



Knowledge transfer policy instruments in Costa Rica - Towards an open experimentation approach

POLICY
CASE
STUDY

Contribution to the OECD TIP Knowledge Transfer and Policies project

Ministry of Science, Technology and Telecommunications

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Executive Summary

For many years the Ministry of Science, Technology and Innovation of Costa Rica has offered innovation grants. However basic reviews have showed that the number of applications to these grants and that the percentage of innovation projects with a strong technology component has been low. Coordination and information asymmetries are part of the reasons for the low application to these funds.

This study case provides an example of a soft policy instrument developed by means of twelve pilots carried out since 2014, to support knowledge transfer and leverage the development of technology-based innovation projects.

The policy experimentation approach was inspired in Charles Sabel's work on Experimentalist Governance, which has been applied in different settings, although not in knowledge transfer (to the extent of our knowledge). The main source of inspiration for the knowledge transfer instrument was the NSF's I-Corps program, and variations of this program implemented in Chile and Colombia.

The central objective of this policy instrument has been to encourage relationships of trust among key stakeholders in the field of knowledge transfer, through the development of interactive workshops. The knowledge transfer instrument has been evolving since 2014, incorporating the recommendations and feedback of the participants.

The findings of this exercise show that to encourage the interaction between academia and industry the government plays a key role, mainly by setting up spaces for interaction and co-creation, as well as the provision of grants for collaborative innovation projects.

Thus, it enabled to verify the importance of reinforcing and complementing different policy instruments to successfully encourage knowledge transfer. Moreover, it has been determined that different mechanisms are required to motivate the participation of the different actors.

1. Main features of the policy

The case describes the work carried out by means of a program called *Programa de Innovación de Base Tecnológica (Technology-Based Innovation Program)* in which the Lean Startup methodology and Open Innovation strategies were used to design and improve activities intended to spark new technology-based innovation projects in collaboration with key stakeholders from the public, private and academic sectors.

1.1. Main characteristics of the Technology-Based Innovation Program

Objective and support provided

This policy instrument consisted on 12 interactive participatory workshops created with the objective of building trust and stimulating new collaborative technology-based innovation projects. This line of work was led by the Ministry of Science, Technology and Telecommunications (MICITT). Funding was also provided by the Development Banking System (SBD).

Target group

The target group consisted of researchers with an interest in applying their knowledge through innovation, aspiring entrepreneurs interested in initiating new technology-based companies, existing companies interested in tech-based intra-preneurial projects and designers interested in being a part of an innovation project.

Annual budget and source of funding

The budget dedicated to this work has evolved as additional partners have joined:

- 2014: \$1k from the Budget of the Directorate of Innovation of MICITT
- 2015: \$14k from the Budget of the Directorate of Innovation of MICITT
- 2016: \$14k from the Budget of the Directorate of Innovation of MICITT, \$65k from the Incentives Fund and \$140k from the University of Costa Rica
- 2017: \$14k from the Budget of the Directorate of Innovation of MICITT, \$65k from the Incentives Fund of MICITT and \$125k from the University of Costa Rica and \$250k from the SBD.

Methodology (see more details in Table 1)

- **Pilots 1-3:** The first three pilots were organized in 2014 by MICITT with support from the technology transfer offices from the five public universities. These pilots consisted on participatory workshops in which over 100 key stakeholders involved in technology-based innovation shared their views on factors limiting knowledge transfer and potential solutions. Since it would not be possible (or even advisable) to try to solve all the problems registered in the participatory workshop, these pilots focused on creating a space for interaction between researchers and business.
- **Pilots 4-8:** The next set of five pilots were implemented in 2015 in parallel with the objective of convening researchers, business people and entrepreneurs to build trust and stimulate new collaborative technology-based innovation projects. In each pilot, one of the public universities convened a 4-8 hour meeting focused on

facilitating interaction. Each university used a different approach to inviting and to facilitating interaction.

