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Sofia Catalina Henao Aguirre

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Science Shops: A Way To Get Colombian Universities Closer To The Community

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Abstract

Science shop is a concept based on participation. It is a bottom-up approach that identifies the community needs and develops research according to them. This is a way for universities to act in a socially responsible manner while using this concept as a pedagogic tool topromote the commitment of students to the academia and the community. Medellin has already developed several projects that are similar to the science shop concept. More particularly, Universidad EAFIT from Colombia has developed projects with the City Mayor's Office that go in line with it.

Introduction

Colombia is currently facing critical problems at the social level. A study by Guerrero &Londoño (1999:3-4) shows the effect of violence in the economy of Latin American countries as well as the relationship it has with education. In Colombia, in 1997, a fourth of the annual production potential was destroyed by the attacks against people and goods, as shown in the table below. These attacks were not related with drugs or guerrilla, but with homicides, domestic violence, child abuse and so on (Guerrero & Londoño, 1999). Furthermore, the research2 shows that the deficiency in the educational sector is the main factor responsible for the increase of violence in the region. This result was achieved through a typical classic epidemiology exercise. The difference of one year of education (between the real education average and the expected education average according to the economic

1 Mechanical engineer from the Universidad Nacional. MBA from Universidad EAFIT. Exchange student at HHL – Leipzig Graduate School of Management in Germany through a double degree agreement. This paper was supervised by Prof. Dr. Maria Alejandra Gonzalez-Perez.

2 The research was developed with the most complete data and the most sophisticated econometric models. A data base was built which contains high quality information about per capita income, income inequality, poverty, educational gap, and homicides in 17 Latin American countries between 1970 and 1995.

development of the country) is statistically linked with approximately 14,000 extra murders per year (Guerrero & Londoño, 1999). As Léon Bourgeois (1901 quoted by Elwitt, 1982:55) said "the social problem was, in the final analysis, a problem of education". Then, the government should take special care in increasing the education coverage and reducing the drop out of formal education as a strategy to reduce violence in the long term. Additionally, the educational institutions also have a key role to play in the Colombian society to help achieve this goal.

The table below was developed by Guerrero &Londoño (1999:26) based on the data of 1997 GDP. It shows the direct and indirect costs of violence, as well as the transference costs, according to the percentage of the GDP. Although, there was a peak of violent acts in Colombia during the latest 1990s and early 2000s, the table can be used as a reference to show the impact that violence can have in the Colombian economy. In the study, it was found that Colombia has experienced major losses in the human capital and the amount of transferences made by criminal acts committed against the property. From this distribution of the costs it was inferred that in Colombia, violence had been professionalized more than any other country in the world. There was a mix of instrumental violence with problems of citizens' co-existence that affected the violent behavior of the citizens (Guerrero & Londoño, 1999).

Table 1. Additional cost of violence in Colombia (% of the GDP of 1997)

DIRECT COSTS	**11,4**
Health losses	5,0
Material losses	6,4
INDIRECT COSTS	**8,9**
Productivity and investment	2,0
Work and consumption	6,9
TRANSFERENCE	**4,4**
TOTAL	**24,7**

Data source: (Guerrero & Londoño, 1999:26)

If universities decide to take an active part in society and to act in a responsible manner towards the community, by accepting their crucial role in the training of tomorrow's leaders and embracing their potential, they have an opportunity to influence the future of the country. Those institutions could adopt several approaches, one of which will be suggestedin this article one approach. This

approach has been successfully implemented in Europe for almost 40 years and could support Colombia in improving its violence problem. This approach is linked to education, but raises the impact that education will have in the reduction of violence because it creates a social commitment among the students. The concept that will be proposed is *science shop*. Science shops are "built around the concept of participation" (European Comission, 2003:5). They work based on a bottom-up approach. This means that they identify the community needs for knowledge and find the best way to satisfy these needs. Members of the community reach the science shops and express their needs, or science shops ask the community for its needs and match them with their own needs. Then, the science shops develop research projects according to the needs identified. This bottom-up approach links the university with society by generating gain for both parts; it assists and promotes university involvement within the community.

What is a Science Shop?

