

Customers' profile of a ready-to-commercialize-technologies identification model. (#1067)

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Abstract

Results of R&D activities derived from technology push approaches are challenging universities and research organizations of the kind to develop commercialization models in order to find the proper customer for those innovative products and or services. Selection criteria and commercialization rules supports an operational platform working under the frame of a Ready-to-commercialize-technology Model which involves researchers, managers, institutional officers and agents, as well as regulatory frameworks such as copyright ownership, taxes and ownership contraction. Matching the innovation supply with its correspondent demand is a key commercialization issue (Economic Theory), being the customer's profile identification a relevant input from the marketing perspective. Barriers emerge when commercialization of innovation activities are new functions for the R&D organization due to the lack of hard data of innovation customers profile. Working in the Technology Transfer field (Management of Technology Theory), marketing concepts such as customer and market segment are integrated as a means to gain efficiency for innovations commercialization efforts (Market Theory). In this paper Technology Transfer operations with 40 innovation customers are described from the commercialization process to the type of interaction realized with the R&D institution to gain understanding in the customer profile as a key component of the innovation management process, assuming that from the buyer perspective, acquiring technology solutions resulted from research and development activities becomes of key importance to add to the *collection of resources* inside an administrative framework, that enables a firm to gain competitive advantage (Resource View Theory). Under this premises, simple questions regarding the customer of R&D results such as Who are they? What do they buy? What type of linkage do they create with the technology developer? What is the impact of the purchase on their businesses? are explored here in an attempt to identify some R&D customer's profile.

Key Words: Technology Commercialization, Technology Transfer, Innovation Management, R&D Customer

Introduction

Technology Management Theory concepts support the idea that under Technology Push perspective, Innovation Management concept extends to the commercialization and transfer efforts required to find a customer and/or user who may benefit from it in the form of new products, processes or services from which the firms generate efficiencies, productive growth and market benefits [1], [2]. Defined as the transfer of systematic knowledge for the manufacture of a product or provision of a service [3] and as the movement of science and technology from one group to another [4], Technology Transfer addresses the assessment, adoption and implementation of

technology. As concepts move to operational fields questions such as: who the customer might be? arouse introducing concepts of other disciplines such as demand and supply from Economic Theory as well as customer profile and market segments from Market Theory, This is an important integration of multidisciplinary concepts derived from the movement of technology innovation or R&D results from the technical and/or scientific field of knowledge to the economics and market principles and concepts which prevails on the operational field. Among these concepts is the one correspondent to *Customer Profile* which is translated in I/TD language as the *user* or innovation *receiver* to be.

Literature on the matter states that Technology Transfer is difficult both to research and to manage in part because *the circumstances surrounding the interaction between technology development sources and technology receivers differ from transfer to transfer*, even within the boundaries of a single organization [5]. Upon this premises, efficient transfer from the innovation and/or technology development (I/TD) *sources* to *receivers* requires information input regarding the receiver/customer's profile. Two distinct dominant transfer situations have been identified in practice and in academic literature: (1) point-to-point and (2) diffusion [5]. In this research the interest of analysis corresponds to a point-to-point transfer mode, that is transfer from a single source to one receiver/user [6], [7]. As the analyzed context refers to dyad relations type, the generic content and structure of common interorganizational linkages considered by Auster (1990) were used to frame the customer's profile characteristics of R&D/Technology Development- results [8]. Upon this basis, the purpose of this paper is to describe the characteristics of the R&D results customer profile in a point-to-point technology transfer context, as a means to generate information useful for the R&D results' commercialization strategies defined within a Technology Transfer Institutional Model (Erosa & Perez, 2013) [9].

As described in Diagram 1, the research study's Conceptual Framework is supported by two main theoretical fields: (1) from Management of Technology Theory concepts such as Innovation Management and Technology Transfer explain main operation of the I/TD source (Organization X) regarding commercialization efforts to match I&D results with the proper receiver or user (Organization Y) who will crop the benefits of the innovation in the business arena. Working under a point-to-point context the marketing effort is oriented to find a single receiver/customer for such R&D result, bringing to the surface a dyad type of relations as well as providing different transfer-to-transfer type of agreement and negotiation conditions. This Organization X working scenario operates under a Technology Transfer Readiness Commercialization Model for mature R&D results. The second supportive theoretical field bridges the innovation generation dimension with the productive dimension, such powerful tool is the Economic Theory from which the concepts of demand, supply and customer emerge [9]. Using this technical language is easy to identify the technology (innovation and technology development) supply provided by Organization X, that should match the demand (satisfy a need) of an Organization Y, who is the subject to be transformed in customer as is a potential user of the R&D results. From this mutual interest a type of dyad relations emerge being embedded both organizations in actions that lead to interorganizational linkages creation between them, being for this reason a key strategic issue the identification of the customer's profile in order to move to market segments configuration as an operational tool to gain efficiencies in the R&D results commercialization efforts during the Technology Transfer process.