- **Pilot 9:** A cross-fertilization session was organized in which representatives from the five technology transfer offices participated. Each university shared the strengths and weaknesses of their approach, and together the five universities proposed a collaborative 9th prototype led by the University of Costa Rica and the Costa Rica Institute of Technology to create the next iteration of the instrument in 2016 based on what they had learned. In this pilot they were asked to perform interviews with participants before and after the activities in order to facilitate learning.
- **Pilots 10-11:** Based on the lessons learned from interviews, two pilots were implemented in 2017, one in the same urban area as in 2016, but with a different area focus, and another implemented in a rural area in a low-income province.
- **Pilot 12:** Based on the lessons drawn from work in 2016, MICITT worked with CONICIT to develop a grant for organizational alliances including an incubator, technology transfer office and chamber of industry to present proposals for implementing a program to add new elements to the spaces for building trust and collaboration. The additional elements were (1) the inclusion of designers in the process, based on the positive experiences from the 3rd pilot, (2) a process to identify 40 global technological frontiers in which Costa Rica has business and research potential, and orient ideation towards those frontiers, based on evidence from various pilots suggesting that focusing on specific sectors would lead to more effective matching processes, (3) a learning-by-doing training process to support multidisciplinary teams to validate their ideas in the market, based on the observation that even when links were formed between researchers and companies, often skills to effectively manage an innovation project were lacking, and (4) funding from SBD for prototyping, based on the fact that many would be innovators struggling to implement their project ideas due to lack of funding.

Table 1. Pilots details: areas and interactions

Prototype	Area	Details
1	All areas of research and all areas of application.	Success stories were shared by successful technology-based innovations and groups interaction was facilitated around specific areas.
2	All areas of research and all areas of application.	1 Success story and feedback and a space for open sharing.
3	All areas of research and all areas of application were invited. In this case designers were also invited.	1 Success story and feedback and a space for open sharing.
4	Focused on inviting companies in a specific area of application of knowledge (chocolate-based products) and invited researchers from any area of knowledge generation that might be relevant	Seminar style presentations and an interactive lunch.
5	Focused on inviting students and professors in a specific area of knowledge generation (biotechnology) and invited a broad range of	Speed-dating activity for all knowledge generators to get to know all knowledge appliers

	companies and investors interested in this type of knowledge.	
6	Focused on inviting business people from the city in which the university is based regardless of their sector in the economy and then on attracting researchers interested in interacting with these companies	Strategic arrangement of business people and companies in tables and questions to prompt interaction.
7	Focused on inviting business people in a rural area in which the university has a regional campus and then on attracting researchers interested in interacting with these mostly agro-industry companies.	1 Success story and feedback and a space for open sharing.
8	Invited a broad range of business people and researchers, and include NGOs and other players in social innovation.	Focused on using a fab lab to help potential collaborators to prototype their ideas during the session.
9	Focused on two specific area of knowledge generation (Biotechnology and Food Technologies) and one specific area of application (Agro-industry).	Combined 2 seminar style talks, a divergent process of group interaction and a convergent process of group interaction.
10	Focused on inviting researchers in the field of engineering and companies interested with engineering needs.	Combined 2 seminar style talks, a divergent process of group interaction and a convergent process of group interaction. (same as in the 9 th).
11	Focused on three specific areas of knowledge generation (tourism, customs and logistics)	Combined 2 seminar style talks, and a round of speed dating in a shorter event.
12	<p>The winning bidder carried out a study to facilitate smart specialization to focus the idea generation phase on the Ten technology frontiers within four main areas of potential: food industry, health and wellbeing, intelligent society, and energy and the environment (total of 40). These frontiers were selected according to the areas of opportunity in global markets in which the country has a research foundation and prior industry experience.</p> <p>Researchers, entrepreneurs, business people and designers interested in these 4 areas were invited.</p>	<p>Interaction: First there was a workshop for each person to fully explore their relative comparative advantages and explore their interests in each of the 40 technological frontiers. Then each person was included in a digital group (using Slack) and teams were formed organically. Throughout the program there were 4 sessions and 4 fieldwork assignments (described in training) in which each group had opportunities to continue to build trust by working together.</p> <p>Training: A learning-by-doing training approach was used to teach interdisciplinary teams the key entrepreneurial methodologies such as Lean Startup and Jobs to be Done by applying them to their idea.</p> <p>Funding: The SBD contributed funding \$10k for prototyping the 25 best projects.</p>

2. Development of the initiative

2.1. Technology-Based Innovation Program rationale and main objectives

The ministry has offered innovation grants for many years, but a very basic review of the approved projects showed that the percentage of innovation projects with a strong technology component was low. Basic qualitative work demonstrated that there were a reasonable number of researchers, entrepreneurs and SME's interested in participating in this sort of work, but no adequate spaces for fostering collaboration.

