FORTEC Survey Of Innovation

Intellectual Property and Technology Transfer Policies and Activities

2021 base year report

fortec

2022

Pesquisa FORTEC de Inovação

Ano base 2021

Políticas e Atividades de Propriedade Intelectual e Transferência de Tecnologia

FORTEC Innovation Survey Annual Report - Base Year 2021

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2022

Message from the Vice-President

The increase in the representativeness of the FORTEC Innovation Survey has been a source of pride. We started with a pilot survey, referring to the base year of 2016, in which 61 Technological Innovation Nuclei (NITs) participated, going through 102 NIT in 2017, 113 in 2018, 128 in 2019, 139 in 2020 and 138 NIT in the research referring to the base year 2021[1]. This means around 190 Science, Technology and Innovation Institutions (ICT) represented here, making the survey more robust and also increasing FORTEC's responsibility to extract information from the captured data, transforming them into concrete actions of support to the NITs and, consequently, to the Brazilian Innovation Ecosystem.

The years 2020 and 2021 were atypical. The coronavirus pandemic has concentrated much of the world's concerns and actions aiming at minimizing its damage, above all to save lives, and will never be forgotten. On the other hand, the importance of science, technology and innovation to enable economic development and guarantee the sovereignty of nations became evident. And what stood out was the fundamental contribution of Universities and Research Centers in this task, especially in Brazil.

Paradoxically, this was revealed at a time when our National System of Science, Technology and Innovation was under threat, with successive budget cuts, whose impacts will be observed in the coming years if that situation is not reversed.

In this round of the survey, there was a significant change in the way data were collected, going from filling out responses in Google Sheets to providing data in a questionnaire on Google Forms, which provided automatic generation of the database and a more reliable data handling. In addition, there were changes in the questionnaire for implementing improvements, some of them suggested by the respondents in the comments of the 2020 base year survey, and the inclusion of some questions regarding general information and strategic objectives of the NITs, requests for intellectual property protection and spin-offs creation.

There was a small drop in the number of survey participants, which represented a decrease in ICT participation (196 ICT in 2020 to 186 ICT in 2021), which possibly had an impact on the decrease in requests for intellectual property protection (2417 in 2020 to 2328 in 2021). On the other hand, there was an increase in licensing agreements generating revenue (316 in 2020 to 389 in 2021) and in royalties earned (R$16 million[2]

[1] The reports referring to previous years of the FORTEC Innovation Survey are available on the FORTEC website (www.fortec.org.br)

[2] The conversion rate from the US Dollar to the Brazilian Real has varied in this period around R$5.00=US$1.00

in 2020 to R$48 million in 2021, approximately).

The FORTEC Innovation Survey also made possible to verify, for example, which innovation support policies the NITs have found more difficult to implement. In this sense, and thanks to the FORTEC project "Training for the implementation of Institutional Innovation Policies in the country's ICT", under the coordination of President Gesil Sampaio Amarante Segundo, events were held and materials were produced to contribute to the efficient implementation of these policies.

In addition to this support for the planning of actions and activities that help FORTEC to fulfill its role, the FORTEC Innovation Research also subsidizes the proposition of public policies and the generation of scientific knowledge to the extent that many academic research have been carried out based on the collected data, which enriches the generation of knowledge about the NITs and even allows the identification and sharing of good practice for the Brazilian Innovation Ecosystem.

Once again, we sincerely thank the NITs that participated in the survey and study for the base year 2021. We are very pleased for the recognition of the importance that this Survey represents.

We also thank the National Council for Scientific and Technological Development (CNPq) and the Rectory of the Federal University of São Carlos (UFSCar), through its Innovation Agency (AIn), for supporting this activity.

We are also immensely grateful to all FORTEC's board, coordinators and advice. Finally, many thanks to the team (Samira, Debora, Patricia and Thiago) who dedicated themselves to this edition of the survey with diligence and commitment.

Many thanks!

Ana Lúcia Vitale Torkomian

Vice-President of FORTEC and Coordinator of the FORTEC Innovation Survey

Summary of Indicators of Base Year 2021

138 NIT participants, representing **186 ICT**

1,573 professionals who drive technological innovation

TT 30,3%

IP 32,5%

With the main objective of contributing to **the local and regional development** of the ICT region

273 Spin offs created by **31 NIT**, being **70,** only in the **year 2021**

58 NIT with information systems implemented and/or in implementation

2666 invention disclosures

2170 IP granted

2328 IP filings

20 New Plant Varieties

1187 Patents

80 Utility Models

221 Trademarks

756 Softwares

64 Others

308 license agreements with income and **55** assignments, generating about US$ **10 million**

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Sumary

1. Introduction

Based on data collected by the FORTEC Innovation Survey, this report aims to present an overview of the efforts of Brazilian Scientific, Technological and Innovation Institutions (ICT) in carrying out activities related to the management of intellectual property (IP), technology transfer (TT), collaborative projects, policy implementation, contribution of ICTs to the innovation system, among other related subjects. To this end, it brings a series of indicators related to the mode of operation of the Technological Innovation Centers (NIT) linked to such themes.

The results presented in this report are aggregated by the Technological Innovation Nuclei (NIT) respondents. This means that the NIT of a multi-campus institution will aggregate all IP and TT protection results for that ICT. Similarly, unless otherwise noted, a NIT shared by multiple ICTs will aggregate all results from those institutions.

Providing information for the FORTEC Innovation Survey is completely voluntary on the part of each NIT. In the base year 2021, the sixth year of the Survey, the number of respondents was maintained, with only one less than in the previous year, from 139 to 138. However, there was a drop in the total number of ICT represented by NIT respondents, from 196 to 186. The inconstancy of the participation of some ICT causes some results to fluctuate, which may increase or decrease from year to year.

This year, the format of the Survey went through changes, especially regarding the way of capturing data and interaction with NIT respondents. The changes aimed at automating some processes, in order to make the Survey even more precise and support growth for the coming years. With the experience of this new format, as well as with the collaboration of the NIT, new adjustments will be made in order to allow a greater reach and accuracy of the data and the treatment of information.

All 138 respondents, when participating in the survey, agreed to share their information for the creation of the annual database, except 1 of them who opted not to include the institution in the list of participants in the annual report of the FORTEC Innovation Survey and 16 of them opted for confidentiality of the respective ICT identification data in the database. The intention of the database is to promote the exchange of information between the participating NITs, facilitating the flow of knowledge and the learning efficient practices for the protection of IP and TT in Brazilian

ICT. Thus, the non-confidentiality of ICT identification data is strongly encouraged by FORTEC, but the decision of the respondents is always respected.

The database for fiscal year 2021, following the example of successful initiatives already implemented around the world (such as the AUTM Licensing Survey and the HE-BCI Survey), may be used by researchers and institutions to conduct studies[3], with the potential to generate important insights for the proposition of public and institutional policies for the promotion of technological innovation based on the knowledge generated in Brazilian ICT.

[3] The request can be made directly by email inovacao@fortec.org.br.

2. The Respondents

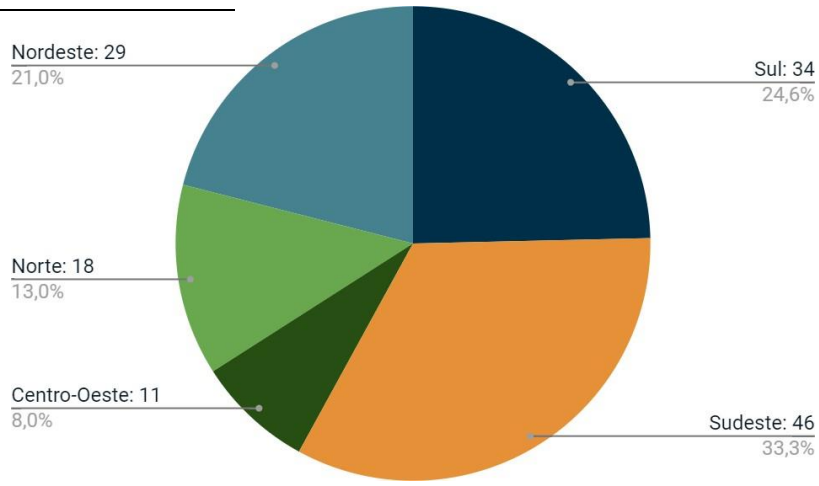
2.1. Base year 2021

In its sixth edition, the FORTEC Innovation survey received 138 responses, representing a total of 186 ICT (among the participants, there are five NIT that account for more than one ICT, either in arrangement or sharing format).

Of the 138 respondents, 117 presented themselves as NIT of public institutions, while 17 as NIT of private institutions and 4 as NIT of institutions of other natures (two community and two public companies under private law). With regard to the type of institutions, 91 identified themselves as NIT of higher education institution, 29 of professional and technological education institute, 14 of research institute and 4 of others[4].

The Southeast region, with 46 respondents, represents 33.3% of the participants in the Survey, followed by the South regions with 34 respondents (24.6% of respondents) and the Northeast with 29 respondents (21% of participants). The North and Midwest regions accounted for, respectively, 18 and 11 respondents (13% and 8% of participants). Figure 1 shows the distribution of respondents by region, while Table 1 summarizes the aforementioned information and Chart 1 presents the institutions that authorized inclusion in the list of participants, their acronyms and UF (Federate Unit = State).

Figure 1- Distribution of respondents by region



Nordeste=Northeast; Sul=South; Norte=North; Centro-Oeste=Midwest; Sudeste=Southeast

[4] Respondents who identified themselves as Others declared themselves: “Institution of Teaching and Research”, “Institution of Teaching, Research and Production of Medicines”, “National Institute of Specialized Health Care” and “University Hospital”.

Table 1 – Distribution of respondents by nature, type and ICT region

Region	Public	Private	Others
Southeast	**43**	**3**	**0**
Higher Education Institution	21	3	0
Research Institute	9	0	0
Institute of Professional and Technological Education	10	0	0
Other	3	0	0
South	**26**	**3**	**0**
Higher Education Institution	22	3	0
Research Institute	1	0	0
Institute of Professional and Technological Education	3	0	0
Other	0	0	0
Northeast	**20**	**10**	**4**
Higher Education Institution	15	9	2
Research Institute	0	0	1
Institute of Professional and Technological Education	5	1	0
Other	0	0	1
North	**17**	**1**	**0**
Higher Education Institution	9	0	0
Research Institute	2	1	0
Institute of Professional and Technological Education	6	0	0
Other	0	0	0
Midwest	**11**	**0**	**0**
Higher Education Institution	7	0	0
Research Institute	0	0	0
Institute of Professional and Technological Education	4	0	0
Other	0	0	0
Total	**117**	**17**	**4**

Chart 1 – List of institutions participating in the FORTEC Innovation Survey base year 2021

ICT	Acronym	UF
Arranjo NIT-Rio*	NIT-Rio	RJ
Centro de Tecnologia da Informação Renato Archer	CTI	SP
Centro Federal de Educação Tecnológica Celso Suckow da Fonseca	CEFET-RJ	RJ
Centro Federal de Educação Tecnológica de Minas Gerais	CEFET-MG	MG
Centro Nacional de Monitoramento e Alertas de Desastres Naturais	Cemaden	SP
Centro Universitário CESMAC	CESMAC	AL
Centro Universitário de Patos de Minas	UNIPAM	MG
Comissão Nacional de Energia Nuclear**	CNEN	RJ

Departamento de Ciência e Tecnologia Aeroespacial* **	DCTA	SP
Embrapa Caprinos e Ovinos	CNPC	CE
Escola Bahiana de Medicina e Saúde Pública	BAHIANA	BA
Faculdade Luciano Feijão	FLF	CE
Fundação Oswaldo Cruz** **	Fiocruz	RJ
Fundação Universidade Regional de Blumenau	FURB	SC
Horizonte do Ambiente Empreendedor – Faculdade Horizontina	HAE - FAHOR	RS
Hospital de Clínicas de Porto Alegre	HCPA	RS
IF Sul-Rio-Grandense	IFSUL	RS
Instituto Adolfo Lutz	IAL	SP
Instituto Butantan	IB	SP
Instituto Capixaba de Pesquisa, Assistência Técnica e Extensão Rural	Incaper	ES
Instituto de Tecnologia do Paraná	TECPAR	PR
Instituto Federal Baiano	IFBAIANO	BA
Instituto Federal Catarinense	IFC	SC
Instituto Federal de Alagoas	IFAL	AL
Instituto Federal de Educação Ciência e Tecnologia do Rio de Janeiro	IFRJ	RJ
Instituto Federal de Educação, Ciência e Tecnologia de Mato Grosso	IFMT	MT
Instituto Federal de Educação, Ciência e Tecnologia de Minas Gerais	IFMG	MG
Instituto Federal de Educação, Ciência e Tecnologia de Rondônia	IFRO	RO
Instituto Federal de Educação, Ciência e Tecnologia de Roraima	IFRR	RR
Instituto Federal de Educação, Ciência e Tecnologia de São Paulo	IFSP	SP
Instituto Federal de Educação, Ciência e Tecnologia do Amazonas	IFAM	AM
Instituto Federal de Educação, Ciência e Tecnologia do Mato Grosso do Sul	IFMS	MS
Instituto Federal de Educação, Ciência e Tecnologia do Norte de Minas Gerais	IFNMG	MG
Instituto Federal de Educação, Ciência e Tecnologia do Pará	IFPA	PA
Instituto Federal de Educação, Ciência e Tecnologia do Piauí	IFPI	PI
Instituto Federal de Educação, Ciência e Tecnologia do Sudeste de Minas Gerais	IF Sudeste MG	MG
Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas Gerais	IFSULDEMINAS	MG
Instituto Federal de Educação, Ciência e Tecnologia do Triângulo Mineiro	IFTM	MG
Instituto Federal de Goiás	IFG	GO
Instituto Federal de Santa Catarina	IFSC	SC
Instituto Federal do Acre	IFAC	AC
Instituto Federal do Amapá	IFAP	AP

Instituto Federal do Espírito Santo	IFES	ES
Instituto Federal do Rio Grande do Sul	IFRS	RS
Instituto Federal Farroupilha	IFFar	RS
Instituto Federal Goiano	IF Goiano	GO
Instituto Nacional de Metrologia Qualidade e Tecnologia	INMETRO	RJ
Instituto Nacional de Pesquisas da Amazônia	INPA	AM
Instituto Nacional de Tecnologia	INT	RJ
Instituto Nacional de Traumatologia e Ortopedia	INTO-MS	RJ
Instituto SENAI de Inovação em Tecnologias Minerais	ISI-TM	PA
Museu Paraense Emílio Goeldi	MPEG	PA
Pontifícia Universidade Católica do Rio de Janeiro	PUC-Rio	RJ
Pontifícia Universidade Católica do Rio Grande do Sul	PUCRS	RS
Serviço Nacional de Aprendizagem Industrial - Departamento Regional do Rio Grande do Sul	SENAI-RS	RS
Universidade Comunitária da Região de Chapecó	UNOCHAPECÓ	SC
Universidade da Integração Internacional da Lusofonia Afro-Brasileira	Unilab	CE
Universidade de Brasília	UnB	DF
Universidade de Caxias do Sul	UCS	RS
Universidade de Cruz Alta	Unicruz	RS
Universidade de Passo Fundo	UPF	RS
Universidade de Pernambuco	UPE	PE
Universidade de Rio Verde	UniRV	GO
Universidade de Santa Cruz do Sul	UNISC	RS
Universidade de São Paulo	USP	SP
Universidade do Estado da Bahia	UNEB	BA
Universidade do Estado de Mato Grosso	UNEMAT	MT
Universidade do Estado de Minas Gerais	UEMG	MG
Universidade do Estado de Santa Catarina	UDESC	SC
Universidade Do Estado do Pará	UEPA	PA
Universidade do Estado do Rio Grande do Norte	UERN	RN
Universidade do Extremo Sul Catarinense	UNESC	SC
Universidade do Oeste de Santa Catarina	UNOESC	SC
Universidade do Vale do Taquari	UNIVATES	RS
Universidade Estadual da Paraíba	UEPB	PB
Universidade Estadual de Campinas	Unicamp	SP
Universidade Estadual de Ciências da Saúde de Alagoas	UNCISAL	AL
Universidade Estadual de Feira de Santana	UEFS	BA
Universidade Estadual de Londrina	UEL	PR
Universidade Estadual de Maringá	UEM	PR
Universidade Estadual de Santa Cruz	UESC	BA
Universidade Estadual do Ceará	UECE	CE
Universidade Estadual do Centro Oeste	UNICENTRO	PR
Universidade Estadual do Norte Fluminense Darcy Ribeiro	UENF	RJ
Universidade Estadual do Oeste do Paraná	Unioeste	PR
Universidade Estadual do Rio Grande do Sul	UERGS	RS

