Development of Industry 4.0 in the Manaus Industrial Hub from priority programs

Desenvolvimento da Indústria 4.0 no PIM a partir de programas prioritários

DOI:10.34117/bjdv7n12-483

Recebimento dos originais: 12/11/2021
Aceitação para publicação: 15/12/2021

Leopoldo Augusto Melo Montenegro Júnior
Graduate Program in Production Engineering at the Federal University of Amazonas
Av. General Rodrigo Octávio, 3000 - Manaus - AM, Brazil
E-mail: leopconcurseiro@gmail.com

Diego Queiroz de Oliveira
Graduate Program in Production Engineering at the Federal University of Amazonas
Av. General Rodrigo Octávio, 3000 - Manaus - AM, Brazil
E-mail: diegoqueirozoliveira@gmail.com

Rosângela López Alanís
Graduate Program in Production Engineering at the Federal University of Amazonas
Av. General Rodrigo Octávio, 3000 - Manaus - AM, Brazil
E-mail: roalanis@gmail.com

Armando Araújo de Souza Júnior
Graduate Program in Production Engineering at the Federal University of Amazonas
Av. General Rodrigo Octávio, 3000 - Manaus - AM, Brazil
E-mail: armandoaraujo@ufam.edu.br

Marcelo Albuquerque de Oliveira
Graduate Program in Production Engineering at the Federal University of Amazonas
Av. General Rodrigo Octávio, 3000 - Manaus - AM, Brazil
E-mail: marcelooliveira@ufam.edu.br

Ocileide Custódio da Silva
Graduate Program in Production Engineering at the Federal University of Amazonas
Av. General Rodrigo Octávio, 3000 - Manaus - AM, Brazil
E-mail: ocileide@ufam.edu.br

ABSTRACT
Owner of one of the most expressive industrial hubs in Latin America, the Manaus Free Trade Zone is inserted in the context of Industry 4.0, initially through the Informatics Law of Western Amazonia and Amapá, which regulates the application of resources in research, development and innovation (RD&D) in the region. The Priority Programs as vectors for the development of Industry 4.0, at the Manaus Industrial Hub, are the central objective of this study, as well as their contributions through projects, partnerships, fundraising and investments in thematic areas focused on enabling technologies that are
the “backbone” of Industry 4.0. To reach the general objective, information was collected from the coordinating institution of the Priority Program for Industry 4.0 and Industrial Modernization and other coordinating institutions of the Priority Programs that aim to demonstrate trends and reflections on the implementation process and the strengthening of Industry 4.0 in the Manaus Industrial Hub, especially, based on the action of the Priority Programs.

**Keywords:** Industry 4.0, Priority Programs, RD&I.

**RESUMO**
Detentora de um dos polos industriais mais expressivos da América Latina, a Zona Franca de Manaus insere-se no contexto da Indústria 4.0, inicialmente, por meio da Lei de Informática da Amazônia Ocidental e Amapá, que disciplina a aplicação de recursos em pesquisa, desenvolvimento e inovação (PD&I), na região. Os Programas Prioritários como vetores de desenvolvimento da Indústria 4.0, no Polo Industrial de Manaus (PIM), são o objetivo central deste estudo, bem como suas contribuições por meio de projetos, parcerias realizadas, captação de recursos e investimentos em áreas temáticas voltadas às tecnologias habilitadoras que são a “espinha dorsal” da Indústria 4.0. Para se chegar ao objetivo geral, foram coletadas informações junto à instituição coordenadora do Programa Prioritário de Indústria 4.0 e Modernização Industrial e demais instituições coordenadoras dos Programas Prioritários que visam a demonstrar tendências e reflexões sobre o processo de implementação e o fortalecimento da Indústria 4.0 no PIM, especialmente, a partir da ação dos Programas Prioritários.

**Palavras-Chave:** Indústria 4.0, Programas Prioritários, PD&I.

**1 INTRODUCTION**

The industrial sector has been undergoing a major transformation and technological change known as the fourth industrial revolution or industry 4.0. This transformation, driven by an increasingly demanding market, forces an increase in the production capacity of companies and the amount of data sharing, as well as requiring speed, the need for adaptation, technological advances in communication and industrial automation. Undeniably, this new revolution has brought about global changes with developments in the social, economic and political spheres (Pereira & Simonetto, 2018).

