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ScienceDirect

Procedia Manufacturing 51 (2020) 1755–1762

Procedia MANUFACTURING

www.elsevier.com/locate/procedia

30th International Conference on Flexible Automation and Intelligent Manufacturing (FAIM2021)
15-18 June 2021, Athens, Greece.

Fostering economic growth, social inclusion & sustainability in Industry 4.0: a systemic approach

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Abstract

The most modern and mature industrial manufacturing revolution is known as Industry 4.0 (I4.0). Technological advance seeks to minimize all sorts of waste, optimizing the firm's performance operations aligning this its competitive advantage. While in developing economies often overlooked the society and environment under the current neoliberalism strategy, whose competitive approach is enforced by the State, with a detriment of local SMEs such as Mexico. Thereby, to lead I4.0 implementation for SMEs, the role of the State for a long-term strategic approach is of utmost importance. The industrial strategy should regard the imminent industrial revolution without leaving behind environmental and social dimensions to implement it, like the Scandinavian economies example. This research proposes the soft systems methodology for dealing with the sustainable complexity context and inclusive industrial development phenomena. Its holistic nature provides useful insights that devise how I4.0 and social inclusion fit into the Mexican context. The theoretical proposal builds upon the social inclusion state-of-the-art in the industry 4.0 and a survey for an affordable I4.0 initiative through a stakeholder system's network communication approach. The inclusive strategy is an effort to align root systems for sustainable development with stakeholders for Mexican SMEs in the manufacturing sector.

Keywords: Sustainable development; social inclusion approach; soft systems methodology; industry 4.0; smes strategy; manufacturing sector

1. Introduction

Being the most mature and modern manufacturing revolution, Industry 4.0 (I4.0) represents a breaking point for innovation on knowledge management digitalization [1]. This maturity revolution stems from the three previous stages, namely industrial revolutions. The first industrial revolution, which became with the first mechanical loom in 1784 with the crafting production paradigm; then, the second revolution, it was launched in 1870 with the innovative technology developed with electricity for mass production. Later, the third one, with the development of the automated devices due to Programmable Logic Controller (PLC) and IT systems.

Eventually, the fourth industrial revolution, mainly characterized by the introduction of cyber-physical systems, interconnects vertically and horizontally throughout the firm's processes [2, 3]. Such interconnection of the firm links internal processes and external ones that associate procedures involving suppliers and customers' instances. Therefore, these links begin with the horizontal operations of the firm, for example, the supply of raw material until the delivery of the final product to

10.1016/j.promfg.2020.10.244

customers or end-users. Meanwhile, vertical integration processes interact with stakeholders' communication of the complex network value [4]. Finally, the integration of both interaction types with cyber-physical systems along the chain value is well known as the end to end engineering [5, 6].

According to the UN, it is of utmost importance to face global issues for preventing disequilibrium of the social, environmental, and economic dimensions, and foster cultural actions dissemination with people. As a strategy to tackle those global issues that threaten disequilibrium, the UN in 2015 deployed the 17 Sustainable Development Goals (SDG) for any country [7]; for that reason, it matters to developing and developed countries their contribution. Notwithstanding, to contribute with such a strategy in this paper, the industrial activity "manufacturing" is proposed as a significant role, since it is one of the main economic activities of human beings [8]. Additionally, the lack of a robust industrial strategy as a critical driver for the economic strategy by the State´s policymakers may unchain unwanted social externalities into the country´s population. For instance: unemployment, income polarization, unsustainability, and insecurity, are happening in many developing countries in Latin America, such as Mexico [1]. However, what is the link between Sustainability and the modern concept of Industry 4.0? Despite what has been said about technology replacing the labor force in the industry [9], technological changes have demonstrated that these technologies get benefits [10] as the improvement of quality of life of workers [11] in certain regions in most developed countries. In the same way, by optimizing the actual supply chain demands of the market, it minimizes environment depletion [12].

