Interview script

01) How were the interpersonal (bureaucratic) steps taken since invention reception and selection, protection, technology transfer, and income generation/*royalties*?
02) What were the standard operating procedures (processes), protocols, customs, and norms?
03) How was the technical and technological (learning, detection, filtering, apprehension, adjustments, and transformation) reception and transmission (sharing) systematics among the members?
04) What tools and models are available and encouraged for technology transfer?
05) How were the component steps of technology transfer rethought, developed, or improved?
06) How did the need to change, to innovate, the practices, and activities related to technology transfer used to be apprehended?
07) Were there any events or facts that motivated the change in the way you conducted, or tried to conduct, technology transfer?
08) Once the changes in the form technology transfer were made, how was this information/knowledge codified and disseminated among those involved?
09) How did the members perceive the need to renew, recombine, or synchronize existing operational capabilities?
10) What resources, operational routines, competencies, and substantive capabilities facilitate developing the ability to transfer technology?
11) Considering the TTC would involve resources, competencies, routines, and other operational capabilities, which of these elements have been created, extended, or modified over the TTC development time adopted by the TIC?
12) Considering that the resources, competencies, routines, and capabilities would contribute to modify the technology transfer process, how would this occur?
13) How were these resources, competencies, routines, and capabilities learned, accumulated, eliminated, or how would they behave during the TTC's development time?
14) During the modification of the technology transfer process it would be possible that one's own resources, competencies, routines and, furthermore, some capabilities would be modified together. How would it happen?
15) Considering the simultaneous change of resources, competencies, routines, and capabilities, what would be the role (participation) of managers and researchers in this process ("meta-routine")?
16) How could managers and researchers sense, filter, conform, and calibrate opportunities to improve technology transfer?
17) How do managers and researchers select resources, competencies, routines, and capabilities to improve technology transfer?
18) Once the opportunities for improvement have been identified, how will the organizational structure, procedures, and internal interests contribute to the new configuration of resources, competencies, routines, and capabilities related to technology transfer?
19) How will resources, competencies, routines, and capabilities interfere with the formulation of technology business models, product architectures, target markets, and other value capture mechanisms?
20) What are the effects of TTC development on the act of transferring certain technology?

Source: Prepared by the authors.

Systematic Observation Script

Items to check:	Analysis Dimension:	Capture Format*:
01) What is the workplace like?	Behavior, throughout TTC's development, regarding resources, competencies, routines, and capabilities.	Photos/Notes
02) How is the current political scenario perceived regarding impacts on technology transfer?		Notes
03) How do the members act?		Photos/Notes
04) How is the integration among the members?		Notes
05) What are the incentives and rewards for the members?		Photos/Notes
06) How is a negotiation between a HEI and a company?		Notes
07) How are formal documentations prepared?		Photos/Notes
08) Which models are available and encouraged for technology transfer?		Photos/Notes
09) How is the learning, the management, and the technology transfer mode?		Notes
10) Are there activities (events, etc.) encouraging technology transfer improvement?		Photos/Notes
11) What are the standard operating procedures, processes, protocols, customs, and norms in effect?		Photos/Notes
12) How do the members perceive the need to renew, recombine, or synchronize existing operational capabilities?		Notes
13) Which resources, competencies, routines, and capabilities are inferable and related to technology transfer?		Photos/Notes
14) How do resources, competencies, routines, and capabilities behave during the dynamics of technology transfer capability development?		Notes
15) How is the "meta-routine" and the operational routines regarding technology transfer?		Notes
* - Observations will be collected using photos, audio recordings, or digital device annotations as deemed necessary and with proper recording permission.		

Source: Prepared by the authors.