Universidade Estadual do Sudoeste da Bahia	UESB	BA
Universidade Estadual do Tocantins	UNITINS	TO
Universidade Estadual Paulista "Júlio de Mesquita Filho"	UNESP	SP
Universidade Federal da Fronteira Sul	UFFS	SC
Universidade Federal da Paraíba	UFPB	PB
Universidade Federal da Bahia	UFBA	BA
Universidade Federal de Alagoas	UFAL	AL
Universidade Federal de Alfenas	UNIFAL-MG	MG
Universidade Federal de Campina Grande	UFCG	PB
Universidade Federal de Goiás	UFG	GO
Universidade Federal de Juiz de Fora	UFJF	MG
Universidade Federal de Lavras	UFLA	MG
Universidade Federal de Mato Grosso do Sul	UFMS	MS
Universidade Federal de Minas Gerais	UFMG	MG
Universidade Federal de Ouro Preto	UFOP	MG
Universidade Federal de Rondônia	UNIR	RO
Universidade Federal de Rondonópolis	UFR	MT
Universidade Federal de Santa Catarina	UFSC	SC
Universidade Federal de Santa Maria	UFSM	RS
Universidade Federal de São Carlos	UFSCar	SP
Universidade Federal de São João del Rei	UFSJ	MG
Universidade Federal de São Paulo	UNIFESP	SP
Universidade Federal de Sergipe	UFS	SE
Universidade Federal de Uberlândia	UFU	MG
Universidade Federal de Viçosa	UFV	MG
Universidade Federal do ABC	UFABC	SP
Universidade Federal do Amazonas	UFAM	AM
Universidade Federal do Ceará	UFC	CE
Universidade Federal do Espírito Santo	UFES	ES
Universidade Federal do Estado do Rio de Janeiro	UNIRIO	RJ
Universidade Federal do Maranhão	UFMA	MA
Universidade Federal do Oeste do Pará	UFOPA	PA
Universidade Federal do Pampa	Unipampa	RS
Universidade Federal do Pará	UFPA	PA
Universidade Federal do Paraná	UFPR	PR
Universidade Federal do Recôncavo da Bahia	UFRB	BA
Universidade Federal do Rio de Janeiro	UFRJ	RJ
Universidade Federal do Rio Grande	FURG	RS
Universidade Federal do Rio Grande do Norte	UFRN	RN
Universidade Federal do Rio Grande do Sul	UFRGS	RS
Universidade Federal do Sul e Sudeste do Pará	Unifesspa	PA
Universidade Federal do Tocantins	UFT	TO
Universidade Federal do Triângulo Mineiro	UFTM	MG
Universidade Federal do Vale do São Francisco	UNIVASF	PE
Universidade Federal dos Vales do Jequitinhonha e Mucuri	UFVJM	MG
Universidade Federal Rural da Amazônia	UFRA	PA

Universidade Federal Rural de Pernambuco	UFRPE	PE
Universidade Federal Rural do Semi-Árido	UFERSA	RN
Universidade Feevale	FEEVALE	RS
Universidade Presbiteriana Mackenzie	UPM	SP
Universidade Regional do Noroeste do Estado do Rio Grande do Sul	UNIJUÍ	RS

* The NIT-Rio arrangement is a NIT arrangement of the State of Rio de Janeiro linked to the Ministry of Science, Technology and Innovation (MCTI). It is responsible for the IP and TT management activities of the research units Centro Brasileiro de Pesquisas Físicas; Mineral Technology Center; Brazilian Institute of Science and Technology Information; National Institute of Pure and Applied Mathematics; National Institute of Technology; National Laboratory of Scientific Computing; Museum of Astronomy and Related Sciences; and National Observatory.
** The National Nuclear Energy Commission is a shared NIT linked to the Institute of Nuclear Engineering and also responsible for the IP and TT management activities of the Institute of Energy and Nuclear Research; Institute of Radioprotection and Dosimetry (IRD); Nuclear Technology Development Center; Midwest Regional Center for Nuclear Sciences; Northeast Regional Center for Nuclear Sciences and the Poços de Caldas Laboratory (LAPOC).
*** The Aerospace Science and Technology Department (DCTA) is a shared NIT linked to the Air Force Command. It is responsible for the IP and TT management activities of the research units of the Instituto Tecnológico de Aeronáutica (ITA); Institute of Aeronautics and Space (IAE); Institute of Advanced Studies (IEAV); Institute of Promotion and Industrial Coordination (IFI); Flight Research and Testing Institute (IPEV); Alcântara Launch Center (CLA); Barreira do Inferno Launch Center (CLBI); Air Force Logistics Institute (ILA); Air Force Logistics Center (CELOG); São José dos Campos Aeronautics Computing Center (CCASJ); Aeronautics Chemical-Pharmaceutical Laboratory (LAQFA); Institute of Operational Applications (IAOP); Brigadeiro Médico Roberto Teixeira Institute of Aerospace Medicine (IMAE) and Airspace Control Institute (ICEA).
**** The Fiocruz Technological and Innovation Management System is a nationwide NIT arrangement. It is responsible for coordinating the IP and TT management activities of the Institute of Technology in Immunobiologicals – Biomanguinhos research units; Laboratory Animal Breeding Center – CECAL; National School of Public Health Sérgio Arouca- ENSP; Polytechnic School of Health Joaquim Venâncio- EPSJV; Institute of Pharmaceutical Technology – Farmanguinhos; Ageu Magalhães Research Center - CpqAM; Carlos Chagas Institute - ICC; Institute of Scientific and Technological Communication and Information in Health (RJ); Fernandes Figueira Institute; Gonçalo Moniz Research Center; Leonidas and Maria Deane Institute; National Institute of Quality Control in Health; Oswaldo Cruz Institute; Evandro Chagas Clinical Research Institute; Renee Rachou Research Center; Fiocruz Ceará; Fiocruz Rondônia; Fiocruz Mato Grosso do Sul; House of Oswaldo Cruz; Center for Technological Development in Health; and Institute of Molecular Biology of Paraná - IBMP.

2.2 Respondents from 2017 to 2021

As of its second edition, in base year 2017, the FORTEC Survey continues to be updated, but maintains a similar structure of the questionnaire and questions, enabling the comparative analysis of various points presented in the survey. Throughout the report some of these analyzes will be presented.

With regard to the respondents' profile, regarding nature, type and region, Table 2 summarizes such information. It shows a growth in the number of ICTs represented by NIT respondents – with a slight drop in the last year, possibly due to the change in the questionnaire delivery format, which changed the contact between the Survey and the respondents.

With regard to the type and nature, the majority continue to be from higher

education institutions and public institutions, with a fluctuation in the other categories. In the analysis of respondents by region, the Southeast continues with greater participation, but the growth of the North region among the participants stands out.

Table 2 - Profile of respondents by base year of the Survey

	2017	2018	2019	2020	2021
Total NIT	102	113	128	139	138
Total ICT	127	132	148	196	186
Public	79,4%	80,5%	75,8%	84,17%	84,78%
Private	18,6%	18,6%	18,8%	11,51%	12,32%
Others	2,0%	0,9%	5,5%	4,32%	2,90%
Higher Education	68,6%	68,1%	69,5%	64,03%	65,94%
Research Institute	14,7%	8,8%	7,8%	11,51%	10,14%
Institute of Professional and Technological Education	16,7%	21,2%	18,8%	20,86%	21,01%
Others	0,0%	1,8%	3,9%	3,60%	2,90%
Midwest	5,9%	8,8%	8,6%	10,07%	7,97%
Northeast	25,5%	19,5%	18,0%	19,42%	21,01%
North	6,9%	7,1%	6,3%	10,79%	13,04%
Southeast	36,3%	35,4%	33,6%	33,81%	33,33%
South	25,5%	29,2%	33,6%	28,1%	24,64%

3. The Technological Innovation Nuclei (NIT)

3.1 Experience and start of IP and TT activities

Regarding the implementation of NITs in the base year of 2021, 133 (96.4%) NIT participants in the Survey stated that they were implemented, while 5 (3.6%) are in the implementation phase. Considering the age of NITs from their creation year to 2022, the result varied between 2 and 41 years, with an average of 13.3 years.

The age of the NIT, according to the year of its creation, however, does not always coincide with the beginning of its activities, being this considered the first year in which the ICT dedicated at least one professional (even if part-time) to activities of intellectual property protection (IPP). Among the respondents, 82 started IPP activities concomitantly with the creation of the NIT, while 23 started activities before institutional creation, and 33 started to act only after being effectively created. These cases, in which activities started only one or/and two years after the creation of the NIT, can happen when the NIT is created without the existence of any regulations for activities related to IP protection, or even when it is created within a pre-existing structure, responsible for activities such as the signing of university-industry partnership agreements, business incubation, among others.

Figure 2, below, provides an overview of the average ages of NITs in different regions of Brazil.

Figure 2 – Average age of NITs respondents by region

In addition to the implementation of the NIT as an internal organizational structure of the ICT, the Survey questioned whether or not the NIT had its own legal personality. Of the 138 respondents, two (HAE - FAHOR and FEEVALE) NIT reported having a legal personality different from their original ICT, one of them indicating that it was through association. In addition to these, four (UFMG, UFS, Unicamp and INMETRO) indicated that they had started a formal process with this objective and 66 indicated that they had an agreement or cooperation contract signed with private non-profit entities, such as support foundations.

3.2 NIT Collaborators

3.2.1 Function and link

Regarding the number of employees working in the NITs, there were a total of 824 professionals with full dedication (average of 5.97 per Nucleus) and 749 professionals with part-time dedication (average 5.42 per Nucleus). The median values for the total number of professionals working in the NITs were 3 full-time employees and 3 part-time employees. It is worth noting that the average values reported above are influenced by a few NITs that concentrate a high number of employees. It should also be noted the considerable growth of part-time employees when compared to the results of previous years. While in 2021 there are a total of 749 part-time employees, in previous years the maximum was 471, in 2020.

Considering that 1 part-time employee can be computed as 0.5 full-time employee, the average of full-time equivalent professionals per NIT (or FTE) becomes 8.6 while the median becomes 5.0. Of the NIT employees in FTE, 47.7% were civil servants and fixed staff (civilian and/or military); 22.5%, scholarship holders and interns; 14.2%, directors; 8.8%, outsourced employees working permanently at the NIT; 4.1% other types of employees; and 2.5%, volunteer employees. Table 3 summarizes data related to the staff of the NITs by function performed.

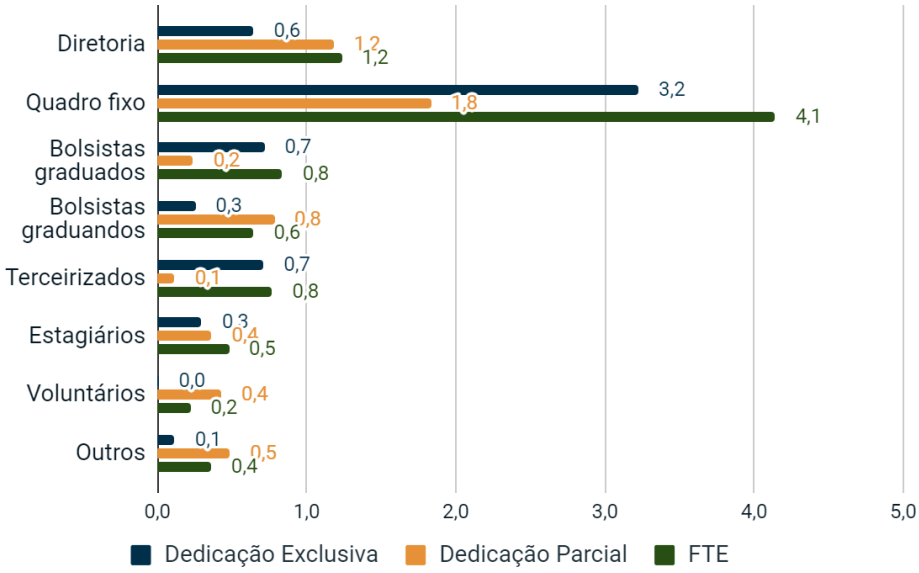
Table 3 – NIT Collaborators by function performed

	Full time dedication		Partial time dedication		Full-time equivalent employees (FTE)*	
Function performed	**Average**	**Median**	**Average**	**Median**	**Average**	**Median**
Board of Directors	0,6	0,0	1,2	1,0	1,2	1,0
Permanent servers/employees	3,2	2,0	1,8	0,0	4,1	2,0
Graduate scholarship holders	0,7	0,0	0,2	0,0	0,8	0,0
Undergraduate scholarship holders	0,3	0,0	0,8	0,0	0,6	0,0
Outsourced with permanent role in NIT	0,7	0,0	0,1	0,0	0,8	0,0
Interns	0,3	0,0	0,4	0,0	0,5	0,0
Volunteer collaborator	0,0	0,0	0,4	0,0	0,2	0,0
Others	0,1	0,0	0,5	0,0	0,4	0,0
Total	6,0	3,0	5,4	3,0	8,7	5,0

* The column “full-time equivalent employees (FTE)” was calculated considering the following ratio: FTE = (number of full-time employees) + 0.5x (number of part-time employees).

Figure 3 brings a comparison between the average number of professionals in the NIT with full dedication, part time dedication and FTE according to the type of job.

Figure 3 – NIT Professionals by type of link (average per NIT)

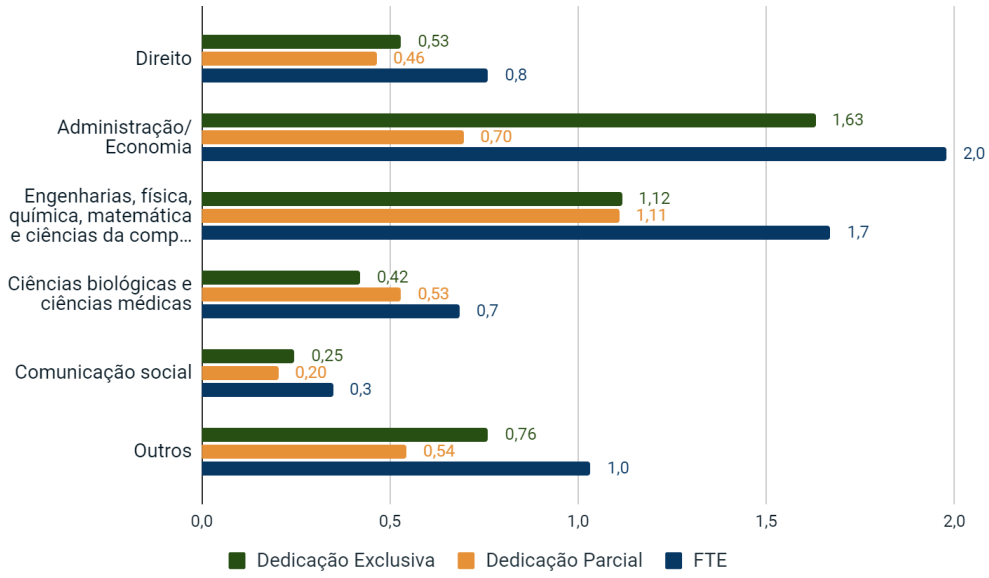


Diretoria=Board of Directors; Quadro fixo= Permanent servers/employees; Bolsistas graduados= Graduate scholarship holders; Bolsistas graduandos=Undergraduate scholarship holders; Terceirizados= Outsourced collaborators; Estagiários=Interns; Voluntários=Volunteers; Outros=Others

3.2.2 NIT Professionals Background

Analyzing the background of professionals working in the NIT, it was found that, in terms of FTE, the average of administrators and economists was 2.0 per NIT (30.6% of the total in FTE); that of engineers, physicists, chemists, mathematicians and computer scientists was 1.7 per NIT (25.8% of the total in FTE); that of professionals with law background was 0.8 per NIT (11.8% of the total in FTE); that of professionals in the biological and medical sciences was 0.7 per NIT (10.6% of the total in FTE); that of communication professionals was 0.3 per NIT (5.4% of the total in FTE); and that of other formations was 1 per NIT (15.9% of the total in FTE). Figure 4 brings a comparison between the averages of the number of professionals in the NIT with full dedication and part time dedication according to background, information detailed in Table 4.

Figure 4 - NIT professionals by background [average per NIT]



Direito=Law; Administração/Economia=Administration/Economy; Engenharias,física, química, matemática e ciências da computação=Engineering, Physics, Chemistry, Mathematics and Computer Sciences; Ciências Biológicas e Ciências Médicas=Biological and Medical Sciences; Comunicação social=Communication; Outros=Others

Table 4 - NIT professionals by background [average per NIT]

	Full time		Part Time		Full-time equivalent (FTE) employees*	
Academic Education	**Average**	**%**	**Average**	**%**	**Average**	**%**
Law	0,5	11,25%	0,5	13,09%	0,8	11,8%
Administration/Economy	1,6	34,67%	0,7	19,63%	2,0	30,6%
Engineering, Physics, Chemistry, Mathematics and Computer Sciences	1,1	23,73%	1,1	31,29%	1,7	25,8%
Biological Sciences and Medical Sciences	0,4	8,94%	0,5	14,93%	0,7	10,6%
Communication	0,2	5,24%	0,2	5,73%	0,3	5,4%
Others	0,8	16,18%	0,5	15,34%	1,0	15,9%
Total	4,7	100,0	3,5	100,0	6,5	100,0

* The column “full-time equivalent (FTE) employees” was calculated considering the following ratio: FTE = (number of full-time employees) + 0.5x (number of part-time employees).

