TTOs as hybrid organization: Strategies of integration and differentiation

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Abstract
In the last decades we are witnessing an increase in public-private partnerships that are built to strengthen innovation capabilities of regional systems through technology transfer and tackle issues that single organizations could not face on their own. Technology transfer offices (TTOs) may play a relevant role in such partnerships. Given that industry and university operate according to different logics that are in turn rooted in different cultural frames, interests, goals, and behaviors, intermediary organizations like TTOs base their activity on lowering the potential for misunderstandings and disagreements, as well as on building bridges of communication to improve the efficiency of their particular technology transfer activities. This work discusses technology transfer offices as brokers pursuing hybridization strategies based either on integration or differentiation. In particular, insights are drawn from literature on new organizational forms to debate hybridization strategies (i.e., differentiation and integration) in technology transfer partnerships.

Keywords: Technology Transfer Offices, public-private partnerships, hybridization strategies

Introduction
The phenomenon of public-private partnerships (PPPs) for innovation has been frequently theorized and highly disputed both in scientific literature and in managerial conceptualizations (Osborne, 2002). Socio-economic challenges introduced by the rapidly globalizing economy, including increasing international competition and hybridization of markets, new governance models for the public sector and shortcomings of traditional models of regional development are pushing organizations across the private and public sector to engage in hybrid forms of collaboration (Asheim & Isaksen, 2002; Audretsch et al., 2002; 2014; Cooke et al., 1997; Doloreux & Parto, 2005; Etzkowitz & Leydesdorff, 2000; Stiglitz & Wallsten, 1999).

The main stakeholders of public-private partnerships for innovation are organizations such as universities dealing with increasing financing needs, private companies operating in highly competitive sectors where scientific and technological progress develop rapidly and public organizations that must increasingly legitimate their role in the public domain. Since sources of knowledge are widely distributed in modern economies, such organizations must come to terms with the fact that singularly, they no longer have the required skills to bring significant innovations to the market or to their main stakeholders. Consequently, a rising tendency shows such organizations in search for innovation resources and stimuli outside their boundaries and thus, outside their comfort zones (Chesbrough, 2007; Googins & Rochlin, 2002; Selsky & Parker, 2005; Ungureanu et al., 2019).

While a large number of studies have explored the technology transfer under a wide range of perspectives (for reviews see Agrawal, 2001; Autio & Laamanen, 1995; Bozeman, 2000), the role of intermediary organizations such as TTOs is still largely overlooked in the literature (Klerkx & Leeuwis, 2009). This is surprising because most innovation partnerships have one or several intermediary organizations that bridge the boundaries between the different mindsets that co-exist inside the partnership. While the specific objective for which intermediaries are set up may vary, a

key role is to build relationships and facilitate communication and collaboration of universities with industry and in some cases also with other actors such as policy makers and the local government. A main feature of TTOs is that usually they are strongly connected to the mission, goals and strategic objectives of the university partner, although the strength of such connection may vary. For instance, a TTO may be set up to facilitate the commercialization of university intellectual property (IP) through licensing or firm formation (Bigliardi et al., 2015; Markman et al., 2005; Villani et al., 2017). TTOs can additionally facilitate entrepreneurial activity, for instance spin-off activity and stimulate interaction between spinoffs, new entrepreneurial firms and public or private investors (Comacchio et al., 2009; Weckowska, 2015). Additionally, some TTOs may also have the mission of actively driving and managing collaborative research projects with industry (Boehm & Hogan, 2014; Ungureanu et al., 2018a, 2018b; Ungureanu & Macrì, 2018). Specifically, given that university and industry operate according to different logics that in turn are grounded in different cultural frames, goals, interests, motives and behaviors, intermediary organizations base their activity on reducing the potential for disagreements and misunderstandings, as well as on creating communication bridges to improve the efficiency of their particular technology transfer activities (Boehm & Hogan, 2014; Comacchio et al., 2009; Siegel et al., 2004). In concrete terms, TTOs can have several key functions. Not only they reduce overall transaction costs (including costs to search partners) and coordinate with potential partners, but they also strive to create a sufficient 'platform' effect to motivate partners' active participation to the partnership and work to overcome rising conflicts and misunderstandings between partners (Amesse & Cohendet, 2001; Kodama, 2008; Villani et al., 2017; Ungureanu et al., 2018b).