A science shop is an entity within a university or NGO that carries out research activities in a wide range of disciplines by matching them to society needs (European Comission, 2003). These research activities are usually free of charge to the community and, when held by a university, they are part of the curriculum. Usually, the organizations that reach the science shops are not in a position to afford the cost of such investigations by themselves. According to Living Knowledge(2002), the most important association of science shops, "they are small entities that carry out scientific research in a wide range of disciplines – usually free of charge and – on behalf of citizens and local civil society". Another definition is given by Caspar De Bok and Norbert Steinhaus(2008:172). Caspar De Bok is from the Science Shop of Biology of the Utrecht University and Norbert Steinhaus is from the Bonn Science Shop: "A science shop provides independent, participatory research support in response to concerns experienced by civil society".

During the development of research activities, society members as well as students and university researchers gain knowledge and skills, while building partnerships among themselves. The science shop also informs "university leaders and policy-makers of research and education needs of civil society" (Worthington, 2007:475). On the other hand, the organization requesting research should be non-commercial, it should be able to prove its lack of resources preventing it from doing the research itself, and finally it has to demonstrate its capacity to put the research result into practice (Worthington, 2007).

The main purpose has been the democratization of scientific and technical knowledge by enhancing its spreading (Farkas, 1999). The participation of students and

community in the projects is achieved by a bottom-up approach that takes into account the current needs of society when choosing the research projects that are going to be developed (European Comission, 2003; Farkas, 1999; Living Knowledge, 2002; Worthington, 2007).

The Science Shop concept was created in the Netherlands in the early 1970s. The chemistry faculty in Utrecht established the first science shop in 1973 (Fischer, Leydesdorff, & Schophaus, 2004). This initiative started with a group of students and university employees from Utrecht and Amsterdam Universities which support activist groups that worked on subjects such as environment, feminism, nuclear resistance, minorities and their workplace. In the beginning, science shops were informal organizations as expressed by Jan Weerdenburg (editor of two Dutch-language volumes on science shops in Holland) to Nicole Farkas: "the University of Amsterdam's first science shop was located in a box. We had a box with files of client questions. When we wanted to work we would go pick up the box and take it to an empty room" (Farkas, 1999:33).

Now, this informal organization, that evolved from a box of files to a functional organization, has materialized and spread throughout Austria, Belgium, Denmark, France, Germany, Northern Ireland, Romania, Spain, the United Kingdom, the Netherlands, Finland, Sweden, Italy, Switzerland, Norway, Estonia, Latvia, and Turkey in Europe; to Canada, USA and Brazil across the Atlantic; and South Africa, Australia, Japan, China, Israel, and South Korea in the rest of the world (Yuankai, 2009; European Comission, 2003; Fischer, Leydesdorff, & Schophaus, 2004; De Bok & Steinhaus, 2008). Science Shops have different approaches according to the local needs of society. In the Netherlands, they were founded by universities and they do their own research, while the ones developed in Germany are independent NGOs, and the ones in Northern Ireland link community groups to university researchers .

Science shops can be classified according to how they are set up: university-based or separate NGOs; or based on their organizational structure: centralized or decentralized. Whether they are university-based or non-university-based, they perform three types of functions: "services delivered directly to the client (by all shops); influencing research policies in universities (by university-based shops); and engaging in university education (also by university based shops)" (Fischer, Leydesdorff, & Schophaus, 2004:202). Within the university-based science shops, centralized shops have an office within the university and link the needs of the citizens to students from different disciplines. This is also known as an intermediation model, because they procure research rather than conducting it. Decentralized shops have more than one office located in different university departments.

This model is known as a participation model because the research activity is held within the science shop and this allows universities to be closer to the citizens. The problem with this model is that the research activities are limited by the discipline of the selected science shop (Farkas, 1999).

Why Medellin?

On the one hand, Medellin is known as one of the main financial and industrial centers of Colombia, and it has developed five industry clusters: electrical energy; textile/clothing, design and fashion; construction; business tourism, fairs and conventions; and health services (Cámara de Comercio de Medellin, 2009). On the other hand, Medellin has around 229,460 higher education students in around 33 educational institutions (Ministerio de Educacion Nacional, 2007; Alcaldia de Medellin, 2000). There are also 584 research groups in Antioquia, the second biggest after Bogota (COLCIENCIAS, 2008).

ParqueE[3] (Park E), which is a partnership between the *Universidad de Antioquia*[4] and the City Mayor's Office, supports entrepreneurs that have a higher education degree or one which has value-added business ideas. Furthermore, the Mayor's Office has created *Cedezos*[5], which supports entrepreneurs in the development of small and family businesses according to previously defined clusters.

