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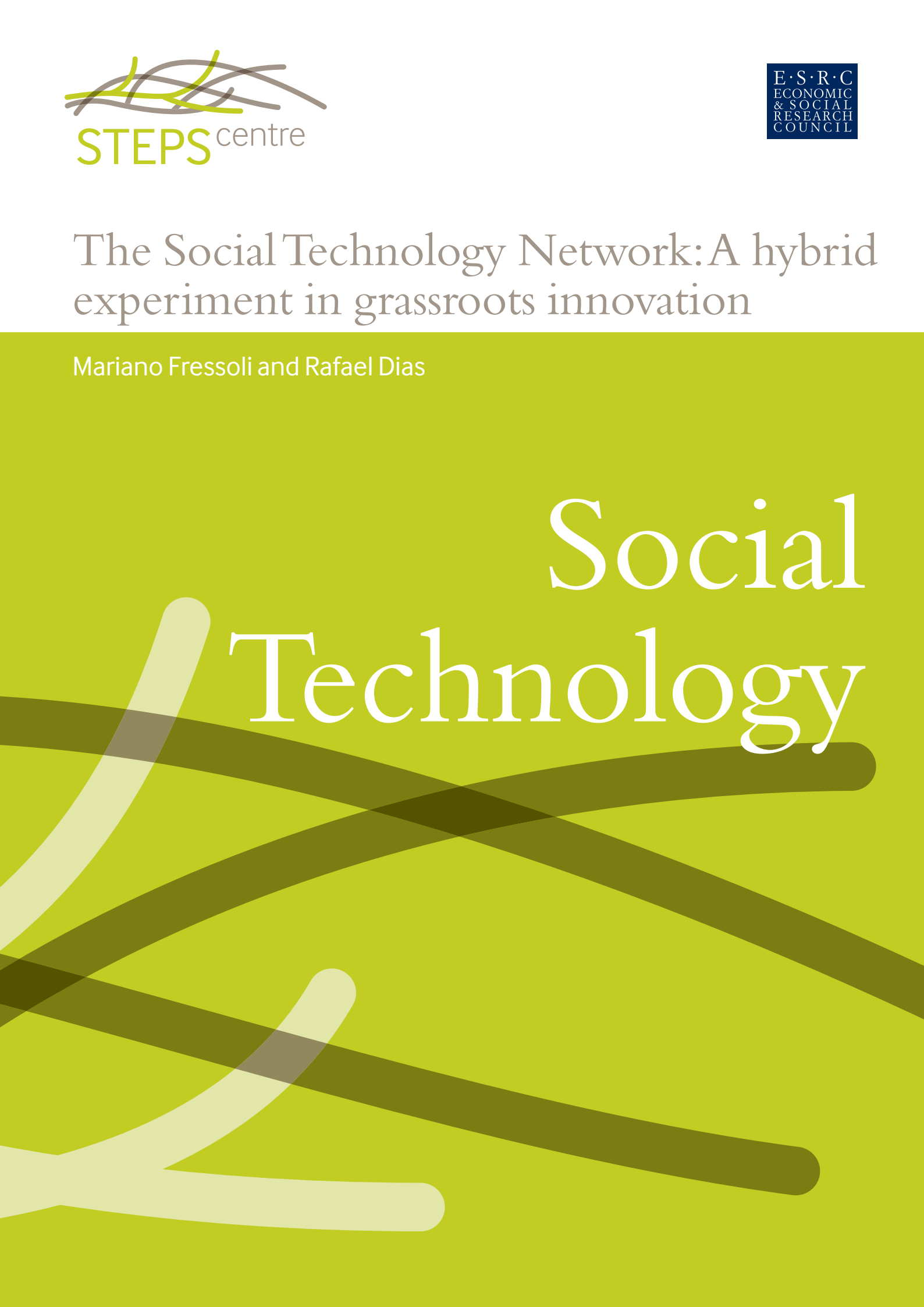
The Social Technology Network: A hybrid experiment in grassroots innovation

Mariano Fressoli and Rafael Dias



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Created in 2004 with the arrival of the new center-left government of the Workers Party in Brazil, the Social Technology Network (STN) aimed at fostering a process of social inclusion, public participation and income generation by drawing from existing capabilities in S&T. From the beginning, the STN relied on a hybrid alliance between social movements, NGOs, national institutions and semi-public companies like Banco do Brazil's Foundation and Petrobras. This allowed the STN to develop a bank of social technologies, scale up experiences at a national scale and reach more than 900 institutional adhesions, including some from other South American countries. However, as the STN started to plan further expansion and larger projects it also faced the limits of its informal structure and crumbled under different expectations and tensions between civil society actors and public institutions. The short story of Brazil's STN raises questions about what are the best strategies in the pursuit of grassroots innovation, what should be the role of the State, funders and civil society actors, and how to combine the urge to scale up solutions to poverty situations with the aim of empowering marginalized social actors. In this paper, we analyze the origins and background of the STN, its framing and spaces of development along with exemplary technologies in order to understand how this hybrid grassroots movement attempted to build pathways of social inclusion and sustainable development.