Constitutive and operational definitions

Variables	Constitutive definition	Operational definition
External environment	Comprised by elements that are external to the organizations, and beyond their domains, having a wide scope and encompassing the way resources are distributed and used, the characteristics and attributes of society, governmental obligations, legislations, approved and accepted rules, approaches to producing goods and services, and existing procedures and equipment (Chiu & Chen, 2009)	The data, information, knowledge, resources, competencies, routines, capabilities, and factors that were not under the domain of the investigated Brazilian public HEIs and that were verified in the documents, interviews, and observations.
Intellectual precedence	Highest level of scientific and technological development reached in a given time and space and accessible to the public (Pimentel, 2005; 2010).	Empirically observed regarding the theoretical models available in the literature, or the best practices of other organizations, on technology transfer that explicitly influenced the construction or structuring of the technology transfer of the HEIs targeted by the study.
Apprehension	Capturing opportunities (Teece, 2007).	Based on the data, it is evidenced as internal actions of the investigated HEIs aimed at the continuous improvement of operational procedures after detecting problems or opportunities for change.
Prior path	An organization's prior path over time that causes it to accumulate knowledge and transform resources, processes, and routines (Teece, Pisano & Shuen, 1997; Zahra, Sapienza & Davidsson, 2006).	In this study, we verified all the information that constituted the characteristics of each Brazilian public HEI investigated over the years prior to the first year of analysis, according to the study's time frame.
Dynamic capability	"The ability of an organization to purposefully create, extend, and modify its resource base" (Helfat et al., 2007, p. 4).	Verified by evidencing the routine efforts, and supported by resources and competencies, which had a common aim of improving technology transfer actions, and determining if this process was intentional and if it was improved along the years.
Operational or substantive capability	Bundles of resources, competencies, and routines that are basic or indispensable for the organization's competitive effectiveness in the market (Penrose, 1959; Barney, 1991; Prahalad & Hamel, 1990; Peteraf, 1993).	Understood as a composite of resources, competencies, and specific, punctual, stable, and constant routines that interfered in the development of the technological transfer process of the studied HEIs or were combined or reconfigured because of the referred institutions' TTC.
Coding	Exteriorization of tacit knowledge through symbolic representation so that it can be	Exteriorization of tacit knowledge through symbolic representation so that it can be stored in a particular

	stored in a particular medium or media (David & Foray, 2003).	medium or media (David & Foray, 2003).
Competence	Ability to mobilize knowledge, values, and decisions to take pertinent action in a given situation (Prahalad & Hamel, 1990; Fleury & Fleury, 2001).	Both the individual and the organizational ones were empirically verified regarding the existence of previous formalized trainings that allowed the conscious and technical performances of the employees individually, or in teams, in the transfer process.
Organizational knowledge	Set of all the knowledge or understanding grasped by the organization and its members (Zahra, Sapienza & Davidsson, 2006).	Evidenced from the institutional documents made available, the interviewees' statements, the bulletin boards posted, and the digital databases observed in each of the investigated HEIs.
Context	A set of interrelated circumstances whose texture is deduced from a certain fact or situation, circumstance(s), conjuncture, and situations (Michaelis, 2016).	Empirically observed from all the historical events since the origins of the research and the respective scanned TICs, in the time frame predefined in this survey, and which were related to certain licensing contracts, or assignments, carried out. In the meantime, events, actions, occurrences, facts, and so on that indicated internal environmental changes in the HEIs, and also in their TICs, and external to them which induced the TTC development in time and space were highlighted.
Detecting	Detecting while shaping new opportunities through exploration, creation, learning, and interpretation activity (Teece, 2007).	Perceived in each report, documented or observed information that made explicit the action of scrutinizing, auditing, or evaluating internal transfer procedures, and investigating routines or information searches from outside the institution.
Organizational strategy	"The dynamics of the organization's relationship with its environment to take the necessary actions to achieve its goals and/or increase performance through rational resource use" (Ronda-Pupo & Guerras-Martin, 2012, p. 180).	Verified based on the knowledge formalized in documents or in the interviewees' reports regarding the internal efforts and objectives to anticipate environmental situations and increase or maintain the positive results of the analyzed HEIs.
Organizational structure	Strictly speaking, it has been treated as the way in which the activities undertaken by an organization are divided, organized, and coordinated, while broadly speaking, it encompasses the physical, human, financial, legal, administrative, and economic aspects of an organization (Gosselin, 1997; Damanpour &	Understood as all the configuration, division, organization, and coordination of activities, resources, competencies, routines, and capabilities of the investigated HEIs, and which aimed at achieving the proposed objectives. They were verified in the document records, in the exhibition in tables or in *banners*, or even from the interviews.