The common goals that the science shops and the City Mayor's Office seek are to transform the city of Medellin into a city of entrepreneurs and to boost its economic development. With a joint effort from universities, the city will be able to spread the entrepreneurship culture among its citizens (Bosma, J. Acs, Autio, Corduras, & Levie, 2008). Beyond that, it will also help universities to take part in the transformation of the city and to become major actors, by leading current and future entrepreneurs.

3 *Parque E*, which stands for Entrepreneurship Park in Spanish, is an initiative of the *Universidad de Antioquia* and the City Mayor's Office. Its goal is to strengthen the entrepreneurship culture and to support business creation. The business ideas should come from business opportunities or investigation results and academic activities (Alcaldia de Medellin, 2001).

4 The Universidad de Antioquia was founded in 1803 by Antioquia Government. It is the second biggest public university of the country, after the National University. Its principal activities include research, teaching and extension courses. It has around 25.000 students. It offers almost 80 undergraduate programs and more than 100 postgraduate programs. (Universidad de Antioquia, 1995).

5 Spanish abbreviation of Centers of Zonal Business Development. The *Cedezos* are located in strategic neighborhoods where they support the creation of new businesses and strengthen the existing ones (Alcaldia de Medellin, 2001).

Furthermore, the science shop model is based on the idea of volunteerism and learning, which goes in hand with the idea of service learning. Students and researchers will offer their services and time free of charge. But, although they do not earn anything in financial terms, they will have the opportunity to develop their own skills. Specifically, the Colombian Government has begun to endorse volunteering several years ago. It started with the creation of the Law 720 of 2001 which has the following objectives (a) to promote, recognize, and facilitate voluntary action as an expression of civic participation, solidarity, and social responsibility; and (b) to provide a framework for voluntary work in public or private organizations and the relations between the volunteer and the organization. A *Red Nacional de Voluntariado* (National Volunteering Network) has been developed within this framework, which comprises 34 volunteering organizations. This network is set up with a wide variety of organizations, from civic-oriented organizations to other organizations related to environment, religion and health.

In line with the Government's goals on volunteering, Medellin Mayor's Office has developed a volunteering program called *Apasionados por Medellin* (Passionate about Medellin) which bases its activities on a coexistence manual called *Vivir Bueno en Medellin* (Living well in Medellin). This project was created based on 2008-2011 Medellin Development Plan and its purpose is to encourage civic participation to help strengthening the organization and the security of the city. This group is formed by 250 active volunteers that can take part in the program using any of the two models: *Juntos SI podemos* (Together we can) and *Volturtario por un día* (Volunteer for a day).

Universities can also play a role in the Government and City Mayor's Office activities around volunteerism by creating science shops. Students will have the possibility to volunteer for the well-being of the community. Moreover, they will be able to exercise their right to be citizens by making the decision of supporting the community. They will have the opportunity, as citizens, to work towards the betterment of the community and to improve the life of all citizens. Besides, the definition of citizenship has broadened. "Rather than service to the political community, citizenship as a concept is also related to specific groups by profession and class and by religious or other groups"(Hodgkinson, 2004:192), which allows individuals to identify themselves as citizens of the world.

Additionally, Colombian universities have a lot to gain with the implementation of the science shop model. Students increase their involvement in the learning process when their academic activities have real results and consequences. At the same time, students acknowledge the importance of community engagement and become active members of the community. It was documented by Astin, Volgelge-

san, Ikeda, and Yeethat(2000) that students who had participated in learning activities which at the same time serve community have "stronger outcomes in academic, writing ability, values, choice of a service career, and plans to participate in service after college"(Whitney, McClure, Respet, & Clayton, 2007:185) than those who only volunteer. The study was made in the United States through "a quantitative longitudinal study of a national sample of students at diverse colleges and universities and a qualitative study of students and faculty who participated in service learning at a subset of these institutions" (Astin, Vogelgesang, Ikeda, & Yee, 2000:i).

What can Universidad EAFIT[6] offer to the local community as a science shop?

Universidad EAFIT, as a university, has the responsibility of transferring the knowledge it creates to the local community. For this knowledge spillover to be effective, there are several factors that affect the process, the geographic location of the university within the community being the more important one (Feldman & Desrochers, 2003). Another factor that can contribute to an adequate knowledge spillover is the establishment of a science shop. Although Medellin is already the second biggest industrial city in Colombia, it can improve its current situation by using this knowledge transfer mechanism. For example, a science shop can foster the creation of industrial clusters within the city due to the direct relation between a cluster of firms and universities or other knowledge producing institution. This linkage can foster the creation of the cluster or help in its development (Etzkowitz, 2003).