Studies suggest that TTOs play an important part in accompanying regional innovation systems (RIS) throughout their development stages (Benassi & Minin, 2009; Bigliardi et al., 2015; Perez & Sanchez, 2003; Roxas et al., 2011). For instance, since cooperation and learning behaviors do not emerge spontaneously, it is necessary to support interaction around issues that tend to be complex in PPPs, like planning, decision making, resource allocation, project control and outcome evaluation. Studies have generally referred to these support strategies as network management (Perez & Sanchez, 2003; Roxas et al., 2011; Siegel et al., 2007; Ungureanu et al., 2018a, 2018b). However, as straightforward as the benefic effects of TTOs may seem, there are many challenges that condition their effectiveness (Audretsch et al., 2014; Geuna & Muscio 2009; Nelson & Byers, 2015; Siegel et al., 2007). It is here argued that an important yet under investigated issue about TTOs is the degree to which they remain connected to the university partner or undergo a process of increasing hybridization. The topic is both timely and relevant, since there has been a recent debate in Europe on the importance of TTOs as leverages of public-to-private technology transfer and questions have been raised about the efficacy of their actions and their overall performance. Since the connection with researchers and the research institutions is supposed to be a determinant of success, investigating this relationship, as well as its evolving dimension, becomes a necessary step to the comprehension of the mechanisms of technology transfer. To further explore these issues, the study now turns to literature on logic hybridization in general, and on public-private logic hybridization in particular.

From representing one to representing many: TTOs and public-private logic hybridization

It is widely acknowledged that often times innovation projects require significant changes in both the innovators and the systems they put in place in order to innovate. However, when partners must make decisions about their collaboration as the project unfolds, many challenges arise. As partners become both observers, participants and decision makers in their environments, their perceptions of how affording or constraining the collaboration is, may significantly impact how they decide to use their broker to structure the collaboration.

It has been argued that despite the long list of benefits and advantages of public-private collaborations for innovation, many of them fall short of meeting the desires and expectations of participants when they don't fail for other reasons as well, and the role of TTOs in such processes has often been considered determinant (Audretsch et al., 2014; Bertolotti et al., 2019; Geuna & Muscio 2009; Nelson & Byers, 2015; Siegel et al., 2007). Importantly, while there are many cases in which TTOs remain highly connected to one of the partnering organizations – i.e., usually the university – it has also been suggested that for TTOs to succeed in their brokering role, they must be acknowledged as such by the partnering organizations (Bertolotti et al., 2019; Etzkowitz, 2002; Sarpong et al., 2017). For instance, an organization may be more willing to share information with the TTO, transfer resources to the broker or delegate decision-making if they perceive that the TTO represents its interests within the collaboration/partnership, and not those of the other partners (Ungureanu et al., 2018a, 2018b). Additionally, it has been shown that managing multi-stakeholder cross-sector innovation systems is a challenging mission, with TTOs managers often having difficulties in gaining partners' legitimation and support (Koppenjan & Klijn, 2004), and struggling with interpersonal dynamics such as partners' mistrust or their oscillating behavior (Bertolotti et al., 2019; Ungureanu et al., 2018a, 2018b). Therefore, in many public-private partnerships for innovation, the hybridization of the TTO represents an important step in the lifecycle of the collaboration and significantly influences its ability to evolve and reach higher levels of integration (Huyghe et al., 2014; Ungureanu et al., 2018b; Ungureanu & Macrì, 2018). However, the process by which the operating logics of the TTOs become hybrid, and its impact on partnership collaboration, have received little attention so far.

Public-private hybridization strategies: differentiation, integration and beyond

Public-private hybridization implies crossing boundaries between public and private logics or reducing such boundaries by gradually creating models that lie 'in-between' and that vary in terms of how integrated, or how core to the functioning of the organization the two logics are. The literature on hybridization processes has acknowledged that organizations commonly transgress private and public logics in search of a renewed equilibrium between external changes (industry shocks, sectorial crises, new policies and regulation) and internal needs for growth and development, depending on a firms' lifecycle or process of innovation in progress (Cornforth & Spear, 2010; Van Looy et al., 2005; Koppenjan & Klijn, 2004; Ebrahim et al., 2014; Rago & Venturi, 2014). Importantly, literature has also begun to discuss the advantages and challenges related to hybridization, and the strategies that organizations use to deal with deriving opportunities and threats (for a review see Battilana & Lee 2014).