The research literature review was analyzed by the bibliometric software VOSviewer of the latest papers in the SCOPUS scientific database. Firstly, the search process performed found 43 documents by using the keywords sustainable development, industry 4.0, and social inclusion. In sum, this field of study has been growing exponentially, being led by the European countries, mainly the United Kingdom, Italy, and Denmark. The Bibliometric analysis depicted in **Fig. 1** shows 4 clusters where Industry 4.0 and the Internet of Things are the most common keywords in the search used by researchers. Each of the main keywords represents the head of the information clusters. Whereas according to the analysis, sustainable development links with sustainability, circular economy, and digitalization. On the other hand, sustainable development also links with the Industry 4.0 applications such as the Internet of things and the digitalization of the optimized supply chain management by sustainable and green operations of the smart manufacturing activity. Therefore, the research does not show a clear link between I4.0 and sustainability with social inclusion.

2. Social sustainability

As a consequence of global warming and poverty, there is a commitment to play an active role and tackle critical global issues among developed and developing countries and fulfill the 2030 Agenda for Sustainable Development Goals (SDG) [7]. Notwithstanding, five years after the agenda launch, the UN reports that we are still far from achieving sustainable goals [13]. It was explained, in the research published in 2019 titled Towards Sustainable Industrial Development - A Systems Thinking-Based Approach, how Mexico has not achieved sustainability in the Triple Bottom Line (TBL) perspective [1]. Although the focus of the current research relates to sustainability involving the TBL perspective (Economic, Social and Environmental dimensions), fostering economic growth with social inclusion is mainly the focus of this investigation.

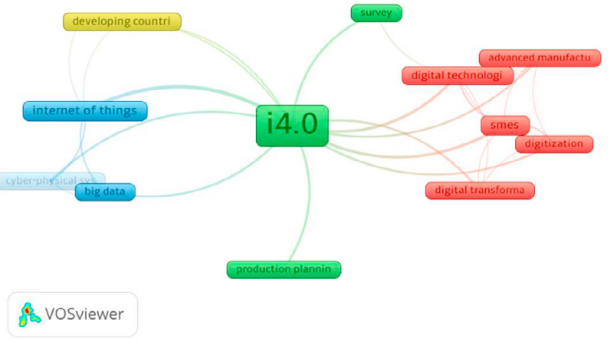

Fig. 1 VOSviewer Keywords SCOPUS cluster map

The study previously mentioned reported that talking about social measurements, such as the mortality rate of Small and Medium Size Enterprises (SMEs), is representative high as it unchains unemployment. Then, other social issues consequences as its side effects reflected in a low human development index and poorly productive labor. SME's mortality study resulted in a relationship between the number of employees per company and its mortality rate in one and five years. In general terms, there are more chances of closing an SME business with fewer employees than with more. Although the establishment of a company should be profitable at most in the fifth year [1], the chances of breaking it down with less than ten people are almost 50%, whereas with 50 employees are close to 20% (see **Fig. 2**). In other words, the firm would strengthen with the social component due to the higher number of employees in the firm. Nevertheless, it does not mean that the labor force is used productively in the firm. Albeit the occupied population has been growing, the global productivity labor index seems to be struggling to perform [1]. Additionally, the informal work population is higher compared with formal workers, resulting in a disequilibrium economy. According to the United Nations Development Programme in 2015 reported that the GINI index is close to 0.5, which means in the polarized economy [1].

Therefore, bearing in mind that the social arrangement does not fit with the industrial system. Notwithstanding, in this regard, it is worth noting that the case of the six leading countries in I4.0 technologies such as Canada, Japan, Germany, Austria, Australia, and Switzerland. So far, they have successfully combined new technologies with global competitiveness, economic growth, and social well-being while keeping minimum inequality and sustainable environment into

their domestic economies [14]. Moreover, in the emerging context, SMEs are more aligned along with the neoliberalist strategy growing, where the state played a passive role [15], such as the maquila market has shown. In so far, regarding the paragraph aforementioned, to come up with a proposal for the industrial strategy void reflected and reformulate it for tackling the lack of industrial strategy, the following section explains the methods for the proposal devising. Thereby, to foster social sustainability and consider how the proposal can be a maturity bridge for getting I4.0.