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The Social Technology Network:

A hybrid experiment in grassroots innovation

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STEPS Working Paper 67

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Acronyms

AT	Appropriate technologies
BBF	Bank of Brazil Foundation
BNDES	Banco Nacional do Desenvolvimiento (National Development Bank of Brazil)
CIAAT	Centro de Informação e Assessoria Técnica
CNPq	Conselho Nacional de Desenvolvimento Científico e Tecnológico (National Council of Science and Technology Development)
CSO	Civil society organisations
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária
GI	Grassroots innovation
INTI	National Institute of Industrial Technology
IP	Intellectual property
ITS	Institute of Social Technology
MST	Movimentodos TrabalhadoresSem Terra
NGO	Non-governmental organisation
PAIS	Produção Agroecológica Integrada Sustentável (Sustainable and Integrated Agro-Ecological Production)
PSB	Socialist Brazilian Party
PT	Partido dos Trabalhadores (Workers' Party)
P1MC	One Million Cisterns Program
PUC-SP	Catholic University of São Paulo
R&D	Research and development
S&T	Science and technology
S&TI	Science, technology and innovation
TISA	Technologies for Social Inclusion Network

RTS	Rede de Tecnologia Social
SEBRAE	El Servicio Brasileño de Apoyo a las Micro y Pequeñas Empresas
SENAES	Solidarity Economy Secretariat
STN	Social Technology Network
ST	Social technology
UN	United Nations
UFOP	Federal University of OuroPreto
UFRJ	Federal University of Rio de Janeiro
UNICAMP	State University of Campinas
USP	University of São Paulo

Abstract

Created in 2004 with the arrival of the new center-left government of the Workers Party in Brazil, the Social Technology Network (STN) aimed at to fostering process of social inclusion, public participation and income generation by drawing from existing capabilities in S&T. From the beginning, the STN relied in a hybrid alliance between social movements, non-governmental organisations (NGO), national institutions and semi-public companies like Banco do Brazil's Foundation and Petrobras. This allowed the STN to develop a bank of Social Technologies, scale up experiences at national scale and to reach more than nine hundred, including some from other South American countries. However, as the STN started to plan further expansion and larger projects it also faced the limits of its informal structure, and crumbled under different expectations and tensions between civil society actors and public institutions. The short story of Brazil's STN raises questions about what are the best strategies in the pursuit of grassroots innovation, what should be the role of the State, funders and civil society actors, and how to combine the urge to scale up solutions to poverty situations with the aim of empowering marginalised social actors. In this paper, we analyse the origins and background of the STN, its framing and spaces of development, along with exemplary technologies in order to understand how this hybrid grassroots movements attempted to build pathways of social inclusion and sustainable development.

Introduction

Following several previous talks, in July 2004, a heterogeneous group of institutions, led by the Bank of Brazil's foundation and including several national ministries such as the Ministry of Science and Technology and the Ministry of Social Development, together with semi-public companies like Petrobras and CaixaEconômicaFederal, met along with numerous representatives of NGOs, social movements and universities to discuss polices for social and technological development. This meeting led to the creation of the Social Technology Network,[1] a hybrid experiment to promote grassroots innovation in Brazil and seeking to combine participation and empowerment of civil society actors in technological development with the design of large-scale public policies for social development and poverty reduction.

Created just after the beginning of the Lula Administration, the STN embodied much of the aims and hopes of the new political scenario of the early 2000s in Brazil. This scenario combined the long-term rise of social movements like the Landless Movement, the recently created World Social Forum, with some restoration of the role of the State and a broad commitment to redistribution of income. The emergence of the STN coincided with propitious time to experiment with alternative frames of development and new ideas, like Solidarity Economy, fair trade and sustainable development, into public policies.

From its origins in 2004 until its suspension in 2012, the STN reached more than 900 members, involving a wide range of participants, from academics to activists, unions, government representatives, funding agencies and, especially, NGOs, community representatives and social movements.

