

## Building Bridges: Social Inclusion Problems as Research and Innovation Issues

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### Abstract

*This article discussed why specific efforts aimed at establishing direct relationships between social inclusion problems and research and innovation projects are needed, what are the main difficulties to achieve this objective, and how these difficulties can be addressed. This focus came from the successive calls of a program called “Research and Innovation Oriented to Social Inclusion,” implemented by the Research Council of the Universidad de la República, Uruguay. A critical appraisal of this experience and the main lessons learned were presented through the lens of an analytical tool: a circuit in which different types of actors interact while traveling along it. The point of departure of the circuit was the recognition that a problem that hampers social inclusion exists; the end of the circuit is reached if an effective solution for that problem is achieved. Some examples from actual research projects were included to illustrate the functioning of the circuit. The article analyzed with some detail the possible short circuits that may occur at each stage of the circuit and what their causes might be. It analyzed as well the transformations undergone by the “Research and Innovation Oriented to Social Inclusion” program and its attempts to avoid the short circuits, evolving in that way toward a more hands-on strategy to link research and societal needs.*

**KEY WORDS:** social inclusion, Uruguay, innovation, social policy

### Introduction

The arguments for research and innovation in the public discourse have been mainly centered on the view that both, combined, would create economic growth and lead eventually to economic development. Economic growth would be the increased productivity in the existing activities; economic development would come from the opening, through research and innovation, of new production branches or the birth of knowledge-based firms (OECD, 2005; Schumpeter, 1934). Other justifications centered on the contribution of research and innovation to solve some specific social problems have been put forward as well. For

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instance, as Cozzens and colleagues (2007, p. 2) posited, “innovation policies generally respond primarily to the competitiveness agenda, but can also be directed in pro-poor ways by putting jobs front and center and focusing on pro-poor technologies.” To what extent the “social inclusion” part is winning a real place within research and innovation policies is not yet clear though. If we take, for instance, the Economic Commission for Latin America and the Caribbean (ECLAC, 2010) report, *Time for Equality: Closing Gaps, Opening Trails*, we will find that innovation, a term repeatedly referred to in the text, is without exception used in relation to competitiveness, sustainable economic growth, closing the structural heterogeneity gap in productivity, and the like, but not as a direct tool in the fight against poverty and inequality.

The hypothesis that there is a trickle-down effect from economic growth to social inclusion, implicit in many analyses, is illusory; even the blending of improved economic conditions and focused social policies have left important parts of the population in many countries without access to dignified life conditions (see, for instance, Infante & Sunkel [2009] for the Chilean situation). Equally illusory is the hypothesis that with greater scientific and technological achievements, we will be capable of solving the social exclusion problems that our societies face. That this is not true has been stated long ago; an inspiring essay by Richard Nelson (1974) analyzed the reason why it is (at least) naive to believe that taking a man to the moon would assure the eradication of the ghettos; his argument stands after more than 30 years (Nelson, 2011).

A variety of initiatives, at the international level, are becoming increasingly visible, which rejects the ideas that social inclusion comes naturally from growth and the existing knowledge would automatically collaborate with such inclusion (see, for instance, both the “old” Sussex Manifesto [Singer et al., 1970] and the “New Manifesto” [STEPS, 2010]). What old and new initiatives have in common is the recognition that collective knowledge is a powerful tool, combined with others, in the search of social inclusion.

This recognition is shared by the Universidad de la República, Uruguay. As an exploratory attempt to align such recognition to practice, a specific program, organized as a competitive call for projects, was designed. It aims to foster research agendas that incorporate problems affecting the most deprived sectors of the population. The reflections included in this article relate to the experience in implementing this program.

The program focuses on problems without workable or/and accessible solutions faced by socially excluded groups: we refer to them as “social inclusion problems” (SIPs). The solutions to be found may be technological or not; they have in common the need for research as part of their construction. While designing the program, diverse questions were raised. For instance, what is a SIP from an academic research point of view? This is not an easy question. Researchers who might have the knowledge required to help solve some SIPs will work on them, as researchers, if the problems require research as part of their solutions. However, as has often occurred in efforts to connect people affected by SIPs and researchers, the former brings up issues where research has no relevance. There is, thus, a problem of demarcation that must be solved by identifying SIPs where new knowledge can contribute to finding solutions. However, research will always remain a part of such

solutions: important as it may be, little would be accomplished if many other actors, seriously and systematically, do not combine their actions in a rational way in the pursuit of a shared goal that commits them all. Who are those actors? There is no general answer: much will depend on the problem itself and on those directly affected by it. However, the question is valid, and it leads to an additional one: how may a complete map of the actors capable of intervening in the building of solutions, its diffusion, and full implementation be outlined or elaborated? Two assumptions are made in relation to these questions: first, there are SIPs for which academic research can (and should) contribute to find solutions; second, that searching and obtaining solutions implies a multistage process, requiring a systemic behavior of the different actors involved.

Our reflection develops in the Uruguayan setting, meaning that even though we use the National Systems of Innovation approach, we take as well into account that differently from the “North,” we are working with a rather “ex-ante” theoretical construct (Arocena & Sutz, 2003). This implies that we will probably not be dealing so often with well-behaved systemic circuits but, instead, with incomplete trajectories. This is why besides depicting the circuit as an analytical tool to take into account the encounters between actors in the process of problem solving, special attention is paid to the possible short circuits that can truncate the travel and affect the systemic behavior. The article is organized in five sections: the next section characterizes SIPs as research problems, section three deals with the actors that intervene in the process and their interactions, section four describes the traveling along the circuit (and the short circuits) providing concrete examples as illustrations, and section five reflects on the process of institutional learning that fostered the changes followed by the program from its first call until now.