Besides, "Academic-industry-government relations are emerging from different institutional starting points in various parts of the world, but for the common purpose of stimulating knowledge-based economic development" (Etzkowitz, 2002:2). Colombia can strengthen the triple helix of university-industry-government by strengthening the relationships between these three entities through science shops.

Universidad EAFIT has already worked with the City Mayor's Office through *Cedezos* in different projects, like the one executed in 2008 entitled *Promocion y*

6 The Universidad EAFIT was found in 1960 in Medellin, Colombia. In the second semester of 2009 there were 8,536 registered students. It has 17 undergraduate programs and 45 postgraduate programs, nine of them are master programs and 2 of them are doctorate programs. It has 45 research groups registered in Colciencias(Universidad EAFIT, 1995).

gestion de empresarismo social comuna 13 y corregimiento de Santa Elena[7] (Promotion and management of social startups in the 13th district and Santa Elena[8] county). In this project the three stakeholders were involved: Universidad EAFIT in the role of the university, the people that were targeted on the project in the role of the industry, and the *Cedezos* in the role of the Government. And although this project shows the triple helix relation, it can also be seen as one of the first steps towards the development of a science shop concept in Universidad EAFIT. During this project, MBA students developed their master thesis on different topics that were related to the project. For example, Ana Maria Salazar[9] helped women standardize their food production line according to the health standards established by the Colombian government. Through this, the women were able to offer more competitive compliant products.

In addition, the University Volunteering Network could assist with the replication of this model in different universities in Medellin. Universities such as UPB[10], Universidad de Antioquia, Universidad Nacional de Colombia and EIA[11] are part of this network that focuses on an academic practice and university volunteering. Although Universidad EAFIT is not yet a part of this network and "only 6% of the students are concerned about social/civic engagement at the point of being part of internal volunteering groups" (Chacón-Piedrahíta & Ordonéz-Buitrago, 2009:13) there have been projects related to the topic of volunteering that had not been developed under this framework.

Theory

Social responsibility of universities.

Universities need to think about their role in society. They need to take into account their actions and the consequences of those actions. They must see themselves as a university, but also as a citizen of the world with citizenly responsibilities towards the world (Barnett, 2007).

7 This project aimed at promoting social undertakings of vulnerable women in the age between 15 and 45. The project took place in the 13th district and Santa Elena county.

8 It is one of the 5 counties of Medellin. It is located at the east of Medellin, 17 km from the city center. Its population is approximately 11,000 people. Its main economic activities are the harvesting of potatoes, flowers, and blackberry, and the production of milk and forest related products.

9 Ana Maria Salazar graduated of the MBA program on March 2010

10 UPB because of its name in Spanish *Universidad PontificiaBolivariana* (Bolivarian Pontifical University)

11 EIA because of its name in Spanish *Escuela de Ingenieriade Antioquia* (Engineering School of Antioquia)

Today, universities need to play a much different role to the one they played when they were created. They need to move from creating, storing and sharing knowledge to actively getting involved with the community to solve their problems (MacLaren & Gonzalez-Perez, 2007). Society is beginning to realize the influence of universities can have on its own future. They are the ones in charge of shaping the future citizens of the world. They should be training their students for a life as active citizens, and a role as tempered radicals in the jobs they will hold. Because of that, universities need to focus on strengthening public as well as private reason. Universities need to facilitate public deliberation about today's great issues. This also means engagement with community groups and civil society activists in a joint search for new knowledge. Simultaneously, they need to recognize their previledged role as protected zones of rational thinking and independent critique that underpin the exercise of accountability through the application of rigor to public policy problems (Edwards, 2007).

One of the main problems for universities these days is that students feel a gap between the problems that surround them and the possibilities of finding solutions to these problems. "This disconnect occurs in classroom because the enormity of the structural injustices that create conditions of oppression and dehumanization is so daunting that students fail to understand that these structures are the objects of human choice" (Doorley, 2007:133). Thus, universities have the responsibility to support and guide students in this transition through a world that is an object of human deliberation and choice. They should help students realize that injustice is not just given, but they have causes and consequences. They must help students realize their own role in society and the consequences of the choices they make.

