Innovation Policy, Open Innovation and Business Model in the University

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Abstract
The aim of this paper is to examine how innovation policy (IP) can foster open innovation (OI) and trigger change in the business model (BM) of the organization. Then, through a case study, it is intended to illustrate the close relationship among IP, OI and BM at the Brazilian university. The research is an exploratory and qualitative that adopts the reflective methodology and case study. The main research findings are: (a) based on literature review, source of resource, collaboration, intellectual property, technology transfer and new organizational forms are five kinds of close relationships among IP, OI and BM; (b) the case study illustrate that the five kinds of close relationships among IP, OI and BM have their origins in IP, foster OI and trigger changes in the BM of the university. The findings are innovative and have practical implication for scholars and practitioners.

Keywords: innovation policy; open innovation; business model; organization; university

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1. Introduction

Innovation policy (IP), open innovation (OI) and business model (BM) are three independent and distinct topics that have been increasing the interest of practitioners and scholars (Edler & Fagerberg, 2017; Gao *et al.,* 2020; Randhawa *et al.,* 2016; Fielt, 2013; Foss & Saebi, 2016). Each topic has its own literature and field of study, with academic, social, economic, sociological and management relevance (Sahut & Periz-Ortiz, 2014). In the academic literature for each topic, some specific papers jointly analyze IP and OI or vice versa (Flor *et al.,* 2020), IP and BM or vice versa (Henriksen *et al.,* 2012) or OI and BM and vice versa (Chesbrough, 2003a; 2006; 2007; Zhu *et al.,* 2019; Saebi & Foss; Aranha *et al.,* 2016). There are academic papers that focus on analyzing only one of the topics.

The notions of IP, OI and BM have several interesting points. First, the IP is a set of government intervention instruments aimed at fostering innovation with the focus on providing social well-being and economic prosperity (Radosevic, 2012). IP must have rationality, efficiency, consistency and predictability over time (Cirera & Maloney, 2017). Second, OI refers to knowledge flows that create value and capture value for the organization. Knowledge flows can move from the market to inside the organization or from the organization to the market or both (Chesbrough, 2003a; 2003b; Chesbrough *et al.*, 2018). OI knowledge flows change the organization's BM (Chesbrough, 2003a; 2003c). Third, BM relies on the idea of an organizational architecture with interrelated components. BM adopts a logic of creating and capturing value (Teece, 2010).

However, despite each topic has vast academic literature, studies on the relationship among IP, OI and BM, in an integrated way, have been neglected. In particular, there are no studies that seek to shed light how source of resource (Cirera *et al.,* 2020), collaboration (Cirera *et al.,* 2020; Fjeldstad *et al.,* 2012), intellectual property (Bloom *et al.,* 2019; Cirera *et al.,* 2020), technology transfer (Sinell *et al.,* 2018; Cirera *et al.,* 2020) and new organizational forms (Miles & Snow, 1986; Cirera *et al.,* 2020), that are main IP components, can foster and facilitate the OI knowledge flows, and then, trigger change in the BM (Fielt, 2013; Foss & Saebi, 2018) of the organization. Therefore, it is important to emphasize that IP, OI and BM have relationships with each other, but do not have causalities.

Why examine the relationship among IP, OI and BM in an integrated way in the organization? First, IP contains a set of instruments and mechanisms that trigger transformations in the organizations and society (Cirera *et al.,* 2020) and can broaden the understanding of OI and BM (Bogers *et al.,* 2018); second, OI is an open knowledge flow that move in two directions, from market to organization and from organization to market (Chesbrough, 2003a). The OI knowledge flows can be driven by IP instruments and mechanisms for the transformation of the organization´s BM; third, BM is a logical architecture with interconnected components aimed at creating and capturing value (Fielt, 2013). The change in BM has origin in IP. IP fosters OI knowledge flow then, OI can trigger change in the BM.

The basic question of this study is to investigate the relationships among IP, OI and BM in an integrated way in the organization. We intend to answer the following question: how can source of resource, collaboration, intellectual property, technology transfer and new organizational forms, that integrate innovation policy, foster open innovation and trigger changes in the business model of the higher education organization? The aim of this research is to examine how innovation policy can foster open innovation and trigger change in the business model in a higher education organization. Then, through a case study, it is intended to illustrate the close relationship among IP, OI and BM in the Brazilian university.