This industrial revolution came to Brazil mainly by the headquarters of the factories that brought the concepts and machines so that the change could occur. Examples of this are the factories of Fiat and Mercedes-Benz, which use exoskeletons, virtual reality, collaborative robots and machine learning in their plants. Mercedes-Benz, for example, had a 15% increase in production efficiency, a 20% increase in logistics efficiency and a reduction in component storage from 10 days to 3 days (FIRJAN, 2019).
Since the Manaus Industrial Hub represents one of the most technologically advanced parks in Latin America and contributes significantly to the Brazilian Gross Domestic Product (GDP), this article seeks to analyze, through qualitative research, trends and initial results of the application of resources in Priority Programs involved in the Informatics Law of Western Amazonia and Amapá and their connections with the implementation and evolution of Industry 4.0 in the Manaus Free Trade Zone.

This article is organized into 5 sections, starting with this Introduction (Section 1). Section 2 presents the main theoretical concepts related to Industry 4.0, the Manaus Industrial Hub and the Research, Development and Innovation (RD&I) resources of the Informatics Law for Western Amazonia and Amapá. Section 3 presents the methodology applied in the research and Section 4, in turn, describes the main results of the Priority Programs analyzed in relation to the implementation of Industry 4.0 in the Manaus Industrial Hub. Finally, Section 5 brings reflections and considerations on trends of the evolution of the application of resources and implementation of projects concerning this topic in the region.

2 THEORETICAL REFERENCE

2.1 INDUSTRY 4.0

According to Hermann, Otto & Pentek (2015), industry 4.0 can be understood as a German term, in which it designates a collective concept of technologies and smart factories in the face of process monitoring.

Lasi et al. (2014) bring guidance in two distinct development directions. On one hand, there is a demand for applicability, which is based on the convergence of the operations environment to a new context. In this scenario, the main changes are, in particular: short periods of product development; demand individualization; production flexibility; decentralization in decision-making; economic and ecological resource efficiency.

For Branger & Pang (2015), the technologies associated with the new industrial revolution are fundamental for companies digitalization processes, in which they become responsible for the development of organizational activities.

In this context, the Fourth Industrial Revolution refers to the growth of the digitalization process and interconnection of people, products, value chains and business models, driven by the adoption of the so-called enabling technologies: Cyberphysical Systems, 3D Printing, Robotics, Smart factories, Cloud Computing, Artificial
Intelligence, Cybersecurity, Big Data and Virtual, Augmented and Mixed Reality, among others. The industry of the future is intelligent, creates with customers and partners, explores the connection between real and virtual, aiming to add value efficiently, versatility and innovation, increasing the competitiveness and productivity of the entire production chain.

In Brazil, in the face of this scenario, the Federal Government established in June 2017, through the Ministry of Development, Industry and Foreign Trade, the Working Group for Industry 4.0, with the participation of more than 50 representative institutions, aiming to draft a proposal for a national agenda for the topic, which resulted, among other actions, in the Brazilian Agenda for Industry 4.0 (ABDI and MDIC, 2018).

2.2 RD&I AND THE INFORMATICS LAW OF THE WESTERN AMAZON AND AMAPÁ

The Manaus Free Trade Zone is inserted in the context of Research, Development and Innovation (RD&I) and Industry 4.0, initially, through the Informatics Law of Western Amazon and Amapá (Law No. 8,387, of December 30, 1991), as a way to minimize the effects of Law No. 8,248/91, which started to establish, for the other regions of Brazil, incentives for computer products that were also granted in the Manaus Free Trade Zone (Rey, 2019).

Thus, it was instituted a public policy to stimulate RD&I through tax incentives (exemption from the Tax on Industrialized Products and a reduction of up to 88% of the Import Tax) for companies in the Manaus Industrial Hub that manufacture so-called technology goods and services information and communication.

With the production of these goods, the beneficiary companies take advantage of the tax incentives, with the counterpart investment of 5% of the gross revenue resulting from the commercialization of these products in Research, Development and Innovation activities. The RD&I activities have their concepts defined in art. 21 of Decree No. 10,521, of October 15, 2020:

Art. 21. For the purposes of the provisions of art. 1st and art. 5th, research, development and innovation activities are considered:
I - Basic research - experimental or theoretical work performed primarily to acquire new knowledge of the fundamentals underlying the observable phenomena and facts, without any particular application or use in view;
II - Applied research - original research carried out with the objective of acquiring knowledge, which is primarily directed towards a specific objective or practical target;
III - Experimental development - systematic work, based on pre-existing knowledge and aimed at producing new products and processes or improving existing ones;
IV - Technological innovation - implementation of products, goods and services or a new or significantly improved technological process;
V - Professional training or qualification - those of medium, higher or postgraduate levels, in areas considered a priority by CAPDA, or those linked to the activities covered by items I to IV;

This counterpart on the part of the beneficiary company of 5% of its gross sales is nothing more than the investment in projects that have the scope of RD&I and are developed within the Western Amazon and Amapá, an area permitted by law for this type of investment.

