliers' and customers' data. Very few of these businesses base their work on market studies done by specialists or specialized companies; even few keep updated records on market information.

A similar situation is noticed in the process of forecasting raw materials, auxiliary materials, complementary or diversified products. In most cases, the replenishment for these items is based on requests by storage staff and is recorded when the order arrives in the company. Only a few Albanian businesses use digital platforms for managing raw materials supply, or to enable an integrated supply plan that can be adaptable in real-time during the yearly activity of the company.

Another important indicator evidencing the considerable gap between the perception and measured reality is the way Albanian businesses decide to introduce new products in the market. Most of the observed companies accept they introduce new products mainly relying on the intuition of managers and following the competition actions. The introduction of new products rarely is preceded by a market study by third parties or by an analysis of specific data archived over the years. All this evidence that most Albanian businesses miss the fixed procedures for introducing new products, moreover paper-based ones. This is because they don't have medium- or long-term plans for the company activity both in terms of productive technology and the introduction of new products.

The average level of perception in this field is 32.67 points and the factual measurement is 28.56 points. On the other hand, the role of information systems focused mainly on the provision and analysis of the data produced is slightly recognized as an element of industry 4.0.

3. The perception of top managers in terms of organizational structure and dissemination of information mainly through the integrated platforms (*third field*) is distant from reality. The average level of perception is 29.11 points, while its real measure is 24.44 points.

Data from the survey in terms of marketing and customer service show that the sales indicators are monitored either to record the receivables or to evaluate the work of the sales staff. They rarely are processed by digital platforms for automatic forecasting of expected economic data.

Sales data in the surveyed businesses are stored and used in electronic form. Several large companies, subsidiaries of foreign companies, do use digital platforms as well. The fact that the sales indicators are widely used in Albanian businesses for the work evaluation and remuneration of the employees is encouraging, especially in trade companies and big supermarkets. While the sales data are important for Albanian businesses, the marketing data are mainly used to evaluate employee performance. Only four of the surveyed companies use marketing data to identify the potential for customer development. Such data are used by management in decision-making only from two of the companies surveyed.

Finally, for this area, it is noticed that companies have shortcomings in evaluating after-sales customer satisfaction. Very few of them have built evaluation systems for after-sales product tracking or considering the data in the decision-making system.

Dissemination of marketing and sales data is in the few cases performed according to a digital procedure, from a centralized unit to other interested units.

4. The biggest difference between perceived and measured levels of digitalization is noticed at 'Decision-making systems and the role of management protocols for the forecast, implementation and changing the business objectives in real-time' (*field four*), respectively 27.56 and 21.78 points.

These lowest levels need to be evidenced and raise awareness of the Albanian business for the long road ahead toward an organized digital economy.

The organization of Albanian businesses in relation to the increase of the work effectiveness of the employees and the increase of the productivity leaves much space for improvement. Thus, it is noticed that most businesses do not have an evaluation system for the human resources evaluation. In most cases, businesses do only one appraisal per year.

Very few firms associate the evaluation process with concrete measures to increase work effectiveness. Automatic evaluation of work efficiency is also rare, based on an integrated platform that guarantees decision-making with certain indicators. This shortcoming is an important obstacle to the development of the elements of entrepreneurship 4.0 in Albanian business.

The two elements analyzed above are closely related to the system a company has built to produce the necessary information for different levels of management. Most of the information produced by Albanian businesses is for accounting, tax, and cost estimation. There is a growing trend of information produced by electronic invoices combined with storage and sales indicators and very few platforms that generate accounting, production, storage information, and real-time valuations.

Human resource management, evaluation and elimination of human error, and decision making based on economic indicators is another element of management efficiency. To judge on the organization of Albanian business we addressed to top managers the question of how they reacted in cases when wrong actions were taken by subordinates. In most cases, the administrators identified the error, recorded it, and took action according to their judgment. There were cases when, in addition to the steps shown above, ways or protocols were required so that the error would not be repeated. The survey shows that less than 10% of Albanian businesses had a certain protocol for error assessment, a structured way of assessing the damage, a procedure for not repeating it, and a strategy for improving the process. They had used this for ISO certification purposes and to build corrective actions, avoiding repeated mistakes.

The least understandable part and the least used element in the Albanian business is the decision-making based on data. The interviews with owners and administrators of these businesses permitted to notice that there are interesting efforts for decision making using certain indicators in terms of sales and marketing. But this does not happen at all in forecasting, or in decision-making for investments. In this respect Decision Making (fourth area) has only a few elements of industry 4.0.

6. Conclusions

The main purpose of the survey and the entire study was to assess the situation and at the same time to disseminate knowledge related to digital developments and technological advancement in economies and industries around the world. From this point of view, the results of the survey allow us to mention these main findings:

- Most of the administrators and owners of businesses at the forefront of the Albanian market have shallow knowledge of the industry 4.0 elements and are interested in business digitization. Digitalization is a phenomenon that is better known by Albanian entrepreneurs, compared to the concept "industry 4.0".
- The level of perception on the current state of digitalization of their businesses is generally higher than the real one. We consider this as an obstacle to the faster development of these processes. When you think you are better than the surrounding reality, you hardly change it. In this aspect, the non-objective assessment of the situation is an obstacle for digital development.
- The driving factor for the digitalization of Albanian businesses is the integration of the Albanian market in the global one. This is evidenced by the fact that all foreign companies or subsidiaries of foreign companies had a higher level of digitalization and a more realistic perception of the industry 4.0.
- Some of the obstacles for the development of elements of industry 4.0 are the size of the

Albanian market, the degree of evaluation of the human capital stock, and the shortcomings in the professional education of senior and middle management staff.

The study has its limitations both in terms of the level of a general judgment about the Albanian market and in the evaluation of the entities that make up the majority in its structure. This survey was conducted for certain companies that in the author's opinion represent the most dynamic part of the market and not the most representative part of it. However, we believe that when the vanguard of a market dares to invest in the most advanced business models, sooner or later it will have effects on the rest of the market.

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