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2. Literature Review

2.1 Innovation Policy

The IP refers to the government's public intervention to support the generation and dissemination of innovation (Edler *et al.,* 2016). IP paves the way for disruptive innovation through new product, service, technology, process, software and hardware that are made available to be marketed (Schumpeter, 1961). The IP has a mix of instruments and mechanisms, including tax incentives for R&D, policies for training and skills development, entrepreneurship policies, innovation network policies and policies to support collaboration (Edler *et al.,* 2016). The mix of instruments and mechanisms of IP should effectively implemented (Cirera & Maloney, 2017) with the aim of achieving social well-being and economic prosperity. Five components of IP are highlighted: funding source (Cirera *et al.,* 2020; Edler *et al.*, 2016; Bloom *et al.*, 2019), collaboration (Radosevic, 2012; Fjeldstad *et al.,* 2012), intellectual property (Bloom, *et al.*, 2019), technology transfer (Cirera *et al.*, 2020) and new organizational forms (Miles & Snow, 1986).

The first component concerns to source of resource that involve financial resources, including tax incentives, fees and essential investments for the development of R&D, generation of intellectual property and levers to finance other instruments of innovation policy (Cirera & Maloney, 2017; Cirera *et al.,* 2020; Bloom *et al.*, 2019). The second component refers to supporting collaboration. Radosevic (2012) argues that the innovation system (IS) perspective captures the essence of the concept of collaboration of IP of the contemporary society. IS perspective broadens the concept of collaboration because it deals with science, technology and innovation in an integrated way (Radosevic, 2012). Collaboration from an IS perspective mitigates the creation of innovation networks involving main actors of science, technology and innovation. The actors can be universities, innovation centers, government agencies, companies, governments, investment organizations and support for entrepreneurial and innovative capital (Edler *et al.,* 2016; Cirera & Maloney, 2017; Cirera *et al.,* 2020). The third component is the intellectual property that involves patents, copyright, trademarks and other instruments (Bloom *et al.,* 2019; Davidson & Potts, 2016). Intellectual property gives rise to new products, services, technologies, processes, software or hardware, that is, new solution. When the new solution is original and has elements that characterize as creative destruction, new solution promotes rupture, surpasses and destroys the available and current solution in the market (Schumpeter, 1961; Cirera & Maloney, 2017; Cirera *et al.,* 2020).

The fourth component that integrates the IP is the technology transfer (Cirera *et al,* 2020; Bloom *et al.,* 2019). According to the Association of Technological University Managers technology transfer is the process of transferring academic research results from an organization to another, with the purpose of commercialization, involving the main activities of identification of new technologies, protection of technologies through patents and copyright, commercialization, definition of marketing and licensing strategies, for companies or the creation of startups. In the process of technology transfer from the university or research organization to companies or other organizations, the technology transfer can occur in the form of patents, spin-offs and licensing, data flows and consulting (Trosow *et al.,* 2012). The fifth component is the new organizational forms. Miles and Snow (1986) argue that the increasingly turbulent and competitive environment constrains organizations and leads to arise new organizational forms. The new organizational forms combine strategy, structure and management processes and are called forms of dynamic networks (Miles & Snow, 1986). IP must have instruments and mechanisms that stimulate new organizational forms (Cirera *et al.,* 2020) to lead the country towards an economy driven by innovation.

2.2 Open Innovation

OI has been increasingly broadening the penetration in academic and business environments, leveraging benefits in a distributed, decentralized and participatory way in organizations (Bogers *et al.,* 2018; Dahlander & Wallin, 2020). The OI has helped practitioners to change the R&D logic of organizations towards boosting the company's internal and external information flows, strengthening collaboration and fostering the creation of new BMs (Chesbrough, 2006; 2007; Chesbrough *et al.,* 2018). The concept of OI has spread in different contexts, participants, applied theories and approaches (Gao *et al.,* 2020; Randhawa *et al.,* 2016; Hossain *et al.,* 2016). OI academic articles involve several participants including universities, suppliers, competitors, customers, partners, consultants and governments (Gao *et al.,* 2020). Some scholarly articles explored OI in the public sector (Gao *et al.,* 2020; Flor & Ortiz, 2020) and OI connected with BM (Zhu *et al.,* 2019).