Data extracted from the Superintendence of the Manaus Free Trade Zone, except for the years 2019 and 2020, which will be presented in the Analysis of Results section, indicate the values of obligations and investments in RD&I projects in the Western Amazon and Amapá between the years 2010 and 2018 (Table 1).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Obligation in R&amp;D</td>
<td>214.6</td>
<td>237.4</td>
<td>318.0</td>
<td>459.0</td>
<td>499.1</td>
<td>437.1</td>
<td>518.6</td>
<td>602.01</td>
<td>710.9</td>
</tr>
<tr>
<td>Amount invested</td>
<td>218.4</td>
<td>250.8</td>
<td>332.4</td>
<td>467.0</td>
<td>500.2</td>
<td>458.3</td>
<td>502.6</td>
<td>638.5</td>
<td>681.8</td>
</tr>
</tbody>
</table>

Source: https://www.gov.br/suframa/pt-br/zfm/pesquisa-e-desenvolvimento/lei-de-informatica/resultados

Law 8,387/1991 also offers options for the application of the 5% counterpart in RD&I projects, as shown in Table 1.

**Figure 1: RD&I investment modalities**

Source: Prepared by the authors, based on Law No. 8,387/1991
One of the options is the so-called Priority Programs, defined by art. 2nd, item I, of the Committee for Research and Development Activities in the Amazon’s Resolution No. 2, of March 31, 2020, in its item I defines:

I - PRIORITY PROGRAM: a set of projects aimed at the development of science, technology and innovation considered by the Committee for Research and Development Activities in the Amazon - CAPDA as great for regional development;

Regulated by the Committee for Research and Development Activities in the Amazon, the thematics of the Priority Programs and the Priority Program for Industry 4.0 and Industrial Modernization are regulated by the Committee’s Resolution No. 9, of October 29, 2019. Art. 6 of this regulation creates the program object of this study and defines its areas of operation:

Art. 6 It is established the Priority Program for INDUSTRY 4.0 AND INDUSTRIAL MODERNIZATION, which consists of the development of an ecosystem geared to industry 4.0 and the manufacture of the future, covering: I - Cyber-physical systems; II - Intelligent systems and manufacturing; III - Automation of industrial processes; IV - 3D printing; V - Robotics; VI - Smart factories; VII - Artificial intelligence; VIII - Cybersecurity; IX - Analysis and treatment of large volumes of data (bigdata); X - Virtual reality; and XI - New lean manufacturing and industrial digitalization techniques.

The Priority Program for Industry 4.0 and Industrial Modernization has as its coordinating institution CITS Amazonas - International Center for Software Technology - whose main task is to raise funds with investing companies (responsible for providing financial resources as a result of investment obligations in RD&I) and external investors (companies, individuals or investment funds responsible for providing financial resources in their interest). Based on the identified demands and the thematics of CAPDA Resolution No. 9/2019, CITS Amazonas also promotes the monitoring and management of RD&I projects carried out by an executing institution (ICT, incubator, accelerator, support foundation, Brazilian entity official education accredited by CAPDA) or startup (a nascent technology-based company with products and services resulting from the intensive use of technology).

2.3 MANAUS INDUSTRIAL HUB

Implemented by the Brazilian government between the 1950s and 1960s, the Manaus Free Trade Zone is a model of socio-economic development administered by the Manaus Free Trade Zone Superintendence, a federal autarchy currently linked to the
Ministry of Economy. The creation of the Manaus Free Trade Zone was initially carried out by the Decree-Law no. 3,173, on June 6th, 1957, which instituted the Free Port of Manaus, an area whose main objective was to transport goods to other regions of the country (Garcia, 2004; Gouveia, 2018; Tavares, 2013).

Mendonça (2013) states that the Manaus Free Trade Zone is the Union's regional development policy for the Western Amazon based on the granting of tax incentives to capital investment, which have the Manaus Industrial Hub as its main focus. Today, the Manaus Industrial Hub is undoubtedly more prominent in terms of its ability to attract investments, generate jobs and move both the regional and national economy. According to data from the Industrial Performance Indicators of the Manaus Industrial Hub, turnover in 2020 was approximately R$ 120 billion, generating more than 90 thousand direct jobs, including permanent, temporary and outsourced workers (SUFRAMA, 2021).