With regard to the level of education of full-time employees working in the NITs surveyed, 19.6% have a doctorate degree (average of 0.8 per NIT); 24.3% master's degree (average of 1 per NIT); 12.1% MBA (average 0.5 per NIT); 5.1% have completed PROFNIT[5] (average of 0.2 per NIT); 11.2% have a lato sensu graduate degree in topics related to IP or TT (mean of 0.4 per NIT); 21.9% have previous experience in the industry (average of 0.9 per NIT); and 5.8%, have previous experience in creating startups (average of 0.2 per NIT).

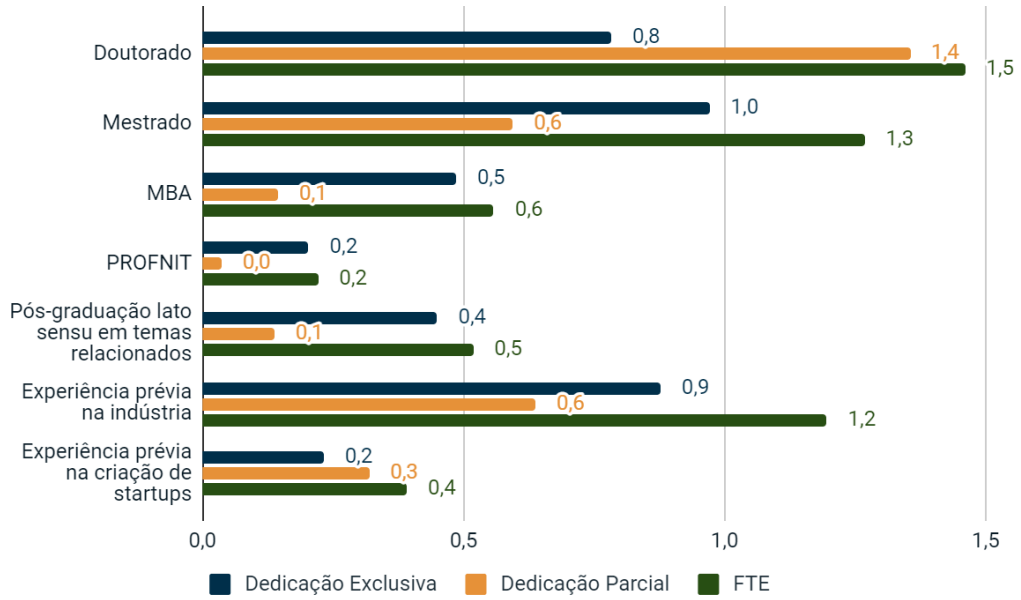
Among professionals on a part-time basis, in turn, it was observed that 42% have a doctorate degree (average of 1.4 per NIT); 18.4% master's degree (average of 0.6 per NIT); 4.5% MBA (average 0.1 per NIT); 1.1% have completed PROFNIT (average less than 0.1 per NIT); 4.3% have a *lato sensu* graduate degree in topics related to IP or TT (mean of 0.6 per NIT); 19.8% have previous experience in the industry (average of 0.6 per NIT); and 9.9%, previous experience in creating startups (average of 0.3 per NIT).

At a first glance, the difference in the number of professionals with a doctorate degree between the full-time and part-time groups may seem unusual. However, it is plausible considering that most NIT directors are professors/researchers who have a doctorate degree, but dedicate only part of their time to activities at the Nucleus. Figure

[5] PROFNIT is the graduate program developed by FORTEC, at the professional master's level, with the objective of training professionals in the areas of action of the NIT.

5 summarizes the above information, including averages by FTE.

Figure 5 - Professionals by level of education and/or experience [average by NIT]

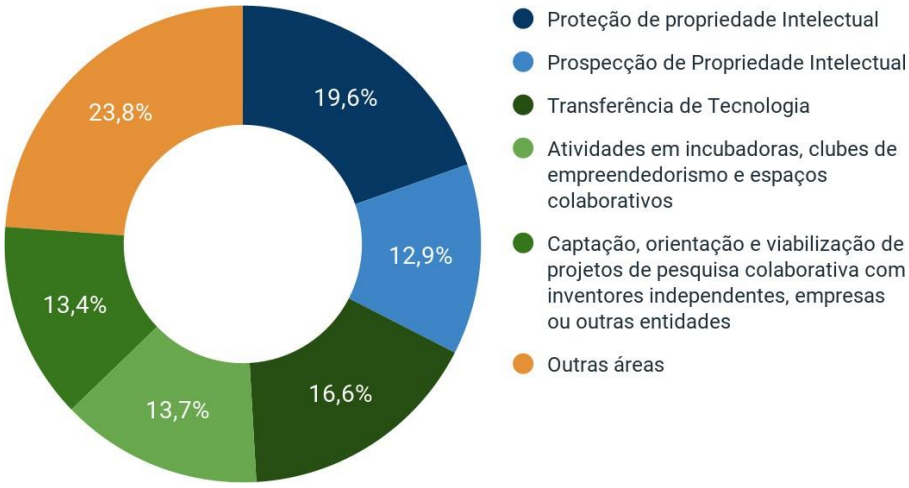


Doutorado=PhD; Mestrado=Master; MBA; PROFNIT=Master; Pós-Graduação lato sensu em temas relacionados=MBA in related areas; Experiência prévia na indústria=Previous industry experience; Experiência prévia na criação de startups= Previous experience in creating startups.

3.2.3 Áreas de atuação

Regarding the areas of activity of NIT employees, it was found that general activities such as direction, coordination, administrative tasks, secretary and others are in first place, with 23.8% of the total, followed by intellectual property protection activities, with 19.6%; technology transfer, with 16.6%; activities in incubators, entrepreneurship clubs and collaborative spaces, with 13.7%; fund-raising, guiding and facilitating collaborative research projects, with 13.4%; and finally intellectual property prospecting activities, with 12.9%. Such information is summarized in Figure 6.

Figure 6 - NIT professionals by area of activity [%]



Proteção da propriedade intelectual = IP protection
Prospecção de propriedade intelectual = IP prospection
Transferência de Tecnologia = Technology Transfer
Atividades em incubadoras, clubes de empreendedorismo e espaços colaborativos= Activities in incubators, entrepreneurship clubs and collaborative spaces
Captação, orientação e viabilização de projetos de pesquisa colaborativa com inventores independentes, empresas ou outras entidades= Fund-raising, guiding and facilitating collaborative research projects with independente inventors, and intellectual property prospecting activities.

Considering these activities as typical of IP and TT management, 32.5% of NIT human resources worked with IP and 30.3% with TT in 2021. Table 5 presents comparative data for each year the survey was carried out.

Table 5 - Area of activity per survey base year*

Area of activity	**2017**	**2018**	**2019**	**2020**	**2021**
IP Prospection	12,6%	12,9%	11,1%	11,2%	12,9%
IP Protection	32,6%	31,9%	31,4%	29,2%	19,6%
IP Total	45,2%	44,8%	42,5%	40,4%	32,5%
Technology Transfer	14,8%	14,3%	12,6%	12,8%	16,6%
Incubating activities	13,0%	14,7%	12,7%	13,7%	13,7%
TT Total	27,8%	29,0%	37,4%	36,5%	43,7%
Joint research	-%*	-%*	12,1%	10,0%	13,4%
Internal activities	26,9%	25,4%	20,1%	22,2%	23,8%

* In the 2017 and 2018 base year surveys, the Joint Research area was not included among the activities.

3.3 Participation in training programs

Regarding the involvement of the NITs surveyed in training and qualification programs, only 1 (0.7%) stated that they had not participated in initiatives to develop their employees' intellectual property management, marketing and/or negotiation skills.

Among the others, 128 (92.8%) respondents participated in distance courses offered by the INPI (National Institute of Industrial Property) or by the WIPO (World Intellectual Property Organization), while 43 (31.2%) participated in face-to-face courses from the same institutions. Considering the coronavirus pandemic that made a large part of face-to-face activities impossible during the years 2020 and 2021, the answers regarding face-to-face courses referred to initiatives that took place until the end of 2021, thus, it may have occurred in a period prior to social isolation.

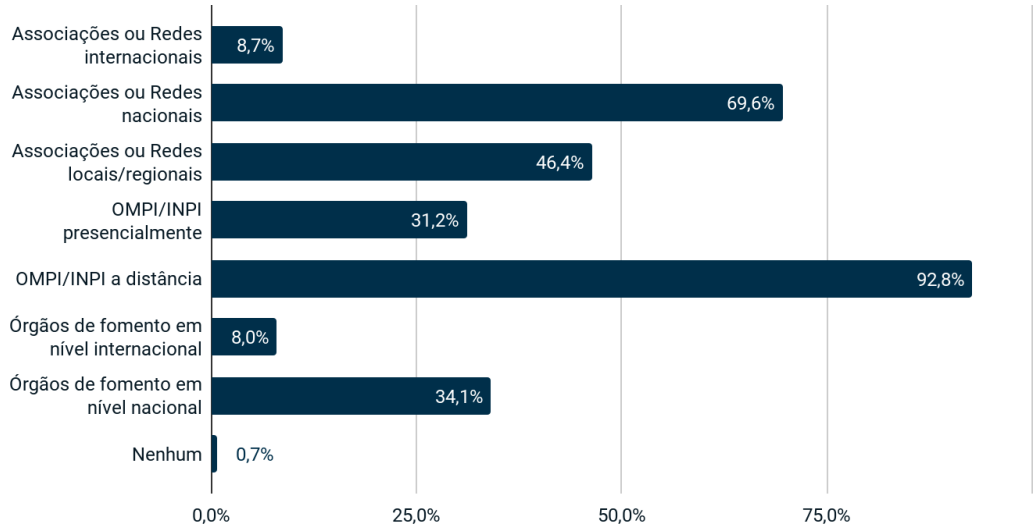
With regard to training offered by associations or networks, 96 (69.6%) respondents participated in courses/initiatives by associations or networks nationwide (FORTEC, ANPEI[6], ANPROTEC[7], among others), 64 (46.4%) courses/initiatives by associations or local/regional networks (NIT-NE Network, Inova-SP Network, among others); and 12 (8.7%) from courses/initiatives by associations or networks with an international scope, such as AUTM, PraxisAuril and others.

Besides operating workshops in cooperation with organizations such as INPI, WIPO, and LES Brasil (Brazilian Association of Licensing Executives), national entities offer their own training programs to NIT employees, such as PROFNIT, from FORTEC, in addition to organizing events and thematic conferences in the area of IP and TT management.

Among the respondents, 47 (34.1%) participated in initiatives at the state and national level by development agencies (CNPq[8], FAP[9], among others) aimed at developing human resources and NIT processes. Finally, 11 (8%) NIT participated in initiatives at an international level offered by development agencies to encourage research. Figure 7 summarizes the above information.

[6] National Association of Innovative Enterprise
[7] National Association of Incubators and Technological Parks
[8] National Council for Scientific and Technological Development
[9] Regional Research Support foundations

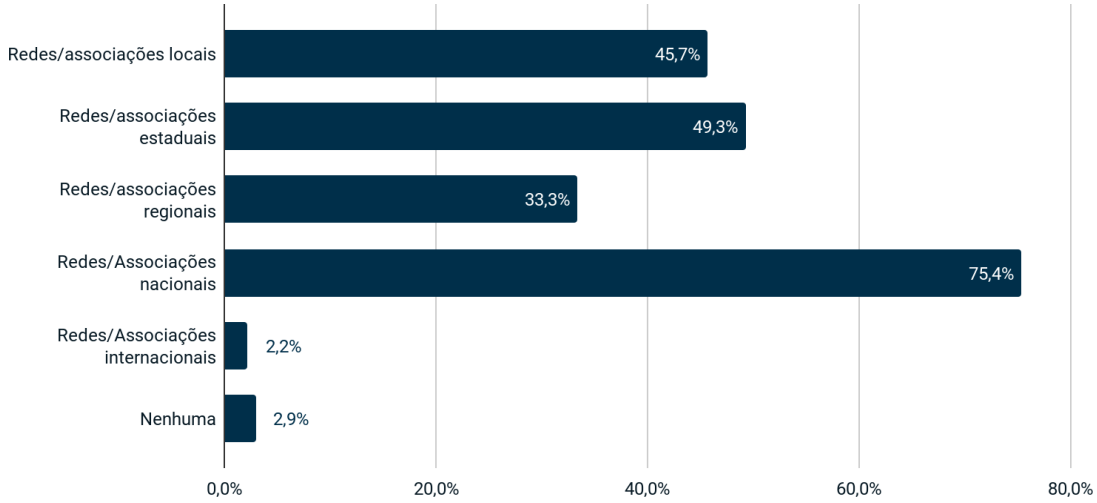
Figure 7 - Percentage of NIT participants in training activities



3.4 Participation in associations or networks

It was found that 134 of the 138 respondents participate in associations or networks. 45.7% (63) of the NIT participated in local networks/associations; 49.3% (68) in state networks/associations; 33.3% (46) in regional networks/associations; and 75.4% (104) in nationwide networks/associations. Of all participants, only 3, representing 2.2%, were associated with international networks. Figure 8 summarizes this information.

Figure 8 - Percentage of NITs that participate in networks/associations



3.5 Outsourcing of activities related to intellectual property and technology transfer management

Among the activities of intellectual property and technology transfer management processes, some are outsourced by the NIT to enhance and optimize their actions. The participants of the Survey answered that in the base year 2021, 44.2% (61) carried out some type of outsourcing, while 55.8% (77) carried out the listed activities only with their internal work capacity. Of the latter, 13.8% had a valid licensing contract and their average age was 12.8 years.

For existing activities, two groups were separated according to their respective types, namely intellectual property (IP) management and technology transfer (TT). From the answers obtained, it is observed that the average age of the NIT that outsourced some IP-related activity is higher than those who outsourced TT activities, being 14.4 for the first group and 12.8 for the second . Still in this division, among the respondents who outsourced IP activities, 13% indicated that they had valid licensing agreements, a much smaller number in the second group, 2.9%.

With regard to the activities themselves, of those referring to IP processes, the most frequently outsourced were, in descending order: drafting national patents, with 33.3%; prior art searches, 23.2%; filing and follow-up of patents in Brazil and writing of international patents, both with 15.9%; filing and monitoring of patents abroad in the national phase and filing and monitoring of patents abroad by PCT, both with 10.9%; legal advice for representation in eventual lawsuits, 5.8%.

With regard to activities related to TT processes, the most frequently outsourced were, in descending order: valuation of technologies and analysis of market potential, with 9.4%; assistance in finding potential licensees and assistance in drawing up licensing contracts, both with 5.1%; assistance in negotiating licensing agreements, 3.6%; consultancies for the elaboration of marketing and commercialization strategies, 2.9%.

Figure 9, below, refers to the data presented, with the types of IP management activities outsourced by the NITs surveyed, while Figure 10 does the same for TT activities.