Usually hybridization is said to cause drastic changes in the governance and business model of an organization, requiring the organization to rethink how organizational resources are used to move the organization forward, the relationship with multiple stakeholders or the organizational and human resources management (Daily et al., 2003; Ebrahim et al., 2014; Mair et al., 2015). Studies that emphasize the positive aspects of institutional plurality suggest that operating in institutional interstices and combining multiple logics might open up opportunities, such as access to broader sets of resources and practices, which allows organizations to be innovative, to create new products and services and to pioneer new ways of organizing (Jay, 2013; Kraatz & Block, 2008; O'Mahony & Bechky, 2008; Reay & Hinings, 2009). By contrast, other studies have emphasized that the context of institutional plurality in which such organizations operate creates ambiguity about incentives, resources and performance indicators (i.e., the organization must learn to manage, integrate and account for mixed resources, partly deriving from public funds for non-profit activities and partly deriving from typically for-profit instruments) and possible conflicts and tensions that the organization does not know how to face (i.e., solving conflicts between stakeholders, users, customers and other beneficiaries, in particular in relation to problems related

to the determination of the price of goods sold or services provided) (Anheier & Krlev, 2014; Doherty et al., 2014; Ebrahim et al., 2014; Pache & Santos, 2010, Propersi, 2011; Townsend & Hart, 2008). Other mentioned challenges concern the need to introduce elements of innovation such as greater transparency, evolved accountability tools, better management of information flows; new models of risk sharing and new ways of strengthening organizational cultures and organizational identities of hybrid organizations (Propersi, 2011; Venturi & Rago, 2014).

As far as the strategies employed by organizations to implement hybridization, studies have emphasized different strategies, each having its own significant challenges (Battilana & Dorado, 2010; Battilana & Lee, 2014; Besharov & Smith, 2014; Jay, 2013; Doherty et al., 2014; Mair et al., 2015; Pache & Santos, 2010). So far, two macro-types of strategies for coping with hybridization challenges have been discussed.

Differentiation refers to the strategy by which an organization tries to expand its mission in another sector not by developing the new logic internally but by relying on external partners (i.e., balancing dual performance) (Battilana & Dorado, 2010; Battilana & Lee, 2014; Ebrahim et al., 2014; Mair et al., 2015; Pache & Santos, 2010). In the case of a university TTO, differentiation would mean specializing one's resources in relation to the competencies and objectives of the university (patenting, academic research commercialization, fund raising, spin-off venturing) and at the same time establishing strong partnerships with the TTOs of the other partners such as the R&D offices of private companies participating to the partnership, or the innovation offices of public organizations such as municipalities or public utility companies, provided these offices exist, that they are also strongly specialized in carrying forward the innovation mission and objectives of their organization of reference, and provided they are motivated to develop such strong collaborations with the other offices for the sake of the partnership.

Integration, by contrast, refers to internal recombination based on interaction between the two logics (private and public) and on control mechanisms that try to ensure that one logic does not prevail on the other. Integration may be focused on reconciling and reducing the tensions between different stakeholders, for instance by creating a unique point of refence (i.e., unique TTO) for the partnership and hiring personnel that can learn to apply logics synchronously, providing the TTO with mixed capital, creating a governance system that is both strong and independent from the single partners, as well as creating a strong organizational identity for the TTO that incorporates values from both logics and transforms them into something new (Battilana & Dorado 2010; Ebrahim et al., 2014; Mair et al., 2015).