### **Social Inclusion Problems as Research Problems: Bridges to be Built**

SIPs are those problems that severely affect the quality of life of some groups, at a material or symbolic level. Such problems refer to the disadvantages of individuals or social groups that are excluded from the opportunities shared by others (Sen, 2000). We do not mean that any “feeling of disadvantage” configures a social exclusion situation; that is why we focus on situations that limit the quality of life in terms of jeopardizing the survival possibilities or the dignity of life. In agreement with Sen, we set social exclusion analysis in a frame that extends the definition of poverty to comprehend it as capability deprivation and we distinguish between the constitutive and instrumental nature of social exclusion. Constitutive exclusion situations are those that constitute a significant deprivation: typical examples of this type of exclusion can be found in the realm of health. On the other hand, we have situations of deprivation that could not have much intrinsic relevance but, through causal chains, may derive to other deprivations: they are called instrumental exclusion. The program “Research and Innovation Oriented towards Social Inclusion” faces both types of “exclusion problems,” even though the examples presented later are mostly of the constitutive exclusion type.

Any exclusion situation is social and historically situated; it is a relational situation, which has other social groups as a reference. As already indicated, this does not mean that every situation of this type should be equally looked after in our frame

of work but rather the most urgent ones—concrete deprivations that cause significant limitations to the quality of life in absolute terms.

Once the SIPs are delimited, there are at least two conditions they should fulfill to allow academic research to address them. The first condition is that the problem becomes visible. This can be achieved by setting a point of view or a demand. In Hirschman's (1970) terminology, this would imply that the problem has "voice," that it expresses "any attempt at all to change, rather than to escape from, an objectionable state of affairs" (Hirschman, 1970, p. 30). This is akin to Sen's approach, whose recommendation in relation to the development process is to visualize people as agents, not as patients (Sen, 1999). "Voice" can be seen as a concept connected with people's objectives, which are valued, wanted, and sought for a reason. Problems that lack "voice" not only are difficult to detect but also the essential articulation between different actor's efforts, in pursuit of a possible solution, is almost impossible.

We consider that a problem "has voice" if it is recognized as such by an actor directly linked to it. Not infrequently, researchers may figure out how their knowledge can contribute to the solution of some SIPs, but this outlook "from the knowledge supply side" does not guarantee "voice." The second condition alludes to the nature of the problem and to the kind of interventions needed to reach a solution: if new knowledge is not required, research will provide little help. The "social inclusion problem that requires research for its solution" notion deserves further discussion. If at the problem's roots we identify justice and power asymmetry as main causes, the academic research contribution can be seen as a palliative, of little effectiveness as a solution component. Problems with such roots are, for example, the extremely high cost of some vaccines for diseases that affect mainly or fundamentally some countries that do not have the resources to pay for them, or the absence of investment in vital infrastructure such as sewage, or starvation and undernourishment in the midst of the world's food overproduction, among many others. This is why we stress that both the notion of problem and of resolution that we are using in this article does not necessarily address the identification of structural causes and less so implies working on their removal. The main condition that problems must meet is to be a barrier to social inclusion and require new knowledge as a part of the solution-building process. We also want to stress that although we emphasize the need of new knowledge to contribute to finding solutions, with similar forcefulness, we recognize that the articulated commitment of a diversity of actors is an essential ingredient. In turn, the question remains why the Universidad de la República intends to build bridges that put in contact research and SIPs as a contribution to solve the latter. One answer is because it is a specific way of expressing the university social commitment. Another, and by no means less important, answer is to foster the recognition of SIPs by the researchers' "academic radars." The expectation is that the resulting research agendas will therefore become richer and the university integration into society will become stronger.

### **The Intervening Actors**

We take Sabato and Botana's (1968) classic concepts, particularly their systemic approach to understand sociotechnical performances at the national level, as a frame

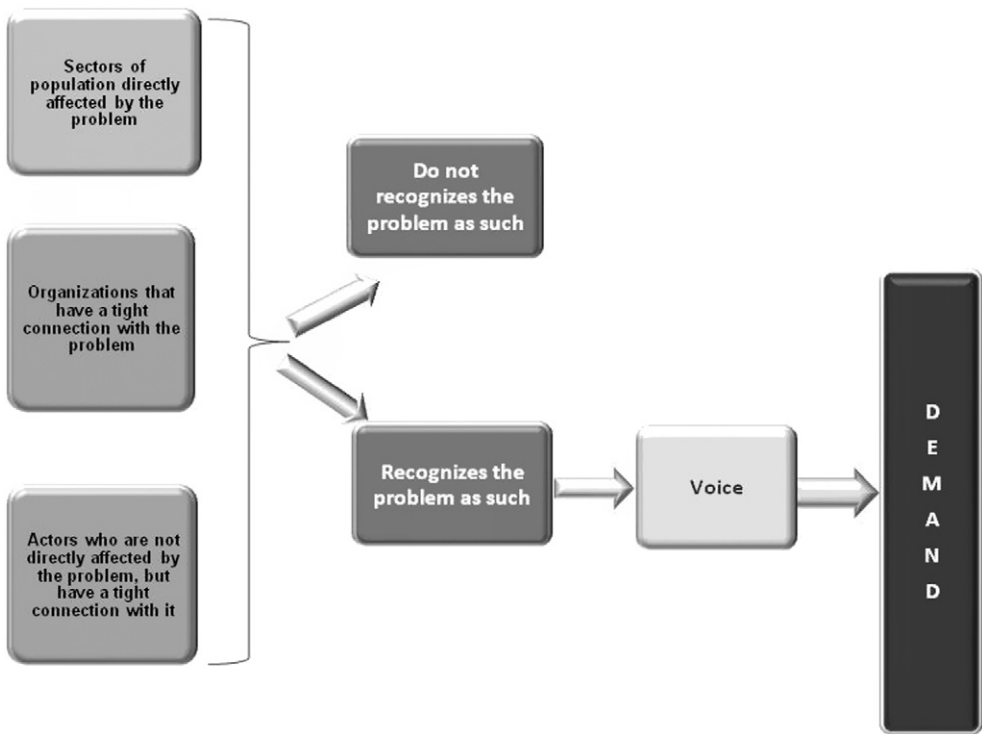
of reference in order to characterize the social inclusion–problem resolution circuit. The system they proposed to depict is an interplay between knowledge and the process of development. This interplay is composed of three types of actors, represented in the geometric shape of a triangle, with particular emphasis on the relationships between the vertexes to describe the dynamics of the system. These actors include government, scientific and technological structure, and production structure.