Figure 9 - Main services outsourced by NIT for IP management [%]

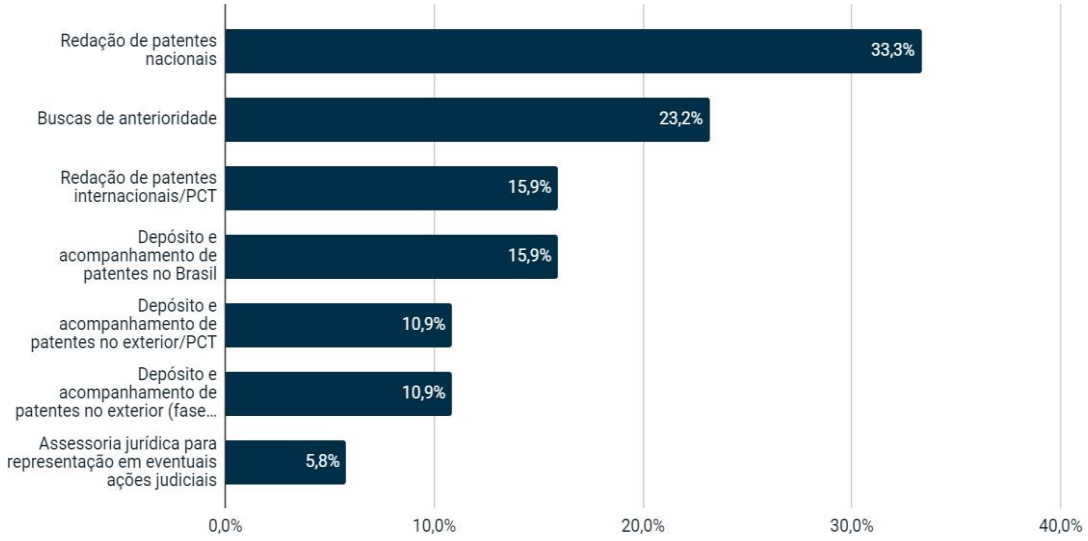
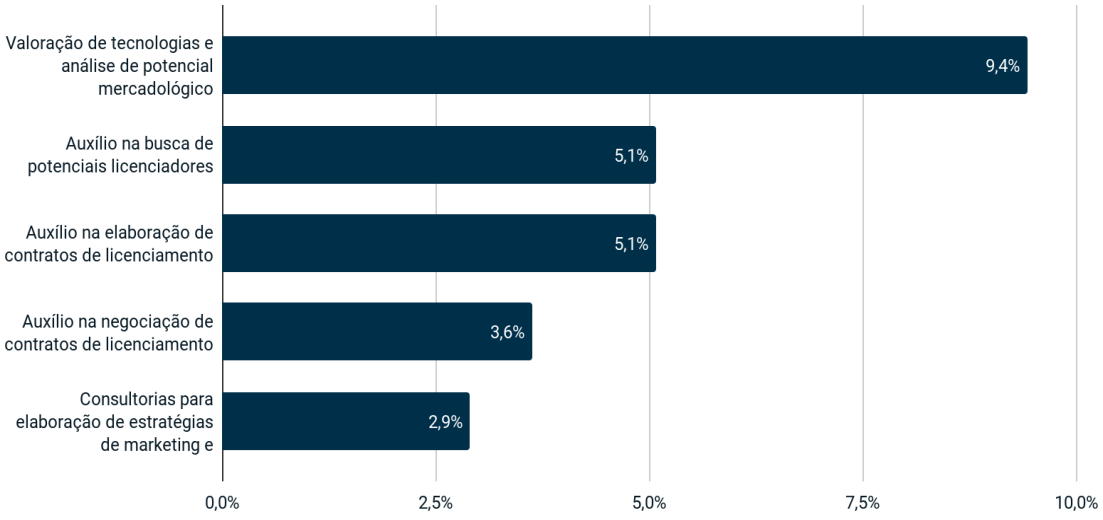


Figure 10 - Main services outsourced by NIT for technology transfer [%]



3.6 NIT Strategic Definitions

In the FORTEC Innovation Survey for the base year 2021, two new questions were included in order to identify whether the NIT has a plan of strategic actions to achieve internal objectives and whether the NIT participates in strategic practices with ICT. With this, it was identified that 71.7% of respondents have an internal strategic planning and 92% of the NIT are included in the ICT planning and management instrument.

To better understand NIT's strategic priorities, participants ranked the

importance of potential strategic objectives and success metrics used to measure NIT performance on a 5-point scale, where 1 is unimportant; 2, relatively important; 3, important; 4, very important; and 5, extremely important.

The objective “contribute to the local and regional development of ICT” was classified as the most important by the respondents (average importance of 4.1), followed by “promoting the dissemination of scientific and technological knowledge of ICT” (average importance of 4 ,0); “providing services to ICT inventors/researchers” and “promoting ICT's relationship with companies, public institutions and the third sector” (average importance of 3.9); “prospect technologies to guide ICT innovation actions” and “facilitate the practical application of inventions originating from research” (average importance of 3.6); “generate revenues through collaborative research agreements between ICT and companies” and “generate revenues through licensing agreements” (average importance of 3.5); “assist the creation of spin-off companies” (average importance of 3.4); “providing services to other ICT, companies, public and third sector institutions” (average importance of 3.2); “providing service to independent inventors/researchers” (average importance of 3.0).

Figure 11 provides an overview of the importance of the strategic objectives for the NITs surveyed in 2021.

Figure 11 – Importance of NIT strategic objectives [average per NIT]

Of the 138 survey participants, 111 reported the degree of importance for all strategic objectives and 27 reported that at least one objective is not part of their scope. Among the strategic objectives that were not part of the scope of the NITs in 2021, 15 respondents reported the objective “to provide services to other ICTs, companies, public and third sector institutions”; 13 respondents identified “assisting the creation of spin-off companies”; 11 respondents, “providing services to independent inventors/researchers”; 8 respondents, “generate revenues through collaborative research agreements between ICT and companies”; 5 respondents, “prospecting technologies to guide ICT innovation actions”; respondents, “generate revenues through licensing agreements”; 4 respondents, “facilitating the practical application of inventions originating from research”; 3 respondents, “promoting ICT's relationship with companies, public institutions and the third sector”; 1 respondent, “promote the dissemination of scientific and technological knowledge of ICT” and “provide services to inventors/researchers of ICT”.

Considering that more than one objective could have been classified with the same importance, the respondents still listed, in descending order of importance, the four priority objectives for their NIT. The results are summarized in Figure 12. Priority objectives, in descending order, were “providing services to ICT inventors/researchers”, indicated by 32.6%; “contribute to the local and regional development of the environment in which ICT is inserted”, indicated by 23.2% of respondents; “promote the dissemination of scientific and technological knowledge of ICT”, indicated by 9.4%; “generate revenues through collaborative research agreements between ICT and companies”, indicated by 8.0%; “promoting ICT's relationship with companies, public institutions and the third sector”, indicated by 5.8%; “generate revenues through licensing agreements”, indicated by 5.1% of respondents; “facilitating the practical application of inventions originating from research”, indicated by 3.6%; “prospect technologies to guide ICT innovation actions”, indicated by 2.9%; “providing services to other ICT, companies, public and third sector institutions”, “assisting the creation of spin-off companies” and “providing services to independent inventors/researchers” were not mentioned by the respondents.

As the second priority objective, also in descending order, were cited “generating revenue through collaborative research agreements between ICT and

companies" and "promoting the dissemination of scientific and technological knowledge of ICT", by 17.4% of respondents; "contribute to the local and regional development of the environment in which ICT is inserted", by 14.5% of respondents; "providing services to ICT inventors/researchers" and "promoting ICT's relationship with companies, public institutions and the third sector" by 12.3% of respondents; "facilitating the practical application of inventions originating from research", by 10.1% of participants; "prospect technologies to guide ICT innovation actions" and "assist the creation of spin-off companies", by 2.9%; "generating revenues through licensing agreements", by 2.2%; "providing services to other ICT, companies, public and third sector institutions" and "providing services to independent inventors/researchers", by 0.7% of participants each.

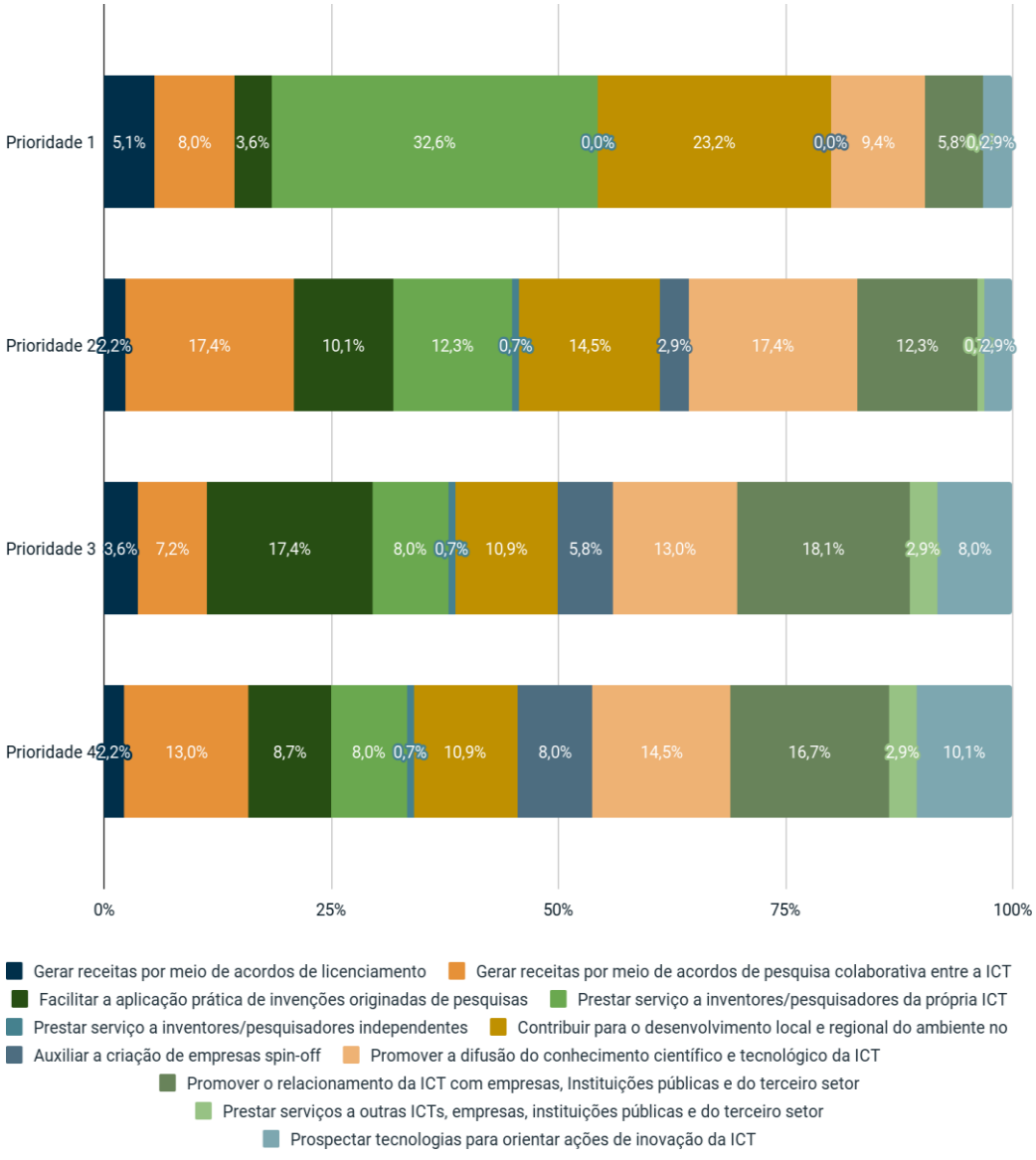
As for the results for the third priority objective, "promoting ICT's relationship with companies, public institutions and the third sector" was indicated by 18.1% of the participants; "facilitating the practical application of inventions originating from research", informed by 17.4%; "promoting the dissemination of scientific and technological knowledge of ICT", indicated by 13.0%; "contribute to the local and regional development of the environment in which the ICT is inserted", indicated by 10.9%; "prospecting technologies to guide ICT innovation actions" and "providing services to ICT inventors/researchers", indicated by 8.0% of respondents each; "generate revenues through collaborative research arrangements between ICT and companies", indicated by 7.2% of respondents; "assist the creation of spin-off companies", reported by 5.8%; "generate revenues through licensing agreements", reported by 3.6%; "providing services to other ICT, companies, public and third sector institutions", reported by 2.9%; "providing services to independent inventors/researchers", indicated by 0.7% of respondents.

And finally, for the fourth priority objective, "promoting ICT's relationship with companies, public institutions and the third sector" was indicated by 16.7% of respondents; "promoting the dissemination of scientific and technological knowledge of ICT", reported by 14.5% of participants; "generate revenues through collaborative research agreements between ICT and companies", indicated by 13.0% of participants; "contribute to the local and regional development of the environment in which ICT is inserted" informed by 10.9% of the participants;

"prospecting technologies to guide ICT innovation actions", indicated by 10.1% of respondents; "facilitating the practical application of inventions originating from research", reported by 8.7% of respondents; "providing services to ICT inventors/researchers" and "assisting the creation of spin-off companies", indicated by 8.0% each; "providing services to other ICT, companies, public and third sector institutions", indicated by 2.9%; "generate revenues through licensing agreements", reported by 2.2% of respondents; "providing services to independent inventors/researchers", cited by 0.7% of participants.

Figure 12 provides an overview of the strategic objectives as priorities for the NITs surveyed in 2021.

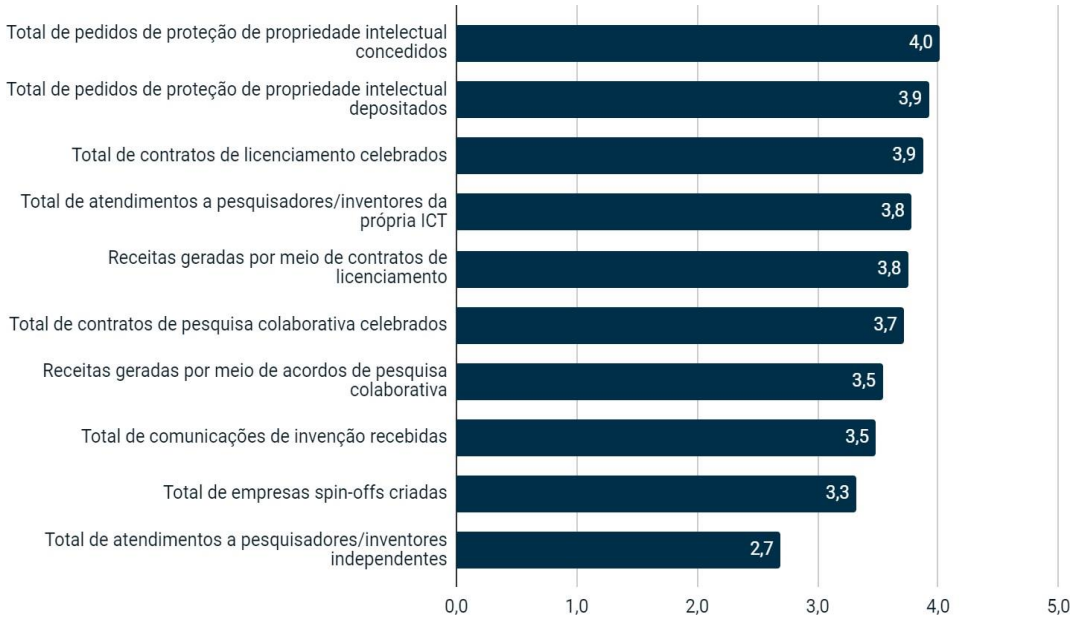
Figure 12 - Priorities of respondents' strategic objectives [%]



As for the success metrics used to measure NIT performance, in descending order of importance, “total intellectual property protection requests granted” were reported with greater importance (average importance of 4.0); followed by “total intellectual property protection requests filed” and “total licensing agreements concluded” (average importance of 3.9 each); “total services provided to ICT researchers/inventors” and “revenues generated through licensing agreements” (average importance of 3.8 each); “total number of joint research contracts signed” (average importance of 3.7); “revenues generated through joint research contracts” and “total invention disclosures received” (average importance of 3.5 each); “total spin-off companies created” (average importance of 3.3); “total visits to independent researchers/inventors” (average importance of 2.7).

Figure 13 provides an overview of the importance of the success metrics used by respondents in 2021.

Figure 13 - Importance of success metrics used to measure NIT performance [average per respondent]



Of the 138 participants, 107 reported that they used all the metrics presented and 31 reported that at least one metric was not part of their scope. Among the success metrics that were not part of the scope of the NITs are “total number of visits to independent researchers/inventors”, being the most frequent answer cited by 21 participants; “total spin-off companies created” (20 respondents); “income generated through joint research agreements” (14 respondents); “total number of joint research contracts signed” (10 respondents); “total license agreements signed” and “revenues generated through licensing agreements” (9 respondents each); “total invention disclosures received” (6 respondents); “total number of visits to ICT researchers/inventors” (5 respondents); “total intellectual property protection requests granted” and “total intellectual property protection requests filed” (3 respondents each).

Respondents reported the most important success metrics used to measure their performance and the result is shown in Figure 14. In descending order, they were: “total number of visits to ICT researchers / inventors”, indicated by 33.3% ; “total intellectual property protection requests filed” indicated by 27.5%; “total intellectual property protection requests granted”, indicated by 9.4%; “total joint research contracts signed”, reported by 8.0% of participants; “total invention disclosures received”, indicated by 5.1%; “total license agreements signed”, indicated by 2.9%; “revenues generated through licensing agreements” and “revenues generated through joint research agreements”, indicated by 2.2% each; and “total spin-off companies created” and “total services to independent researchers/inventors” were not mentioned by any respondent.

In second place in order of importance: “total intellectual property protection requests filed”, indicated by 20.3% of respondents; “total intellectual property protection requests granted”, indicated by 15.9%; “total invention disclosures received”, indicated by 14.5%; “total joint research contracts signed”, reported by 11.6%; “total consultations with ICT researchers/inventors”, indicated by 10.1%; “total license agreements signed”, informed by 5.8%; “revenues generated through licensing contracts”, reported by 4.3%; “total visits to researchers / independent inventors”, indicated by 2.9%; “income generated through joint research engagements, indicated by 2.2%; “total spin-off companies created”, reported by 1.4% of respondents.

