Organizational design of research results transfer offices: systematic revision of the literature

Diseño organizacional de oficinas de transferencia de resultados de investigación: revisión sistemática de literatura

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Abstract  
This article presents a literature systematic review of the academic material published regarding the existing gaps that may create research problems in the Organizational Design and Research Results Transfer Office (OTRI for its acronym in Spanish) environment. This is based on the approach developed by Siegel, Waldman, & Link, (2003). The main results are presented quantitatively from the findings obtained at SCOPUS, JStor, Academic Search Complete and EconLit.

Keywords: Organizational Design, Research Results Transfer Offices, Literature Systematic Review.

Resumen  
Con el fin de descubrir los vacíos existentes que puedan llevar a construir problemáticas de investigación en el ámbito de diseño organizacional y oficinas de transferencia de resultados de investigación, este artículo presenta la revisión sistemática de literatura sobre lo publicado en el ámbito académico al respecto de las dos temáticas. Los principales resultados se exponen de manera cuantitativa a partir de los hallazgos en las búsquedas realizadas en Scopus, JStor, Academic Search Complete y EconLit.

Palabras clave: diseño organizacional, oficinas de transferencia de resultados de investigación, revisión sistemática de literatura.

1 “This work is the result of the 797 Agreement signed between the Colombian National Education Ministry and Institución Universitaria Politécnico Grancolombiano”
Introduction

Organizational design is a challenge for companies within the global context (Vargas-Hernández, 2006). Rico et al (2004) justify their empirical research work regarding how important new forms of work organization are within the context of knowledge society. These authors took into account more specifically, the increase of the flexibility and participation of workers, which are topics that belong to organizational design.

Siegel, Waldman, & Link, (2003) analyze the productivity of OTRIs by using the estimation of stochastic frontier as a tool and the Cobb-Douglas production function as an estimator. However, the authors indicate that there is a gap in order to determine the way organizational tendencies affect productivity, and that this is the reason why their model changes.

On the other hand, Wijk, Jansen, & Lyles, (2008) analyze the forms of knowledge transfer in order to fully understand its background and consequences. By using the meta-analysis methodology, the first model sets Performance and Innovation Capability as the main consequences and elucidates three key components as preceding events of the organizational knowledge transfer: Types of Knowledge, Organizational Dimension, and Generation of Networks.

Likewise, Tiffin & Kunc, (2011) measure the roles universities play in development. Afterwards, they match those roles to what is defined as performance indicators: training (new extension courses), research, consulting, new firms, and facilitating linkages (among companies, state, and universities.) In addition, they suggest studying deeply these roles because micro-level problems may explain macro-level problems.

Collecting the previous recommendations and the gaps found in the first model of this section, it is important to study organizational design as a premise, a micro-level problem, and a variable in the middle of knowledge transfer, especially, when Colombian universities are not well-prepared to face the challenge of taking part in ambitious projects of royalties for science, technology, and innovation. For all these reasons, this paper systematically revises all types of literature that can enlighten this topic of research and make us reflect about research results transfer and organizational design.

Reference Framework

Arocena & Sutz, (2001) indicate that Higher Education Institutions are the main knowledge producers in Latin America. They set a series of scenarios in order for those institutions to interact between the generation of knowledge and their transformation. They basically outline two scenarios: one optimistic and the other one pessimistic. The following table summarizes the descriptions provided by the authors for each scenario:
Table 1. Prospective of Knowledge Generation

<table>
<thead>
<tr>
<th>Optimistic Scenario</th>
<th>Pessimistic Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Productive actors trust in local R&amp;D</td>
<td>• Scientists and engineers leave universities and the</td>
</tr>
<tr>
<td>• University-Business Alliances in order to face complex</td>
<td>country</td>
</tr>
<tr>
<td>strategic problems</td>
<td>• Tensions that impede university growing</td>
</tr>
<tr>
<td>• Successful cases of the previous items</td>
<td></td>
</tr>
<tr>
<td>• Structures to be adapted in universities focused on</td>
<td></td>
</tr>
<tr>
<td>business needs</td>
<td></td>
</tr>
<tr>
<td>• Virtuous circle to solve local problems</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Compilation Based on Arocena & Sutz, (2001)

Leaning towards the optimistic scenario, it is crucial to revise the knowledge management paradigm where Nonaka (2007) states that knowledge generation responds to the synergy and interaction between continuous and steady communication processes of what is tacit and explicit. Due to all this, it is possible for organizations to generate, transfer, and pass on knowledge between their contributors and stakeholders.

It is important to mention that tacit knowledge is the one that belongs to one or several individuals. It is implicit because it is not formal within the organization and corresponds to individual experiences or to the know-how of particular character. In contrast, explicit knowledge is formal and by definition, it should have evidence in the history of the organization. For this reason, and unlike tacit knowledge, it is easily transferable.