The idea that propelled STN was built upon previous experiences in Appropriate Technologies (AT) in Brazil in the 1980s and 1990s, though its main ideas and vision differed deliberately from the technologically-centered frame of AT. For instance, from the beginning, STN had as its main aim the fostering of a more democratic process of innovation for development by turning isolated initiatives into broader public policies and applications (Miranda *et al.* 2011).

During a seven year trajectory, the STN documented hundreds of grassroots technological developments and selected dozens to be re-applied by the thousands in other communities, through collaboration with funders, technicians, academics, policy makers and civil society organisations. Innovative initiatives were evident in areas such as water sanitation, agro-ecological production, social housing and solid waste recycling. Through these actions STN also fostered a debate, in Brazil and elsewhere, about the need to combine technological development with social inclusion and the democratisation of knowledge: a vision that became acknowledged and incorporated among social movements, NGOs and policy makers. However, the network itself was suspended in 2012 due to irreconcilable differences between civil society organisations and funders over its formal structure, funding and pace of development.

The short story of Brazil's STN raises questions about what are the best strategies in the pursuit of grassroots innovation, what should be the role of the State, funders and civil society actors, and how to combine the urge to scale up solutions to poverty situations with the aim of empowering marginalised social actors.

[1]Rede de Tecnologia Social (RTS), in Portuguese.

In order to understand these issues, this paper will try to answer the following questions:

- How and why the Social Technology Network was created
- How Social Technology advocates mobilised support and activities in grassroots innovation
- What challenges and dilemmas the Social Technology Network faced

This work is based on a qualitative approach that benefits from the great amount of documentation and interest around the STN, along with a set of interviews with relevant actors in this process. The paper is organised as follows. The first section will explore the origins and background of the STN, including some considerations about the political landscape in the 2000s. The second section analyses the diverse (and not always coherent) framings of Social Technology (ST). The third section describes the main spaces where ST was able to develop, and the fourth section provides some relevant examples of re-applied technologies. Section five discusses some results and lessons that can be learnt for path construction from the history of the STN. Finally, the paper concludes with a revision of contribution of the STN to understanding grassroots innovation in Latin America.

1. Origins and Background of the Social Technology Network

In 2002 LuizInácio Lula da Silva and the Workers' Party (Partido dos Trabalhadores – PT) won the Brazilian presidential election in what was regarded as a watershed moment for the country. After three consecutive defeats, PT's rise to government represented a change of political tone compared to the neo-liberal policies prevalent amongst governments in the region and signaled a shift towards more social inclusive policies oriented towards fighting poverty, inequality and exclusion. Furthermore, PT, the largest left-wing party of Latin America, would finally have an opportunity to implement, on a national scale, what it was doing locally in several cities and states and was being called, 'PT's way of government' ('modopetista de governar'). This involved the commitment to redistributive policies in favour of the poorest part of the population and the 'democratisation of the state' through increasing forms of participation in setting public agendas including, for instance, participatory budget schemes (Samuels 2004; Hochstetler 2004; Paes de Barros and de Carvalho 2003).

In this political scenario, the construction of new public policies which could target social development and at the same time build bridges with social movements was keenly favoured by the Government. As Kathryn Hochstetler argues, there was a genuine effort to include social movements and NGOs in some areas and initiatives of the Government. This involved the inclusion of several activists among its staff and the call to support government social programmes (Hochstetler 2004). In this sense, the changes PT was implementing in Brazil signaled a shift from a state-centered managerial approach to a different one, more permeable to public participation and social movements, in particular regarding social assistance areas. This scenario thus combined the aim to implement new policies of poverty alleviation with the commitment to public participation. It also provided the opportunity to experiment with innovative policies of social inclusion and science and technology development at a national scale.[2]

However, PT faced huge challenges in translating the experiences of some pioneering local policies to the national level. In part, the PT was tied the political alliances with other political parties and it also needed to deal with a looming debt crisis (that also affected other Latin American countries, notably Argentina), all of which left little space for radical policies and constrained the simultaneous implementation of the goals of inclusion and democratisation. The PT Government did indeed privilege the construction of massive social inclusion programmes, such as *Bolsa Familia*, a social security program of direct cash transfer based on existing initiatives of the previous administration, which was inspired by the United Nations (UN) Millennium Goals and later received worldwide recognition.[3]

However, there was also room for more experimental policies regarding public participation and social inclusion, such as the creation of the Solidarity Economy Secretariat (SENAES) within the Ministry of Employment in 2003, amongst others. One of those initiatives was the Social Technology Network. As it

[2] Although as we will see, the scope of this experimentation with science and technology for social inclusion was limited and insulated within S&T mainstream organisations.