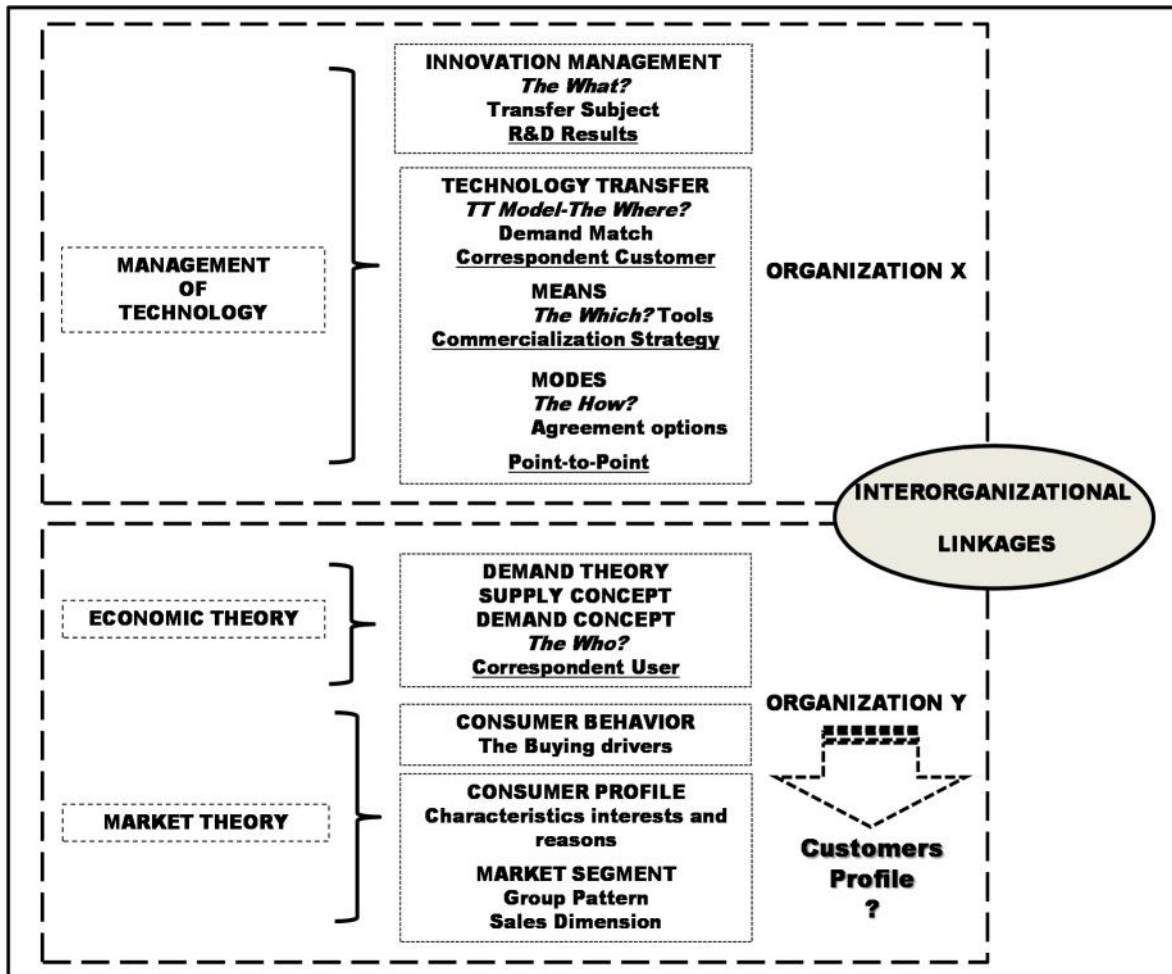


DIAGRAM 1. Conceptual Framework of the research study

The study's objective and derived Conceptual Framework leads the research work to dig into the meaning of two main constructs: Customer Profile and Interorganizational linkages. The first refers in the market theory arena to the description of a type of customer based on their *Demographic* (industry, location, size, employees, capital, etc), *Sociographic* (decision making process, business strategy, characteristics of problem areas, investment patterns, etc), and *Psychographic* (risk aversion, organizational culture type, organizational behavior, etc) properties [10]. The second construct -Interorganizational linkages- is defined as relations between two or more organizations formed to transfer, exchange, develop or produce technology, raw materials, products or information, the term linkage is used because the extent to which this relationships are mutually beneficial should not be overestimated (Auster, 1987, Buckley & Casson, 1988) [11] [12]. Content of a linkage refers to what is exchanged or transmitted (Homans, 1961; Blau, 1964). [13], [14]. Under the assumption that Technological Transfer is a one way linkage formed to transfer technology from organization X to organization Y, this paper explores key research questions in regard of *Who* are the R&D-results customers' of a Technology Source working under the technology push perspective and a point-to-point commercialization model? *What* do the customers buy? *What* type of linkage does the customer/technology user creates with the technology developer?

The Study and Setting

As a second part of a major research project [9] focused on the R&D results customer profile identification, the analysis setting is a Higher Technology Education Institution -comprised by 11 R&D Centers across the country, 4 R&D Centers in the Capital City of the country and 34 Engineering Technical Schools- was selected as Unit of Analysis due to two main characteristics: operates under a technology push perspective using a point-to-point practice as dominant transfer mode. This characteristics lead to work at the *Institution* level of analysis following a single case study research strategy [15], being the R&D results receiver *firms* the unit of analysis at customer level. Due to the nature of the research objective, description method is used to provide clarity to the identified relationships, this method do not predetermine dependent variables but instead is focused in the complexity of the phenomenon under study as new components appear [16], [17]. Based on data analysis to develop explanations (Explanation Building) for the phenomenon studied through careful analysis of the processes identified, on a first stage basic Technology Transfer activities were mapped as a Diagram and interactions among Technology sources and Technology receivers