	Gopalakrishnan, 1998; Zheng, Yang, & McLean, 2010).	
Project management	Method and procedures for coordinating activities aimed at meeting the expectations of *stakeholders* (Guide, 2008).	Verified based on the document records or mention in the interviews, by the creation or maintenance of programs, events, routines, or even projects related to the capability of transferring technology from the referred HEIs.
Manager (leader)	The individual focused on guiding the organization's transactional actions, by coordinating and supervising current practices and transformational actions in order to encourage experimentation with new practices (Vera & Crossan, 2004; Khadra & Rawabdeh, 2006).	The managers were considered to be leaders and were evidenced by the explicit indications in the interviewees' speeches, in the documents, by the display of the organizational flow chart in a bulletin board or *banner*, or by the hierarchical observation of the members in action.
Innovation	First launch or announcement in the market of a certain good or service (Artz et al., 2010).	Empirically verified in two situations. The first referred to the launching of some of the technologies exposed in the contexts of the investigated HEIs and indicated in the interviews, documents, and through the observations. The second, on new resources, from the perspective of the investigated institutions, which have been created or adopted to improve the TIC's TTC.
Market	Group of customers and suppliers who interact in such a way that their interactions affect the buying and selling conditions of the other actors (Sandroni, 2016).	Private companies and the competition between them were considered generically as a market and were evidenced by referring to their actions towards the investigated public HEIs in the interviews, in the quotes in documents, or through the observations.
Mainstream	Core activities in the current state of the organization (Lawson & Samson, 2001).	*Mainstream* activities were perceived based on the empirical explicitness of the resources, competencies, routines, and capabilities of the alluded HEIs, which comprised the standardized and codified procedures in effect.
Newstream	All of an organization's resources that are dedicated to identifying and creating new value for customers (Lawson & Samson, 2001).	The results of the *newstream* activities were verified empirically by the continuous improvement routines of the practices and standardized procedures in place at the TIC of each HEI studied, and aimed at improving the technology transfer macro process.
Policy (Public)	A state act aimed at guiding decisions and actions that impact public and private institutions, and also the civil collectivity	Based on the documentary records, mentions in the interviews, and observational data, we identified the (public) policy factor in legislation

	(Howlett & Ramesh, 2003; Secchi, 2010).	and actions of national public institutions, including public companies, which interfered in the innovation management and technology transfer of the HEIs investigated, including their TICs.
Position	Current strategic situation of an organization in its industry and regarding its rivals (Porter, 2004).	The position was considered in two situations. The first as being the current state after the institution's previous path, that is, an extension of the previous and observed path. Broadly speaking, it is the current situation of the investigated HEIs. The second as being the TTC state, at a given time, that is, the answer regarding "what" were its elements and components and "how" these were configured, integrated, or combined in a given context. The position was found based on the information in the documents, the mentions in the interviews, and the observational data.
Learning process	Set of constant stages of improvement based on knowledge interpretation, creation, and application (Senge, 1990).	Statements in the interviews, indications in documents, exhibitions of documents posted on the walls, and the very expression of the members in actions regarding courses and training carried out or being carried out for and by the employees allowed us to infer the learning processes' existence.
Operational process	Codified and standardized work instructions, rules, or procedures that facilitate the invariable dissemination of the organization's practices among employees to achieve expected results (Auch, Klenk & Göker, 2010).	Considered as the totally or partially standardized procedures executed throughout a given technology transfer of the referred HEIs and that were documented, mentioned in the interviews, or visualized in the observations.
Reconfiguration, transformation, or modification	Combine, recombine, configure, reconfigure, or reinforce the intangible and tangible assets of the organization in maintaining competitiveness (Teece, 2007).	Statements in interviews, quotes in documents, or exhibits observable in loco that referred to changes in the configurations, combinations, and elements or components of the TTC of the investigated Brazilian public HEIs, over time, were considered reconfigurations, transformations, or modifications of the referred capability.
Resources	Any and all assets, whether tangible or intangible, subject to organizational use (Caves, 1980).	Empirically, the resources were identified in the documents, interviews, and observations when they interfered or were part of the macro technology transfer process of the HEIs studied, such as equipment, *software*, people, money, and furniture.

Operational routine	Interaction pattern that represents successful solutions to specific problems (Teece & Pisano, 1994).	Identified based on strategically pre-established, standardized, and codified behaviors, which referred to how to deal with the macro process of technology transfer within the scanned HEIs. Such behaviors were evidenced in the documents, in the interviewees' speeches, or in the *in loco* observations.
Society	Harmonic group of individuals who share the same culture and tradition and are located in space and time (Durkheim, 1977).	Based on the documental, observational, and interview data, we also found human and cultural influences, external to the HEIs, in the macro process of institutional technology transfer, and which could not be classified as intellectual precedence, innovation, market, or public policy, and were then grouped as an aspect of society.

Source: Prepared by the authors.