[3] Introduced at the beginning of Lula da Silva's Government, it reached almost 30 million people, approximately three quarters of those living under poverty (Hall 2006). Bolsa Familia and associated programs represented a massive effort to alleviate poverty and rapidly became a flagship of the new Government. However, it was also acknowledged that this programme had limitations and that there was a need to provide further assistance, including technical assistance, to the rural poor (Graziano da Silva 2009: 370).

will be described below, the idea behind the Network had previous antecedents, but found space and a strong support within the new Government.

1.1 Early Antecedents of Social Technology

The drive towards ST started at the end of the 1990s and beginning of 2000s. The origins of the idea of ST involved a diverse set of public and semi-public institutions that were experimenting with different concepts and visions of technology for social development.

In the early 2000's a small group of people at the Ministry of Science and Technology started to explore the possibility of launching a revamped version of the old appropriate technology programmes that were implemented by the National Council of Science and Technology Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico or CNPq in Portuguese) during the late 1970s through to the 1990s. From the idea of Appropriate Technologies, they later joined and contributed to the discussion of the concept of Social Technology (Brandão 2013).

The Bank of Brazil Foundatin (BBF) is the private foundation of the flagship bank and one of the largest in Brazil. Its interest in ST arose from the recognition of the limits its own social development programmes faced and its acknowledgement of the need to include technological solutions in the fight against poverty (Fonseca 2011; de Oliveira Pena and Claiton 2004). As a result, in 2001 BBF created the National Prize on Social Technology with the aim of publicising the then fairly unknown technological solutions for social demands in themes, such as water supply and sanitation, food production, energy, education, income generation, health, social housing and environment (de Oliveira Pena and Claiton 2004: 84).

Another important actor at the beginning was the Institute of Social Technology (ITS), created in 2001 and aimed towards linking social needs with scientific knowledge available in the country. Between 2001 and 2004, ITS developed a series of workshops and debates on how to build bridges between the third sector and public science, technology and innovations (S&TI) institutions that led to the first discussions of the concept of Social Technology (Instituto de Tecnología Social 2004a). Finally, the Advanced Centre of Social Technology from the Ayrton Senna Foundation was also involved in these early discussions.

> The actors that were later to become part of the STN started to discuss at the 2nd edition of the Prize Bank of Brazil's Fund of Social Technology, in November 2003. In this event, the Federal Government, represented by the then Ministry of the Secretary of Communication and Strategic Management of the Presidency declared their interest in promoting the debate on ST in order to support the creation of public policies. [the authors' translation]
> (Fonseca, 2011)

On a smaller scale, STN's early setting also involved a small number of academics directly involved with earlier research on appropriate technologies and other complementary themes, such as solidarity economy, agroecology and permaculture and Freire's 'pedagogy of the oppressed'. Notable researchers involved with these early efforts were professors Renato Dagnino (State University of Campinas (UNICAMP)), Paul Singer (University of São Paulo (USP) and then National Secretary for Solidarity Economy), Ladislau Dowbor (Catholic University of São Paulo (PUC-SP)), Jacqueline Rutkowski (Federal University of OuroPreto (UFOP)) and Sidney Lianza (Federal University of Rio de Janeiro (UFRJ).

From the beginning the STN was also supported by several social movements and NGOs, such as the Semi-Arid Association (Articulação no Semiárido Brasileiro), the Amazonian Working Group (Grupo de Trabalho Amazônico), the National Coordination of NGOs, Abong (Associação Brasileira de Organizações Não Governamentais). Therefore, to help the creation of this network along with public institutions was advantageous for the new Government, not only because it would aid in the empowerment of its own political base, but also because of its potential creation of challenges for the incumbent monopolies in public policy (Hochstetler 2004). The alliance between social movements, public and semi-public institutions also proved to be fruitful, helping to install the idea of Social Technologies at the national level and to promote support for Social Technologies' programmes. The network organisation helped to create spaces for the flourishing of ST, and there even were 'networks effects' that moved beyond its formal organisation, spreading to other countries and settings. However, as with other initiatives involving civil society organisation in the Lula Administration,[4] these heterogeneous institutions were not easy to coordinate. The actors and institutions in Brazil's STN comprised very different knowledge and practices, as well as aims and spaces of intervention that represented an institutional challenge for every participant and ultimately turned into a limitation for some of its members. As a result, differences between social movements, NGOs and public institutions and, in particular, difficulties to find a suitable institutional form for the network would later play a major role in the suspension of the STN in 2012.