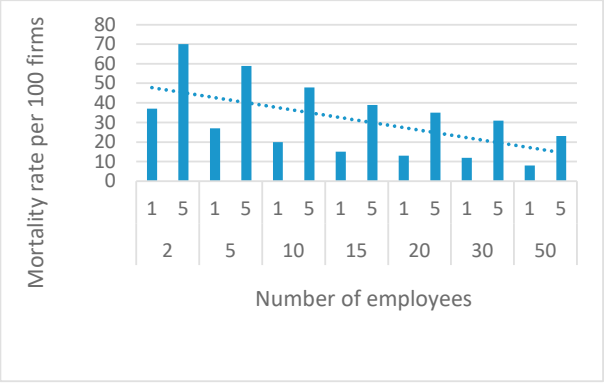

Fig. 2 The mortality rate of Mexican SMEs in 1 and 5 years [1]

3. Literature review

According to Porter [12], the missing driver for a strong-sustainable strategy is the lack of innovation in the firm's strategy. It does not only give a competitive advantage by minimizing wastes in the production processes but also improves environmental and social variables. For instance, improving the workers' quality of life with ergonomic working stations and enhancing their working environment [11, 16]. However, achieving an efficient innovation system represents a significant challenge since a trustworthy environment should prevail in the innovation system [17, 18]. It is of utmost importance to remove barriers for achieving a better knowledge's stakeholders sharing place [17] into the sustainable industrial development context [18]. Thereby, if innovation complies with knowledge transfer coordination and specialization [19] about the sustainable industrial field, so that knowledge can be exploited [18] by an intensive knowledge environment [20]. Therefore, for sustaining a competitive advantage, knowledge transfer among stakeholders must be coordinated according to the education requirements of the productive structure. Whereas research and development activities should focus on new products' development [18].

Notwithstanding, intending to get such a trustworthy context, it is imperative to develop an entity that fulfills not only with trustworthily but also with the innovative capacity to face stakeholders' requirements through the sustainable industrial development framework. Hewes & Lyons (2008) suggested the development of a social champion figure to join and bring stakeholders to be together as well as bring them involved directly with Eco-Industrial Parks' construction [21]. Conversely, according to Zhou et al. [22] in their research, they identified and evidenced an inverse relationship between risks and trust. Then, in case of a lack of confidence among stakeholders, a weak and negative impact of the overall risk perception where there is an organization system of stakeholders would affect.

Although stakeholders are drivers for sustainable industrial development, the State plays a significant role as an economic driver when it comes to the design and implementation of the industrial and economic strategy vis-á-vis the rest of "stakeholders" to attain such equilibrium [14]. According to Mendoza et al. [1], they depicted the system in focus named Industrial cluster. The cluster system is embedded in the Triple Bottom Line [TBL] supra-system. In sum, the bedrock to foster inclusiveness and industry transformation to sustainable industrial development is the proper linkage among critical systems: industry, research & academia, government as the state, and financial institutions aligned with the core strategy of the local region.

Notwithstanding, the model would complement sustainability by strengthening the missing link of inclusiveness in the sustainable industrial development model. For that reason, stakeholders are the critical drivers for inclusiveness into the system in focus. According to the Eco-industrial park manual by the World Bank [23] and the sustainable industrial park guidelines by UNIDO [24], it is necessary to strengthen the strategy; for eco-industrial and sustainable parks respectively, by forming a group of members and adding allies to represent stakeholder´s interests. Even the Mexican industrial park norm NMX-R-046-SCFI-2015 developed by significant actors for economic development and the environment actors [25]. Moreover, Gómez et al. [26] indexed triple helix stakeholders, like users and audit units, into the green energy's framework. Finally, critical Stakeholders systems identified for the transformation of industrial growth to sustainable & inclusive industrial development: The State, Cluster, Industrial Products and services system, Academia, Environmental institutions and, Foreign & Local actors.