were identified. For this reason data collection methods included semi structured interviews to first top level managers who attend technology transfer activities at the selected Unit of Analysis. A second stage of data collection refers to intense revision of 72 Technology Transference project records of the time period of 2003-2010, developed for 52 private customers- to make sure that all of them are already inserted in the production and operating practices of the receiver. Each set of data from the different collection methods was grouped in meaningful dimensions using Content Analysis technique to build a typology of inter-organizational linkages resulting from the technology transfer operation process between the source and the receiver from which a set of socio-graphic characteristics was identified based on the content or specific technology/service transferred. Resulting socio-graphic characteristics were related to demographic characteristics of the technology receivers to produce sets of profiles identified.

Findings

The inter-organizational linkage creation

Technology Transfer procedures engages organization with different objectives and culture structures [18]. It is widely accepted the view of an organization as a coalition of groups and interest, each attempting to obtain something by interacting with others with its own goals and preferences [19]. Under this assumption, the process of linkage creation between organizations is managed as a means of three partner integration: the R&D founding supporter with a determined objective oriented to increase economic development (industry/region/sector, and others), the technology source (R&D institution) and the technology receiver usually a firm operating in the business arena with clear profitability objective. The three type of organizations share a common objective: obtain benefits from R&D results. Working for this purpose they move around different actions to make contact. To identify how the unit of analysis of this research study finds their partners to engage in the technology transfer process, data from semi-structured interviews were organized according to the linkage formation stage. In Table 1 are presented five stages identified for the linkage creation among the technology sponsor/supporter/the technology source and the technology receiver or R&D results customer. Each stage represents an intentional action made to generate inter-organizational linkages that could be developed into working networks creation. The contact stage is related to marketing efforts for results commercialization, while true linkage creation occurs when funds supports intentions and linkage operations then takes place. To do so, some operation guidelines are posed in form of communication rules and performance criteria to close honoring the agreement conditions formalized by the parties producing the required evidence.

Table 1.