[4]PT's strategy of including civil society organisations did not always work so well. Some initiatives sponsored by the Government, like the Economic and Social Development Council, were embraced eagerly at the beginning by CSOs only to wonder later if this kind of space was suitable for their demands (Hochstetler 2004).

2. Framing for Social Technologies

The definition of Social Technology (ST) was originally built in a debate between social movements, NGOs, public and semi-public organisations and a few researchers between 2000 and 2004. These early interactions were crucial to the constitution of Brazil's Social Technology Network which defined its object as follows:

> Social Technology comprises products, techniques and/or re-applicable methodologies developed in the interaction with the community and that must represent effective solution in terms of social transformation.
> (RTS 2014)

'Re-application' is arguably the main idea present in this concept. It implies that successful experiences should be multiplied, but thoroughly translated in a way that they would be able to connect properly to the specific characteristics of the contexts in which they would be implemented. Thus, to the actors linked to the STN, scale-building was just as important as the respect for the local culture, economy and environment.

Another relevant point is the broadness of the concept used by the Network. Even though it did draw some criticism because of its lack of focus – especially because many of the methodologies it referred to did not have an explicit technological component – this broad concept enabled the STN to incorporate a wide variety of organisations in its early years, contributing to the Network's political sustainability and visibility.

The discussion around the concept presented above originally drew on previous definitions and ideas about Appropriate Technologies and discussions about ST&I policies for social inclusion. However, the framing of Social Technology was explicitly linked with a broader array of social problems ranging from inequality, empowerment of civil society actors, income generation and sustainable development, Solidarity Economy, and the role of the State and its public policies in the search for inclusive development. In the constitutive document of the STN these dimensions are clearly mentioned:

> The STN has the aim of fostering:
> - The adoption of Social Technology as public policies
> - The re-appropriation by the communities' stakeholders of re-applied Social Technologies
> - The development of new Social Technology in those cases where there is not Social Technology for its re-application
>
> (RTS 2014)

These dimensions show the concerns which resulted from the previous experiences and debates from the diverse actors which then constituted the STN. These included concerns and ways of framing from different positions including: (a) the new drive to re-direct resources from public and semi-public institutions toward inclusive social development in conjunction with social movements; (b) social movements and NGO's previous experience in programmes and approaches in the fight against poverty and exclusion; and finally (c) the definition of Social Technology represented an attempt to engage with

scientific institutions in a different arena, that of social development problems and policies. Although these concerns were complementary, they were not always coherent and tensions between different frames sometimes remained. In this section we explore the framings of Social Technology, focusing on the following issues: Social Technology as public policies; Social Technology as a source of income generation, Social Technology as empowering and leading to effective forms of public participation; and the interpellation involved in the creation of a network which ultimately led to a process of identification with ST.

2.1 Social Technology as an Alternative Strategy of Development

At the beginning of the new century, some Brazilian institutions and social movements realised the need not only to challenge market driven strategies of economic growth but also to search for new approaches for tackling poverty and social inequality.

There was a double recognition on the issues of poverty, social development and science and technology. Simultaneously, policy makers and social militants started to think of ways to tackle the huge scale of social problems in Brazil and therefore realised the need to design heterodox solutions. The framing of Social Technology was related to the construction of these new policies. It also offered a fresh view into the demanding problems of inequality and poverty. In that sense, the basic framing of Social Technology attempted to bridge some ideas that, although related, were not explicitly connected. For example, there was a need to provide food to the poorest population but also to promote income generation among informal actors in a sustainable way. Overall, the aim was to connect the dots of rich ideas and experiences in order to experiment with an alternative strategy of (technology) development.

Therefore, ST bridged social inclusion through technology with other issues that were in the agenda of social movements and social development at the moment, such as social empowerment with long-term goals of structural transformation. Two themes in particular that were supported by actors that would become very relevant for ST, Solidarity Economy and sustainable development.

Solidarity Economy aims to restore humans as the central aim of economy development through the development of cooperative self-management, local production.[5] Solidarity Economy advocates, including members of SENAES,[6] participated from the beginning on the debate about ST. The need to widen the debate on access to science and technology was included on the agenda of the Solidarity Economy (Alves da Silva and Sardá de Faria 2010) reasonably swiftly due to the common spheres in which backers of both groups often circulated. The Network of Incubators of Social Cooperatives was also a strong supporter of the STN. For Solidarity Economy advocates, social technology (TS) initiatives were important in order to upgrade and to adapt technologies used in cooperatives or occupied factories to the values of solidarity and self-management. In particular, Solidarity Economy stakeholders were keen to develop areas where they already had experience or interest, such as urban disposal recycling, renewable energies, sustainable food production and open software for social inclusion. These were of special interest to Solidarity Economy (Alves da Silva and Sardá de Faria 2010: 70).