Moreover, the implementation of I4.0 in a firm represents challenges and risks. However, it is of utmost importance that companies not stop focusing on sustainability [10] since it is the sustained focus for the firm's operations maturity. Mora Sanchez [10] explained that companies should bear in mind that before implementing an efficient I4.0 in the firm, it is necessary to analyze the risks involved in technologies related. They developed a strategy for getting I4.0 with Corporate Social Responsibility. Which it consists on, before implementing technological I4.0 tools, evaluate challenges and risks of implementing Internet of Things (IoT) and Industrial Internet of Thing (IIoT) with the main social, economic and environmental issues: Financial, Connectivity, Employment, Time Vulnerability, and Education [27]. Meanwhile, Gómez et al. [28] depicted a holonic framework in sustainable industrial practices to mitigate the metabolic rift by using the I4.0 tool. For instance, the use of I4.0 enablers in the circular economy for the sustainable supply chain. Albeit, Götz & Jankowska [5] suggested the cluster strategy for a more straightforward I4.0

implementation. The cluster can be a hub that offers scales economies of the main three I4.0 enablers: Big Data, Autonomous Robots, and Simulation.

4. Methods

Systemic tools are useful to understand a problem from a holistic perspective. Albeit, such a situation should be delimitated as the scope of the system in focus. Hence, it means that it considers every aspect which is involved in such a system. Therefore, the methods section aims to mention the methods, methodology, and tools to foster sustainability and get an I4.0 strategy with economic development and social inclusion.

First, Flood & Jackson [29] published their work Total Systems Intervention: A Practical Face to Critical Systems Thinking in 1991. They developed a meta-methodology named: Total Systems Intervention (TSI), which consists of three main phases: creativity to depict the problem situation and choose the appropriate systemic intervention methodology and implementation. Creativity, the first phase, describes the problem situation by systems metaphors to get an organized structure. Then, choose the appropriate systemic intervention methodology is the second phase, where it is the selection of the method that fits better with the system in focus. Choosing the appropriate tool phase regards two main aspects. On one side, the type of problem, whether it is simple or complex; on the other side, the context of the problem bears in mind the nature of the participants' relation, if it is: unitary, or pluralist, or coercive (see **Table 1**). Finally, the implementation phase employs the particular system methodology chosen before to get a change proposal for the solution.

Table 1 A System of Systems Methodologies [27]

Problem /Context	Unitary	Pluralist	Coercive
Simple	Simple-Unitary	Simple-Pluralist	Simple-Coercive
Complex	Complex-Unitary	Complex-Pluralist	Complex-Coercive

The soft systems methodology by Peter Checkland [30] is a suitable option for leading with a proposal with further clarification in a pluralistic context [29] based on the system in focus. The methodology consists of 7 steps (see **Fig. 3**), according to the author, they are not applied strictly in order. Additionally, there are two types of system activities in the methodology; the events that belong to the real world, such as the problem's perception. While the activities which address the abstract world, they refer to those relevant systems models of the problem situation expressed.

5. Results

The critical systems identified to examine from several perspectives for the sustainable and inclusive development transformation are systems involved in environmental institutions, social and foreign actors. Environmental institutions' system works as monitoring and auditor element of the system in focus, meanwhile social ad international actors trace the path for inclusiveness and the supra-system route for sustainability. Although environmental institutions, social and foreign actors are part of the strategy, their performance as a whole has not achieved expected sustainable outputs since any of the TBL targets have not achieved under a sustainable development goal commitment [1].

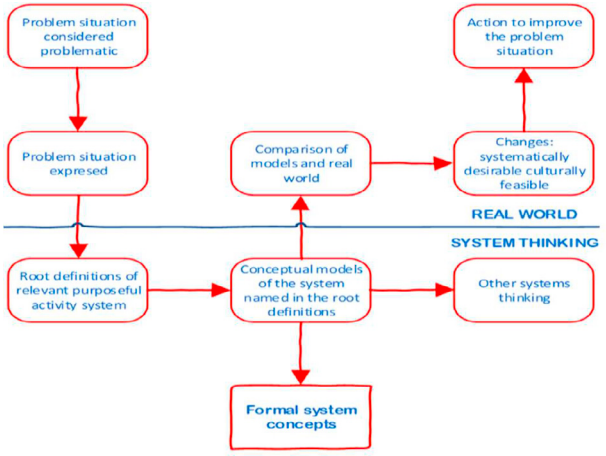

Fig. 3 Soft Systems Methodology [28]