Just like any other citizen, universities need to act in a socially responsible manner. Social responsibility is defined in general terms by the "Golden Rule: Invest in the conditions which foster social cooperation for mutual benefit" (Suchanek, 2008:4). This definition brings up an important aspect of social responsibility that is not usually taken into account. It is common knowledge that the main objective of social responsibility is to foster social cooperation, but it is often forgotten that in order to achieve that goal, the conditions should benefit everyone involved. This is the basis on which partnership should be built to guarantee it will last (Bray, 1999). When self-interests are satisfied by the new conditions, the possibility of a sustainable partnership increases. But, people need to be aware that their own interests as well as their partner's interests are being fulfilled.

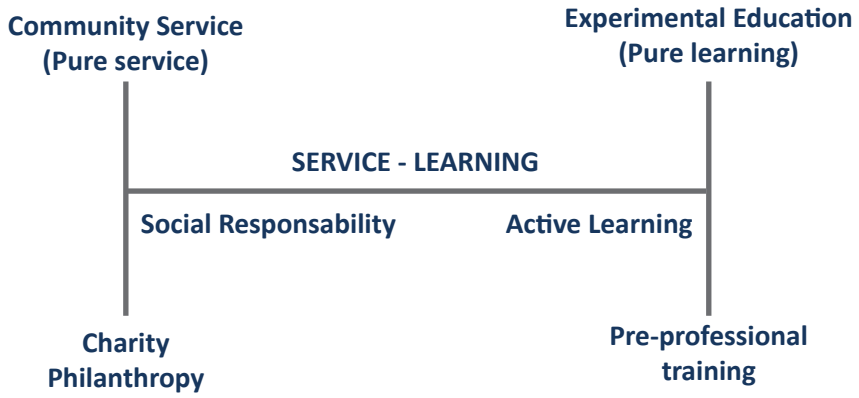
In the case of universities, "partnerships that link universities with communities to address community problems can be mutually beneficial. Universities can con-

duct research and practice in communities. Communities get help understanding and improving their conditions" (Baum, 2007:234). This can lead, in the long run, to dependent relations between university and communities. Then, the likelihood of ending the relationship will decrease because of the high level of commitment developed by the partners. This will lead to healthy interdependency (Bringle & Hatcher, 2002).

One way that can allow universities use to establish an interdependent partnership is through volunteering. "Volunteering is part of the way societies are organized, how they allocate social responsibilities, and how much engagement and participation they expect from citizens" (Anheier & Salamon, 1999:43). Even governments are talking about the Tocquevillian notion of volunteers as part of the social glue that holds modern societies together (Anheier & Salamon, 1999). Hence, thinking of science shops as students volunteering with the self-interest of learning makes it a perfect mechanism to create interdependent partnerships that will engage students with society.

Science Shops as a pedagogic tool.

Teaching is changing. Nowadays, students do not just want to sit and memorize but they are expecting to put the knowledge learned into practice. Students are eager to prove how useful the information learned in the classrooms is, to observe the knowledge in motion and what it can create. And, one of the objectives of a science shop is to develop a framework for students to do just that. Science shops are based on a concept called service-learning. Service-learning is a "course-based, credit bearing educational experience in which students (a) participate in an organized service activity that meets identified community needs, and (b) reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced



Data source: (Zlotkowski, 2007:43)

But for this activity to fully impact students and community certain criteria must be met. According to Zlotkowski (2007:43), for an activity to be considered service-learning in the full sense of the term, it must evidence:

- Explicit, assessable learning objectives
- Community-sponsored activities that promote civic responsibility
- Structured, multi-layered reflection opportunities

Reciprocity between the academic and community partners with regard to the resources, needs, objectives, and priorities that define the partnership

University lecturers must remember that the main idea is not just helping the community. They need to have a clear understanding of the project and the learning related activities that will be carried out. This may seem to be a lot of work for some teachers, but the reward will be worthwhile; not only because of students' civic engagement, but thanks to the effectiveness of the learning process they are involved in. Moreover, the simple rationale of this methodology shows how rewarding it could be for all the people involved, how all the self-interests are met while creating welfare for the community.

Beyond that, science shops are the tool used by universities to implement this methodology. They are a critical factor in the application of this methodology in universities. "The campuses that had a coordinating center for service-learning activities were able to advance their service-learning initiative more substantially over a three-year period than campuses that did not have a coordinating entity" (Furco, 2007:72-73). Then, parallel to the implementation of service-learning, there must also be the creation of a science shop that supports teachers and community during the process.