Holland et. al (2019), in a study published by the Getúlio Vargas Foundation, highlighted the relevance of the Manaus Industrial Hub in the local and national economy, pointing out that “even with 0.6% of Brazilian industrial units (PIA, IBGE, 2016), the state of Amazonas accounts for 3% of the net revenue from industrial sales in the country”. The study also points out that “the Manaus Free Trade Zone industry adds more value for each R$ 1.00 produced than the Brazilian manufacturing industry. This is probably due to the incorporation of new technologies such as smartphones and LED screens”.

3 METHODOLOGICAL PATHWAY

The objective of this study is to analyze trends and initial results of the application of resources destined to projects of the Priority Program for Industry 4.0 and Industrial Modernization. To carry out the study, qualitative research of exploratory nature was developed with the coordinating institution of the Priority Program, CITS Amazonas – International Software Technology Center (Minayo, 2017; Cardano, 2017). Thus, this study is characterized as a multiple case study (Yin, 2014).

To carry out this documental research, a qualitative methodology of exploratory and descriptive nature was used, since the central objective was to describe the results achieved by the Priority Program for Industry 4.0 and Industrial Modernization in the year 2020. The data was collected through a spreadsheet sent electronically to CITS Amazonas and the other coordinators of the Priority Programs.
The spreadsheet sought to gather and identify data on the total of projects carried out and resources invested in the program in 2020, the total of projects and resources carried out in each of the eleven thematics of the priority program, a brief description of each project carried out, and trends and future projections until 2024.

The data obtained from the other coordinators of the Priority Programs are related to the totals captured by each of them in the years 2018 to 2020 and for the Digital Economy Program, the projects carried out by thematics and their percentages. The results are presented through the description and evaluation of the data obtained, in addition to the values extracted from the RD&I obligations of Law No. 8,387 / 1991 and the coordinators of the Priority Programs, to respond clearly, in the form of tables, graphs and other pertinent information. The central objective of this study is the analysis of the results and trends in the application of resources destined to projects of the Priority Program for Industry 4.0 and Industrial Modernization.

4 ANALYSIS OF RESULTS

The results obtained from the Priority Program for Industry 4.0 and Industrial Modernization relate to its applications within the context of Law No. 8,387 / 1991, with activities beginning in 2020.

The program in question is one of the strategic actions chosen by CAPDA for the development of the Western Amazon and Amapa, in addition to four others: Digital Economy Priority Program; Human Resources Priority Program; Bioeconomics Priority Program; and Priority Program to Promote Innovative Entrepreneurship.

Although the Priority Program for Industry 4.0 and Industrial Modernization is the focus of this study, it is important to understand that other programs were initiated, before the year 2020, and that, specifically, the Priority Program for Digital Economy, created in 2017, has thematics equivalent to the Industry 4.0 program, starting before this one. Therefore, to reach the central objective of this study, it is important to verify not only the applications of the Priority Program for Industry 4.0 and Industrial Modernization but also the total investments that have been made in all programs, especially the Digital Economy program.

Based on the total amounts received by each program, from 2018 to 2020, the values applied in the Priority Program for Industry 4.0 and Industrial Modernization will be sought, the number of projects carried out, their values and the thematics chosen for its execution.
In this light, from the total obligation amounts of Law No. 8,387 / 1991, it is extracted what was invested, per year, in the Priority Programs:

![Graph 1: General obligations and contributions to Priority Programs](image)

Source: Prepared by the authors, based on information provided by the coordinators of the Priority Programs and the Suframa Indicator System, in April / 2021

The percentages per year of application in the Priority Programs are shown in Graphs 2, 3 and 4.

![Graph 2: Percentage Applied to Priority Programs in 2018](image)

Source: Prepared by the authors, based on information provided by the coordinators of the Priority Programs and the Suframa Indicator System, in April / 2021
It should be noted that for companies that are beneficiaries of the law, there are rules in the application of the RD&I obligations, which makes it impossible, in some cases, to invest all the amounts of obligations in the Priority Programs.