Based on economic, environmental, and social indicators measurements, there is a lack of strategy for achieving sustainability in the Mexican industrial development context. For instance, the SMEs' death rate as a social driver of poverty deploys other social unwanted issues. Then, there is a lack of a strategy in the Mexican context for achieving sustainability in industrial development. Even though the use of TSI began with the metaphor system depicted in the sustainable industrial development model [1], the root definition criterion of each critical system needs to be aligned and coordinated under a sustainable industrial and inclusive development strategy.

Thereby, to achieve a feasible strategy that involves the pluralist stakeholders' focus and the complexity of the problem, soft systems methodology is chosen for tackling these issues. Hence, the roots' definitions of the relevant systems are expressed with the Customers, Actors, Transformation, Weltanschauung, Owners, & Environment (CATWOE) holons [30] of the system in focus transformation. For strong sustainability, the strategy for sustainable and inclusiveness of the industrial development transformation should align with an innovative core business of the firm, industrial park, or industrial cluster (industrial management unit) [1, 32, 33]. Each company embedded in the industrial management unit would only focus on its core business activity regarding sustainability products and processes.

The root definition for the transformation of the industry [T] is the system in focus for sustainable and inclusive industrial development in industrial development. It is defined as "*the strategic and sustainable industrial development that meets the needs of the environmental, social, and economic dimensions of the present generation and the future generation ones*" [1]. In that way, customers of the system in focus [C] are products and

services industry solutions systems that [W] produce goods and services sustainably to satisfy the TBL of the market's demands. Actors [A], who are also part of the systems, can get more straightforward such industrial transformation.

Moreover, [A] and [C] are not only formed by industrial entities, which means firms can be customers or suppliers of a product or service of the core product, but also the sustainable management can scale up by management systems as industrial parks or even industrial clusters. In that way, those superior systems which oversee performance development would advise systems embedded for correcting from local to global issues, for instance, global warming. The dynamics of the sustainable and inclusive transformation process is performed by a different industrial management unit in the manufacturing sector [E], where the state [O], most of the cases, governs the policy for economic development, which is the case of a peripheral economy as Mexico [33].

The root definition of sustainable and inclusive industrial development (S2ID) depicted in **Fig. 5** shows the critical systems involved: industrial solutions systems. They play active roles in sustainable and inclusive development in the industry. Then, the essential actors for S2ID who facilitate the transformation from industrial development strategy to S2ID strategy are the academia for R & D and financial institutions that enable the innovation with other systems into the economic cycle. Industrial management institutions that are in charge of playing the innovative active role can approve and boost such a loop by linking critical systems for healthy and sustainable industrial development. Furthermore, local social actors must consider the strategy inclusiveness and be part of the labor force, since industrial development is embedded in society. Otherwise, the algedonic channel would receive a negative impact from local social actors and complicate the performance or even collapse the system. Thereby, the state acknowledged as the ruler, and the social network owner should pay attention to this channel. Additionally, foreign actors give goals and economic, environmental, and social policies to get global equilibrium.