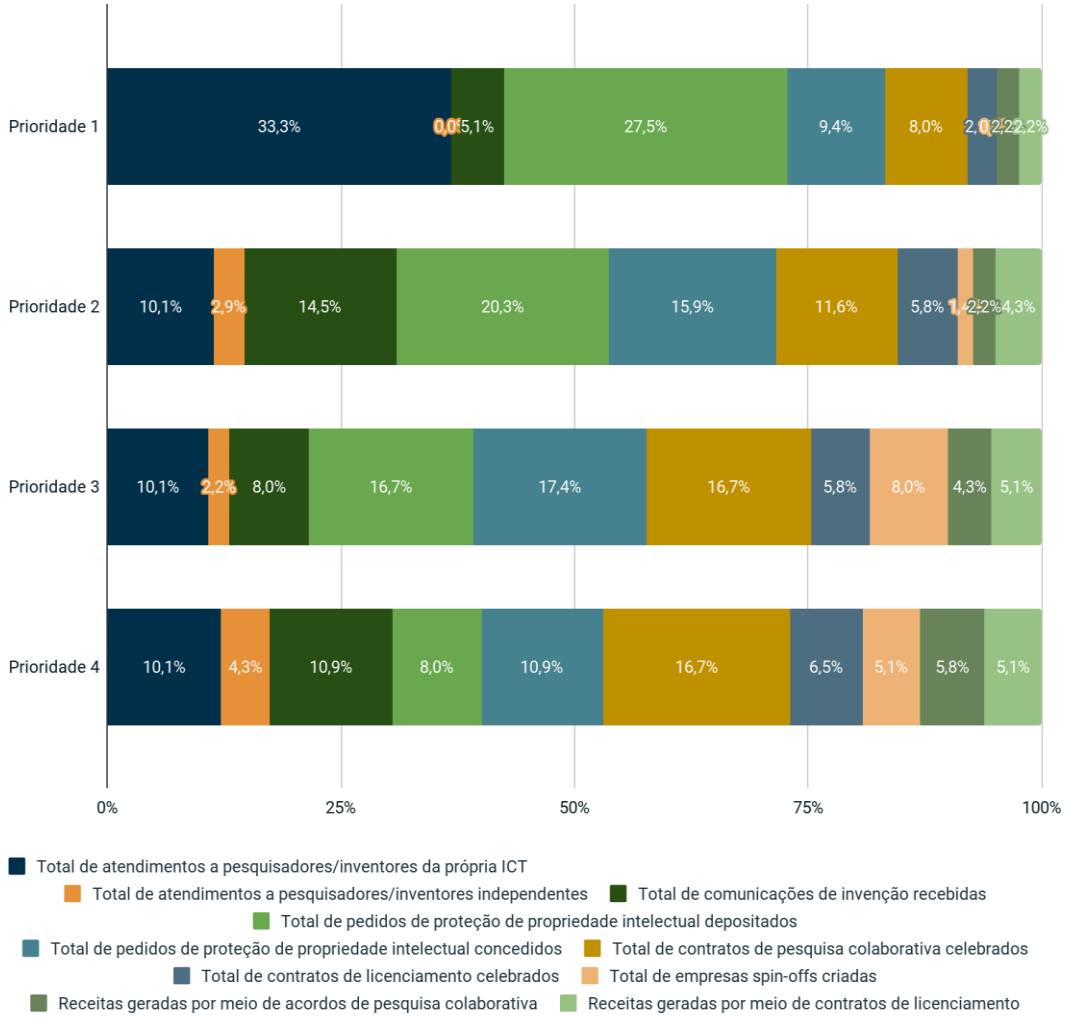
As for the third most important metric: “total intellectual property protection requests granted”, indicated by 17.4% of participants; “total intellectual property protection requests filed” and “total joint research contracts signed” reported by 16.7%

of participants each; “total visits to ICT researchers/inventors” indicated by 10.1% of respondents; “total invention disclosures received” and “total spin-off companies created”, reported by 8.0% each; “total license agreements signed”, indicated by 5.8%; “income generated through licensing agreements”, reported by 5.1%; “income generated through joint research contracts”, indicated by 4.3%; “total visits to independent researchers/inventors”, reported by 2.2%.

Finally, regarding the fourth most important metric: “total joint research contracts signed”, indicated by 16.7% of respondents; “total invention disclosures received” and “total intellectual property protection requests granted” reported by 10.9% of respondents each; “total visits to ICT researchers/inventors”, indicated by 10.1% of participants; “total intellectual property protection requests filed”, indicated by 8.0% of participants; “total license agreements signed”, indicated by 6.5% of respondents; “income generated through joint research agreements”, indicated by 5.8%; “total spin-off companies created” and “revenue generated through licensing agreements” were indicated by 5.1% each; “total visits to independent researchers/inventors” was indicated by by 4.3% of the participants.

Figure 14 provides an overview of priorities regarding success metrics for NITs surveyed in 2021.

Figure 14 - Priorities of success metrics used to measure respondent performance [%]



4. Intellectual Property Management, Technology Transfer, Innovation Policies, Entrepreneurship and Partnerships

4.1 Results of intellectual property management

4.1.1 Invention Disclosures and Intellectual Property Protection Applications

Of the 138 NIT surveyed, 126 received invention communications in the base year 2021. The average value of invention disclosure per respondent was 19.0, while the median was 10.0. With regard to filed IP protection applications, it was observed that 104 respondents claimed to have deposited invention patents, 37 NIT reported having filed Utility Model (MU), in Brazil in 2021[10], while 23 used the PCT treaty and 50 filed applications in the national phase, internationalizing them.

This year, in Brazil, a total of 2328 IP requests were filed by the ICTs, of which 1,187 were filed for patents, 80 for utility models, 756 for computer programs, 221 for trademarks, 20 for new plan varieties, and 64 for other categories (industrial design, circuit topography, geographical indication, among others). As for requests abroad[11], there were 73 requests, including patents (64), utility models (6) and trademark registration (3). The average of IP protection claims in Brazil by respondents in the base year 2021 was 8.6, while the median was 3. Table 6, below, summarizes these data and provides more details.

Table 6 - Overview of intellectual property requests made by ICT in Brazil in the base year 2021

Type of IP	Number	%	Average/NIT	Median /NIT
Utility Model	80	3,4	0,6	0,0
Patent	1187	51,0	8,6	3,0
Computer program	756	32,5	5,5	2,5
Trademark	221	9,5	1,6	0,0
New plant varieties	20	0,8	0,1	0,0
Others	64	2,7	0,5	0,0
Total	2328	100,0	16,9	10,0

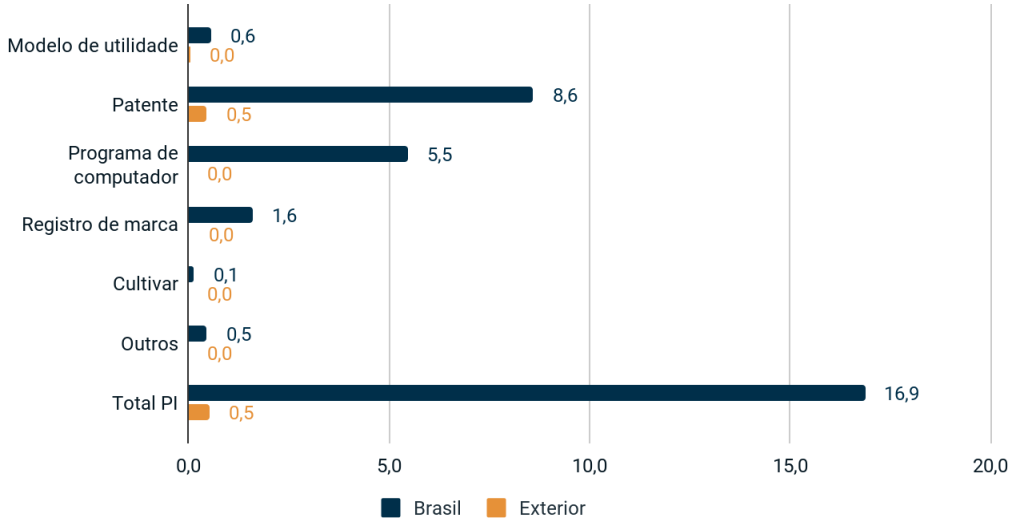
In Figure 15, below, a comparison can be found between IP protection requests made by NITs

[10] The number of respondents who received invention disclosures was less than the number of respondents who filed IP protection applications. This can be explained by considering that NITs can deposit IP in years following invention disclosures. In addition, there are NITs that only consider as disclosure of invention what is related to invention patents, not counting the other IP communicated.

[11] These applications include those made directly abroad and entries in the national phase. It is worth mentioning that the same technology deposited in different countries may have been computed more than once. PCT requests were computed separately in topic 4.1.2.

in Brazil and abroad in the base year 2021.

Figure 15 - Intellectual property protection requests filed in the base year 2021 [average by NIT]



Considering all the applications filed by ICTs and that were in force in 2021 (including those made in previous years), the respondents had filed in Brazil a total of 10,724 patent applications, 542 for utility models, 5,176 for computer programs, 2,189 for trademarks, 210 cultivars (new plant varieties) and 692 from other categories (industrial design, circuit topography, geographical indication, among others). In addition, by the end of the 2021 base year, 28 respondents had been responsible for the filing of 1,092 patent applications in force abroad[12], while 3 participants had been responsible for filing 16 utility models, and three participants had been responsible for registering 107 trademarks under the Madrid Protocol[13]. Overall, the average total number of IP protection requests in force in Brazil per respondent was 141.5 and the median 62.0.

Table 7, below, summarizes these data and provides more details. Again, the apparent discrepancy between average and median values was caused by the presence of some participants who showed high inventiveness. For example, when respondents with more than 500 requests for intellectual property protection are excluded from the analysis (there are 9), the average of the total number of IP protection requests in force per respondent decreases to 95.9, a value of 32.2% smaller. On the other hand, the median

[12] These orders include those made directly abroad and entries in the national phase. It is noteworthy that the same technology deposited in different countries may have been computed more than once. PCT requests were computed separately in topic 4.1.2.

[13] Madrid Protocol is an international treaty that aims to protect your trademark from a single registration in approximately 128 signatory countries (this number may change at any time). Access the countries through the link: https://www.wipo.int/madrid/memberprofiles/selectmember.

value decreases by 9%, becoming 56.0.

Table 7 - Overview of total intellectual property requests made by ICT in Brazil until the end of the base year 2021 (including previous years)

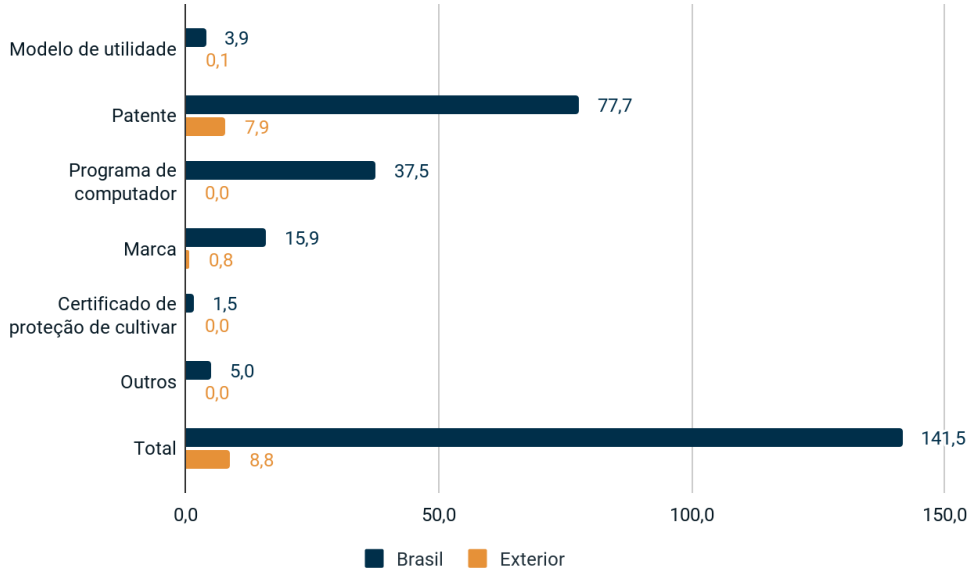
Type of IP	Number	%	Average	Median
Utility Model	542	2,8	3,9	1,0
Patent	10724	54,9	77,7	22,0
Computer Program	5176	26,5	37,5	14,5
Trademark	2189	11,2	15,9	5,0
New Plant Variety (cultivar)	210	1,1	1,5	0,0
Others	692	3,5	5,0	1,0
Total	19533	100,0	141,5	62,0

In Figure 16, below, a comparison can be found between the IP protection requests made by NITs in Brazil and abroad until the end of the base year 2021.

[6] Esses pedidos incluem os realizados diretamente no exterior e as entradas em fase nacional. Vale ressaltar que uma mesma tecnologia depositada em países distintos pode ter sido computada mais de uma vez. Pedidos de PCT foram computados separadamente no tópico 4.1.2.

[7] Protocolo de Madri é um tratado internacional que visa a partir de um único registro proteger sua marca em aproximadamente 128 países signatários (podendo mudar a qualquer momento esse número). Acesse os países pelo link: https://www.wipo.int/madrid/memberprofiles/selectmember.

Figure 16 - Total requests for intellectual property protection in force in the base year 2021* [average per respondent]



* All requests made in previous years and that were still in force in 2021 are considered.

4.1.2 Patent applications under the PCT (Patent Cooperation Treaty) and National Phases

Of the 138 respondents, 23 (16.6%) filed PCT applications in 2021[14] (international patent applications under the Patent Cooperation Treaty – the term PCT comes from the English Patent Cooperation Treaty), totaling 92 applications (average of 4 applications per respondent of 23). On the other hand, 46 (33.3% of respondents) had filed PCT requests by the end of 2021, also considering previous years, which totals 1037 accumulated requests (average of 22.5 requests among the 46 depositors). With regard to the National Phases, in the base year of 2021, 50 (36.2%) participants filed 652 patent applications in different countries, excluding Brazil. The average for this case is 13 deposits for each of the 50 depositors. Considering the deposits made until 2021, which means all previous years including 2021, 67 (48.6%) applicants filed 5250 patent applications in the National Phase, with an average of 78.4 per participant, among the 67 applicants.

With regard to the National Phases, in the base year of 2021, 50 (36.2%) participants filed 652 patent applications in different countries, excluding Brazil. The average for this case is 13 applications for each of the 50 depositors. Considering the applications made until 2021, which means all previous years including 2021, 67 (48.6%)

[14] Applications made through the Patent Cooperation Treaty - PCT.

applicants filed 5250 patent applications in the National Phase, with an average of 78.4 per participant, among the 67 applicants.

4.1.3 *Granted patent applications*

Based on the information provided, it was observed that the number of granted patent applications in 2021, 994, was lower than the number of filings of new applications, 1,187. The average of total national patent applications in force until the end of 2021 was 77.7 per respondent, while the average of accumulated grants in the same period was 25.1. It is observed that there was a decrease in this difference, considering the total number of concessions until the end of 2021, which was 15.8. This difference is due to the long period required for the INPI to evaluate and grant patent applications. However, due to the publication of the Project to Combat the Backlog "aimed at substantially reducing the number of patent applications pending a decision, within a period of 2 years"[15] implemented by the agency, the time for analysis and granting has been decreasing, making it possible a patent will be granted in 2 to 4 years.

With regard to computer program registration, the gap between the total number of requests and registers was considerably smaller. The greater speed in registering these requests is due to the fact that said rights are linked to copyright, as they do not depend on a technical examination and registration is not mandatory. As a result, the registration average is seven days, that is, much faster than patent examination. Of the total number of computer programs registered nationally by the end of 2021, 93.6% of registrations had already been registered by the end of the same year, an average of 35.1 requests registered per NIT respondent.

For national new plant variety (cultivar) protection, 80% of applications made by the end of 2021 were granted by the same deadline (average of 1.2 concessions per participant), while for trademarks the registration rate was even higher, with a total of 91.1% of registrations obtained in the same period (average of 14.5 concessions per participant). For utility model applications, 46.7% of the total had been granted by the end of 2021 (average of 1.8 grants per participant). In the case of other categories (industrial design, circuit topography, geographical indication, among others) 64.3% of

[15] Backlog Combat Plan. INPI, 2022. Available at: <https://www.gov.br/inpi/pt-br/servicos/patentes/plano-de-combate-ao-backlog>. Accessed on: 08/18/2022.

the total number of registrations had been granted by the end of 2021 (average of 3.2 concessions per participant).

In Figure 17 below, a comparison can be found between the number of IP applications granted in the base year 2021 in Brazil and abroad, by the average number of applications per NIT. Figure 18 makes a similar comparison, however it considers the total concessions until the end of the base year 2021 (also including previous years).