The aim of this section is to characterize an ideal (in a Weberian sense) system of interrelations between different actors, to address SIPs' need for new knowledge. We are fully aware that new knowledge will be one ingredient of a solution; political will and resources will always be. The actors involved in the system belong to four vertexes: policy makers, knowledge producers, goods and services producers, and actors directly linked to SIPs. This fourth vertex is a collection of diverse and heterogeneous actors but defined by a common role within the system. Policy makers can play multiple roles in the system: to provide that acceptable levels of quality of life for the inhabitants are achieved, to actively demand knowledge for problem solving, to bear responsibility in the implementation or research results, to facilitate interactions with and among the other actors. Knowledge producers are not only called to integrate the system for their ability to generate new knowledge. This actor also has the role of generating knowledge concerning the problem itself, integrating it with the knowledge that the affected population and other stakeholders may have. In addition, they have a role to play in creating the mechanisms to allow for the effective integration of all the system stakeholders. The role of the goods and services producers is to render operative the solutions generated in the research process. Particularly in the case of technological solutions, these actors are responsible for passing from the prototype stage to the delivery of complete products and services able to be put to work.

We now turn to those actors directly linked to SIPs. Their characterization and definition is perhaps the most complex one. This vertex is made up of actors directly related to the problem but with different types of connections with it. These actors include:

- Sectors of the population directly affected by the problem, namely, those who suffer it; it includes their organizations as well.
- Actors who are not directly affected by the problem but have a tight connection with it.
- Civil society organizations.
- State sectors and nongovernmental organizations (NGOs) implementing social public policies.

The category “directly affected by the problem” is given to actors suffering as a result of SIPs. For the rest of the actors in this vertex the membership is given by their direct knowledge of the sectors of the population suffering the problem, their direct knowledge concerning the problem, or its symptoms. The membership to this vertex is given by the potential or effective capacity of making the problem visible for the rest of the population and to generate a demand for solution. The



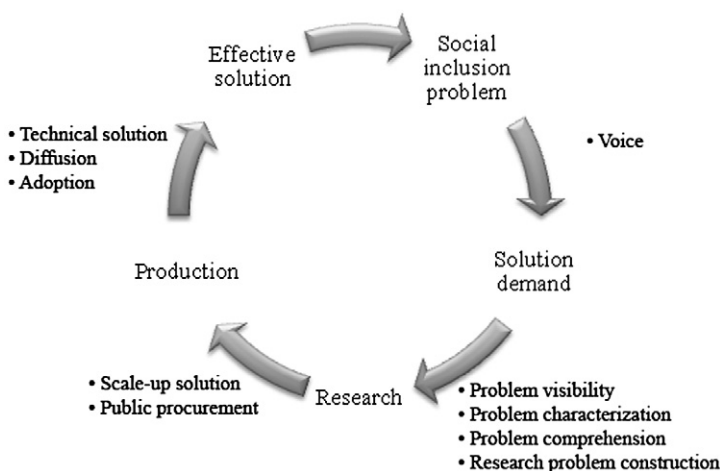
**Figure 1.** Actors Directly Linked to the Social Inclusion Problem

actors in this vertex acquire, in turn and in different ways, responsibility for the solution's implementation and acceptance.

It is important to distinguish between i) those people directly affected by the problem who do not recognize it as a problem (they are identified by others as being affected by it) and ii) those affected by a problem and that are conscious of being affected. For the first ones, the problem may be naturalized, being a part of their lives, and therefore not taken as a problem. Moreover, once the problem is assumed as such by someone, the possibility to become visible at a macro-social level widens. The issue of the visualization of problems is a capital one; thus, the actors capable of producing information and analysis concerning the problems are strategic for finding solutions. Figure 1 illustrates the structure of this vertex that perhaps should be better characterized as a "cloud."

### **The Circuit and its Short Circuits: from the Problem to its Solution**

Presenting the different stages through which the travel along the circuit takes place may describe more clearly the process by which the necessary links between the different actors are established (Alzugaray, Mederos, & Sutz, 2011). It should be noted that in certain cases, some stages in the circuit may be absent; moreover, the route presented is not necessarily sequential and progressive, and it permits going back to a previous stage to refine the definition of the problem, redefine it, or to clarify some other points. Negotiation and dialogue between different actors can occur in each stage, making it necessary to discuss the previous assumptions.



**Figure 2.** The Complete Circuit, from the Problem to its Effective Solution

The beginning of the circuit is defined by the existence of a sector of the population affected by a problem. The first stage in the travel through the circuit is composed of the recognition of a problem by the affected population or other stakeholders. This does not necessarily involve describing or diagnosing the problem (at least at this stage) but acquiring awareness of the existence of an unequal situation that limits the quality of life of the affected sector and may be linked to at least one problem whose solution can come from new knowledge. Figure 2 depicts in a stylized way the circuit and the travel around it.

The travel around the circuit is far from smooth, though, and short circuits can happen in each passage from one stage to another. Each problem will lead to a “unique travel” where different stages can be found and even loops within each stage can appear. In a sense, we could say that the circuit has fractal features; that is, we can recognize similar patterns while looking in more detail into the different stages. For instance, a much more complicated circuit, albeit perfectly recognizable in our experience, would be the following: solution existing in one group → feeling of injustice and deprivation → solution demand (voice) → SIP → (NGO, political, industrial, or research) agenda setting → research → controversy regarding the orientation of research programs or the solutions → fight for a different resolution process → exclusion of some researchers and inclusion of others → redefinition of the problem → on-the-shelf technical solution and implementation → new controversy and new definition of the SIP → local design of a solution → recuperation of the solution by local artisan or enterprise → improvement of the solution by an NGO → improvement, standardization, commercialization, and dissemination by a multinational company → creation of new differences and emergence of new SIPs.<sup>1</sup>

### ***From Problem to Demand Stage***

Once the problem is understood, or at least its symptoms are understood as a barrier to social inclusion, a demand for solution must be set so that the problem



can acquire social macro-level visibility. We define demand as an abstraction of the problem, recognized as such and externalized in terms of “need for a solution” to an unacceptable situation in a given society, according to its parameters of justice. Many actors may intervene in the construction of demand, in a combined way or alone: actors that suffer the problem, their organizations, those that have a direct link with it, and/or academic actors.