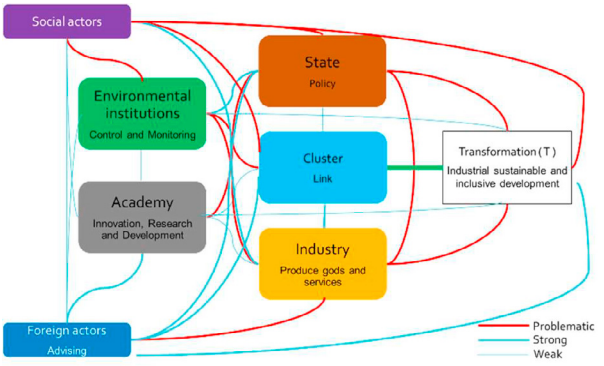

Fig. 5 Root definition of the Critical Systems for SID

6. Discussion

The discussion section consists of the comparative of the theoretical model of the critical systems root definition for the transformation of S2ID against the point of view of the main actors in the sustainable context. On the one hand, **Fig. 5** shows the relationship among the element of critical systems for the S2ID; red links denoted conflict between them. The transformation system shows conflicts with the essential systems: social actors, the state, and services and goods solutions systems. As explained before, the algedonic channel reflects the behavior of suitable or unsuitable decisions by mainly social actors. On the other hand, questionnaires were elaborated by google forms for discussing the sustainable context with academicians, people, and decision-makers in SMEs. Each questionary is divided into three sections, two of them based on Garbei's questionnaire [6], The first section is related to General Sustainability, while the second one, in the Industrial sustainability evaluation (only for the firm's managers). Lastly, the third section based on Benesova's questionnaire [34], it is related to "Industry 4.0 and Education 4.0" (only for the firm's managers too).

Firstly, the questionnaires revealed in the first section that the main concerns of people, academicians, and managers in general sustainability are social factors (see **Fig. 4**). Social factors refer to a lack of commitment from the State since there is a failed strategy to tackle corruption, an absence for trust, and inadequate public security service. It affects not only the trustworthiness of the links system but also the overall state components. Moreover, the answers to the environmental sustainability part also reveal a weak environment field, since the answers denoted a void in the academic people formation. Likely, it would be the reason for the absence of people's environmental culture as the sustainability field is not appropriately disseminated, as it happens in developed countries.

However, some answers to the three sectors also mention a big concern of them with the country's economic future as responses denote that they do not find an optimistic scenario. Secondly, the services and industrial solutions system presents a conflict with the State and environmental institutions as part of the state and foreign actors. There is a survey section related to evaluating industrial sustainability to regard only the concerns of decision-makers (see **Fig. 6**). Seemingly, this pattern of answers is like a general sustainability section answerer. There are weaknesses in social and environmental factors, as they mainly report, according to entrepreneurs, that sustainability is not part of their firms' strategy. Even though they find an uncertain economic scenario for their growth, it would be the lack of strategy that reflects an unsteady market position.

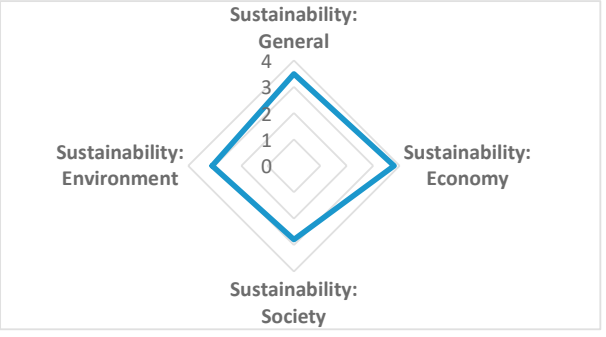

Fig. 4 General Sustainability: Average measure per sustainable field

Additionally, the current economic context does not encourage further productive investment, such as I4.0 technologies, as well as new projects. On the one hand, managers are concerned about social aspects, which are, for instance, the absence of workers, mainly for medical reasons. According to accident rate records of their companies, managers must pay a higher amount for popular insurance, which is what the survey reports with a high labor accident rate. Notwithstanding, the training is absent, which entails not only technical issues but also social ones such as professional illnesses development as an inference of health cause.

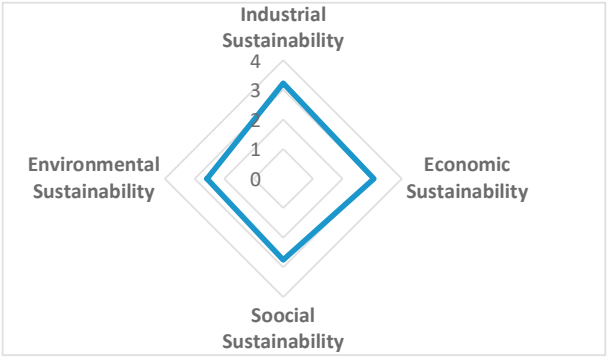

Fig. 6 Industrial Sustainability: Average measure per sustainable field.