Figure 17 - Intellectual property protection applications granted in the base year 2021 [average per respondent]

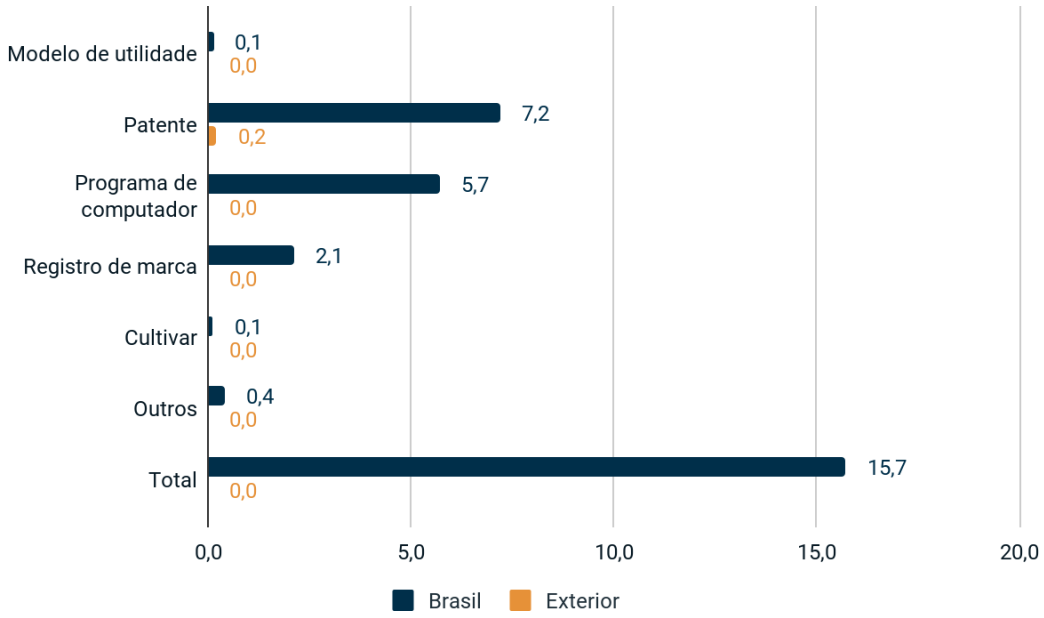
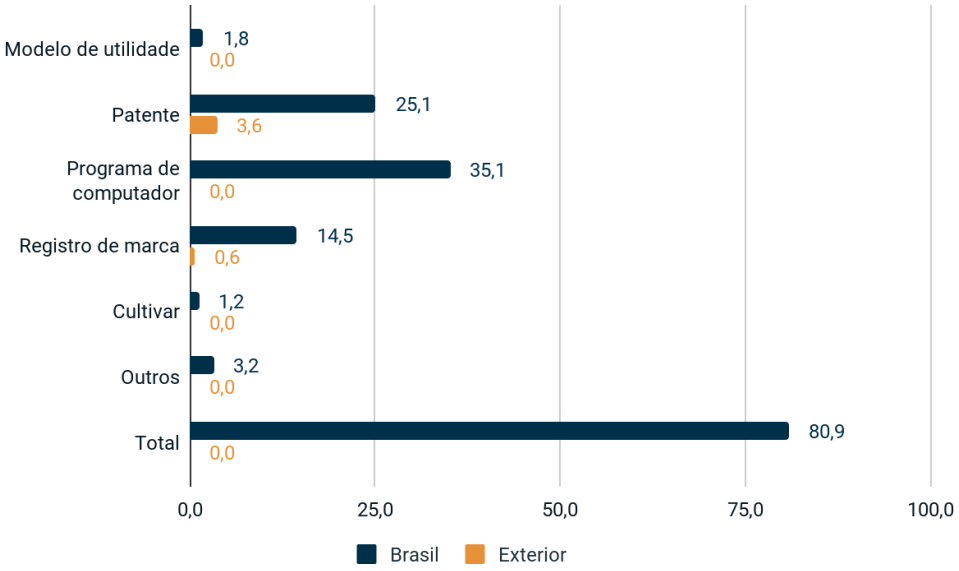


Figure 18 - Intellectual property protection applications granted by the end of the base year 2021 (also considering all concessions made in previous years) [average per respondent]



4.2 Research partnership agreements

As for research partnership agreements, 16 respondents (11.6%) reported that they are responsible for managing all joint research projects in ICTs, while 61 (44.2%) reported that they are responsible for managing some of the projects joint research project at ICT and also 61 (44.2%) respondents stated that they were not responsible for managing a joint research project at ICTs.

4.3 Licensing agreements and technology assignment

Based on the data collected, it was found that 45 respondents (32.6%) entered into a total of 308 new licensing agreements in 2021. Of these respondents, 41 were of a public nature, 3 of a non-profit private nature and 1 other. Regarding the type of ICT, 32 were called higher education institutions, 7 were called professional education institutes, 4 were called research institutes and 2 others.

With regard to licensing agreements in force in the base year 2021, 50 institutions (36.2% of respondents) reported having a total of 975 agreements (including those entered into in previous years and still in force in 2021). Of these respondents, 44 were of a public nature, 4 of a non-profit private nature and 2 others. Furthermore, 35 were called higher education institutions, 7 were called professional and technological education institutes, 5 were called research institutes and 3 others.

Considering only licenses that resulted in revenues in the base year 2021 (including contracts signed in previous years, but which resulted in revenues in the base year 2021), a total of 389 agreements were observed, signed by 35 of the 138 respondents. The amount raised through these agreements in 2021 was approximately R$48.17 million (about US$10 million). Of this total, a single respondent with the highest reported revenue concentrated 41% of the combined revenue. Considering the next 9 respondents, all with revenues greater than 1 million reais ((US$ 200.000), together they accounted for 52% of the annual amount of all respondents, while the other 25 respondents accounted for the remaining 7%.

Table 8 below provides an overview of licensing activities reported by respondents.

Table 8 – Overview of reported licensing activities

	All respondents (N=138)			Respondents who claimed to have valid licensing agreements (N=50)	
	Average	Median	Total	Average	Median
Licensing agreements signed in 2021	2,2	0,0	308	6,2	2,5
Agreements in force in 2021	7,1	0,0	975	19,5	5,5
Exclusive*	2,0	0,0	273	5,5	1,0
Non-exclusives	4,8	0,0	667	133	3,0
Collaboration with licensor	2,3	0,0	317	6,3	2,0
Licensing agreements that generated revenue in 2021	2,8	0,0	389	7,8	2,0
Total revenue from licensing agreements in 2021 [in RS1,000]	349,11	0,0	4.8177,22	719,06	42,7
Percentage of licensing revenue given to inventors [%] **	-	-	-	19,6	27,5

* Exclusivity was not informed for all existing agreements.

** It was decided not to calculate the average and median relative to the calculation with all respondents, since many did not enter into licensing agreements and consequently did not share royalties with the inventors. For this calculation, only respondents who obtained revenues from licensing agreements were considered.

Analyzing only the 50 respondents with licensing agreements in force in 2021, an average of 73.6 licenses was observed for every 1000 national requests for IP protection. On the other hand, the average license agreements per full-time NIT professional (FTE)

was 1.5 licenses/FTE. Evaluating only those respondents who obtained revenue from licensing agreements in 2021 (33 participants), an average of 81.3 licensing agreements generated revenue in 2021 per 1000 national IP protection applications was observed. As for the number of licensing agreements that generated revenue in 2021 for each full-time NIT professional (FTE), the average was 1.7 licenses/FTE. Two other indicators were also considered, the total revenue obtained through licensing for each national application for IP protection, and the total revenue obtained through licensing for each respondent's FTE. The average of the first indicator was R$4,788.5/national IP protection application in 2021, while the average of the second indicator was R$98,320.9/FTE in 2021. Table 9 presents these data, separating respondents with current licenses, those whose licenses generated revenue.

Table 9 - Additional statistics of reported licensing activities

	Respondents who claimed to have valid licensing agreements (N=50)	Respondents who earned revenue from licensing agreements in 2021 (N=33)
	Average	Average
Licensing agreements effective in 2021 per 1000 domestic IP protection applications	73,6	-
Licensing agreements effective in 2021 for each FTE	1,5	-
Licensing agreements that generated revenue in 2021 per 1000 domestic IP protection applications	-	81,3
Licensing agreements that generated revenue in 2021 every FTE	-	1,7
Total revenue (in BRL) from licensing agreements in 2021 per national IP protection application	-	4.788,5
Total revenue (in BRL) from licensing agreements in 2021 per FTE	-	98.320,9

The execution of licensing agreements is a more complex process than that of requests for intellectual property protection, which depends on idiosyncratic factors, such as the nature of the technology in question, its stage of development, the time of negotiation and execution of the signing of the contract, the institutional policies related to technology transfer and the skill set of the team involved in the technology transfer process. Thus, it is normal that Brazilian NITs, being relatively young, are more focused

on IP protection activities than on technology transfer activities. Table 10, below, provides a comparison of some NIT attributes with and without licensing agreements in force in 2021.

Table 10 - Additional statistics on reported licensing activities [average per respondent]

	Respondents without licenses in force in 2021	Respondents with licenses in force in 2021
Respondent NIT age	12	16,2
Employees in FTE	6	12,5
Current national IP protection numbers	35,1	155,3
Percentage of public respondents	82,9%	88%
Percentage of respondents with at least one outsourced IP management service	16,8%	34%
Percentage of respondents with at least one outsourced TT service	7,8%	12%

From Table 10, it can be seen that NITs which had licenses in force in 2021 were, in general, older, had more employees and had a significantly larger stock of intellectual property. In 2021, the percentage of public institutions was relatively similar between respondents with and without current licensing. Respondents with and without current licensing outsourced IP management activities more often than did TT activities, and respondents with licensing had outsourced more IP and TT management activities than participants without licensing.

Table 11 below presents some data related to the management of intellectual property in a comparative way between the years in which the Survey was carried out, between 2017 and 2021. An increase in the average of granted requests can be seen, with emphasis on the base year 2021, as well as for the percentage of NIT with signed licensing agreements. The other data, except the average value collected, which fluctuates due to few NITs with high income concentration, show subtle variations between periods.

Table 11 - IP Management Highlights by Survey Base Year

	2017	2018	2019	2020	2021
Average of IP Applications submitted	16,4	18,2	19,1	17,4	16,9
Average of IP Applications granted	8,9	10,2	9,9	11,1	15,7
% NIT with licensing agreements	24,5%	21,2%	24,2%	28,8%	36,2%
Average of licensing agreements in force per NIT	7,2	6,1	5,6	6,3	7,1
Current agreements / agreements with income	3,1	2,1	2,0	2,8	2,5
Average of value obtained per NIT*	R$ 97.058,82	R$ 1.336.283,19	R$ 313.281,25	R$ 120.863,31	R$ 349.110,29

*****1R$= 0,196022 USD

With regard to the assignment of creative rights, it is observed that 12 respondents (8.7%) have signed assignment agreements, while the remaining 126 (91.3%) reported not having agreements.

The types of IP assigned were: 31 computer programs, 10 patents for invention or utility model, 7 know-how, 4 biological materials associated with licensing and 3 trademarks, totaling 55 IP assignments.

4.4 Expenditures with protection, maintenance and commercialization of intellectual property

Among the respondents, 121 made expenditures, totaling approximately R$12.3 million. These values varied strongly among the research participants, with an average value of R$100.2 thousand and a median value of R$7.6 thousand, in relation to expenses with registration fees. The largest share of expenditures was related to registration and maintenance fees for intellectual property[16] in the base year 2021, totaling R$12 million, spent by 121 respondents, followed by other expenditures that totaled R$146 thousand, carried out by 12 respondents. Regarding expenditures on legal representations in lawsuits, 3 participants stated that they had invested a total of R$ 38 thousand.

[16] Fees from INPI and other patent offices, both in Brazil and abroad; software licenses and database subscriptions; outsourcing of prior art searches, drafting of national and international patents, and filing and monitoring of patents both in Brazil and abroad; and outsourcing services related to technology transfer (valuation of technologies, elaboration of commercialization strategies, search for licensing partners, negotiation and elaboration of licensing contracts).

4.5 Spin-offs

4.5.1 In operation and created in 2021within the scope of the ICT

Regarding the identification of how the NITs monitor the creation and development of spin-off companies within the scope of the ICT, 83 respondents (60.1%) reported that the NIT does not accompany the spin-offs created, 35 participants (25 .4%) indicated that the NIT monitors some of the spin-offs created and only 20 respondents (14.5%) reported that the NIT monitors all the spin-offs created.

Based on the data obtained through the Survey, it was found that 32 respondents (23.9%) reported the existence of spin-off companies operating in the base year of 2021. These companies are created with the aim of exploiting ICT intellectual property. Of the respondents with activities related to spin-offs, 28 are linked to public institutions and 4 to non-profit private institutions. Furthermore, 25 are higher education institutions, 4 research institutes and 3 professional and technological education institutes.

Twenty three respondents stated that they created 70 new spin-off companies in 2021. The total of these companies created by the end of that same year (considering all previous years) was 273, of which 48.0% were created through licensing agreements, 52.0% without licensing agreements, 53.5% had been created by ICT researchers and 1.1% had ICT as shareholder. One higher education institution and 1 research institute reported shareholding in spin-off companies (shareholding in 2 spin-offs).

Table 12 summarizes this information and presents a summary of indicators related to spin-offs in 2021.

Table 12 - Results on spin-offs in operation

Number of spin-offs in **operation**	273
% spin-offs with licensing agreement	48,0%
% spin-offs without licensing agreement	52,0%
% spin-offs created by researcher	53,0%
% spin-offs having ICT as shareholder	1,1%
Spin-off in operation every 1000 national orders	30,8
Spin-off in operation every FTE	0,6

Analyzing only participants with spin-off activities (32 respondents), an average of 106.9 spin-offs per 1000 national IP protection requests was observed. As for the number of spin-offs operating in 2021 per full-time NIT professional (FTE), the average

was 0.2 spin-offs per FTE.

Table 13, below, provides an overview of spin-off companies' activities according to respondents.

Table 13 - Overview of activities of spin-off companies

	All respondents			Respondents who claimed to have spin-offs operating in 2021		
	Average	Median	*N*	Average	Median	*N*
Spin-off **created** in 2021	0,51	0,00	138	2,19	1,00	32
Spin-off created through licensing	0,30	0,00	138	1,28	0,00	32
Spin-off created without licensing	0,21	0,00	138	0,91	0,00	32
Spin-off created by ICT researchers	0,44	0,00	138	1,91	1,00	32
Total of spin-off **in operation** in 2021	1,98	0,00	138	8,53	2,50	32
Spin-off created through licensing	0,95	0,00	138	4,09	1,50	32
Spin-off created without licensing	1,03	0,00	138	4,44	0,00	32
Spin-off created by ICT researchers	1,06	0,00	138	5,84	2,00	32

In order to compare the evolution of research data in the last 5 years, Table 14 was developed.

It is important to point out that although the creation of spin-off companies without a licensing agreement still happens in most cases, there has been a significant increase in the percentage of spin-off companies in operation that were created to exploit the technologies developed by ICT through licensing. On the other hand, the indicator for the number of spin-offs in operation per employees in equivalent time at the NIT reduced significantly.

Regarding the characteristics of respondents who have spin-off companies in operation, it is possible to observe that in the last 5 years, there has been a maintenance of a greater participation of public ICT and of higher education institutions.

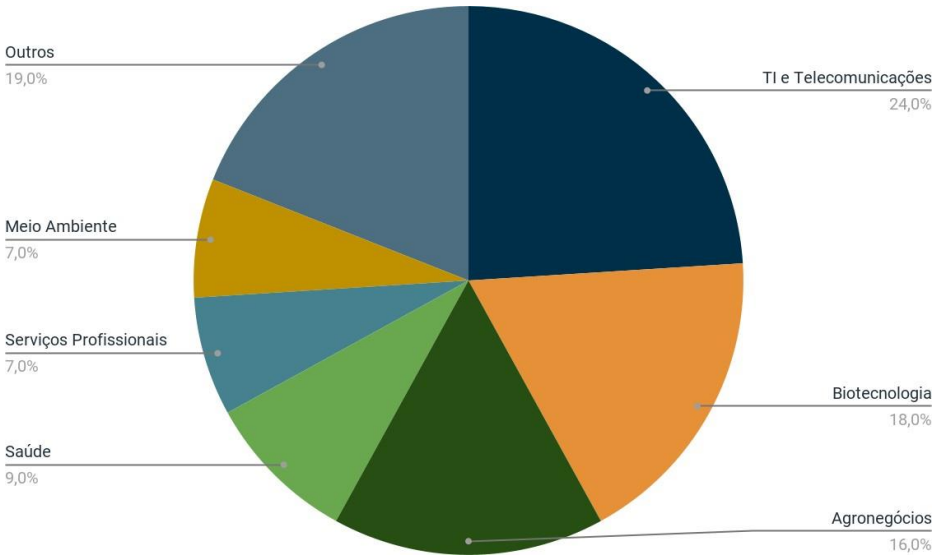
Table 14 - Evolution of results on spin-offs

	2017	2018	2019	2020	2021
NIT follows **all** spin-offs created in the scope of the ICT	-	-	18,0%	14,4%	14,5%
NIT follows **some** spin-offs created in the scope of the ICT	-	-	22,6%	19,4%	25,4%
NIT **does not** follow spin-offs created in the scope of the ICT	-	-	53,96%	64,7%	60,1%
Number of spin-offs **created**	31	58	86	66	70
Number of respondents with spin-offs **created**	7	12	22	14	23
Number of spin-offs **in operation**	179	208	246	259	273
Number of respondents with spin-offs **in operation**	17 (16,7%)	22 (19,5%)	30 (23,4%)	31 (22,3%)	32 (23,2%)
Public ICT	12	15	23	25	28
Private ICT	4	6	7	6	4
Others	1	1	0	0	0
Higher Education Institution	15	20	25	24	25
Research Institute	2	2	3	4	4
Institute of Professional and Technological Education	0	0	1	3	3
Others	0	0	1	0	0

4.5.2 Sectors in the market

In this base year of 2021, a question was included to understand the sectors in which spin-off companies operate in the market. For this, the respondents specified the number of spin-offs by sectors of economic activity. Most spin-offs are from the information technology (IT) and telecommunications sector (24.0%), followed by biotechnology (18.0%), agribusiness (16.0%), health (9.0%), environment and professional services (7.0% each). The other sectors accounted for a total of 19% of spin-offs. It is noteworthy that only 100 spin-offs had their sectors specified, as 6 respondents did not respond or were unable to respond. Figure 19 presents a summary of spin-off companies' results by economic sector.