Main TTC transformations by HEIs

Year	USP	UNICAMP
2003	**Creation:** TTC foundation in the respective TIC.	**Creation:** TTC foundation in the respective TIC.
2004	**Improvement:** style and intentionality of the Technology Transfer Technical Director combined with external and internal institutional pressures, i.e., a favorable environment.	**Improvement:** leadership and intentionality of the Executive Director proposing strategies and making decisions for effectively building a conducive institutional environment.
2005	**Replication:** the creation of the first legal institutional frameworks and the fruit of a successful technology transfer contract favored the positive image of the TIC that started to replicate its transfer model to other HEIs, despite internal communication and document management problems.	**Replication:** standardization of activities and processes constituted best practices that soon started to be replicated to other Brazilian HEIs.
2006	**Improvement:** joint effort of the Coordinator and the Transfer Director coupled with the beginning of the operation of a business incubator, the adoption of a management tool to classify technologies and, specifically, a signed licensing contract.	**Regression (negative factor):** legal changes and employees transition greatly reduced the number of effective licensing contracts. Nevertheless, a reactive movement was initiated to reestablish the TTC evolution.
2007	**Replication:** the formation of a Committee and the Coordinator's leadership style favored the formalization or institutionalization of procedures in favor of technology transfers, despite contrary negative factors such as staff shortages and permanent communication deficiency.	**Recombination:** composition of actions, including the recombination between the communication capability and the relational capability, favored the emphasis on replicating this TIC's transfer model.
2008	**Improvement:** creation of a sector to regularize ownership, transfer, and licensing contracts. Furthermore, entering into a partnership with a foreign university for technology dissemination and international *benchmarking* actions contributed to the TTC development.	**Renewal:** TTC showed renewal expanding procedural flows and technology transfer contracts, a result of the previous year's actions.
2009	**Replication:** the licensing of a computer software for TIC management favored the TTC development, but the lack of dedicated technical personnel restricted the elevation of the capability stage. In turn, a project made this TIC's image more attractive and favored the replication of capability.	**Replication:** the promotion of this TIC's technology transfer model gained emphasis with a national project and after the publication of a book on its best practices.
2010	**Improvement:** identifying the need to improve their negotiation skills along the actions of relational learning and management capabilities favored the TTC development.	**Recombination:** agglutination of the management system for contracts, agreements, and registration of negotiation histories with that of intellectual property management in a single system.
2011	**Regression (negative factor):** abandonment of a licensed computer software in 2009, disuse of the management tool to classify the technologies adopted since 2006, and headquarters address change. The interpretative limitations and leadership rationality were evident.	**Replication:** partnership with a foreign university associated with the emphasis on disseminating best practices. Nevertheless, the capability remained at the same stage due to sedimentation or formation of the TTC *mainstream*.
2012	**Improvement:** partnership with an international company, beginning of the publication of newsletters as a showcase, more actions to improve the TIC's visibility in the market, promotion of regional events and fairs, and the constitution of an international network project.	**Renewal:** acceleration of bureaucratic procedures for signing partnership contracts, creation of new projects, and the adoption of a business classification and validation model have matured and renewed the TTC.
2013	**Replication:** persistence of problems from previous years kept the TTC at the same stage, but	**Replication:** no change in the stage due to the paralysis in developing an internal

	the technology transfer model had a territorial increase when reaching Latin American organizations.	management system. However, it was possible to improve the communication capability with alternative use of public social media while maintaining the level of TTC replication.
2014	**Regression (negative factor):** headquarters change, invention, and strike. The severity of the resulting effects on the TTC development was not greater due to the implementation of new remote process management systems, the creation of a new communication sector, and the beginning of a multilingual project to internationalize technology supply.	**Improvement:** leadership in creating a regional innovation network and improved standardized procedures have positively reinforced the TTC.
2015	**Renewal:** update of the legal institutional framework, constitution of a new acceleration program for new companies, the division of the newsletters into two journals, and the creation and improvement of several newly implemented computerized management systems allowed the TTC renewal.	**Replication:** maximum level of best practices consistency, and also their dissemination. Better technology supply targeting using a specific computer software, new projects, the creation of a new Committee related to technology transfers, and the conduction of national and state events corroborated the TTC replication in Brazil.
2016	**Improvement:** despite the communication and personnel limitations, the consolidation of software, systems, and interorganizational relations increased the TTC.	**Replication:** improvement in the layout of the published annual report and increase in licensing contracts, demonstrating the development consolidation at the maximum TTC level.
2017	**Improvement:** despite the drop in technology transfer contracts, the software and projects consolidation, the newsletter improvement, and the launching of an innovation award event supported the TTC at the same level.	**Replication:** *mainstream* maintenance.
2018	**Replication:** the effects of the previous year's actions provided TTC replication characteristics.	**Replication:** *mainstream* maintenance.
2019	**Replication:** second edition of the awards event and improvement in the dissemination of TIC information on the website allowed an increase in TTC replication.	**Replication:** *mainstream* maintenance.
2020	**Regression (negative factor):** Covid19 pandemic paralyzed this TIC's TTC.	**Renewal:** substantial increase in the quantity of effected technology transfers.

Source: Prepared by the authors.

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