On the other hand, the environmental field is not included in the companies' strategy, since most of them do not regard an ecological management department. It means that neither eco-friendly activities (such as waste recycling) nor proper procedures for toxic waste disposal are not part of the product process development. Therefore, the conflict (link) between industry and environmental institutions is primarily due to improper industrial activities. Besides, the survey also highlights that investment aims to technology acquisition for economic growth and a faster return on investment or an economic feasibility pathway. Whereas, the last investment decision factor is greener production technology.

Moreover, some interviews applied to two automotive Cluster managers and one cluster certification manager, where they expressed their concerns. Highlighting that Cluster is one of the drivers' systems for sustainable industrial development [1]. The director of the industrial cluster certification expressed that *"there is an identity absence of clusters. It is because mainly they are not as physical entities as to how a European cluster is. Conversely, clusters are only generated by industry demands like workforce, technology, and material demands"*. The technical manager of the Automotive Mexican Cluster, of the State of Mexico and, the manager Director of la Laguna Automotive Cluster (CAL) confirmed this. For instance, despite the CAL has asked for support to the Academy, he answered that Academic services of engineering development have offered overpriced. Thereby, cluster demands have been preferably supplied by the private sector instead of academics, where prices are even around one-third of the Academy cost.

Finally, the last section of the questionnaire related to I4.0 answered by industrial managers shows their concerns about implementing I4.0 in the company. Despite what has been said about their economic scenario concerns, managers are willing to invest not only in I4.0 technology but also in training workers to achieve the knowledge and skills necessary for working with these technologies. Although their focus on improving manufacturing processes' efficiency could improve green practices, their answers revealed that saving money is by far the primary choice from the SME decision-makers' point of view. Since the productive improvement investment centers mainly in technological processes digitalization and its automation, avoiding environmental and working conditions into the investment scope. Notwithstanding, their economic concerns, as aforementioned, are more related to the current economic context, which is not favorable for a risky investment, so it would be the reason that they aim to get profits as soon as possible. Although I4.0 dates back to 2011 in the Hannover Fair in Germany [35], as a developing country, Mexico is not still working on this kind of technology; since there is a lack of industrial policy that could help the industrial development [36]. Moreover, SMEs even stalled in the first or second productive models generations [37]. The questionnaires answerers showed that just 22% of the firms surveyed are working with an ERP for digital representation of the company in real-time, as one of the beginner's steps towards I4.0 [38]. Meanwhile, remaining firms are struggling to manage paper data systems, or at least that is what managers answered.

From the managers' point of view, there are two main concerns for launching I4.0: the problematic implementation and threats & risks. On the one hand, there are some problems involving I4.0 technologies; for instance, managers mentioned that I4.0 technologies are unaffordable. Furthermore, also it includes the technological compatibility of different suppliers of new and actual I4.0 technologies. Moreover, the implementation costs of hiring high-tech and skillful workers, mainly for operating I4.0 technologies in the production line, would be considerable. Thereby, it involves risks since it takes time, money investment, and training on them. Besides, another riskier option can be to hire and train new workers, who have recently graduated from I4.0 university careers. On the other hand, the questionnaire responses showed threats & risks of implementing I4.0, additionally of the previous risks mentioned. They felt into the cultural barrier, which is one of the mains social concerns of managers. They reported that the cultural wall is generated by not regarding the workers from business development. Unchaining that workers could spoil business operations intentionally. Even external threats are also subjected to technology with cyber-attacks, then it requires more skilled workers to manage these threats. Furthermore, low sales in the market represent a threat to a firm's bankruptcy. It comes when there is an uncertain economic market context with low income and high expenditure (bearing in mind expenditure of I4.0 technologies investment) [39].

Relatedly with human resources, managers reported that most of working skills profiles are related to technical professions. However, any manager mentioned about strengthen their strategy with social or environmental professional profiles. The suitable professional profiles, which

the questionnaire reported, could face problematic implementation and risks & threats of I4.0 previously mentioned are systems and processes engineering, software development engineering, ICT's engineering, and business. Due to the I4.0 technology investment is high, business and systems engineering both are required to align the core business with I4.0 technologies and maximize them throughout horizontal and vertical processes. Moreover, ICT's and software development engineering tackle technological issues like I4.0 devices integration with the enterprise system and improve the system robustness against external attacks. Therefore, in this way, the workforce should be ready to meet not only current needs but also future ones by forming human resources both in the academy and in the industry [11].