*Short Circuit from Problem to Demand*—Why may a problem not be identified as such, remaining invisible to those that suffer from it? The answer to this question is important for the program because invisible problems will never become research subjects. The phenomenon denominated by Jon Elster (1983), “adaptive preferences,” can be a significant obstacle for the recognition of the problematic nature of some situations, particularly for those people who have been for a long time directly affected by them. According to Elster, adaptive preferences evolve from an unconscious process of adaptation to situations where opportunities are limited; the effect is to diminish the frustration derived from desiring something that is out of reach. Such frustration is explained by Elster’s use of the concept of cognitive dissonance proposed by Festinger (1957) in which every person tries to achieve an internal coherence between their opinions and their attitudes. Inconsistencies in these are psychologically uncomfortable and those that experiment these inconsistencies try to eliminate them and to reestablish the previous coherent state. The way to resolve these cognitive dissonances would be through adapting the volitions to the real opportunities at hand; this can be achieved through a process of degradation of what is, at the same time, desired and unachievable and by valuing more what already exists.

In this way, after a long and daily experience of situations of social exclusion that either are not addressed or not resolved, adaptive preferences may provoke a sort of naturalization of these situations. If this happens, it would be difficult for different types of actors to conceive them as problems, hampering the possibility to design circuits oriented to its solution (see example 1).

Example 1: rural rice workers. When a problem has been turned invisible by a mechanism such as an adaptive preference, we will not know concerning it: this is merely a tautological assertion. However, sometimes, the problem is rendered visible while the actors remember when it was invisible. This is the case of a trade unionist of the Uruguayan rice rural workers, interviewed during the evaluation process of a project presented to the program. He explained how the consciousness of a health problem took place: “[w]e knew that policemen retire, that teachers retire, that public servants retire, and that we, rice-workers, die before retiring. We die faster, without any doubt. [...] If you apply glyphosate to pastures, you put it and you don’t go there in the next three months. However, in rice is different: you put the poison today and you must go into the water tomorrow, the same water into which you have spread the poison the day before. This is, we believe, the great difference.” Now they are worried, they are organizing themselves, they are talking with people from the university, at the extension services and at the chair of occupational medicine, but until recently, they simply understood death as a consequence of “regular” illnesses and not as a process accelerated by working conditions. Workers, family, and social environment had naturalized the high prevalence of deaths at relatively young ages compared with life expectancy of men in the country. They also naturalized suffering from respiratory diseases, skin conditions, and types of cancer. Such diseases began to be seen as problematic by the Rice Worker’s Union, and the demand was gathered by researchers



at the Universidad de la República and reflected in a project that was funded by the program in 2010.

The capacities to build demand are linked to overcoming the eventual naturalization of problems. For that, a disruption is needed. In the previous example, such disruption was provided by the workers' organization, which was able to recognize a problem and express a demand. The trade union capacity to give voice to this problem is perhaps linked to the concrete historical process going on in Uruguay where "neglected workers" such as rural workers and domestic workers gained recently parliamentary recognition for their organizations. It is interesting to reflect on what would have been the situation if under another correlation of forces rural workers' trade unions continued to be unrecognized.

### ***From Demand to Research Stage***

At a cognitive level, the demand unraveled in the previous stage must be recognized by researchers with the capacity to generate appropriate knowledge in relation to an associated problem. If the main features of the problem have already been identified, the researchers will need to understand them; otherwise, they must "translate" the problem into a research problem. Researchers may get involved with demands in direct dialogue with those that suffer the problem or by means of third actors or "mediators." Once involved, they proceed to evaluate whether the problem can be tackled with the research skills they have at hand; if they reach a positive answer the SIP can be translated into a research problem. The third actors or "mediators" we were referring to may be quite diverse:

- Other researchers.
- Policy makers.
- Civil society organizations and NGOs.
- Mass media.

This diversity of actors will give rise to different styles of dialogues.

*Short Circuit from Demand to Research*—The passage from demand to research can be short-circuited by different types of difficulties.

Even if problems are identified, and the need for research to solve them is recognized, the concrete demand for producing the needed knowledge can be quite weak. Eventually, the weakness of knowledge demand will produce the short circuit that can stop the travel along the circuit.

In Latin America, the weakness of knowledge demand, even though usually analyzed in the case of production, is even more accentuated in relation to SIPs for at least two reasons. The first reason is due to the weakness of all types of demands stemming from the population most affected by SIPs. Weak knowledge demand is, in this case, a particular manifestation of a more general situation (Arocena & Sutz, 2010). This weakness is associated, among other issues, to the lack of self-constitution as a social group, with atomization as a main consequence.

The second reason is related to the fact that the organizations that give voice to marginalized groups and try to better their situation, be they NGOs, civil society organizations, or the state, rarely view academic research as a tool at their disposal. One of the persons interviewed with the aim of detecting demand before the second program's (2008) call was responsible for the Ministry of Social Development's section on disabilities. She identified clearly a bottleneck in the betterment of children with severe neuromuscular problems: the high cost of imported special spoons that would allow them greater levels of autonomy. The university's Center for Design could have tried to search for a solution if the problem would have been put forward, but the idea that researchers are able and willing to address the challenges in the country was not present, inhibiting the expression of demand.

Sometimes, the researchers' "academic radar," that is, the tool they use to detect and include the problems to be tackled in their working agenda, is not able to capture the kind of problems associated with social inclusion (see example 2). Besides that, well-known difficulties for linking research to developmental purposes, in general, and to problems of social inclusion, in particular, stem from the academic reward system (Singer et al., 1970). This is not only a "Southern" difficulty; concerns regarding the uselessness and distorting effects of counting articles as the paramount criteria for academic excellence is growing everywhere (Chat-away, Smith, & Wield, 2006). However, in places where the seriousness of social exclusion makes focused research more important, the developmental and social blindness of the academic reward system is particularly worrisome. The short circuit may also appear because research is not able yet to deliver solutions, or because the local conditions for doing research make it difficult to tackle a given problem (the working strategy may be too costly or require cognitive capacities that are not present) (Bianco, Oliva, Sutz, & Tomassini, 2010).