OI represents for contemporary organizations an imperative to intensify innovation, creating, capturing and delivering value to society (Bogers *et al.,* 2018; Chesbrough *et al.,* 2018). OI knowledge flows can innovate BMs of the organizations. Knowledge flows enable create value, capture value and move from the external environment to the internal environment from the internal environment to the external environment or both directions (Chesbrough *et al.,* 2018; Remneland-Wikhamn & Styhre, 2019; Hossain & Kauranen, 2016). OI raises three elements that need to be emphasized. The first element of OI is knowledge flows (Berchicci, 2013; Brem *et al.,* 2017; Chesbrough *et al.,* 2018). Knowledge flows are essentials to OI practices in companies and involve the outsourcing of R&D, strong collaboration with business networks, acquisition of technologies and the spread of knowledge in the company through mergers and acquisitions (Cammarano *et al.,* 2019; Chesbrough, 2003c).

The second element of OI is source of resource (West & Gallagher, 2006; Berchicci, 2013). Source of resource allows putting into operation knowledge flows, accentuated collaboration (Antikainen *et al.*, 2010), intellectual property (Brem *et al.,* 2017; Secundo *et al.,* 2018; Hannigan *et al.,* 2018) and technology transfer (Sutopo *et al.,* 2019; Sinel, *et al.,* 2017) aiming to drive organizational transformations and in BM (Ballestra *et al.,* 2018). The third element increasingly highlight is the collaboration (Tobiassen & Pettessen, 2018; Antikainen *et al.,* 2020). Collaboration is a way to foster creativity and innovation to create and capture value in the organization (Antikainen *et al.,* 2020). The collaboration broadens the attraction of partners and the developing trusting relationship (Tobiassen & Pettessen, 2018). Collaboration strengthens relationships between company and

ecosystem (Remneland-Wikhamn & Wikhamn, 2013). Another important element identified in OI is the close connection with the public sector, particularly with IP (Mergel, 2018). OI knowledge flows, particularly investments and source of resource, intellectual property, technology transfer, organizational transformations and BM can be stimulated in the public sector, through innovation law and policy (Cirera *et al.,* 2020; Cirera & Maloney, 2017).

2.3 Business Model

The vast knowledge accumulated over more than two decades of research of BM was not enough to seek agreement among the authors on the definition of BM (Fielt, 2013; Foss & Saebi, 2016). The initial notion is that the BM establishes a logical business architecture aimed at creating, capturing and delivering value. BM is composed of interconnected elements involving the value proposition, customer segment and finance (Teece, 2010). The business value logic architecture aimed at creating, capturing and delivering value mentioned in the initial BM definition is clearly expressed in the five V tool (Taran *et al.,* 2016).

The five V tool has at least two main interesting contributions to foster innovation in the organization (Taran *et al.,* 2016). First, the five V tool provides a BM ontology for mapping the organization's business processes. The ontology has five components in which the notion of value is expressly embedded in each component as: a) value proposition; b) value segment; c) value network; d) value configuration; e) value capture. The second important contribution is that the five V tool offers a list of more than 60 BM success processes/strategies adopted by companies that can drive innovation in the new BM.

The five V tool stimulates innovation in BM and helps in understanding of the difference between BM and BM innovation (BMI). Foss and Saebi (2018) emphasize that the lack of a clear definition of BM and BMI is a perverse and paradigmatic problem and offer a distinction between BM and BMI. According to Foss and Saebi (2018), BM embeds the notion of a constellation of specific activities focused on creating, capturing and delivering value to customers and stakeholders, while BMI means changes in the constellation of activities. In this line of distinction proposed by Foss and Saebi (2018), the five V tool makes it possible to foster BMI. Innovation in the BM as proposed by Foss and Saebi (2018) is closely linked to OI due to knowledge flows. These knowledge flows move from the external environment to the internal environment, from the internal environment to the external environment or both, establishing a new logic of relationship with the BM, making them an open BM, enabling the creation, capture and delivery of value of BM (Chesbrough, 2006; Chesbrough, 2007).

2.4 Innovation Policy, Open Innovation and Business Model Relationships

Based on literature review what are the relationships of source of resource, collaboration, intellectual property, technology transfer and new organizational forms of IP with OI and BM? Taking into account the analysis of the literature carried out previously, Table 1 summarizes two evidences. The first evidence refers to the studies examined in the literature that address the components and elements of IP, OI and BM. The second evidence is the close relationships of each component and element of IP, OI and BM and how the literature emphasizes these relationships. There are five kinds of relationships.

Table 1: Relationship among Innovation Policy, Open Innovation and Business Model.