For beneficiary companies with revenues of R$ 30 million or more, according to figure 1, compliance with the external modality (2.3%) and its percentages of 0.9%, 0.2%, 0.4% and 0.8% is mandatory, which reduces the optional percentage, perhaps, to be invested in the Priority Programs. For those with a turnover of less than R$ 30 million, there is the possibility of investing in the way they choose, including being able to invest the entire amount of obligation in the Priority Programs. The Human Resources Priority Programs (PPRH), Digital Economy Priority Programs (PPED), Bioeconomics Priority Programs (PPBIO), Priority Program to Promote Innovative Entrepreneurship (PPEI) and Industry 4.0 and Industrial Modernization (PP 4.0) received R$ 81,235,504.84 (eighty-one million, two hundred and thirty-five, five hundred and four reais and eighty-four cents) of investments in 2020, divided by program (Graph 5).
That same year, taking into account the general obligation of the Informatics Law and the investments of all beneficiary companies in the Priority Program for Industry 4.0 and Industrial Modernization, we have the following values and percentages shown in Graph 6.

The Priority Program for Industry 4.0 and Industrial Modernization received a total investment of R$ 11,822,567.35 (eleven million, eight hundred and twenty-two, five hundred and sixty-seven reais and thirty-five cents), divided into two projects executed and four more Resource Utilization Plans approved, totalling six projects in 2020, which together amount to R$ 9,138,000.00 (nine million, one hundred and thirty-eight thousand reais).

For the projects within the eleven areas covered by CAPDA Resolution No. 9, of October 29, 2019, there are some choices, according to the data presented in Table 2 and Graph 7.
Table 2: PP 4.0 Thematics

<table>
<thead>
<tr>
<th>Thematics</th>
<th>Number of projects</th>
<th>Percentage of projects</th>
<th>Total resources invested (R$)</th>
<th>Percentage Amount applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Cyber-physical systems</td>
<td>0</td>
<td>0,00%</td>
<td>-----</td>
<td>0,0%</td>
</tr>
<tr>
<td>2 Intelligent systems and manufacturing</td>
<td>4</td>
<td>66,67%</td>
<td>7.902.000,00</td>
<td>86,47%</td>
</tr>
<tr>
<td>3 Automation of industrial processes</td>
<td>0</td>
<td>0,00%</td>
<td>----</td>
<td>0,00%</td>
</tr>
<tr>
<td>4 3D printing</td>
<td>0</td>
<td>0,00%</td>
<td>----</td>
<td>0,00%</td>
</tr>
<tr>
<td>5 Robotics</td>
<td>0</td>
<td>0,00%</td>
<td>----</td>
<td>0,00%</td>
</tr>
<tr>
<td>6 Smart factories</td>
<td>0</td>
<td>0,00%</td>
<td>----</td>
<td>0,00%</td>
</tr>
<tr>
<td>7 Artificial intelligence</td>
<td>0</td>
<td>0,00%</td>
<td>----</td>
<td>0,00%</td>
</tr>
<tr>
<td>8 Cybersecurity</td>
<td>0</td>
<td>0,00%</td>
<td>----</td>
<td>0,00%</td>
</tr>
<tr>
<td>9 Analysis and treatment of big data (big data)</td>
<td>0</td>
<td>0,00%</td>
<td>----</td>
<td>0,00%</td>
</tr>
<tr>
<td>10 Virtual reality</td>
<td>0</td>
<td>0,00%</td>
<td>----</td>
<td>0,00%</td>
</tr>
<tr>
<td>11 New lean techniques for manufacturing and industrial digitization</td>
<td>1</td>
<td>16,67%</td>
<td>1.008.000,00</td>
<td>11,03%</td>
</tr>
<tr>
<td>12 Human Resources Development</td>
<td>1</td>
<td>16,67%</td>
<td>228.000,00</td>
<td>2,50%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6</strong></td>
<td><strong>100%</strong></td>
<td><strong>9.138.000,00</strong></td>
<td><strong>100,00%</strong></td>
</tr>
</tbody>
</table>

Source: Prepared by the authors, based on information provided by CITS in April / 2021

The thematic of Human Resources Development, which in the table above appears as the 12th area, is a specific type of project that can be carried out by all Priority Programs. This is due to the fact that the conceptualization of what is RD&I of art. 21 of Decree 10,521, of October 15, 2020, encompassing basic research, applied research, experimental development, technological innovation and training or qualification of human resources.
The thematics of the Industry 4.0 and Industrial Modernization Programs and the Digital Economy Program have similarities, especially in the technologies called enablers - which are the group of the main technologies involved in the digitization process of companies for Industry 4.0.