Example 2: malnutrition in Uruguay. A paradigmatic case of this type of short circuit was recorded in the Second Meeting on Research and Innovation Oriented to Social Inclusion (September 2009) in which a punctual demand to a particular problem was staged: the growth retardation detected in children under two years belonging to low-income homes. The problem was described in different ways by diverse officials of the Ministry of Social Development, Ministry of Public Health, National Food Institute, the National Primary Education, and members of the United Nations Development Program in Uruguay. According to the usual dynamic of those meetings, an invitation was extended to university researchers from all areas of knowledge and particularly to those with specific cognitive capacities which presumably could be placed at the service of finding answers to the problem. The result was striking and illustrative of the aforementioned short circuit: no project around malnutrition was proposed.

The passage from demand to research can be also stopped if the researcher is not able to characterize or to properly understand the SIP in his or her own cognitive terms, thus failing in building a research problem. This can occur even when dialogues between researchers and actors directly linked to the problem are in place: in such a case, a communication failure is probably present, driven by the use of different linguistic codes. Communication difficulties have been reported again and again in the literature on cognitive dialogues between people with quite diverse types of knowledge or belonging to different settings (Caron-Flinterman, Broerse, & Bunders, 2005; Chataway & Smith, 2005; Ostrom, 1996).

### ***From Research to Production Stage***

The outcome of the research process will be a solution prototype for the identified SIP. We understand as prototype any research outcome, in any knowledge area, that has not yet been taken to the necessary scale to solve the target problem. Once the prototype is in place, it must be scaled up to allow the solution to reach all the people in need of it. Actors in the productive structure of goods and services, in the private and in the public sphere, are those who should take charge in this stage of production.

For “traveling” from prototype to production, the intervention of public policy becomes crucial. Public procurement is fundamental to achieve operative solutions for SIP: setting accurate incentives and warrants able to drive innovation decisions are two of the tools they can provide. This is so because the part of the population frequently affected by SIPs usually does not constitute an attractive market for business firms and so the certainty provided by public procurement can have a very effective countervailing effect.

*Short Circuit from Research to Production*—The SIPs can be extremely complex in cognitive terms, requiring sometimes unorthodox heuristic approaches. It can occur that researchers do not find a solution in cognitive terms: progress could have been made and even solid steps toward a solution could have been achieved, but the research project could not deliver what it had promised.

Sometimes, the research process does not deliver a workable solution (see example 3). For example, a laboratory solution has been found, but to implement the solution in real life, much more research is needed, or much more money is necessary, or actors such as business firms should enter into play and there is no certainty that they will do that, or the characteristics of the users were not carefully taken into account and they will not be able to incorporate the would-have-been solution.

Example 3: group B streptococcus. An example of this type of short circuit is represented by the failed attempt to get a diagnostic kit to detect the presence of group B streptococcus in pregnant women in real time just before delivery. Group B streptococcus is a bacterium that causes illness in newborn babies and may even lead to death. These bacteria, lodged in the mother’s vagina, infect the baby when passing through the birth canal. The disease does not manifest in the mother so it is necessary to conduct a prebirth test to detect it on time and treat it. This test is routine in late pregnancy; however, many women, especially low-income ones, do not attend these controls. The population potentially affected is not aware of the problem: its identification and characterization comes from doctors in contact with it. The demand for a solution was expressed in the First Meeting on Research and Innovation Oriented Social Inclusion (August 2008) by a clinical doctor. This doctor is, in our scheme, an *actor directly linked to a SIP* who has information concerning it but no capacities to solve it. The demand was collected by a chemical engineer who, jointly with the mentioned doctor, presented a research project to develop a kit to detect this disease at the time of delivery. The kit would also be low cost to ensure its incorporation into the whole health system. The research ended with a prototype that did not reach the required threshold for detecting the streptococcus, thus leading to a short circuit of the type “from research to production from the research side.”

Occasionally, a mismatch between the research process and the problem can also occur. A research proposal dealing with SIPs usually needs great amounts of

dialogue between the researchers in charge of the project and other actors related to the problem in a way or another. If such dialogue is too sparse, it can be expected that the sphere of research and the sphere of the problem “in real life” become incrementally divorced. In a worst-case scenario, such divorce can be detected at the end of the circuit, when there is no chance to redress its effects.

Short circuits in research to production usually come from the difficulties found on the production’s side to implement the solution even in small batches. It takes time, it costs money, it needs a lot of adjustments, and it can require transformations in the marketing and logistics strategies: we are talking concerning innovation in its classical meaning of changes in routines. These obstacles can be overcome with the right set of incentives, aimed at countervailing the difficulties to explore new and uncertain productive venues.

The well-known public technology procurement policies can have great impact on redressing this short circuit; specific public policies can be fundamental to avoid it (see example 4). When a public policy, for instance, in the realm of health, creates a market by assuring that everyone will have access to a health product even if they are not able to pay for it because the state will take care of the cost, an important incentive is set to pass from cognitive results to production.

**Example 4: synthetic human skin.** The SIP that motivates the search is the high incidence of severe skin lesions (burns) in the poorest population of Uruguay due to the means of heating used as well as the type of precarious housing. The high cost of the imported synthetic dermal segments available on the market prevents the state from acquiring it massively for public hospitals; this seriously compromises the chance of survival and subsequent quality of life of the injured people.

Researchers have developed, at prototype level, synthetic skin made of soluble collagen from bovine tendon (waste material in the meat industry, abundant and free of “mad cow” disease in Uruguay), which costs much less than the imported synthetic skin having similar quality. The demand for a solution to the problem was not expressed in an organized way. Even if such demand has been put forward in isolated events, by relatives of fire victims (especially in the mass media), it has not been enough to reach visibility at a macro-social level. The cost of imported synthetic skin is seen as a barrier by those directly involved with the problem (those who suffer from it, their family, and doctors). However, this recognition was not sufficient to raise an effective and clear demand from the public health policy: the passage from “social problem” to “research problem” was mainly due to the sensitivity of the researchers. The origin of this short circuit can be traced back earlier in the circuit: the lack of a clear and “voiced” demand for solutions to an unacceptable situation ends blocking the possibility of producing a solution out of a working prototype.