Stages of linkage creation between Technology Source and Technology Receiver in the context of a Technology Push perspective and a Point-to-Point transfer mode

Stage	GOVERNMENT AGENCY (Third Party)	ACADEMY (Technology Source)	INDUSTRY (Technology Receiver)
1. Contact creation	Publishes in different media (Web, journals, newspapers, etc) the period to submit Innovation Projects for funds (usually low rate interest loans, seldom grants). No personal contact unless specific notice	Personal interviews, event participation, personalized written communication, web communication. Public Relations contact in Cameras and related Industry Organizations	In search of funds, consult, react and/or respond to Web submission periods. Makes or respond to contact with academy through personal communication.
2. Linkage creation	Fund requirements presented by the firm in the application should be supported by evidences or diagnosis.	The firm ask for a specific service, such as a technology position or competitiveness diagnosis	The firm accepts the results for the application as well as observations of the Government Agency and technical proposals from the educational institution.
3. Linkage operation	Decides about the fund amount to be authorized. Has full authority to accept or deny the application	Presents budget to potential customer usually subject to revision and negotiation	Negotiate prices of the service with academy, accepts results from the Government Agency.
4. Linkage communications	Budget control procedures (reports). Mail and written communication	Personal communication, written communication	Follows communication procedures determined by the selected partner
5. Linkage accountability	Contract and written Reports upon budget program	Contract and invoices payment	Follows control procedures determined by the selected partner

Types of Linkages.

What type of linkage do customers create with the technology developer?

As analytical tool, the generic content and structure of common interorganizational linkages or relative dependence of forms ranked by Auster [8] using the degree of resource investment that each linkage type consumes is the typology criteria.

1. Supply. One way linkage formed to sell raw materials or products from organization X to organization Y
2. Licencing. Organization Y buys the right to use a processes for a limited time period from organization X
3. Technological Transfer . One way linkage formed to transfer technology from organization X to organization Y
4. Technological Exchange. Two way linkage formed to exchange technology or technological information between organization X and organization Y
5. Joint R&D. Two way linkage formed to develop and share research jointly between organization X and organization Y
6. Joint Venture. Organization X and Organization Y create a separate organizational entity to produce goods and/or services

Under this framework, R&D results customers develop linkages of type 3 and 4, even when type 1 could be considered if technological services rendering is included there. This inter-

organizational linkages typology reveals *purchasing* practices profile involving financial resources transactions, not investment or risk sharing as linkages 4 and 5 types represents. Implication of this this finding is related to business strategy as it is widely accepted that firms with strategies oriented to gain market leadership are heavy investors in new product and/or services development, while firms looking for margin growth use technology as cost reduction and/or efficiency enabler, practice related to linkages of 1, 2, 3 and 4 type.

Operating under a type of linkage leads to generate a pattern of interaction which map effort intensity required by the dyad work. Findings presented in Diagram 2 reveal an inter-organizational linkage pattern of the type correspondent to *one way linkage formed to transfer technology from organization X to organization Y*, being considered as *technology source* each of the R&D results generator of the unit of analysis, playing the receiver of technology role each one of the customers selected to match the resulting innovation and/or technology development. This pattern suggest decentralized or autonomous R&D units (From Organization X) working at their own pace, rhythm and criteria, each with a customer (Organization Y) portfolio that implies multiple tailored management effort. A pattern of this kind challenges the efficiency of Technology Transfer actions at top management level.