[5] The concept of social economy includes issues in areas such as economic and solidarity relations, work economy, and alternative economic arrangements in civil society. There is some consensus among groups and movements that a solidarity economy entails the search for economic alternatives to a full-fledged capitalist market economy.

[6]The SENAES became a funding institution of the STN later in 2009 (RTS 2011).

Similarly, sustainable development was very much present in the imaginary and practices of ST's actors and institutions. Ecological ideas were used to challenge the advance of agri-business which involved massive monoculture with heavy use of agrochemicals and displaced local farmers. Since the bulk of stakeholders and experiences that were promoted by STN were mostly rural, it was not surprising that there were clear affinities with sustainable methods of production and development. Initiatives like PAIS (a sustainable farm production system based on agroecological principles) or the One Million Cisterns Programme, oriented towards the construction of cisterns on the northeastern part of Brazil, attended to the needs of rural populations and were designed to be sustainable, using minimum resources and including organic family farming. Moreover, in the long ter, the ST's vision was keen to create a whole strategy of development 'more sustainable' than available technological systems (RTS 2005).

2.2 Beyond Mainstream Notions of S&TI and Commercial Innovation

During the 1980's and 1990's, Science and Technology agendas were colonised by the neo-liberal motto of market-driven innovation and university-firms collaboration oriented exclusively towards promoting industrial and agricultural competitiveness. Neo-liberal S&T policies in Latin America were based in previous ideas of technology transfer from public universities to companies, but they now seek a much more radicalised posture, transforming public and universities' research and development (R&D) institutions into active producers of industrial innovation through joint ventures with companies, looking for R&D that could generate private intellectual property, and selling services (e.g. consultancy) for the commercial secto (Dagnino *et al.* 2011).[7] There were, of course, some exceptions to this policy. In Brazil the most notable was perhaps the Appropriate Technology Programme developed by the CNPq during the 1990's (Brandao 2001). But these were regarded as isolated efforts amid a wave that effectively privatised public knowledge production and thus weakened the recognition of other social needs and actors unable to make effective demands through markets, and which therefore needed the help of the State.

In the early 2000's an incipient counter-hegemonic discourse which sought to modify the historical Brazilian S&T orientation towards the resolution of pressing problems of poverty, hunger and inequalities began to emerge in Brazil (Dias 2011). This diagnostic was based on two main issues. First, ST advocates claimed that S&T in Brazil had achieved a high level of development and expertise that was oriented by the international scientific agenda and thus was unable to attend to local problems (Suarez Maciel and Castihlos Fernandez 2011). Second, ST advocates thought that there was an untapped reservoir of technological and knowledge solutions to social problems in several areas, such as health, food production, renewable energies. Furthermore, usually this knowledge had been developed by publicly funded institutions like the Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA),[8] El Servicio Brasileño de Apoyo a las Micro y Pequeñas Empresas (SEBRAE)[9] or by Federal Universities, and had generally laid idle on the shelf of these institutions. So, there was a feeling of, 'Why we did not think in Social Technologies before' (Lassanje Jr. and Pedreira 2004).

[7]For a similar account of market driven policies in S&T see Moore *et al.* (2011).

[8] EMBRAPA is a National Institution of Agricultural Research linked to the Ministry of Agriculture and probably one of the bigger research institutions in Brazil.

[9]SEBRAE is an autonomous semi-public organisation that supports small and medium business in Brazil.

As a result, there was a growing recognition that locally available S&T capabilities could be redirected to tackle issues in social inclusion. This claim was not only an ethical demand but also a political need for the S&T system, since:

> The support and legitimacy of scientific and technological activities depends on the effective attention and satisfaction of the basic need of the population. [Authors' translation]
> (Instituto de Tecnologia Social 2004b)

This diagnosis also took account of previous initiatives, such as those of Appropriate Technologies, which were generally appraised in critical terms and regarded as 'small-scale, isolated and partial solutions' and were based on the paternalistic approach of transference of technology from research and engineering institutions to the poor. It was claimed that those characteristics of appropriate technology had hampered the construction of authentic public policy at national scale, the participation of local communities, and the use of local knowledge at the micro level (see below).