### ***From Production to the Effective Solution Stage***

Production can deliver a technical solution, but it has to pass through a process of diffusion to reach all the affected sectors, and through a process of adoption, the final stage in the achievement of a solution for the SIP. Again, public intervention is crucial in this stage, given that the transit from a technical solution to an integral solution is far from spontaneous. Public policies can develop a series of instruments and mechanisms to facilitate the diffusion and the adoption of solutions.

*Short Circuit from Production to the Effective Solution*—The “effective solution” concept deserves more attention: we only say here that we conceptualize effectiveness as the

incorporation of the solution in such a way that the problem detected at the beginning of the circuit diminishes its harmful consequences. It seems clear from this characterization that the role of the public policy is of great importance, from assuring complementary interventions needed to put the solution in place to a good distribution of the solution if necessary (see example 5). Short circuits can appear, then, in case of weaknesses in several of the fundamental workings of public policy: legitimacy, capacity to exercise control over the territory, or the functioning of the state bureaucracy. They may also arise from lack of public technology procurement policies.

Example 5: severe neonatal hyperbilirubinemia. This one type of short circuit is illustrated by the case of “Bililed,” trademark of a technological device to treat infants with severe neonatal hyperbilirubinemia. This disease, a type of strong jaundice, has a high prevalence among premature infants (approximately 60 percent); teenage mothers and deprived women are overrepresented in premature birth.

The appropriate therapy is composed of directing a very precise beam of blue light toward the baby’s body; this achieves the degradation of the bilirubin molecule responsible for the jaundice. There are two types of blue light lamps on the market. On one side, there are the halogen bulbs. They have some disadvantages, such as a relative lack of precision in the light spectrum, presenting additionally the difficulty that the lamp burns out quite often, and the spares are very expensive. This leads the pediatric intensive care units equipped with such lamps to frequently keep them inactive.

On the other hand there are the light emitting diode (LED) lamps whose lifetime is longer. However, as each LED has a very low intensity, many LEDs are required, increasing the price of the lamps. The problem lies in the combination of these two situations: no lamps for treatment in public hospitals, leaving as the only alternative the (dangerous) therapy of replacing all of the baby’s blood.

The solution found by a researcher from the faculty of engineering is composed of a phototherapy instrument: “optical elements (. . .) designed to maximize the light intensity useful for treatment, with a small number of LEDs in a compact and low cost unit” (Geido, Failache, & Simini, 2007, p. 1). The equipment’s virtues are high precision, long life, and low cost, and, in addition, in contrast to conventional lamps, they can be used in incubators.

The prototype was developed at the Center for Biomedical Engineering from the Faculty of Engineering, and the results were successfully tested at the university hospital (Hospital de Clínicas).

The passage from prototype to production took a long time. Finally, with support from international funds, the technology was transferred from the university to a national electronics company, under university patent. The company introduced improvements to the prototype and hired another company specialized in marketing of medical products for its distribution.

Regarding policy, the Universidad de la República donated five lamps to hospitals in different parts of the country. There was no other political initiative, particularly at the Ministry of Industry or the Ministry of Public Health; this situation prevented the spread of the solution to all affected populations.

In those cases in which diffusion successfully occurs, the issue of the adaptive preferences mentioned at the beginning of this section can constitute an obstacle at the very end of the circuit. The circuit could have been traveled and this travel could have been accompanied by people with an acute consciousness of the problem and a strong will to overcome it, but they may as well represent a minority of the people affected by it. If the majority has developed adaptive preferences, the implementation of the solution can be blocked. This case was analyzed by Pereira

(2007): he posited that this could be one of the reasons why social policies targeted to people in extreme poverty or victims of domestic violence fail even if they have been carefully designed. The fable of the fox and the grapes with which Elster (1983) illustrated the operation of the cognitive dissonance can be a clarifying analytical device to understand why the blockage of the technical solution can occur at the end of the circuit. Even if a solution is made available, the grapes may seem too sour to be accepted. However, there are successful examples, such as in the case of epilepsy (see example 6).

Example 6: refractory epilepsy. A successful case of travel around the circuit is a project funded by the program whose purpose was to seek cognitive solutions to enable real-time imaging to assist surgeons during surgery of epilepsy refractory to drug treatment. The problem is that the tools available so far for surgery (the most effective alternative) in the university hospital provided a vague spatial position of the location of the epileptic focus. The unaffordable alternative was importing a special software.

The passage from the problem to demand was mediated by *actors who are not directly affected by the problem, but have a tight connection with it*: the neurosurgeons from the university hospital. It is no coincidence that the demand was clearly expressed by physicians: in the case of health care, technicians who daily face limitations on the quality of their attention of patients can clearly identify barriers to perform a better job.

The passage from demand to research was mediated by a virtuous combination of use of existing capabilities, accumulated knowledge and human resources, and generation of new knowledge. Specifically, the passage was given by the interaction of the Epilepsy Surgery Program (PCE) of the Hospital de Clínicas and the research group of Image Processing, Faculty of Engineering, Universidad de la República. The research project was executed jointly by researchers from these two institutions.

The transition from research to production was easy because the cognitive outcome obtained is free software so it does not require material investment or large-scale logistics for implementation. Indeed, it could be said that there was an almost immediate passage from research to the effective resolution. The software developed was transferred directly to the PCE for use in patients, while the research group made contacts with members of the international medical community for evaluation and accreditation, which may allow its use worldwide.

As stated at the beginning of this section, we have characterized the functioning of a system of interrelationships among different actors whose aim is to find solutions to a particular kind of SIPs: those in need of new knowledge to be solved. We propose to call this set of interrelationships between actors and institutions *System of Research and Innovation for Social Inclusion*. The differences between such a system and others (national, sectorial, and so on) stem from at least two aspects: the first one is that this specific system deals exclusively with SIPs; the second one relates to some of the actors included, who are seldom referred to in more “classical” systems of innovation.