For these reasons, efforts were focused on a policy instrument that could help building relationships of trust with key stakeholders in the field of knowledge transfer in order to achieve 3 main objectives:

- To bring those closest to researchers and entrepreneurs into the process of ideation and feedback in a way that facilitates the emergence of their best new ideas and effective learning about what works best.
- Create a sense of participation to crowd in investment in the form of financial and human resources.
- To create a sense of ownership by non-government stakeholders in order to ensure sustainability of the work beyond one government administration and into the next.

The instrument has focused at the national level, with most of the iterations in the urban central valley. The process itself allowed a smart specialization strategy to emerge which channeled the work towards specific sectors.

The government chose to work with key intermediaries who play a role in technology transfer through entrepreneurship: university technology transfer offices, university business incubators, business chambers, design intermediaries. The objective would be to eventually include all stakeholders in the target group, starting with those with greatest access to the most talented researchers and entrepreneurs in the country.

2.2. Technology-Based Innovation Program tailored application

The policy process used to tailor the instrument to the context could be summarized as follows:

- In 2014, MICITT worked with the University of Costa Rica's Incubator and Technology Transfer Office to organize a series of seven interactive participatory workshops in which over 140 key stakeholders involved in technology-based innovation shared their views on factors limiting knowledge transfer and potential solutions.
- In 2015, MICITT convened a working group to exchange best practices in technology transfer. This started by developing a relationship with the five public universities' technology transfer offices that are organized in NEXO, the National Council of Presidents of Public Universities' (CONARE) working group for technology transfer. Over time, this group was expanded to include startup incubators and business chambers.
- MICITT facilitated, through public contracts using the Ministry's Directorate of Innovations' budget, small grants (\$4k-\$14) to finance the organization of the

mentioned interactive participatory workshops (spaces for researchers, companies and entrepreneurs to interact). Slightly larger grants (\$70k) were facilitated through the Incentives Fund for Science and Technology to move beyond a program just focusing on building trust and ideation, to also include processes to validate new ideas in the market.

3. Interactions with policy mix

3.1. Previous policy mix gaps

Prior to the development of the Technology-Based Innovation Program, the following policy instruments existed, each with its own gaps:

1-PROPYME (Innovation Fund for SMEs, funded with national budget): This is a fund created by law to support SMEs with the adoption of technology and incorporation of innovation. The fund is used to provide innovation grants to SMEs, for a series of reasons, including certifications, technology adoption, innovation and collaborative innovation. Between 2010 and 2014 the demand for these funds increased significantly, but few of the projects received really proposed innovative uses of technology.

2-PINN (Program for Innovation and Human Capital for Competitiveness, funded by a loan from Inter-American Development Bank): This is a new and temporary fund comprising a series of funding instruments, two of which are relevant to the topic on knowledge transfer. The first is an innovation grant for SMEs willing to engage in innovation projects alone or in collaboration with technology development centers. Considering the demand for the PROPYME funds mentioned above, an important intervention would be necessary to support SMEs to qualify for these funds, mainly strengthening their capabilities and fostering links between academia and SMEs. The second is a program to support technology based startups with local incubation and international acceleration. There was also some concern about the availability of technology-based startups ready to engage in a world-class incubation program.

3-Seed capital (SBD seed capital): Created by law, the SBD has funds to support entrepreneurs with seed capital grants. However, early experiences in awarding these grants had unfavorable results. This had led the organization to stop this line of funding because of a perception of the risk involved in this sort of investment. The organization perceived the need of a mechanism that could somehow reduce the risk of these investments.

In summary, despite the existence of financial instruments to promote innovation, the number of applications had been low, especially due to information asymmetries. For this reason, a policy instrument was required to better communicate existing financing options for technology-based innovation projects.

Likewise, the low technological component in the projects financed by these instruments could be a result of coordination asymmetries, which limited the articulation between the private sector and academia. For this reason, this policy instrument was ideal to generate knowledge transfer processes that would leverage the development of technology-based innovation projects.

3.2. Expected interactions with other existing policy instruments for knowledge transfer

The new policy instrument described in this case of study intends to increase the number of entrepreneurs and SME's able to apply to PROPYME and PINN with technology-based innovation projects such that these innovation grants are more effective in achieving their objectives.

Furthermore, the new policy instrument was expected to facilitate the identification of potential partners with research strengths for firms to integrate into their proposal to PROPYME and PINN grants.

3.3. Policy instruments in line with the Technology-Based Innovation Program's objectives

The main other relevant policy area is the entrepreneurship policy led by the Ministry of Economy, Industry and Commerce (MEIC). This policy has a pillar focused on technology and innovation, which is aligned with this instrument. MEIC leads the governing body of the SBD and was influential in SBD's support for the most recent iterations of the knowledge transfer policy instrument.