Innovation Policy (IP)		**Open Innovation (OI)**		**Business Model (BM)**	
Components	**Studies that address the IP component and are linked to OI and BM**	**Elements**	**Studies that address the OI elements and are linked to IP and BM**	**Components**	**Studies that address the BM component and are linked to IP and OI**
Resource Sources	Edler, Gök, Cunningham and Shapira (2016) Davidson and Potts (2016) Cirera, Frías, Hill, and Li (2020) Cirera and Maloney (2017) Cirera, Frías, Hill, and Li (2020) Bloom, Reenen e Williams (2019)	Resource Sources Collaboration	West and Gallagher (2006) Berchicci, (2013) Chesbrough, (2003a; 2003b; 2003c; 2006; 2007) Bogers, Chesbrough and Moedas (2018)	Value Capture	Taran, Nielsen, Montemari, Thomsen and Paolone (2016) Teece (2010) Foss and Saebi (2018)
Collaboration	Edler, Gök, Cunningham and Shapira (2016) Radosevic (2012) Cirera, Frías, Hill, and Li (2020) Cirera and Maloney (2017) Fjeldstad, Snow Miles and Lettl. (2012).	Collaboration Flows of Knowledge	Dahlander and Wallin (2020) Chesbrough (2003a; 2003b; 2003c; 2006; 2007) Chesbrough, Lettl and Ritter (2018) Tobiassen and Pettessen (2018) Antikainen, Mäkipää and Ahonen (2010)	Value Network	Taran, Nielsen, Montemari, Thomsen and Paolone (2016) Teece (2010)

Intellectual Property	Edler, Gök, Cunningham and Shapira (2016) Schumpeter (1961) Davidson and Potts (2016) Bloom, Reenen e Williams (2019) Cirera, Frías, Hill, and Li (2020) Cirera and Maloney (2017)	Flows of Knowledge	Dahlander and Wallin (2020) Bogers, Chesbrough and Moedas (2018) Chesbrough (2003a; 2003b; 2003c; 2006; 2007) Chesbrough, Lettl and Ritter (2018) Cammarano, Michelino, Celano and Caputo (2019) Berchicci (2013) Brem, Nylund and Hitchen (2017) Hannigan, Seidel, Yakis-Douglas, (2018) Secundo, Toma and Passiante (2018) Zhu, Xiao, Dong and Jibao (2019)	Value proposition Value configuration	Taran, Nielsen, Montemari, Thomsen and Paolone (2016) Teece (2010) Foss and Saebi (2018)
Technology Transfer	Edler, Gök, Cunningham and Shapira (2016) Bloom, Reenen e Williams (2019) Cirera, Frías, Hill, and Li (2020) Cirera and Maloney (2017) Trosow *et al.,* (2012)	Flows of Knowledge Collaboration	Chesbrough, (2003a; 2003b; 2003c; 2006; 2007) Bogers, Chesbrough and Moedas (2018) Sinell, Iffländer e Muschner (2017) Sutopo, Astuti, and Wiji (2019) Secundo, Toma and Passiante (2018)	Value proposition Value configuration Value Network Value Capture	Taran, Nielsen, Montemari, Thomsen and Paolone (2016) Teece (2010) Foss and Saebi (2018)
New organizational forms	Cirera, Frías, Hill, and Li (2020) Cirera and Maloney (2017) Flor, Díaz, and Ortiz (2020) Miles and Snow (1986)	Flows of Knowledge	West and Gallagher (2006) Berchicci, (2013) Chesbrough, (2003a; 2003b; 2003c; 2006; 2007) Hossain and Kauranen (2016) Remneland-Wikhamn and Styhre (2020) Ballestra, Fontana, Scuotto and Solimene (2018) Mergel (2018)	Value configuration Value Network Value Capture	Taran, Nielsen, Montemari, Thomsen and Paolone (2016) Teece (2010) Foss and Saebi (2018)

Developed by authors from literature review

The first kind of relationship is resource source of IP (Cirera *et al.,* 2020). Resource source of IP is linked with OI resource source (Berchicci, 2013) and BM value capture (Taran *et al.,* 2016). Source of resource of IP is investment needed to generate intellectual property and support all instruments to foster innovation, such as collaboration (Bloom *et al.,* 2019). Moreover, source of resources finance OI knowledge flows (Chesbrough, 2003a, Chesbrough *et al.,* 2018; Remneland-Wikhamn & Styhre, 2019) that come from the organization itself or from the IP, through of incentives tax. The resource source of IP and OI are closely related to capture value of the organization's BM (Taran *et al.,* 2016).