### **University Research Responds to the Advancement in the Conceptualization of the Problem**

The way to make operative the conceptualization described so far has been a specific “Call for Projects,” with the first edition launched in 2003, followed by three others, in 2008, 2010, and 2012. The conditions of the call evolved through time, following a better comprehension of the difficulties at stake: the analysis of



this evolution is the aim of this section. The account is made from the Academic Unit of the University Research Council's perspective. This group is, at the same time, a scholarly academic group and is in charge of the academic management of the council's research programs. It was responsible for the design of the first call and for proposing transformations both in the conception of the call and in its implementation.

As already mentioned, the overall objective of the call is to foster national research agendas that take actively on board problems that negatively affect processes of social inclusion for large parts of the Uruguayan population. This basic objective, tentatively proposed since the first call, has been reinforced: nothing in the experience developed so far indicates that it was just wishful thinking without practical anchorage. However, transformations were introduced in the following calls: they were induced by changes in the national context as well as by considerations stemming from the learning process associated with the concrete practice of the calls.

The context of the first call in 2003 was a deep social and economic crisis at the national level, whose genesis went back to the beginning of the 1990s. This crisis became full blown with the financial crisis of 2001 in Argentina that severely affected Uruguay in 2002. The social role of the Universidad de la República was fostered by the dramatic situation experienced by the country. The first paragraph of the Call "Research Projects Oriented to Social Emergency" eloquently describes the national situation when the call was being conceived:

Uruguay is immersed in an unprecedented economic and social crisis. A recession of many years combined with the dismantling of a great part of its productive units has led to an unemployment rate near 20%, a figure largely below that of the youngsters seeking for jobs without finding them. The qualification of "social emergency" fits well with the present situation in which endemic hunger gives rise to vast social mobilizations to try to cope with its most dramatic manifestations. This situation affects particularly children and young people, who are the most damaged by the severe process of impoverishment suffered by the population. The growth of precarious lodgings aggravates the sanitary conditions in which more and more people live and the public health system, at the verge of collapsing, is getting out of hand, a situation nurtured by the long agony of the mutual health assistance system. The environmental conditions deteriorate and phenomena like human lead contamination dangerously evolve from isolated anecdotes to permanent problems. The lack of perspectives foster migration processes of an entity only comparable to that occurred thirty years ago.<sup>2</sup> For those whose "social capital" is too low to allow them to emigrate, hopelessness activates circuits of violence which effects are fairly notorious.

The call was directed toward projects for which the "main aim is to study one or several aspects of the social emergency situation in which many sectors of the population are living, and to propose solutions/answers/alternatives to cope with them." To be eligible for this call, the proposals had to do the following:

- 1 Identify precisely the problem associated with some expression of the social emergency suffered by the population.
- 2 Indicate the shortcomings in terms of the existing knowledge to address possible solutions.
- 3 Propose a research strategy for obtaining, even partially, the missing knowledge.



- 4 Indicate the necessary conditions to enable the research results obtained to be an effective contribution to the solution of the problem under consideration, indicating as well the actors that should participate in the solution implementation.
- 5 Devise strategies to involve such actors in the discussion of the proposal and to assure their participation in putting into practice the results that can be obtained by the research.

In this first call, even though the systemic conception was already present, emphasis was put on stimulating only one actor of the system to travel across the circuit: the researchers. The relationship with other actors, not yet clearly identified in the call, was expected to be declared without any requirement to demonstrate the steps undertaken to assure such relationships.

The researchers are expected to design strategies for detecting the problem of social emergency or social inclusion, transform the detected problem into a research problem, obtain the cognitive results, and after all that, assure the effective translation of such results into practice to achieve an effective solution. The travel across the circuit induced by this specific call included only the research stage, even though the need to build linkages between researchers and other actors in the system was indicated.

In 2008, a new call for research projects with similar characteristics was made, introducing some changes derived from the gathered experience and from further academic research around the issue. Moreover, the economic, social, and political context in Uruguay had changed. With the leftist coalition Frente Amplio in government since 2005, different types of sound social policies were implemented, pointing specially to the lowering of poverty and indigence. Some years later, Uruguay showed an unparalleled rate of economic growth: at the end of 2008, the country growth reached 8.9 percent and the level of unemployment was below two digits.

For the 2008 call, special emphasis was made in the previous recollection of demand. One of the lessons learned from the previous experience was that such recollection was a must because researchers were not able by themselves to get fully acquainted with the needs and demands stemming from social problems even though many of them were more than willing to put their capacities to contribute to the solution of such problems. The point was to help the researchers' "academic radar" to identify new and unfamiliar challenges. Undertaking such recollection in general, that is, targeting all possible types of needs and problems would have been totally impractical. This is why it was decided to narrow the search and to focus on three types of problems: equity in access to high-quality health services; the effects of the Plan Ceibal, or "the one laptop per child" program implement in Uruguay since 2007; and the needs and demands present in two poor neighborhoods in Montevideo, profiting from the work done in these territories by a specific extension university program, the Metropolitan Integral Program.

To achieve this initiative, several meetings were organized by the Academic Unit with actors directly related to the type of problems previously defined. Such actors included representatives of the people bearing the problems, intermediate actors with direct contact, and public officers. The information gathered during these

meetings was systematized and publicly exposed to university researchers, public policy officials, and the general population through an open gathering called the First Meeting of Research and Innovation Oriented to Social Inclusion, as well as in thematic workshops. In this way, the Academic Unit started working between actors with direct linkages to the problems and researchers with capacity to build answers. The results of the previous described process were a main ingredient in the definition of the 2008 call. The efforts to identify demand and to communicate it were not strongly reflected in the proposals presented to the call. However, some proposals were built around demands that were not detected beforehand but emerged from face-to-face contacts produced during the workshops.

One important difference between this call and the previous one is that the university research policy recognized itself as an actor in the process and assumed a protagonist role in facilitating encounters between researchers and other actors. As a result, the travel across the circuit from the problem's identification to the demand and from there to the research problem was facilitated. As before, the rest of the travel is recommended or suggested but is not directly induced.

In 2010, a new call was put in place, consolidating the program as a University Research Council regular program. The new call presents similarities but also important differences with the previous two. The call provided a more detailed and precise explanation, widening the characterization of the actors that need to participate in the finding of an effective solution to SIPs. This was incorporated into the formalities to apply to the call: the proposal must demonstrate that dialogues with nonacademic actors were established to get a better comprehension of the issues at stake; the commitment of these actors to contribute in different ways to the success of the proposal was also formally required. The participation of nonacademic actors can take quite different forms, from financial support to participation in the implementation of the solutions found through research: the important point is that such commitment, whatever its form, needs to be stated and signed by these nonacademic actors.