As previously anticipated, both differentiation and integration are said to be difficult to implement: The main challenges associated to the differentiation strategy seem to be related to the fact that the hybrid organization continuously oscillates between the two logics, unable to integrate them. This may also lead to adopting a symbolic process of hybridization that pursues mere legitimation purposes and not a genuine and substantive change process, for instance looking good in the eyes of the partners instead of risking to make some of them discontent as the innovation process is pushed forward (for a discussion of the path from impression management to authentic communication see studies by Ungureanu & Bertolotti, 2016, 2018). In the specific case of the TTO, at least another challenge must be considered: the fact that the other TTOs may not exist or may be less focused on innovation or on boundary-spanning, and thus less willing or able to coordinate with the TTO, vanishing this way the collaborative project of the partnership. As far as integration is concerned, the main finding regards the beneficial but difficult to achieve balance that it provides. While the risk with differentiation strategies remains highly anchored in the original logic and thus unable to assimilate the new logic, a phenomenon that has been frequently reported during integration strategies is mission drift, a process by which an organization gets carried away by the newly adopted logic, growing distant from the logic that was initially core (Ebrahim et al., 2014). For instance, over time, public or social-oriented organizations run the risk

of conforming to demands from their paying customers, and of dismissing the needs of beneficiaries who may lack resources and the ability to pay, or forget about the common good priorities for which they entered the partnership in the first place (Battilana et al., 2014; Austin & Seitanidi, 2012).

It is also interesting to point out that while most studies have argued for one of these strategies, other studies have alluded to 'dissident behaviors' of companies that act as creative bricoleurs towards the logics they adopt, engaging in selective coupling and creative reassembling (Jay, 2013). From such perspective, an organization's ability to generate new knowledge has been suggested to depend on the chosen hybridization strategy. For instance, integration strategies based on synthesis or paradox management may encourage the creation of new knowledge or the exchange of tacit knowledge from the partnering organizations (Jay, 2013; Stark, 2011).

Table 1 summarizes my arguments about the need to create strong connections between the functioning logics of the TTO and its technology transfer activities, especially in those cases in which the TTO pursues a goal of logic (i.e., public-private) hybridization, either through integration or through differentiation.

Table 1. the relationships between functioning logics and TTOs' activities

HYBRIDIZATION STRATEGY	HYBRIDIZATION THROUGH DIFFERENTIATION	HYBRIDIZATION THROUGH INTEGRATION
STRATEGY DESCRIPTION	Strategy by which an organization tries to contain both public and private logics not by developing a new logic internally but by strongly specializing in one logic and relying on external partners for the implementation of the other logic (i.e., balancing dual performance).	Internal recombination based on interaction between the two logics (private and public) and on control mechanisms that try to ensure that one logic does not prevail on the other.

Discussion

As far as differentiation strategies are concerned, more needs to be understood about cases when the TTO is perceived by partners as too disconnected (too much privacy and separation), or as too public and thus threatening of partners' need to maintain differentiation. Also, when the TTO is very much connected to the university partner, other partners' perceptions must also be carefully investigated, as these latter may perceive their autonomy as threatened or the TTO as not really theirs. Another aspect that deserves further attention regards the connotations that each partner projects upon the hybrid organization, via their own understanding of what hybridization implies. Regarding the competencies that TTOs need in order to design effective technological transfer, it is important that TTO management sets up protocols to investigate, both formally and informally, partners' private strategies for hybridization in order to effectively leverage such understandings within their differentiation strategy. Additionally, it is important that managers develop consultation skills to prevent and dismantle partners' resistance towards hybridization attempts.

As far as integration strategies are concerned, I highlight that TTOs need to convey tangible and well-articulated collaboration projects because the discrepancies between tangible projects and intangible expectations related to hybridization can have a negative role on partners' perceived ability to integrate differences in a unique, shared framework. In the same way, TTO organizations that are unbalanced in favoring privacy through the creation of separate or autonomous project areas risk becoming mere containers of weakly integrated organizations that reclaim their autonomy.

Last, I also suggest that another future research direction is understanding competencies necessary for TTOs to design spaces that aim at reflecting mixed hybridization strategies (i.e., strategies in between differentiation and integration). Drawing on the garbage-can theory (Cohen et al., 1972), this work suggests that TTOs that adopt a mixed strategy in between differentiation and integration may be set up and used following a garbage can model, thus as "a collection of choices looking for problems, issues and feelings looking for decision situations (…), solutions looking for issues to which they might be the answer, and decision makers looking for work". However, the issue of mixed hybridization strategies has been underivestigated so far, and new studies on mixed strategies would further develop the arguments proposed in this study.

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