The second kind of relationship is the collaboration of IP which is found in OI and BM. The collaboration established in the IP encourages collaboration of OI (Tobiassen & Pettessen, 2019) moving the knowledge flows of OI, from the outside to the inside or from the inside to the outside (Cammarano *et al.,* 2019). Collaboration of OI enables the company or organization to reduce risks, quickly offer a product to the market, reduce product development costs or increase the performance of the organization's processes (Fjeldstad *et al.,* 2012). The collaboration of IP fosters the collaboration of OI and changes the value network of the organization's BM (Taran *et al.,* 2016). The value network of BM means all kinds of collaboration, transactional and strategic partnerships that contribute to achieving the company's organizational objective (Taran *et al.,* 2016).

The third kind of relationship refers to the intellectual property of IP. Intellectual property of IP stimulates OI knowledge flows, changes the value proposition and the other components of BM. The R&D resulting from the IP generates intellectual property (patents, copyright, trademarks and so on) which are OI knowledge flows. Also, OI knowledge flows can be acquired by the company (Brem *et al.,* 2017; Secundo *et al.,* 2018). The product, service, technology and process resulting from the OI knowledge flows acquired by the company (Bloom *et al.,* 2019) will change the value proposition and the other components of BM (Taran *et al.,* 2016).

The fourth kind of relationship is the technology transfer of IP (Trosow *et al.,* 2012) that fosters OI and change BM. In the technology transfer process of findings of research from organization A to organization B stimulated by IP, the organization B moves the flows of knowledge and collaboration that are of OI (Secundo *et al.,* 2018). In this direction, new solutions provided to the market from technology transfer (Sutopo *et al.,* 2019; Sinell *et al.,* 2017) provide changes in the BM. The technology transfer process can change the value proposition or value configuration, or value network or even value capture of organization BM´s (Taran *et al.,* 2016).

The fifth kind of relationship refers to the new organizational forms of IP that foster OI and change the BM. New organizational forms emerge to adapt and respond quickly to the external environment that is increasingly turbulent and competitive, combining new forms of strategy, structure and management processes (Miles & Snow 1986). Intellectual property of IP is one type of OI knowledge flow that can stimulate the emergence of new organizational forms (Ballestra *et al.,* 2018; Zhou *et al.,* 2019), either at the level structure, strategy and management process. In turn, Intellectual property changes the BM as follows (Taran *et al.,* 2016): a) First, Intellectual property can change the value network of BM where the structure, strategy and management processes are configured to deal with partners that are included in the dynamic value network (Taran *et al.,* 2016); b) Second, Intellectual property can change the value configuration where the entire structure, strategy and management processes involved for the development of the value proposition are included (Taran *et al.,* 2016).

3. Methods and Techniques

The research is an exploratory, qualitative that adopts the reflective methodology (Alvesson & Sköldberg, 2009) and based on case study (Yin, 2014). The exploratory connotation occurs because the investigation deals with a topic in which information on the relationships among components is not yet available (Mesquita & Matos, 2014). The study was carried out in four stages. In the first stage, an analysis of the literature of IP, OI and BM was carried out, seeking to explore the main components and elements. In IP literature review, the five components, such as, source of resource, intellectual property, technological transfer and new organizational forms were explored. In OI literature review, the main elements were analyzed seeking to establish relationships with the components of IP. In the BM, attention was paid to the five components of the five V tool entitled value proposition, value segment, value network, value configuration and value capture.

In the second stage, based on the components and elements identified in the first stage, the main relationships among IP, OI and BM were examined. At this stage, from the analysis of the literature, the chart 1 was developed with the mapping of the five kinds of relationships. In the third stage, the University of Brasília (UnB) was selected for the case study. Three criteria were adopted to select the UnB: a) The geopolitical location of the university which is located in the capital of Brazil and also the only federal university in Brasília. The UnB spreads the findings of researches to the other educational institutions in Brazilian states; b) Material and intangible heritage and relative economic and financial sustainability. The UnB is among the top 5 Brazilian federal universities with the fifth largest net budget; c) Innovation policy and technology park. The UnB with the technology park located in Brasilia become a strategic ecosystem for fostering innovation.

Data collection was performed using secondary university data from official documents. At this stage, the Brazilian Innovation Law (BIL) nº 13,243 of 2016 in force in the country was also analyzed. The fourth stage was the case analysis in which it illustrates the relationships among IP, OI and BM. University data were analyzed considering the five kinds of relationships examined in the literature.