Attention to the detection of demand continues, as well as the determination to organize workshops and wide gatherings to foster face-to-face relationships between actors directly linked to the problems, and researchers who can listen and recognize such problems as belonging to their field of competence. What is new in this call is the effort made from the university side to link these two actors, problem bearers or its representatives and potential research problems solvers, with other type of actors whose role emerges from their capacity to assure the effective implementation of solutions.

The intention was to pay special attention to these types of actors before the closing of the call. On several occasions, these actors played a double role: they were directly linked to the problems by a thorough knowledge of its nature and dynamics, and at the same time, they had access to public action needed to assure the passage from the cognitive solution to an effective solution. In these cases of "double role," it was expected that not only a clear presentation of the problems would be achieved but the assurance of the interest to find concrete solutions would also be conveyed. This is why in the 2010 call, the Academic Unit was not as much involved as in 2008 in the demand detection, but it concentrated on incorporating diverse actors from the sphere of public policy, from social organizations and NGOs, from

society in general, as well as from academia, to a series of workshops. In these workshops, a wide list of themes was addressed: energy, health, habitat, public social policies, gender, and education.

An innovation was also introduced in the evaluation process: part of the appraisal of the proposals included interviews with the nonacademic actors indicated in the presentation forms. These interviews were conducted by members of the expert group in charge of the evaluation and by members of the Academic Unit. The nonacademic actors included representatives from organizations of people bearing the problems, actors related in different ways to the problems but without dealing with them directly, and actors working in the public sphere with capacities to foster the effective implementation of solutions. Only as a way of example, actors of the first type included representatives of cooperatives of hand garbage collectors and of rice rural workers trade unions. Examples of the second type of actors include a medical doctor in charge of the only public laboratory of the country entitled to perform lead contamination diagnoses and a group of psychologists and social workers dealing with different kinds of homeless people. Examples of the third type are the governmental program “Plan Juntos” (Plan Jointly), set to address the issue of people without decent housing, as well as a municipality dealing with urban planning, which tends to include excluded people in the vicinity of a highly expensive and exclusive sea resort. These interviews were important indeed to gain a better comprehension of the problems involved and to better harness the commitment of actors to a future implementation of a solution, if founded. From the Academic Unit perspective, it constituted a very valuable analytical tool for further reflection and learning. Furthermore, these interviews allowed for the detection of new research demands; they also allowed for detecting inconsistencies between what the research proposal wanted to do and the problem that gave rise to the demand. In such cases, the proposals were reformulated, and a much better research strategy was obtained.

Another innovation in the 2010 call was the opening of a second modality of research projects with a lower time frame and less allocation of resources for each individual proposal. Its main objective was to avoid the two first short circuits in the travel across the circuit, that is, from the problem to the expressed demand and, from there, to the research strategy. Again, the stimulus is addressed toward the university researchers, many of whom may want to formulate a project having as a starting point the suspicion of an SIP's existence but for which they lack clarity around its dimensions, depth, characteristics, and scope. The aim of this second modality is to allow the clear delimitation and characterization of the problem and the identification of the actors suffering from it as well as those actors endowed with capacities to contribute to its solution. The outcome of these small projects are full-fledged research projects with a well-developed strategy to deal with the problem and with sound contacts made with other actors to maximize the probabilities to transform their results into solutions. These full-fledged projects will compete again for funds, even though some will be funded directly if the outcomes of this previous stage are good enough. They can be carried out by the same researchers or by different researchers identified in the process of characterizing the problem. This modality goes a step further in pushing the university research policy toward a hands-on strategy to link research and societal needs.

At the time of writing, the 2012 call was still open. It presents an innovation: a problem platform on maternal and child malnutrition to try to gain momentum by stimulating diverse approaches around a common concern. Researchers from all knowledge areas can present projects in the problem platform: those funded will have, somehow, to coordinate their work. The objective of the platform is to concentrate efforts in a complex and multidimensional SIP that is unlikely to be efficiently addressed by more classic and isolated research projects. The interviews with nonacademic actors will be maintained as part of the evaluation process as well as the call for more classic research projects around any identified problem.

## Conclusion

Uruguay has changed dramatically since the program's inception. From the problems of unprecedented hunger, the issues are now the lines at the doors of the big commercial stores to buy plasma television, from violent robberies for food at the time of the first call to different types of security problems associated now with violence related to the uneven economic growth and the persistence of social exclusion, from the bankruptcy of hundreds of firms and the damaging personal indebtedness in dollars to inflation in the national currency and a type of foreign exchange favorable to imported consumption, from massive firings and salary reductions to negotiated rises in salaries between workers and entrepreneurs mediated by the state, plus very low levels of unemployment. All this notwithstanding, Uruguay still has important groups of populations excluded from access to a dignified quality of life, despite the implementation of diverse types of social policies, and a sustained economic growth. The persistence of these situations makes even more valid the premise from which the university program "Research and Innovation Oriented to Social Inclusion" derives its normative vision: there are situations of exclusion whose reversal will not come only through political will or by devoting to their solutions increasing amounts of money, even though these factors are absolutely crucial. For some of these problems, new knowledge is necessary in order to reach effective solutions, in tight and systemic articulation with all the actors that should enter into play, each in his or her role.

The program has advanced in its formulation, refining and clarifying the means to reach its ends; it has achieved this through learning and reflecting from its successive implementations. We can say that the program has made its own travel through the circuit, trying, from one call to the next, to identify short circuits and ways to solve them. However, we should not forget that the university by itself will never be able to assure the completeness of such travel. Only the joint and systemic action of a great variety of actors can allow this initiative to reach the scale needed to tackle at least some of the social exclusion problems that we are facing.

## Note

- 1 We thank an anonymous referee for this valuable suggestion that captures so well what we mean.
- 2 From 1973 to 1985, Uruguay suffered a bloody military dictatorship that emphasized existing migration processes, adding political reasons to preexisting economic causes.

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