Most likely, **Fig. 7**. shows the priorities of the decision-makers to invest in I4.0 technologies in the short term. Seemingly, managers want to begin with the transition to incorporate I4.0 technologies by the interconnection of enterprise resources. Likely, they primarily invest in systems network communication such as an ERP. Furthermore, the 2nd priority, Cyber-physic systems (CPS) and in the 3rd place, the Internet of Things (IoT), the decision-makers are also keen on implementing these technologies. Then investment in I4.0 hardware tools, such as 3D printers in the 6th position and Autonomous Robots 9th position, are not priorities. Whereas, managers would invest preferably in software than hardware I4.0 tools, because the Cloud is in the 4th place, simulation tools in the 5th priority, Cyber-Protection Systems in the 7th, and finally the 8th place the Big Data.

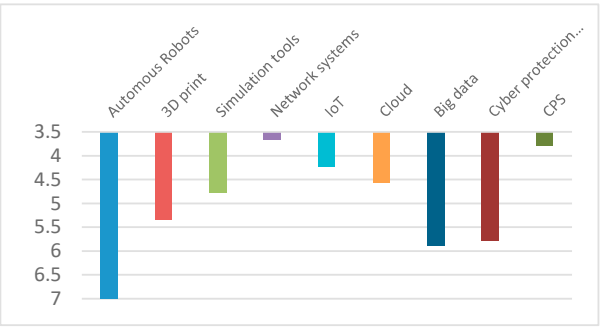

Fig. 7 Investment priorities average

Lastly, the conflicted links in the cluster system are the social actors and environmental institutions (see **Fig. 5**). It has not found so much about these initiatives linking social responsibility and eco-friendly practices with clusters organizations. There are certain exceptions in the Mexican central region context, like eco-industrial or sustainable parks initiatives by AMPIP [40] and the sustainable activities by Querétaro Automotive Cluster [41], works with the Cluster's member actions within a sustainable framework. Therefore, the main Cluster aims to gather industrial demands and offer them a supportive solution with Academia, Government, and other industrial solutions. However, by adopting a holistic and innovative upper solution strategy would tackle the sustainable local challenge led by an innovator such as a viable industrial management system.

7. Conclusion

Finally, in the present research work, it was presented a theoretical framework that would help to develop an inclusive strategy for industrial development. It supports sustainability and inclusiveness for industrial development. The model mainly links different stakeholders involved in sustainable and inclusive industrial development transformation in the manufacturing sector. The State plays a significant role in the sustainable pillars equilibrium of the industry future [42]. A major stakeholders' agreement level involved for S2ID would foster inclusiveness and reshape desirable sustainable outcomes [9, 43]. Moreover, the literature review mentioned how to promote sustainability and inclusiveness into industrial development with I4.0 technologies linking ergonomics with socio-technical systems as the social sustainability base [11, 44].

However, there are highlights in the literature review section about how to shape innovative social strategies for sustainable industrial development, such as a champion like an innovator who builds the stakeholder's trustworthiness to achieve a broader humanistic solution with eco-industrial park construction [21]. Furthermore, it was mentioned in section 6 the social problems unchained by the cultural barrier of excluding inclusive social strategy and what it would trigger if the well-being like workers is not taken into account for the development of the business as well as for I4.0. Lastly, but not least important, for developing and lagging developed economies, the task should be to implement long-term sustainable industrial development gradually. It should be under the stakeholder framework as a critical component for sustainable and inclusive industrial development oriented to balance economic growth with social well-being and regional environment. Thereby, the industry would develop at maturity level by implementing I4.0 technologies without leaving aside boosting their present role in the global market, in the same way, improve their internal equilibrium.

Acknowledgements

We acknowledge funds support from the National Council of Science and Technology of Mexico (CONACYT) under scholarship number 446397/270532.

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