Figure 19 - Number of spin-offs by economic sector [%]



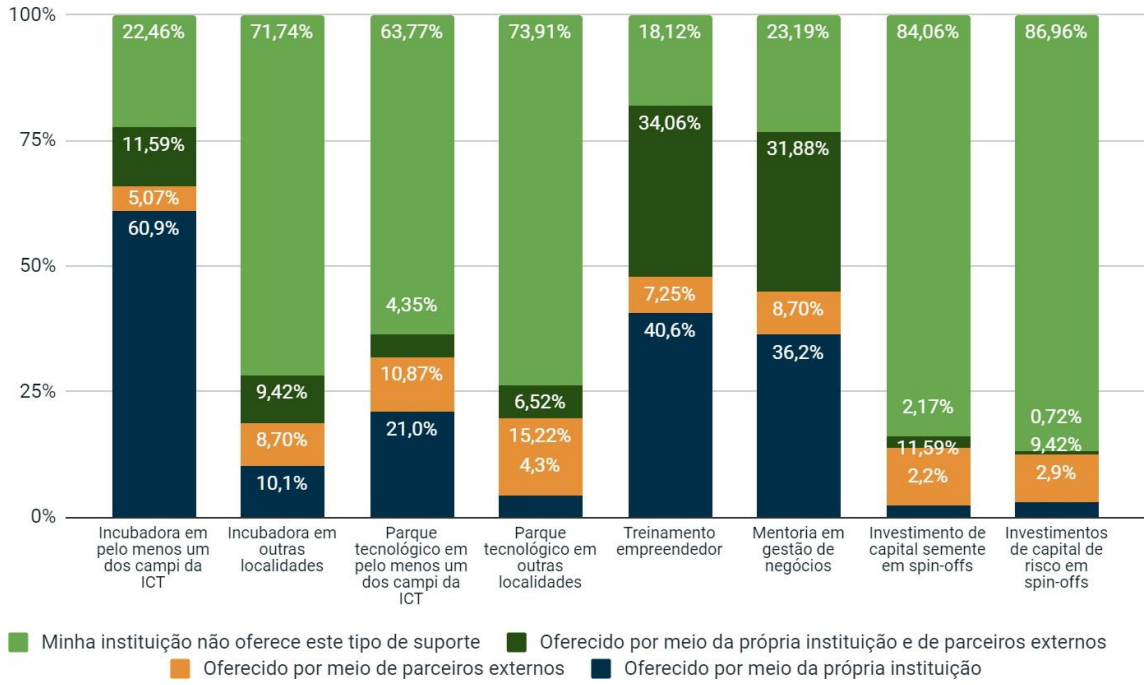
4.5.3 Support Mechanisms

Respondents to the FORTEC Innovation Survey indicated the support mechanisms offered by ICT and/or external partners to support spin-off companies, through an incubator on at least one of the ICT campuses, an incubator in other locations, a technology park in at least one of the ICT campuses, technology park in other locations, entrepreneurial training, mentoring in business management, seed capital investment in spin-offs and venture capital investments in spin-offs.

Based on the data collected, it was observed that a good portion of the respondents offer incubators in the ICT itself, entrepreneurial training and mentoring in business management as support mechanisms for spin-offs. On the other hand, technology parks are a mechanism offered infrequently by responding institutions and their partners. When analyzing seed capital investment mechanisms in spin-offs and venture capital investment in spin-offs, it is seen that most respondents stated that ICT do not offer these types of support.

Figure 20 presents a summary of the results of the support mechanisms offered to entrepreneurial researchers by ICT.

Figure 20 - Support mechanisms for start-ups [%]

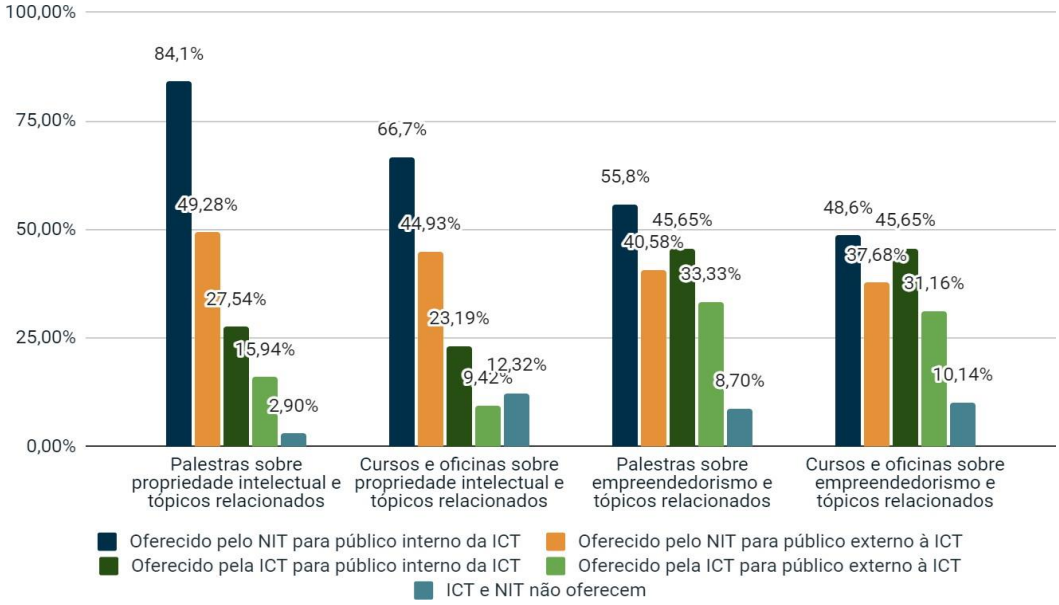


4.6 Course offerings on entrepreneurship, intellectual property and related topics

Respondents to the FORTEC Innovation Survey evaluated the offer, by the NIT and ICT, of lectures, courses and workshops on intellectual property, entrepreneurship and related topics. Based on the data collected, it was observed that a good portion of the respondents offered training to the ICT internal public (the offer to the external public is considerably smaller), most of which on topics related to intellectual property. In fact, IP training is predominantly offered by the NIT, with ICT initiatives as a whole being timid. In contrast, the provision of training on entrepreneurship and related topics was more balanced between NIT and ICT, with most ICT offerings on topics related to entrepreneurship.

Figure 21 brings a compilation of the observed results dividing the offer of lectures and courses into 4 categories: offered by NIT to ICT's internal public; offered by the NIT to the public outside the ICT; offered by ICT to ICT's internal public; and offered by ICT to audiences outside ICT. It is noteworthy that these categories are not mutually exclusive.

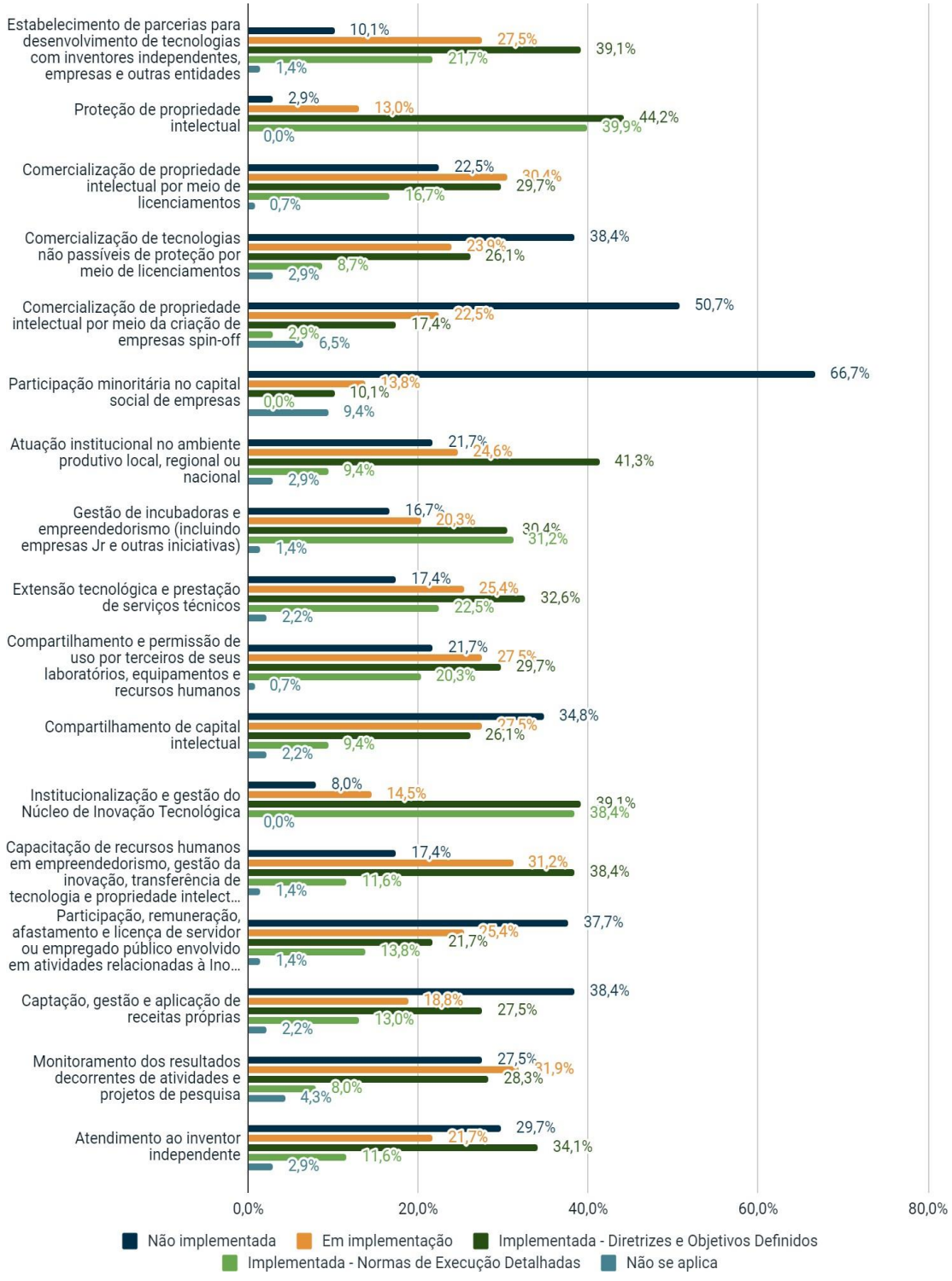
Figure 21 - Offer of lectures and courses on intellectual property, entrepreneurship and related topics [%]



4.7 Innovation policies

In order to assess the existence and implementation of regulations related to IP and TT management in their institutions, respondents classified each of the regulations into five categories: “not implemented”, “under implementation”, “implemented - defined guidelines and objectives” , “implemented - detailed implementing rules” and “not applicable”. Figure 22 summarizes the results.

Figure 22 - Institucionalização de políticas de suporte à inovação tecnológica nas ICT [%]



It is possible to highlight that more than half of the respondents had not implemented, by the end of 2021, policies to institutionalize: i) minority participation in the share capital of companies (66.7%) and ii) the commercialization of intellectual

property through the creation of spin-off companies (50.7%).

Of the policies that were being implemented, only the following were mentioned by more than 30% of the respondents: commercialization of IP through licensing (30.4%); training of human resources in entrepreneurship, innovation management, technology transfer and intellectual property (31.2%) and monitoring of results resulting from research activities and projects (31.9%).

Of the implemented policies that had defined guidelines and objectives, the following were mentioned by more than 30% of respondents: protection of intellectual property (44.2%); institutional acting in the local, regional or national productive environment (41.3%); institutionalization and management of the NIT (39.1%); establishment of partnerships for the development of technologies with independent inventors, companies and other entities (39.1%); training of human resources in entrepreneurship, innovation management, technology transfer and intellectual property (38.4%); assistance to independent inventors (34.1%); technological extension and provision of technical services (32.6%) and management of incubators and entrepreneurship (including Jr companies and other initiatives) (30.4%).

Of the implemented policies that had detailed execution rules, only the following were mentioned by more than 30% of the respondents: intellectual property protection (39.9%), institutionalization and management of the NIT (38.4%) and management of incubators and entrepreneurship (including Jr companies and other initiatives) (31.2%).

Policies that do not apply cited by more than 5% of respondents were: minority interest in the capital stock of companies (9.4%) and commercialization of IP through the creation of spin-off companies (6.5%).

Respondents also rated the quality of implemented policies on a 5-point scale, ranging from 1 (ambiguous and/or very bureaucratic regulation, difficult to implement) to 5 (clear, well-defined and non-bureaucratic regulation, easy to implement). Table 15 presents an overview of the assessment of the quality of policies implemented in the respondent ICT.

Table 15 - Overview of the assessment of the quality of policies implemented in ICT [average per respondent]

	Implemented - Defined Guidelines and Objectives	*N*	Implemented - Detailed Execution Rules	*N*	Implemented - general	*N*
Establishing technology development partnerships with independent inventors, companies and other entities	3,6	52	4,3	29	3,9	81
IP Protection	3,8	61	4,5	54	4,1	115
Commercialization of IP through licensing	3,6	40	4,6	23	4,0	63
Commercialization of technologies that cannot be protected by licensing (e.g. example know-how licensing and biological material transfer contracts associated with licensing)	3,5	36	4,5	12	3,8	48
Commercialization of IP through the creation of spin-off companies	3,3	24	4,3	4	3,4	28
Minority participation in the share capital of companies	3,2	14	0,0	0	3,2	14
Institutional acting in the local, regional or national productive environment	3,8	57	4,5	13	3,9	70
Incubator management and entrepreneurship (including Jr companies and other initiatives)	3,7	41	4,4	43	4,1	84
Technological extension and provision of technical services	3,7	45	4,1	30	3,8	75
Sharing and allowing third parties to use their laboratories, equipment and human resources	3,6	40	4,1	28	3,8	68
Intellectual capital sharing	3,6	36	4,2	13	3,8	49
Institutionalization and management of the NIT	3,9	52	4,5	53	4,2	105
Training of human resources in entrepreneurship, innovation management, TT and IP	3,7	53	4,8	16	4,0	69
Participation, compensation, remoteness and leave of civil servant or public employee involved in activities related to Technological Innovation	3,3	30	4,2	19	3,7	49
Fundraising, management and application of own revenues (Art. 18 §sole paragraph of Law 10.0973/2004)	3,7	38	4,2	18	3,9	56
Monitoring of results from research activities and projects	3,4	39	4,6	11	3,7	50
Independent Inventor Support	3,6	45	4,3	16	3,8	61

4.8 Information Systems

The respondents indicated the existence or not of information systems, websites or databases in their ICTs for the dissemination and promotion of their products related to innovation, whether they are intangible assets, such as intellectual property subject to protection, or academic, such as publications of articles, dissertations, theses, among others. Considering the existence, the participants indicated which stage of implementation such a system is in and which implementation strategy is used - whether developed by the ICT itself, acquired ready-made, or contracted by an external company.

The questions were formatted according to the type of information available in the respective systems, as follows: 1) protected intellectual property; 2) licensed intellectual property; 3) spin offs; 4) daughter companies[17]; 5) junior companies[18]; 6) services provided by ICT; 7) specialists or groups of specialists who provide services; 8) laboratories, equipment and other available infrastructure; 9) professors and researchers and their competences and areas of knowledge; 10) scientific production of professors and researchers; 11) research and extension projects by professors and researchers; 12) services provided by NIT for ICT; 13) ICT internal legislation and regulations on innovation; 14) innovation training opportunities; 15) others.

Thus, in 2021, 39 respondents (28.26%) reported that they have implemented systems on protected intellectual property, while 19 (13.77%) have systems being implemented and 80 respondents have not implemented them (58%). Of those respondents who responded that they had systems at some stage, 32 indicated that they are developed in-house by ICT specialists; 8 are developed internally with outsourcing; 7 are off-the-shelf, purchased systems; 5 are ready systems, acquired by free license; 4 are systems for another purpose adapted for use by ICT; 2 are systems adapted from some free software.