Despite the similarities, in 2020, the coordinators' projects can be represented in Table 3:

<table>
<thead>
<tr>
<th>Priority Program</th>
<th>Thematics</th>
<th>Projects</th>
<th>Total values</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPED</td>
<td>Artificial intelligence</td>
<td>4</td>
<td>R$ 4.815.558,28</td>
</tr>
<tr>
<td>PPED</td>
<td>Cloud &amp; Big Data</td>
<td>2</td>
<td>R$ 4.732.436,87</td>
</tr>
<tr>
<td>PPED</td>
<td>Internet of Things</td>
<td>1</td>
<td>R$ 6.135.879,53</td>
</tr>
<tr>
<td>PP 4.0</td>
<td>Intelligent systems and manufacturing</td>
<td>4</td>
<td>R$ 7.902.000,00</td>
</tr>
<tr>
<td>PP 4.0</td>
<td>New lean techniques for manufacturing and industrial digitization</td>
<td>1</td>
<td>R$1.008.000,00</td>
</tr>
<tr>
<td>PP 4.0</td>
<td>Human Resources Development</td>
<td>1</td>
<td>R$ 228.000,00</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors, based on information provided by the coordinators of the Priority Programs, in April/2021.

The projects carried out meet the requirement established by CAPDA Resolution No. 2, of March 31, 2020, which defines as executing institutions for the projects: ICT, incubator, accelerator, support foundation, Brazilian official education entity accredited by CAPDA or company source of the technological base with headquarters or branch in the Western Amazon or Amapá responsible for the execution of a priority project.

For the execution of these projects, in the year 2020, there was a need to enter into partnerships or even to execute them directly, an item foreseen in CAPDA Resolution nº 2/2020. Partnerships with executing institutions are shown in Table 4.

<table>
<thead>
<tr>
<th>Thematics</th>
<th>Projects</th>
<th>Values</th>
<th>Executing institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligent systems and manufacturing</td>
<td>4</td>
<td>R$7.902.000,00</td>
<td>CITS. AM (2 projects)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CITS.AM/Btracer (2 projects)</td>
</tr>
<tr>
<td>New lean techniques for manufacturing and industrial digitization</td>
<td>1</td>
<td>R$1.008.000,00</td>
<td>MAP Technology</td>
</tr>
<tr>
<td>Human Resources Development</td>
<td>1</td>
<td>R$ 228.000,00</td>
<td>MAP Technology</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>R$ 9.138,000,00</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors, based on information provided by CITS, in April / 2021
These partnerships provide an overview related to what was and is being carried out by the Industry 4.0 and Industrial Modernization Program.

5 CONCLUSIONS

The general objective of this work was to analyze trends and initial results of the application of resources destined to projects of the Priority Program for Industry 4.0 and Industrial Modernization, focusing on investments in the Informatics Law of the Western Amazon and Amapá. The data presented showed that the percentage and amounts of investments made in the Priority Programs from 2018 to 2020 are still small, when compared to the general obligations of the Informatics Law for Western Amazonia and Amapá, even though the legal instrument has specific rules and percentages, in some cases, for investments in RD&I that do not allow the full contribution of the obligation in the programs.

The Priority Program for Industry 4.0 and Industrial Modernization had the fourth largest fundraising in 2020, lagging behind the Priority Programs PPRH, PPEI, PPED and, ahead of PPBIO, which had its activities started in 2019. This fundraising reflects 1% of that year's RD&I obligations, which confirms the need for greater investments in this initiative.

The thematics chosen for the execution of the projects are mainly focused on the application in projects that have the scope of the thematic of intelligent systems and manufacturing, indicating a certain tendency in the execution of future projects. The partnerships established by the Priority Program for Industry 4.0 and Industrial Modernization point to decentralization in the execution in parts of the RD&I projects, which is important since the main role of a Priority Program coordinator is the direction and framework to support the execution, as well as the monitoring and inspection of the RD&I projects carried out.

Thus, given the arguments presented and despite the Priority Program for Industry 4.0 and Industrial Modernization having started its activities in 2020, it is essential to highlight the need for a greater effort to have more investments received by the program, as well as the creation of other fronts that aim to increase the level of investments in RD&I projects aimed at incorporating elements of Industry 4.0 in the production processes, with the motto of promoting an articulated and active ecosystem of innovation and entrepreneurship, capable of promoting the increase of productivity and regional
competitiveness in a sustainable manner. The analysis of the effectiveness of the projects, as well as the impacts they cause on society, is a relevant topic for future research.
REFERENCES