Implementation of a science shop in universities

Science shops are one of the entities that allow universities to get closer to the community. They link community needs to university resources. This means that universities need to bring the academic knowledge to a practical level. In other words, this situation leads to an adaptation process held by the students involved in the project. This adaptation process usually requires tailoring the scientific knowledge to the specific conditions of each community, which finally makes every science shop one of its own. "Despite their global reach, science shops are essentially local organizations, working within local conditions to serve local needs" (European Comission, 2003:4).

The specific conditions of every science shop make it difficult to establish a standardized framework for their institutionalization. Each science shop depends on different conditions, such as their organizational structure or how they are set

up; however, Kecskes and Muyllaert (1997 quoted in Furco, 2007:67) found some development levels that are shared: "Level 1 – Critical Mass Building, Level 2 – Quality Building, and Level 3 – Sustained Institutionalization".

For the case of Universidad EAFIT, the science shop would still be at the first level, where difficulties will appear on both sides of the partnership. These problems will appear around engaging participation. On the side of the universities, science shops might encounter problems because "the willingness to volunteer and the frequency and pattern are not constant over time" (Anheier & Salamon, 1999:55), but if the service-learning activities are embedded in the curriculum and have the full support of the staff and management, the probabilities of success will increase. On the side of the communities, science shops might face issues to systematically incorporate capacity-building participants and communities (Bawa, 2007).

Furco (2007:72-73) made a statistical analysis between three four-year private universities to define the most critical elements (activities, barriers, and strategies for overcoming obstacles) to institutionalize service-learning on their campuses. The result of the analysis can be seen in Table 2:

Table 2. Comparison of the most critical activities for institutionalization by institutional: level in 4-year private institution

LEVEL 1 - CRITICAL MASS BUILDING	
Faculty	Foster faculty awareness of service-learning
Provide incentives for faculty participation	16.3
Students	Use students' voices and experience in service-learning to garner administrative support
Maximize students' involvement in promoting service-learning	5.6
Institutions	Formalize service-learning advisory committee
Maintain a consistent administrative staff for service-learning	5
Evaluation	Utilize both qualitative and quantitative Indicators of success

Data source: (Furco, 2007:72-73)

At the institutional level "faculty buy-in is critical for engagement" (Aronson & Webster, 2007:271) because they are the critical link in the chain. They are the ones that can encourage institutions and students to get involved, and the ones that set the learning activities that will relate the community. For that, universities

need to provide the right incentives to foster participation and raise awareness among faculties and students. Focusing on increasing the awareness will help faculty as well as students in building the critical mass, who are the main actors in the beginning of the institutionalization process.

Conclusions

Science shops can be seen as a key methodology to increase the involvement of universities (teacher, students and faculty) with the community. If universities decide to apply this concept in Colombia, a great impact can be made to change the current situation. Not only is Colombia in need of better education, with wider coverage, but it also requires people to be more socially involved with their surroundings. Colombians have to understand their role as citizens, and the role they may have in the solution of their conflicts.

As explained before, faculty buy-in will be critical to start this kind of organizations in universities around the country. EAFIT has already enquired among teachers about their interest in the science shop concept. Around 80 academics have expressed their likeliness to develop activities based on this concept. They come from different backgrounds. Teachers from the department of administration, engineer and humanities looked for different ways to adapt their lectures in order to commit to the idea of a science shop. And although, this was found out only through a survey, it shows the willingness of the teachers to develop them. This means that EAFIT already has the most important element to build the critical mass. With the faculty buy-in the possibility of establishing a successful science shop has also increased.

Some universities have already started to develop projects that impact the community in a direct manner. *Parque E* is already fostering entrepreneurial culture among citizens from Medellin. This project goes in hand with the *Cultura E* program from the City Mayor's Office. But, for these ideas to spread all over Medellin and Colombia, they should become a model. Science shops can fit that model. Although, they can vary according to the local needs, the general concept can be defined, and a network among similar organizations can be developed. Therefore, they can share the knowledge that they have acquired during the projects, and they can also help themselves to overcome the difficulties. This network can help them increase their opportunities and create synergies among the participants. The network could also act as a basis for a systematic application of the model all over Colombia and to get the support of the government if they identify themselves as organized entities.

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