Regarding the systems that present information on licensed intellectual property, 16 respondents (11.59%) reported that they have implemented systems, while 10 (7.25%) have systems being implemented, 113 respondents (81.88%) have not implemented these systems. Regarding the implementation strategy of the systems on licensed intellectual

[17] Daughter companies: company created by ICT students or alumni.
[18] Junior companies: non-profit civil association, formed and managed by students of ICT courses, aimed at developing consultancy projects in the area of student training; to encourage the practical learning of university students; bringing the labor market closer to academia.

property implemented and being implemented, the participants answered that 17 are developed internally by ICT specialists; 3 are off-the-shelf, purchased systems; 2 are ready systems, acquired by free license; 1 is a system for another purpose adapted for use by ICT; 1 is developed internally with third-party contracting; and 1 is a system adapted from some free software.

Of the 138 survey participants, 10 (7.25%) reported that they have implemented systems on spin-off companies, while 6 (4.35%) have systems being implemented, 123 respondents have not implemented them (89.13%). Regarding the implementation strategy of the systems on spin-off companies implemented and being implemented, the participants answered that 10 are developed internally by ICT specialists; 3 are developed internally with the hiring of third parties; 1 is a system adapted from some free software; and 1 is a ready-made system, acquired through a free license.

Regarding the systems that present information about daughter companies, 8 respondents (5.8%) reported that they have implemented systems, while 5 (3.62%) have systems being implemented, 127 respondents (92%) have not implemented them. Regarding the implementation strategy of the systems on daughter companies implemented and being implemented, the participants answered that 6 are developed internally by ICT specialists; 3 are developed internally with the hiring of third parties; 1 is a ready-made, purchased system; 1 is a system adapted from some free software.

Among the participants, 21 respondents (15.22%) have implemented systems on junior companies, while 8 (5.80%) have systems being implemented and 110 respondents (79.71%) have not implemented them. Regarding the implementation strategy of the systems on junior enterprise(s) implemented and being implemented, the participants answered that 18 are developed internally by ICT specialists; 3 are systems for another purpose adapted for use by ICT; 2 are off-the-shelf, purchased systems; 2 are developed internally with outsourcing; 2 are systems adapted from some free software; 1 is system adapted from some free software.

Of the 138 survey participants, 29 (21.01%) reported that they have implemented systems about services provided by ICT, while 9 (6.528%) have systems being implemented, 100 respondents (72.46%) have not implemented them. Regarding the implementation strategy of the systems on services provided by ICT implemented and being implemented, the participants answered that 23 are developed internally by ICT specialists; 8 are off-the-shelf, purchased systems; 3 are developed internally with the hiring of third parties; 2 are ready-made systems, acquired by free license; and 2 are

systems for another purpose adapted for use by ICT.

Regarding the systems that present information about specialists or groups of specialists that provide services, 18 respondents (13.04%) reported that they have implemented systems, while 8 (5.80%) have systems being implemented, 112 respondents (81.15 %) did not implement. Regarding the implementation strategy of the systems on specialists or groups of specialists that provide services implemented and being implemented, the participants answered that 16 are developed internally by ICT specialists; 5 are off-the-shelf, purchased systems; 2 are developed internally with outsourcing; 1 is a system adapted from some free software; 1 is a ready-made system, acquired through a free license; and 1 is an another purpose system adapted for use by ICT.

Among the participants, 41 respondents (29.71%) reported that they have implemented systems on laboratories, equipment and other available infrastructure, while 13 (9.42%) have systems in implementation and 85 (61.59%) have not implemented. Regarding the implementation strategy of the systems on laboratories, equipment and other available infrastructure implemented and being implemented, the participants answered that 39 are developed internally by ICT specialists; 7 are off-the-shelf, purchased systems; 2 are developed internally with outsourcing; 2 are systems for another purpose adapted for use by ICT; 1 is a system adapted from some free software; and 1 is a ready-made system, acquired through a free license.

Of the 138 survey participants, 48 (34.78%) reported that they have implemented systems about teachers and researchers and their competencies and areas of knowledge, while 17 (12.32%) have systems being implemented, 73 respondents (52.89%) did not implement. Regarding the implementation strategy of the systems on professors and researchers and their competences and areas of knowledge implemented and being implemented, the participants answered that 39 are developed internally by ICT specialists; 15 are off-the-shelf, purchased systems; 3 are developed internally with the hiring of third parties; 3 are systems for another purpose adapted for use by ICT; 3 are ready systems, acquired by free license; and 2 are systems adapted from some free software.

Regarding the systems that present information on the scientific production of professors and researchers, 46 respondents (33.33%) reported that they have implemented systems, while 14 (10.14%) have systems being implemented and 78 respondents (56.52%) have not implemented. Regarding the implementation strategy of the systems

on scientific production of professors and researchers implemented and being implemented, the participants answered that 34 are developed internally by ICT specialists; 19 are off-the-shelf, purchased systems; 3 are systems for another purpose adapted for use by ICT; 2 are ready systems, acquired by free license; 1 is developed internally with third-party contracting; and 1 is a system adapted from some free software.

Among the participants, 52 respondents (37.68%) have implemented systems on research and extension projects of professors and researchers, while 15 (10.87%) have systems in implementation and 71 respondents (51.44%) did not implement. Regarding the implementation strategy of the systems on research and extension projects of professors and researchers implemented and being implemented, the participants answered that 37 are developed internally by ICT specialists; 17 are ready-made, purchased systems; 4 are ready systems, acquired by free license; 4 are systems for another purpose adapted for use by ICT; 3 are developed internally with the hiring of third parties; and 2 are systems adapted from some free software.

Of the 138 survey participants, 43 (31.16%) reported that they have implemented systems about services provided by NIT for ICT, while 18 (13.04%) have systems in implementation and 77 have not implemented (55.79%). Regarding the implementation strategy of the systems on services provided by the NIT for ICT implemented and being implemented, the participants answered that 41 are developed internally by ICT specialists; 6 are developed internally with outsourcing; 5 are off-the-shelf, purchased systems; 4 are ready systems, acquired by free license; 3 are systems for another purpose adapted for use by ICT; and 2 are systems adapted from some free software.

Regarding the systems that provide information on legislation and internal regulations to ICT on innovation, 60 respondents (43.48%) reported that have implemented systems, while 15 (10.87%) have implemented systems and 63 respondents (45.65%) have not implemented them. Regarding the implementation strategy of the systems on legislation and internal regulation of the ICT on innovation implemented and being implemented, the participants answered that 58 are developed internally by ICT specialists; 5 are developed internally with outsourcing; 5 are off-the-shelf, purchased systems; 3 are ready systems, acquired by free license; 2 are systems adapted from some free software; and 2 are systems for another purpose adapted for use by ICT.

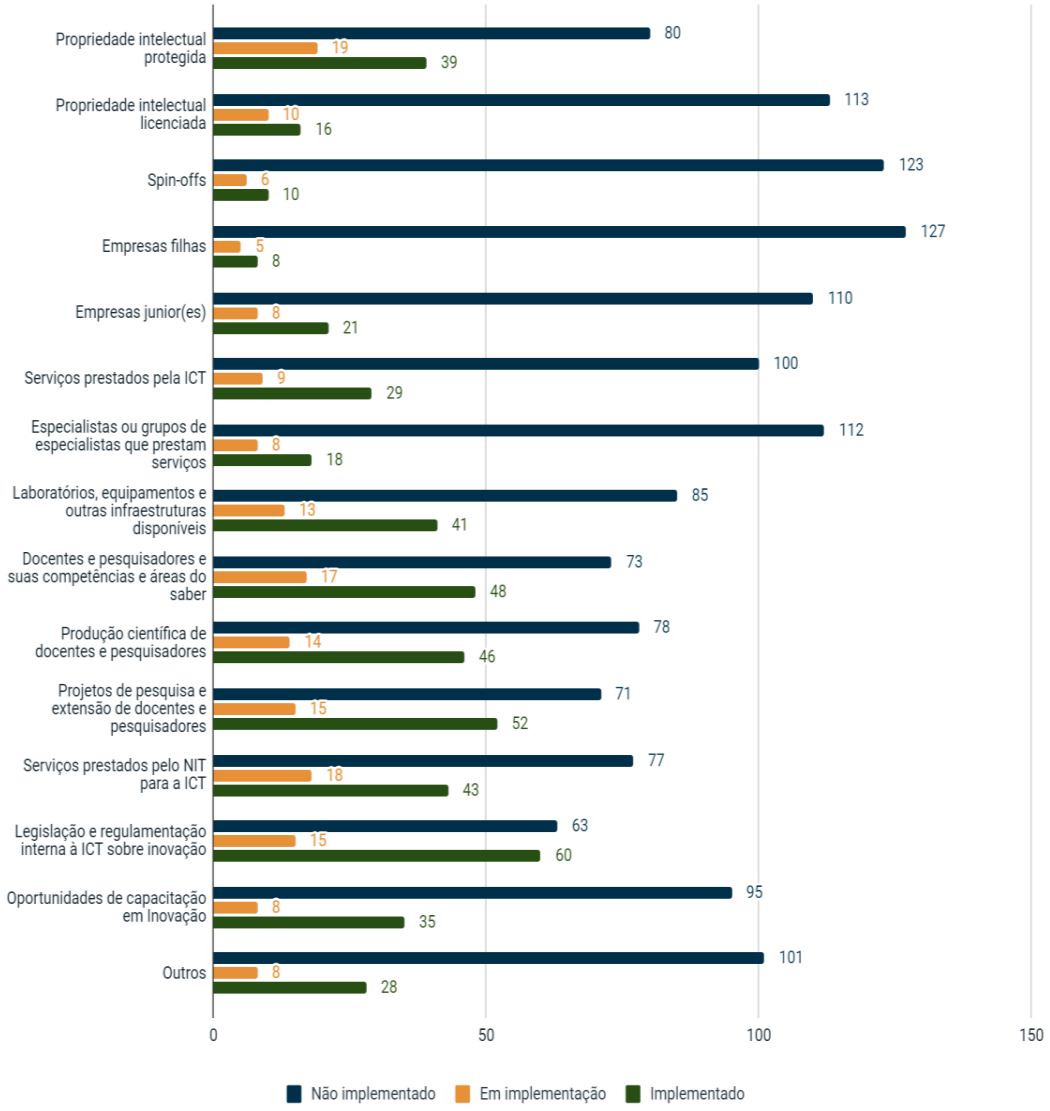
Among the participants, 35 respondents (25.36%) have implemented systems on training opportunities in innovation, while 8 (5.80%) have systems being implemented and 95 (68.84%) have not implemented them. Regarding the implementation strategy of

the systems on training opportunities in innovation implemented and being implemented, the participants answered that 33 are developed internally by ICT specialists; 4 are developed internally with the hiring of third parties; 2 are systems for another purpose adapted for use by ICT; 2 are systems adapted from some free software; 1 is a ready-made, purchased system; and 1 is a ready-made system, acquired through a free license.

Of the 138 survey participants, 28 (20.29%) reported that they have other systems implemented, while 8 (5.80%) have other systems being implemented and 101 respondents (73.18%) have not implemented them. Regarding the implementation strategy of other systems implemented and being implemented, participants responded that 17 are developed internally by ICT specialists; 13 are purchased, off-the-shelf systems; 3 are systems developed internally with the hiring of third parties; 3 are ready-made systems, acquired by free license and 1 is a system for another purpose adapted for use by ICT.

Figure 23 presents a summary on the implementation of the types of information systems.

Figure 23 - Status of implementation of types of information systems in ICTs



5. Final considerations

One hundred thirty-eight (138) NITs participated in this edition of the FORTEC Innovation Survey, representing 186 ICTs in the country. The data collected reinforce results obtained in previous years, showing that there are still NITs that were created without resources or minimal structures for their proper functioning.

Although most NIT respondents reported being implemented (96.1%), less than half (36.2%) had signed licensing agreements and approximately one fifth of respondents, 25.36% earned royalties in 2021. However, with regarding deposits in Brazil, 89.85% (124) have already had experience with IP protection.

The data show that the technology transfer activity needs to be explored or prioritized and there is a need to recognize what are its barriers and difficulties. With regard to new licensing contracts signed, in the base year of 2021, there is a predominance of patent licensing, with 135 licenses, followed by computer programs, 60; cultivate, 30; and, trademarks, 5. Of the 389 licensing agreements that generated revenue in the base year of 2021, 317 resulted from collaboration projects. 'Non-exclusivity' licensing agreements, 667, prevail over exclusive ones, 273.

This report brings new data that are related to patent filings in the national phase, internationalization of applications with Brazilian priority, which accounts for 5,250 patent applications from previous years until 2021, having been carried out by 67 (48.6%) applicants, the which entails an average of 78.4 per participant, among the 67 applicants.

In relation to 2020, which registered 1,337, the number of professionals who work supporting the promotion of technological innovation, through the NITs, showed a slight increase to 1,573 professionals in the base year of 2021. In addition, there was also an increase in the number of employees with part-time dedication, which in 2021 registered an average of 5.4, and in 2020 the average was 3.4.

As for expenses with IP protection, maintenance and commercialization fees, in 2021, 121 respondents stated that they had incurred expenses, compared to 115 participants in 2020. Regarding the resources spent, there was an increase of R$7.9 million in 2020, to R$ $12 million in 2021, with only 13 NITs accounting for more than 80% of the amount.

In 2021, the priority objective, among the strategic objectives of the NITs, is again the same as in the base year of 2019: "contribute to the local and regional development of ICT", with an average of 4.1, followed by "promote the dissemination of scientific and

technological knowledge of ICT" (average importance of 4.0), ranked first in 2020.

In this edition of the Survey, two new questions were included that aimed to identify whether the NIT has a plan of strategic actions to achieve internal objectives, as well as whether the NIT is part of the strategic planning of the ICT. It was identified that 71.7% of the respondents have an internal strategic planning and 92% of the NIT are included in the ICT planning and management instrument. the last result reinforces the commitment and recognition of the ICT with the performance of the NIT.

In the base year 2021, 23 respondents indicated the creation of 70 spin-offs, which accounted for, considering previous years, a total of 273 spin-offs. However, there was a decrease in the number of spin-offs created and operating compared to the previous year, due to 2 respondents reporting a total of 1580 operating spin-offs in the 2020 base, while this year, 2021, the same respondents reported only 23 spin-offs operating. One justification is based on the fact that 35 participants (25.4%) of the NIT follow only a few spin-off companies created within the scope of the ICT, which gives room for such oscillation. Since a relatively small number of NITs have information on all or some spin-offs, general data on the creation of companies remains scarce. Still on spin-offs, a question was added in the base year of 2021, which identified the market sectors of said companies, thus, it was found that most spin-offs are from the information technology (IT) sector. and telecommunications (24.0%), followed by biotechnology (18.0%), agribusiness (16.0%), health (9.0%), environment and professional services (7.0% each).

It was also possible to verify that the vast majority of NITs surveyed had not implemented policies to institutionalize minority participation in the capital stock of companies (75.8%) and the commercialization of IP through the creation of spin-off companies by the end of 2021 (59.4%).

Policies related to the protection of intellectual property; institutional performance in the local, regional or national productive environment; institutionalization and management of the NIT and establishment of partnerships for technology development with independent inventors, companies and other entities were the most cited as implemented policies with detailed execution rules. The importance of policies related to IP can be understood from the observation that IP is the basis of a NIT and it is through it that the other actions of the NIT are triggered.

As for the transfer of technologies, an issue included in the base year of 2020, there was an increase, with twice as many respondents between the two years, rising to 12 (8.7%) participants, who indicated that they had entered into 55 technology transfer

agreements. different types of IP. In 2020, the total number of assignment agreements signed was 9.

As for information systems, which seeks to identify initiatives to disseminate what is produced in ICT, for the second consecutive year, most NITs indicated that the most implemented systems are about legislation and internal regulation of ICT on innovation; and research and extension projects by professors and researchers.

It is worth mentioning that the survey continues to grow also with regard to the content covered, with new questions, both added in 2020 and those added this year, which provided results on strategic planning, spin-off market sectors, orders of patent deposited in the national phase.

With the growth of the Survey, its constant updating and the fundamental participation of the NIT respondents, it is expected that the participants explore, through indicators, aspects of the operation of the NIT of other ICT. By glimpsing the modus operandi of similar institutions, participants will be able to carry out an analysis of which practices employed by other NITs fit their reality and would have the potential to help in the development of their own NIT. At the same time, the database formed by FORTEC Research makes it possible to conduct academic research (some already published in respected international journals and others still in progress) on topics relevant to the promotion of technological innovation, protection and commercialization of intellectual property and improvement of NIT. Furthermore, the Survey also identifies the fragile/weak points and the gaps faced by the NIT, thus raising real data that may subsidize the construction of regional or federal public policies for the sector.

Annual Report

FORTEC Survey of Innovation

Base year 2021

Intellectual Property and Technology Transfer Policies and Activities

2022