In this way, the framing of Social Technology implied an effort to build an alternative view of knowledge production to that of mainstream Science and Technology institutions, but also an alternative that learnt from the shortcomings of earlier appropriate technology initiatives. It was alternative because, although the institutions that supported and funded the RTS were in general powerful actors in the development scene, they were also regarded as outsiders from the mainstream S&T institutions (Fonseca 2011). In particular, the discourse of the STN, 'not only differ from existing ones but also confronted them'(Snow and Benford 2000: 614) at the level of meaning, aims and practices. Mainstream indicators associated with the neo-liberal rationale, for example, were quickly perceived as innocuous when dealing with social technology experiences where processes tend to be more important than products. In these initiatives it has been noted that the empowerment of communities, the development of a local identity and the establishment of cooperative bonds is often far more important than the explicit improvements the technology generates, such as access to water or housing facilities, for example see Zaidi (2001).

There were two issues in particular, that attempted to differentiate ST from the frame of mainstream S&TI, confronting ST with conventional technology and creating knowledge and technology from the grassroots.

The idea of TS was built upon previous debates about appropriate technology (Dagnino *et al.* 2004). In particular, ST was opposed to what was regarded as conventional technologies, namely those artifacts and innovations that were designed for maximising profit, assure control over production and limit social participation. An element of that discussion remained in ST debates, the idea that the values embedded in Conventional Technologies were not adequate for the inclusion of the largest part of the population. On the contrary, it was claimed that Conventional Technologies not only did not attend social needs of the poorest population or environmental problems but largely increased them (Dagnino 2004). Therefore, in order to challenge the idea of conventional technology, the key to deconstruct the common sense about technology:[10]

[10]This move was probably prompted by the critical philosophy of technology background of the STS scholars which supported the STN. The most prominent of then was Renato Dagnino from Unicamp, a senior scholar in political analysis of Science and Technology in Latin America.

> The first step to understand ST is to abandon the vision of neutrality and instrumentality of technology. Neutral technology does not exist; technology is built by incorporating values and interest. Each technology is locally defined in relation with a particular context and certain relation between technology and society. Therefore, every technological project is political. [Authors' translation]
> (RTS 2007)

But, at the same time, this critique had further ideological implications for the framing of ST since the rejection of innovation implied in fact a critique of the market-driven vision of S&T where public knowledge and technologies were privatised through commercial innovation. The rejection of central aspects of conventional technology implied at the same time a change of focus (from restrictive innovation to open participatory technological change), a change of the locus of technology development (from firms as exclusive innovators towards the grassroots). By doing so, this approach sought to assert the role of *people* (as users-producers of technology) in an increasingly market-driven, technological society.

Thus, for instance, the notion of commercial innovation was avoided in the conceptual development of Social Technology. Innovation implied an intellectual property on the knowledge and technologies that were developed. Instead of talking about innovation ST members stressed the idea of technological development, the public access to knowledge and technology and the possibility of re-application of technology by the communities without the need to pay any licenses or being subjected to requirements of the patent or commercial producer.[11] Avoiding paying fees or licenses, in turn, helped to lower the cost of devising and implementing public policies at large scale.

A second interrelated element was the idea that local knowledge was key to the development of suitable social technologies:[12]

> The principal aspect of this change (i.e. sustainable development) is given by a solution built from the alliance between local knowledge and scientific knowledge, this is why is acknowledged and appropriated by the communities. Therefore, this is an endogenous solution, one of the key elements of any process of local development. [Authors' translation]
> (RTS 2011: 8)

By highlighting the local aspect of knowledge creation ST pointed out that the standard linear conception of innovation was not fit to tackle social problems and generate inclusive technologies. It is important to notice that this critique implied not only commercial models of innovation but also referred to the shortcomings of appropriate technology, in particular to the idea of 'technology transfer'.

[11] This aim was quickly tested when one of the central technologies implemented by the STN, the system of sustainable farm production, was patented by a technician and SEBRAE had to redesign the technology and get intellectual protection to avoid its commercial appropriation (Faria *et al.* 2011).

[12] Moreover some scholars, like Dagnino, argue that conventional technology should be turned into ST by a process of socio-technical adequacy (Dagnino *et al.* 2004).

> Overall, TS is different because its overcomes the limitations of the notion of Transference of Technologies still present in Appropriate Technologies. [Authors' translation]
> (Instituto de Tecnologia Social 2007a)

A critique of the limitations of 'technical rationality' is implied here, see for instance Schön 1983, but this was also an explicit call to democratise the access to technology design, technological evaluation and policy making of S&T. The idea of participation in the development of ST was, in that sense, one of the structuring elements of the frame of ST (and thus needs to be revised further in the next subsection).