However, tacit and explicit knowledge coexist within a continuous synergy where the following interactions prevail:

- Systematization (Explicit to Explicit): Conversion of explicit knowledge into new formal-like knowledge.
- Appropriation (Explicit to Tacit): The know-how the organization acquires at the same time that formal knowledge is applied.
- Conceptualization (Tacit to Explicit): Formalization of explicit knowledge.
- Dissemination (Tacit to Tacit): Transmitting to or assimilating informal knowledge from other individuals. (Ikujiro Nonaka, 2007)

Works like the one mentioned above or the one developed by Nonaka & Takeuchi, (1999) revise rigorously the concept and processes of knowledge management and therefore transference in the inter-organizational environment. It is possible to create a metaphor with these processes within the context of Higher Education Institutions because their mission is to appropriate, transfer, and produce knowledge not only to their students, but also to the society.

Different studies have analyzed the roles of universities as knowledge producers for urban development (Bugliarello, 1996; Perry & Wiewel, 2005), technological and economic development (Cummings, Rosentraub, Domahidy, & Coffin, 2005; Rodin, 2005), and development or social change (Ostrander, 2004).

Mayer, (2007) by focusing on the role of universities in economic development, says that the creation and increase of employment levels in innovative regions such as California’s Silicon Valley, Boston’s Route 128, Austin in Texas, and North
Carolina’s Research Triangle Park have brought Science, Technology, and Innovation public policy makers into trying to copy those models. Nevertheless, other regions such as Colorado Springs or Portland, OR, have been hubs of technological development with no universities nearby (Mayer, 2007, pp. 44-47).

In fact, the literature on the characterization of innovative regions talks about three models (Mayer, 2007, p. 34). The first one is characterized by the presence of research universities. The second model hosts research institutions that can or cannot be universities (Luger & Goldstein, 1990; Saxenian, 1985), and the third one focuses on regions that do not have a research university (Mayer, 2007, p. 44).

To Tiffin & Kunc, (2011) there are two ways in which universities can be part of the development of a region: generation and execution. According to the degree of autonomy and of interrelation of universities with their environment, it is possible for them to have roles such as Labor Force, Research –from their role applied to the industry or local problems (Coenen, Moodysson, Ryan, Asheim, & Phillips, 2006; Fleet, 1993)–, Consultancy –helping the industry to solve immediate problems or to take advantage of opportunities (Arvanitis, Kubli, & Woerter, 2008), Entrepreneurship –by favoring technological companies from the Spin-Off and Start-Up phenomena, (Zahra, Van de Velde, & Larraneta, 2007; Luger & Goldstein, 1990), and Cooperation Facilitator –among students, companies, and researchers (Cooke, 2002).

Methodological strategy

Due to the premises and guidelines highlighted by the previous authors, it is really important to measure the status of this topic along the last three decades. This is an essential topic for the construction of knowledge; therefore, it is of great interest to know the research and production status regarding OTRIs and OD (Organizational Design). Wijk, Jansen, & Lyles, (2008) invite to carefully examine these elements because of their relationship and cohesion to achieve transfer processes.

In order to measure this, we took as a reference point the last three decades and the scientific production –through their key words– regarding the main concepts revised in the introduction along with a synonym validated against three (3) experts: Organizational Design, Academic Research, and Transfer of Research Results.

These concepts were entered into the scientific databases SCOPUS, JStore, Academic Search, and EconLit. The search was filtered according to the already mentioned reference point. Table 2 indicates the search equations used. As a result, we obtained 4240 records for a 33 year period, between 1980 and 2013.
Every Abstract and Full Text of the documents found was entered in the tool Mendeley. Duplicate data were deleted and the total number of documents was 3034. These documents were analyzed as follows:

Revision of study field belonging if they met at least one of the following selection criteria:

1) The article is about Organizational Design (OD) within the entrepreneurial environment.
2) The article is about Organizational Design in Higher Education Institutions.
3) The article is about research results transfer within the entrepreneurial environment.
4) The article is about research results transfer structures within the Higher Education environment (or in Higher Education Institutions) - (OTRI).

Each variable text was revised regarding: co-writing country or region of origin, approach, and methodology. Here, we present the findings.

### Findings

When analyzing the time evolution of production regarding this research topic, Figure 1 was created. There, it is possible to observe several systematic behaviors of level, tendency, and seasonality by the display of an upward trend in the academic production of the last three (3) decades.
This shows the growing interest on this topic within the international scientific community. It is worth mentioning that the downfall shown in Figure 1 is due to the level of production for the first months of the current year (2013). This year’s projection will be adapted to the regular behavior of research growth regarding this topic.

Likewise, the selection criteria were revised and we found that the criterion most frequently met was the topic of Organizational Design.