4. University of Brasília Case Study

4.1 Brazilian Innovation Law Landscape

The BIL 13,243/2016 has as main objectives to reduce bureaucracy in the public and private partnership relationship and setting the new legal framework to guide the regulation of this partnership with a triple purpose: a) to reduce legal and bureaucratic obstacles; b) to give greater flexibility to institutions; and c) offer legal security. The new BIL 13,243/2016 provides greater mobility for researchers in the development of business projects and in the agile allocation of public resources. The new BIL 13,243/2016 highlights the encouragement and enhancement of research centers and the participation of institutions that belong to governments at the federal, state and city level in companies to develop innovative products. Table 2 highlights the main components and articles of the BIL 13,243/2016 and the main indicators for the university.

Table 2: Main Components of the Brazilin Innovation Law 13,243/2016

Components	Description
Source of fund Innovation law articles 9º, 10º, 13º, 14º, 16º, 18º, 27º	Infrastructure of research and innovation laboratories; Licensing and royalties Payment of research grants.
National and international collaborations Innovation law- articles 3º, 5º, 8º, 10º,15º e 19º	Internationalization process; Interinstitutional technical and scientific partnerships; Strengthening of the relations among university, business and government; Scientific events in partnership.
Intellectual property Innovation law - Articles 11º e 22º	Protection of research results; Innovation of products, services, procedures and processes.
Technology transfer and scientific knowledge transfer - Innovation Law – articles 3º, 4º and, 6º.	National and international strategic partnerships Research produced at the University Technology production at the University Research groups; Publications made Patents; Companies Subjects with active learning methodologies; Companies supported by the university.
New ways Organizational Innovation Law – article 16º and article 27º	Support Foundation, Social Organization, Research Center or Nucleus, Technological Innovation Nucleus (NIT). Debureaucratization of import purchases, legal security in relation to the control bodies for the use of resources.

Developed by authors from University of Brasilia Management report and Brazilian Innovation Law 13.243/2016.

BIL 13,243/2016 has some similarities with innovation policy when compared to some countries, such as the USA and European countries. The similarities are in relation to the main instruments that integrate the IP (Edler & Fagerberg, 2017) and in relation to the pursuit of good practices of rationality and design of IP instruments (Cirera et al., 2020). However, in relation to the quality of IP implementation, there are no similarities (Cirera et al., 2020). In developing countries such as Brazil, government implementation of IP programs is one of the relevant weaknesses when compared to the USA and European countries (Cirera et al., 2020). The Brazilian government does not follow good IP implementation practices to increase the effectiveness of IP instruments (Cirera et al., 2020).

4.2 Case Study of the University of Brasília (UnB)

The UnB is a Brazilian public federal university, non-profit organizations and was founded 55 years ago. The aims of university is the teaching, research and extension, integrated in the formation of qualified citizens for professional practice and committed to the search for democratic solutions for national problems. The management model of the UnB, in all instances, bodies and academic units is collegiate and decentralized. The principles that guide the actions and activities of deliberative and executive teams are decentralization, transparency, legitimacy, legality, impersonality, publicity and honesty. The information system has flows and processes related to the University's hierarchical levels, where content, connectivity and communication are parameters to spread information well. The UnB has a foundation called foundation of the university of Brasilia (FUB).

Considering the information analyzed the UnB had in 2018, 40,740 undergraduate students, 8,030 graduate students, with 2,627 professors, 346 substitute and visiting professors, 3,316 external researchers, 3,171 technical-administrative employees, 155 undergraduate courses, 159 graduate programs and 20 research centers. Taking account the 2015 data (before of the BIL 13,243/2016) and the 2019 data (after the implementation of the BIL 13,243/2016 at UnB), table 3 contains information from UnB that illustrates and operationalizes the five kinds of relationships among IP, OI and BM. According to table 3, the five components of IP foster OI and change the UnB's BM. In table 3, in the first column are the five components of IP examined in the literature. The five components of IP examined in the literature are operationalized and illustrated through of the BIL 13,243/2016. In the second column has information from UnB before of the implementation of the BIL 13,243/2016 and in the third column has information after the implementation of the BIL 13,243/2016. In the fourth column has the main elements of OI that are related to IP. In the last column has the components of BM that were changed after the implementation of the BIL 13,243/2016.