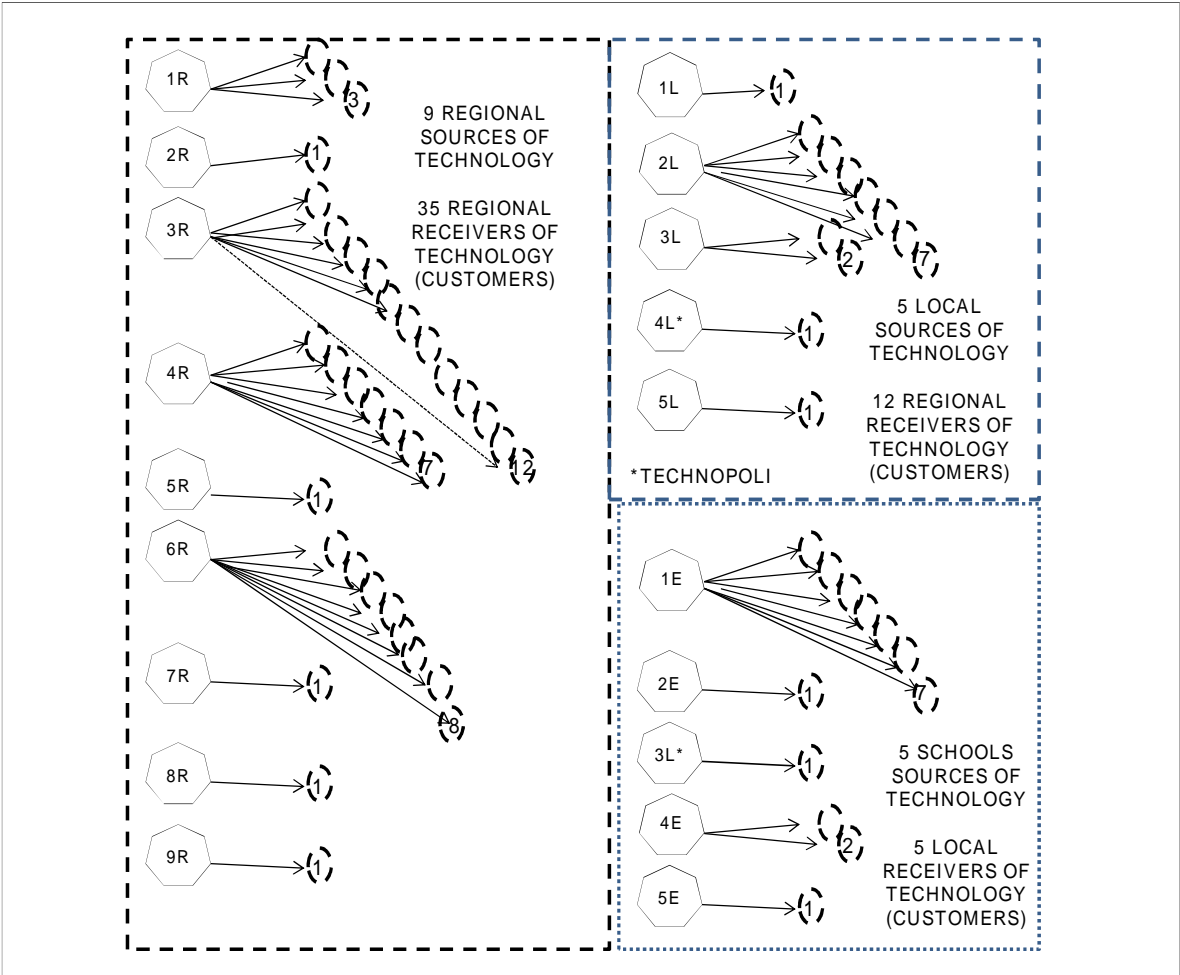


DIAGRAM 2. Interorganizational linkages pattern resulting from the Point-to-Point transfer mode

Customer Profile. Who are they?

Data analyzed in this research reveals that around 65% of the R&D Centers of the unit of analysis generated some technology result that is mature to follow the transfer process (Table 2). In contrast only 7 out of 34 engineering technical schools were engaged in this process during the analyzed period. Findings reveal a wide arrange of activity focus on the receivers side, supporting the technology push operating practice of the unit of analysis. Due to this practice customers are scattered from primary activities (agriculture, fishing) to manufacturing operations, high tech areas (Biotechnology, Pharmaceutical) and services such as banking, consultancy and even R&D activities. The customers are national capital owned, even when 20% of them are subsidiaries of Multinational Corporations working in the host country who excel in the food and pharmaceutical industries. Regarding their activities they cover the full spectrum from R&D to production, retail (consumption product sales), consultancy and service provider.

Table 2.
Technology Source and R&D results customers (receivers) *Demographics*

Technology Source	Receivers Focus	Technology Receiver		Industry	Activity
		National	International		
R&D Centers <u>12</u> *Regional 9 North 5 Center 6 South 1 *Local 4	Sea, Fisheries, agriculture Food production, manufacturing, agriculture, consultancy services, agro-sciences Environment Biotechnology	27	6	Aquaculture (3) Food -consumer goods (9) Pharmaceutical (4) Fresh food (3) Food-raw materials (3) Banking (1) Telecommunication services (2) Telecoms materials (1) Metal mechanics (2) Applied Research (3) Public Services (2) Consultancy (3)	Production Services Retail Consultancy R&D
Engineering Schools <u>7</u>	Manufacturing, Telecommunications Chemical Biotechnology Computer Engineering	16	3	Biotechnology (4) Metal mechanics (2) Food production (7) Pharmaceutical (2) Security (1) Telecommunications (2) Commercialization (1)	
<u>Total</u> <u>20</u>		<u>43</u>	<u>9</u>		
			<u>52**</u>		

**Private institutions = 50 Social Organizations with private institution registry (S, A/SC) = 2

Sociographics characteristics. What do they buy?