### Table 3. Number of Articles that Meet a Certain Number of Criteria

<table>
<thead>
<tr>
<th>Criteria Met by Article</th>
<th>Number of Articles</th>
<th>Percentage Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>61%</td>
</tr>
<tr>
<td>2</td>
<td>48</td>
<td>29%</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>1%</td>
</tr>
<tr>
<td>4</td>
<td>13</td>
<td>8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>163</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

*Source: Author’s Compilation Based on the Articles Found by the Search Equation Applied to the Consulted Databases.*
The development of new methods that can generate structures to transfer research results obtained in companies or higher education institutions is really important and interesting. We present an analysis of this process from the construction of graphics and punctual analysis that will account for the current status of this topic. This revision will be divided in three parts: (1) Information about the production of articles within the last three decades. This analysis is complemented by the Production Distribution Degree, the Co-writing Degree, and the Production Degree per Country; (2) The second analysis comprehends the degree of criteria met by the articles with respect to the central axis of the topic analyzed; (3) Approach Degree and methodology used for each article.

**Information Regarding the Production of Articles within the Last Three Decades; Analysis Complemented by the Production Distribution Degree, the Co-writing Degree, and the Production Degree per Country**

Throughout history, the need to generate economies able to endure global changes has been essential to foster the development of technologies able to place societies at the forefront in order to generate more resources and, therefore, better stability to their inhabitants. Likewise, the need to create support networks arises in order to generate a solidary information exchange between the generator of ideas and the entity that applies and benefits from them. Based on the search for an optimal organizational design, people have investigated different ways and methods to apply an efficient system to transfer the results of a research regarding an organizational design. This has led us to present the production degree of papers on this topic through an analysis of the filtered articles that met the requirements mentioned in the introduction.

**Figure 4. Number of Articles per Year**

![Number of Articles per Year](image-url)

*Source: Author's Compilation*
Production Distribution Degree, Complementary Analysis

Because this research is based on a bibliometric analysis that follows up the status of the research within a time frame of 33 years, we analyzed the distribution degree of the production per Author and the Co-writing Degree that exists in each research document.

**Table 4. Production Distribution Degree (Main Author)**

<table>
<thead>
<tr>
<th>Number of Articles They Co-write</th>
<th>Number of Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>145</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: Author’s Compilation

**Figure 5. Number of Main Authors with Respect to the Number of Articles They Co-write**

Source: Author’s Compilation

**Table 5. Co-writing Degree**

<table>
<thead>
<tr>
<th>Number of Authors</th>
<th>Number of Articles</th>
<th>Percentage Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>37%</td>
</tr>
<tr>
<td>2</td>
<td>58</td>
<td>36%</td>
</tr>
<tr>
<td>3</td>
<td>28</td>
<td>17%</td>
</tr>
<tr>
<td>4</td>
<td>13</td>
<td>8%</td>
</tr>
</tbody>
</table>

Source: Author’s Compilation

**Figure 6. Number of Co-writers Regarding Number of Articles They Co-write**

Source: Author’s Compilation

**Figure 7. Co-writing Percentage Distribution**

Source: Author’s Compilation
Production Degree per Country

After analyzing the production degree, with respect to its main authors and the co-writing degree, it is natural to think of an analysis based on the degree of global production. This analysis was carried out focused on the place where the research related to the central topic of this paper was developed. Below, you can find the figure that indicates the production degree per country:

Figure 8. Production Degree per Country

Source: Author’s Compilation

Degree of Approach and Methodology Used for Each Article

In order to measure the degree of approach, we classified the articles as quantitative, qualitative, and mixed—a hybrid between the quantitative and the qualitative approach. These classifications were made after reading the abstract of each filtered article and the following table was produced:

Table 6. Number of Articles Regarding Type of Approach

<table>
<thead>
<tr>
<th>Approach</th>
<th>Number of Articles</th>
<th>Percentage Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantitative</td>
<td>34</td>
<td>21 %</td>
</tr>
<tr>
<td>Qualitative</td>
<td>114</td>
<td>70 %</td>
</tr>
<tr>
<td>Mixed</td>
<td>14</td>
<td>9 %</td>
</tr>
<tr>
<td>Total</td>
<td>162</td>
<td>100 %</td>
</tr>
</tbody>
</table>

Source: Author’s Compilation

As you can see, the approach of an organizational design (OD) research and of the research results transfer structures (OTRI) is represented qualitatively by 70 %. This can be seen in the following figure:

Figure 9. Number of Articles Regarding Type of Approach

Source: Author’s Compilation

Methods Used

It was necessary to delve into the methodology used according to the type of approach due to the approach degree. This means, if it was a Qualitative Approach, it was possible to use surveys and Focus Group; however, if it was a Quantitative Approach, it was necessary to use surveys, econometric analysis, and data mining. Sometimes, several articles presented a combination of methodologies when using a hybrid approach.
Here, we present the number of articles per type of approach that had a specific type of methodology:

**Table 7. Number of Articles that Applied Any Type of Methodology According to the Approach**

<table>
<thead>
<tr>
<th>Approach</th>
<th>Number of Articles</th>
<th>Percentage Distribution</th>
<th>Mixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviews</td>
<td>18</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Focus Group</td>
<td>16</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>Econometrics</td>
<td>0</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>Surveys</td>
<td>0</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>Data-Mining</td>
<td>10</td>
<td>31</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>44</strong></td>
<td><strong>85</strong></td>
<td><strong>53</strong></td>
</tr>
</tbody>
</table>

*Source: Author’s Compilation*

**Table 8. Authors per Type of Methodology Applied**

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Authors</th>
</tr>
</thead>
</table>
### Methodology

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econometrics</td>
<td>(Novo et al., 2010; Pentland, 2003; Roberts &amp; Greenwood, 1997)</td>
</tr>
</tbody>
</table>

This table shows that the most frequently used methodology in the qualitative approach is surveys, while the most applied in the quantitative approach is data-mining. This can be seen in the following figure:
Discussion

It is important to highlight that the literature on theoretical terms has a gap regarding the aforementioned methodology. Latin American reality—especially in Colombia—does not compare to the contexts that have been successful in the generation of transferable research results, susceptible to generate economic development. Also, many of public policy makers are trying to emulate them (Inventta, 2011).

According to Mintzberg (2001), every human activity that requires to be organized originates two requirements: division of labor and coordination of tasks (page 6). This way, organizational design is the result of the construction or of the change of structure within an organization. All this oriented to the achievement of its goals.

Mintzberg proposes these designs as OD dimensions: positions, superstructure, design of lateral linkages, and design of a decision-making system. The parameters for the design of positions are mediated by two variables: job specialization and behavior formalization, but the parameters for superstructure are degree of unit grouping and of unit size. This theory cannot be applied to the R&D environment in Higher Education Institutions, as stated in the integrated vision of the new concepts of organizational design, DeSanctis, Glass, & Ensing, (2002). They describe three ways to organize work for R&D activities at business level: Decentralized, Integrated, and Network.

The Decentralized design is characterized by having one R&D unit for each business unit saving the idea of having central control schemes for that function. Integrated DO has a centralized R&D area and allows the functioning of projects within business units without losing the control of the system or its information (DeSanctis et al., 2002, p. 62).

Network organization and the theories of Anand & Daft, (2007) regarding the third stage of OD are on the same page. They argue that it is necessary to go beyond and ask for the collaboration of others in order to achieve a common objective. The paradigm here is to research in alliance with the government and research universities.

The approach of the aforementioned authors allows having an OD overview, more specifically regarding R&D in productive sectors. Nevertheless, Bahrami, (1992) concludes, as well as Red de DeSanctis et al., (2002), while studying some cases in Silicon Valley, that it is important to leave behind monolithic models for the organization of work in order to increase flexibility within innovation and development.

Bahrami states that the emergence of flexible organizations within the context of innovation and technological contexts faces dialectic tensions between control

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Bahrami states that the emergence of flexible organizations within the context of innovation and technological contexts faces dialectic tensions between control...
and autonomy by enabling individual creativity and avoiding chaos. In addition, and from its empirical validation, the author finds essential differences between the organizational attributes of the traditional and the emerging models. These are summarized on the table below:

<table>
<thead>
<tr>
<th>Traditional Model</th>
<th>Emerging Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only Center</td>
<td>Multiple Centers</td>
</tr>
<tr>
<td>Autonomous</td>
<td>Panel of Experts</td>
</tr>
<tr>
<td>Independent Activities</td>
<td>Interdependent Units</td>
</tr>
<tr>
<td>Vertical Integration</td>
<td>Multiple Alliances</td>
</tr>
<tr>
<td>Uniform Structure</td>
<td>Diverse Structures</td>
</tr>
<tr>
<td>Provincial Thinking</td>
<td>Cosmopolitan Thinking</td>
</tr>
<tr>
<td>Emphasis on Efficiency</td>
<td>Emphasis on Flexibility</td>
</tr>
</tbody>
</table>

**Table 3. Comparison of Organizational Attributes (From the Traditional Model to Flexibility)**

**Source:** Author’s Compilation Based on the Data Obtained from Bahrami, (1992)

In contrast, this research reflects in Colombia what Bahrami, (1992) stated while studying cases in Silicon Valley regarding the importance of leaving monolithic models behind when organizing labor in order to increase flexibility within innovation and development. The author also indicates that when a flexible organization appears in the context of innovation and technological development, it faces reasoning tensions between control and autonomy so it is necessary to give space to creativity without reaching chaos.

**References**


abstract