Table 3: Innovation Policy, Open Innovation and Business Model Relationships at UnB
Brazilian Innovation Law 13,243/2016

Innovation Policy Components	Before of thee BIL 2015	After the BIL 2019	Open innovation	Business Model (Five v) components
Resource Source	100% of the revenue source is paid by the Federal Government Sales revenue R$ 4,200,559.00	100% of the revenue source still comes from the Federal Government, but with a 30% reduction. Complementing this has been the diversification of sources, including information technology law, partnerships with companies and the third sector. Sales Revenue R$ 6,297,559.88	Knowledge Flows Collaboration Resource source	Value capture
National and International Collaborations	Research Agreements – 90	Research Agreements -113	Collaboration	Value Network
	Agreements with countries – 180	Agreements with countries -195		
Intellectual property	Patents - 33	Patents - 62	Knowledge Flows	Value Proposition Value Configuration
	Computer program - 12	Computer program - 20		
	Brand Registration – 3	Brand Registration - 13		
	Software registration – 20	Software registration – 34		
	Co-Ownership Agreements assinados -1	Co-Ownership Agreements assinados- 3		
	Intangible Assets FUB- 300	Intangible Assets FUB- 552		
	Costs with deposit and order registration with the INPI- R$30.00,50	Costs with deposit and order registration with the INPI - R$45.040,53		
Technology Transfer, Commercialization and Scientific Knowledge Transfer	Patent Applications - 5	Patent Applications -12	Knowledge Flows Collaboration	Value Proposition Value network Value Configuration Value capture
	Know-how transfer -5	Know-how transfer -12		
	Copyright -1	Copyright 4		
	Number of Technical Responses - SBTR – 0	Number of Technical Responses – SBTR -1.546.958.45		
	Technology transfer – 43	Technology transfer - 69		
	Incubated Companies 17 - annual billion – R$ 25 mil	Incubated Companies – 20 annual billion – R$ 42 mil		
	Number of participants in the School of Entrepreneurship – 1464	Number of participants in the School of Entrepreneurship -1472		
	Number of Junior Companies assisted - 32	Number of Junior Companies assisted - 41		
	Technologies available for commercialization 400	Technologies available for commercialization 552		
New Organizational Form	The NIT was a Support Center for Technological Development at UnB and directly linked to the vice-rector. NIT sustainability arising from external projects signed between individual surveys of teachers and the federal and state government. Employees the NIT Teachers -3 Students - 10 external collaborators with research grants: 8	It becomes part of the Research and Innovation Deanship and is included in the University's Institutional Development Plan. NIT's sustainability was included in the University's PDI with maintenance of a research grant, generating a 15% increase in the participation of professors and students in the NIT. Collaborators of the Nit teachers - 6 Students- 20 External collaborators with research grants: 10	Knowledge Flows	Value proposition Value Configuration Value network

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The data presented in Table 3 show the impact of the BIL at UnB, in order to leverage OI and change the BM. Also, the data reveal the increase in all indicators and can be showed in relation to the simplification of innovation research processes, through the creation of the Support Committee for Research in Innovation, providing greater flexibility in bureaucratic procedures. There was an increase in costs with deposit and order registration with the Brazilian National Intellectual Property (INPI). Also, there was a greater visibility of the Innovation Technological Nucleus (NIT) inside of the university, motivating the academic community to participate in this innovation environment and the insertion of UnB in new research networks, increasing the social capital.

5. Findings

This research generated two main findings. The first main finding deals with the five kinds of relationships based on literature review. The five kinds of relationships anchored in source of resource, collaboration, intellectual property, technology transfer and new organizational forms have origins in IP. The IP is linked with source of resource, knowledge flows and collaboration which are the three main components of OI. Then, IP and OI are linked with the components of BM which are value proposition, value network, value configuration and value capture. The second main finding refers to the operation and illustration of the five kinds of relationships in the Brazilian university. Based on empirical data analyzed from the UnB that are summarized in Table 3, the case study presents three illustrations. In the first illustrations, the five kinds of relationships among IP, OI and BM are source of resource, collaboration, intellectual property, technology transfer and new organizational forms. The five kinds of relationships have origins in IP and foster the three main components of OI which are source of resource, knowledge flows and collaboration. Then, OI triggers changes in the four BM components which are value proposition, value network, value configuration and value capture.

In the second illustration, the five kinds of relationships among IP, OI and BM composed of source of resource, collaboration, intellectual property, technology transfer and new organizational forms have origins in IP. Then IP paves the way to foster OI in the university and OI changes four BM components which are value proposition, value network, value configuration and value capture. In the third illustration highlights that BM is not only applied to for-profit companies, but also to non-profit organizations. The case study refers to the close relationship of IP, OI and BM of a Brazilian federal public university, a non-profit organizations. However, the findings reveal the relationships among IP, OI and BM, but there are no causalities.