So far the profile reveals medium size national and large size international customers, operating in the primary, secondary and tertiary activities (as in NGP economic activities classification) selling R&D results to firms operating in a wide variety of technology fields (aquaculture, biotechnology, agriculture, telecommunications, environmental, manufacture, etc). In search of information useful for commercialization actions the *content* of the technology transfer process realized by the group of technology receivers

Table 2.
R&D results Customers' Sociographic Characteristics

DEMAND AREAS	DELIVERABLE/TARGET AREA
<p>1. WHILE IN THE FISHER BUSINESS...</p> <p>R&D projects Epidemiology research on public interest species Feasibility studies for Organic Environmental Protection Technical studies for sea-land protection Toxicity studies Environmental factors in Aquaculture Scientific monitoring services for customer's own R&D</p>	<p><u>Technology Services (Applied R&D services)</u> 1.1 Epidemiology R&D 1.2 Feasibility studies 1.3 S&T applied research studies</p>
<p>2. FILLING THE PLATE OF FOOD...</p> <p>Production facilities diagnosis and evaluation Feasibility Studies Technology Transfer Legal proposals Patent Transfer for production improvement Flavoring products development (Supply Chain integration) Chemical Studies of traditional products Solar energy applications in food production Production processes development New products design Product Quality control</p>	<p><u>Technology Services, Technology Transfer, Process and Product design</u> 2.1 Production efficiency 2.2 Feasibility studies 2.3 Product Development 2.4 Process improvement/update</p>
<p>3. BIOTECHNOLOGY AS BUSINESS ENABLER...</p> <p>New Products development for agriculture, food production and environmental control Product production quality control Process quality control Biotech applications for dairy products Genetic engineering applications Pharmaceutical applications Production processes improvement and updating Information Technology infrastructure use</p>	<p><u>Process improvement and Product design</u> 3.1 Product Development 3.2 Process improvement/update 3.3 Quality Control</p>
<p>4. SUPPORTING MANUFACTURING BEST OPERATION PRACTICES...</p> <p>Production Plant/facilities efficiency improvement New products development Production processes updating Use/introduction of new methods, tools and techniques Automation and control systems design and implementation</p>	<p><u>Production Processes improvement, Product development</u> 4.1 Plant evaluation 4.2 Automation 4.3 New Products development</p>
<p>5. TECHNOLOGY FOR INFRASTRUCTURE...</p> <p>Telecommunications Networking IS Applications: Taxis Control RFID applications</p>	<p><u>Technology Infrastructure</u> 5.1 Information Technology applications 5.2 Information Systems applications 5.3 Identification standards use</p>
<p>6. TAILORED SERVICES AND PRODUCTS UPON REQUEST...</p> <p>Bank operations technology development Airport facilities improvement operations Automotive industry applications Road system operation efficiency systems Urban surveillance systems</p>	<p><u>Technology Services (Applied R&D services)</u> 6.1 IT based 6.2 Systems development 6.3 Energy savings</p>

Six market areas are identified from Table 3. Related to technical knowledge fields demand is concentrated on Fisheries, Food industry, Biotechnology, Manufacturing, Information Technology infrastructure and on the tailored services. In this context, dominant deliverables required are product design, process development, research studies and consultancy of technical services. The resulting profile suggests that the user's motive for technology transfer is the direct acquisition of complementary technology products/services to gain business benefits.

Conclusion

Technology customers profile is a useful tool to focus the commercialization strategies of Technology sources. As identified here, the resulting profile suggests immediate actions to define the desired strategic objective of the transfer operations. Working under a point-to-point mode provides the unique opportunity to evolve relations from single buyer to joint venture partnership and into user involvement in design/development moving the dyad relation pattern to alliance environment. A key conclusion of this analysis is the recognition of the dimension of the effort required to manage technology transfer processes upon the point-to-point basis, as well as the convenience to work under focused or defined markets a structured ready-to-commercialize technology portfolio, to create benefits from commercialization activities and technology transfer budget efficiencies as well.

Implications for further research

Due to the exploratory nature of this research findings correspond to the unit of analysis operating characteristics, there is still a long way to go in this topic, being interesting analysis in different operating technology transfer models. Results correspond to a single country, cross country analysis could support new profiles identification.

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