3.4. Additional measures taken to ensure the success of the policy instrument

The policy instrument itself is what has been used to ensure the incremental success of the knowledge transfer instrument. No policy instruments have been removed.

In the process of developing the pilots three events were organized to convene many of the stakeholders that participated in the original workshops in 2017. These spaces have been used to clarify to researchers, entrepreneurs, SME managers and designers the complementary role that these new instruments are playing with PROPYME, PINN and Seed Capital.

Following the recommendations from various actors from the public, private and academic sectors, this year, a new and sector-specific interaction was carried out. Thus, moving from an open and no-agenda exercise to a more concrete exercise with a prior identification of the requirements of the private sector in a high-potential cluster in Costa Rica (life sciences).

This, in order to link national or international researchers with companies and entrepreneurs and increase the probability of technology transfer.

3.5. Relevant contextual factors to understand synergies and possible conflicting effects of the policy instrument.

These are the most relevant contextual factors that have made these policy instruments **effective**:

1. Piloting policy instruments
 - MICITT has the second lowest budget of all ministries. This makes cost effective strategies important.
 - An approach based on building trust to persuade was important.

- Culturally, Costa Rica is a very consensus-oriented society, which meant that policy decision makers were open to collaborative processes.

2. Instrument for Knowledge Transfer

- In Costa Rica, researchers have had very little contact with entrepreneurs or business people in general.
- In general, even the most talented SMEs have very little knowledge of effective innovation management methodologies.
- Managers of technology transfer offices and incubators are themselves very interested in evolving towards better methods of technology transfer. they perceived that the support of legitimizing initiatives is necessary to persuade other stakeholders within universities.

4. Impacts

4.1. Impact evaluation

The process of evolution of the knowledge transfer instrument is still under way. In November 2018 a new iteration was implemented including some of the recommendations collected from the participants of past iterations. We have used the “build, measure, learn” cycle suggested by the lean startup methodology to have continual feedback on the evolution of the knowledge transfer instrument as pilots have evolved.

As mentioned above, the purpose of this program was initially to generate and promote trust among the different stakeholders of the National Innovation System (researchers, companies and support actors). In that sense, the main metric initially tracked was the number of participants in the events. For example, between 2016 and 2017 more than 250 people participated in the activities.

In 2017, we moved forward beyond building trust and ideation to also include processes to validate new ideas in the market through a learning-by-doing training approach.

The following metrics were established:

- Number of new ideas for technology-based innovation generated: in 2017, 70 new technology-based ideas were tracked as part of this process.
- Number of collaborations between business and research counterparts created: 32 were tracked.
- Number of collaborative teams that are deemed eligible for seed capital: 25
- Number of projects that were eligible of seed capital: 20

As an example, Table 2 shows three collaborative projects that resulted from this process.

Table 2. Examples of collaborative projects

Sector	Project
Food industry	A collaboration was created between a SME in the food sector and the LANOTEC research center. The above implied the investigation of the characteristics of the rambutan shell. From this process the company was able to incorporate antioxidants in its products. The LANOTEC research center is specialized in nanotechnology.
Health sector	From this process a spin-off from the Clodomiro Picado research institute was created, specialized in animal sera. The Clodomiro Picado research institute is specialized in proteomics.
Food sector	A collaborative process was created between an SME, the National Technical University and the Food Technology Research Center (CITA), for the development of food prototypes from the pitaya

5. Implications

5.1. Broader implications

This exercise enabled to verify the important role played by the government in facilitating knowledge transfer practices carried out by stakeholders who have the main responsibility for knowledge transfer in practice.

One of the main lessons was that generating spaces for interaction between academia and industry is a key factor to stimulate the transfer of knowledge. Furthermore, the relevance of designing public instruments such as financial incentives to attract researchers to link to the private sector.

Follow-up and accompaniment to the parties is crucial to ensure that these collaborations derive effectively in knowledge transfer. Thus, the following iterations that will be developed from 2018 seek a greater follow-up.

To be able to measure the impacts of such policy instrument, tracking the outcomes of grant recipients (PROPYME, PINN, Seed Capital) who participated in the Program for Technology Based Innovation compared to those who did not, would be of interest. Our hypothesis is that grant recipients who participate in the program would have more favorable outcomes in the following areas: (1) greater incorporation of science and technology-based knowledge in their innovation ideas as a result of entering in contact with researchers, (2) better product-market fit as a result of a more effective validation process.