6. Innovative Contributions and Practical Implications

What are innovative contributions and practical implications? Is it possible to extrapolate these findings within different contexts and organizations? Yin (2014) mentions that in the case study, the findings are generalizable through analytical generalization. In this line of thought, the findings are innovative and have several practical implications. Two reasons are presented to show that the findings are innovative. In the first reason, IP, OI and BM are three distinct fields of study that have constructs, concepts, approaches and theories. Each field of study is far from one another in the academic literature. Also, there is a lack of academic papers on relationship among the three fields of study, analyzed in an integrated way. The findings are innovative because the five kinds of relationships identified in the literature review are conceptual artifacts and are scientific evidences, confirming that there are links among the three fields of study. The five kinds of relationships are able to build and establish bridges and relationships among the three distinct fields of study, in an integrated way, and the five kinds of relationships fill the gap in the academic literature. In the second reason, the findings are innovative because they reveal how fostering and change occur within the five kinds of relationships of IP, OI and BM. The five kinds of relationships among IP, OI and BM composed of source of resource, collaboration, intellectual property, technology transfer and new organizational forms have origins in IP. IP paves the way to foster OI in the organization and trigger changes in the four BM components which are value proposition, value network, value configuration and value capture.

The findings have several practical applications and only three of them will be mentioned. First, the findings can be used by the leadership and managers of companies and organizations that use the instruments and mechanisms of government IP. Leaders and managers will be able to use the conceptual artifacts, which are the five kinds of relationships identified in the literature review, to mitigate IP, OI and BM, among their employees and in the company and organization as a whole. The mitigation process can start observing how source of resource, collaboration, intellectual property, technology transfer and new organizational forms that integrate IP, foster source of resource, knowledge flows and collaboration of OI and trigger changes in the value proposition, value network, value configuration and value capture of BM.

The second practical implication involves rectors and leadership of higher education institutions that use the instruments and mechanisms of government IP, particularly nonprofit public institution. Leadership will be able to use the five kinds of relationships to stimulate in the academic community, the culture of OI and BM connected with IP, particularly among professors and administrative staff. In the third implication, the findings may encourage researchers to build a research agenda with an integrated focus on the three fields of study. Researchers will be able to explore at least two themes on the research agenda: a) How to overcome barriers to the implementation of practices and strategies of IP, OI and BM, in an integrated way, in organizations. The study of barriers should take into account the five kinds of relationships identified in the literature review. Some of the OI barriers were studied by Oumlil and Juiz (2016); b) Outcome measurement model and outcome indicators of practices of IP, OI and BM, in an integrated way, in organizations. The study of outcome measurement models should take into account the five kinds of relationships identified in the literature review. Measurement model and outcome indicators of practices of OI and BM were analyzed by some authors (De Pablos-Heredero *et al.*, 2013; Mateu & Escribá-Esteve, 2019).

7. Final Remarks

The Greek mythological figure of bound Prometheus by his father Zeus, due catch the fire from the gods and hand it over to humanity, is a good metaphor to emphasize the paradox of innovation between developed and developing countries (Cirera & Maloney, 2017). Landes (1969) was a pioneer in using the idea of untied Prometheus to emphasize technological changes and economic development in Western Europe through innovation, in relation to other countries. Innovation involves new products, services, processes and technologies for the markets. When the new solution is based on creative destruction (Schumpeter, 1961) it drives the economic development and social well-being of a nation (Benjamin & Rai, 2008; Shapira & Azaiza**,** 2010).

New products, services, processes and technologies developed to the market based on the notion of creative destruction (Schumpeter, 1961) has high added value to boost the economy because is accompanied by ruptures in relation to the current technological standard. The notion of creative destruction (Schumpeter, 1961) is related to the creative capacity, in the destruction of existing products, services, processes and technologies to give way to the new technological wave, establishing a watershed between developed and developing countries.

While in developed countries Prometheus was unbound and the fire released to do creative destruction, in developing countries as Brazil, Prometheus is still bound and the paradox of innovation remains. The innovation paradox is centered on three determinants of innovation performance in developing countries (Cirera & Maloney, 2017): a) low investment needed to realize high potential returns; b) the scope of the company's capacity required to undertake the innovation and bring it to the market; c) government capacity required to implement effective IP. The main findings of this case study demonstrate that there is a close relationship among IP, OI and BM in the organization. Source of resource, collaborations, intellectual property, technology transfer and new organizational forms have origins in IP, foster OI, and trigger changes in the BM organization.

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