2.3 Social Technology as Empowering and Participatory Process

One of the most important aspects of the vision of the ST movement is the role of the civil society actors, including NGOs and social movements, during the process of development of technologies for tackling social problems. The social process is at the heart of the mode of developing and applying technologies. This vision attempted to avoid the earlier appropriate technology fixations on finding the right gadget whilst forgetting the process. But the real purpose behind social technologies was to nurture social inclusion through technology development, supportive learning and empowerment processes from project to project, and from community to community.

From the beginning, the definition of ST was based on the recognition of the new role that third sector organisations could play (and were indeed playing) in the development of technological solutions for their own problems (Baumgarten 2006).[13] Giving voice to third sector organisations also implied the recognition of other forms of knowledge, such as popular knowledge, indigenous knowledge and alternative visions of technological development to those most predominant in the mainstream S&TI system (Instituto de Tecnología Social 2004a).

> On issues of S&TI, we know that the key challenge of the nation is to make possible that the huge benefits generated by advances in science and technology can be distributed in a more egalitarian form, that popular knowledge gets acknowledged and valued, and that technologies and knowledge can be appropriated by those groups that historically have not had access to them. And that S&TI policies can be oriented toward social inclusion and for the construction of a Brazil more human, equalitarian, sustainable, and solidarity. [Authors' translation]
> (Instituto de Tecnologia Social 2007b)

The goal of social technology was to empower people and seed wider social transformation through the capabilities acquired during a particular project, and that then drive initiative in subsequent projects in the locality. Therefore, the RTS advocated for a complex vision of participation that rejected an *a priori* division between technology developers and users. Stakeholders like local communities, NGOs, cooperatives and social movements had a central role in the process of replication of technology. It was assumed that they should intervene in the design and implementation, but they should also have a voice in the process of policy making. In practice, the partnerships that were formed were about making sure immediate solutions

[13] As Baumgarten (2006) describes, the re-consideration of the role of the third sector, in particular NGOs, was already debated during the 1990s in Brazil and was included in the Livro Branco (White Report on Science, Technology and Innovation).

are locally fitting but also about empowerment in the process of the development of technology. However, aspirations for grassroots influence over broader technology policy agendas proved elusive.

Thus, a second aspect to participation in the technological process was that of appropriation of technologies. The idea of appropriation played a double meaning. On one side, it implied the ability of local communities to control their technological solutions as a key element of autonomy and self-management. Thus, appropriation by the grassroots was a key factor since it allowed a process of empowerment and participation in the development of technologies. On the other side, the same process of participation and autonomous technological development was assumed to guarantee the adaptation of technologies to local context, allowing re-developments to include local and traditional knowledge in a sensible way. In contrast to market-based understandings of the term, appropriation for ST did not mean exclusive ownership, but rather the ability to build capabilities and learn from others (technicians, scientist, neighbors, and politicians) in a process of cooperative development.

Finally, social technology, was also intended to improve the ability of the community to organise and solve further problems, develop and exploit economic opportunities, and create the capacity to mobilise resources from others. Grassroots innovation capabilities were seen as requiring political and economic capabilities whose capacity increases through successions and networks of projects. Therefore, each project needs innovations to adapt to local contexts, and hence build innovative capabilities that help to create a voice for these communities in larger debates on S&T agendas and economic development (Instituto de Tecnologia Social 2007b).

As we have seen above, this was at the same time an outside view of S&T and one that tried to reveal the politics of science and technology development. In that sense, the vision of Social Technology not only confronted mainstream S&T ideas and institutions but also questioned their practices and vision of technological change. This critique implied questioning very explicitly the leaning of S&T towards conventional technology and the lack of interest in including Social Technology in their agendas. At the same time, social movements and NGOs within the STN were also questioned by this view of participation and empowerment. Through the participation in STN activities they started to recognise their practices and approaches as actions which already involved the development of knowledge and technology akin to ST. Thus, the self-recognition as social technologist was an important part in construction of the identity of the movement and it helped to realise its potential capacity of mobilisation (Barros, 2013).

2.4 Social Technologies as Public Policy

One of the main lessons from previous experience in appropriate technologies was the idea that in order to support ST and bring social inclusion, then 'isolated' solutions needed to be connected with public funding and gain national scale re-application (RTS 2010). The question of scale was key to surpass the limitation of isolated experiences and transform ST into viable strategy of social development.

> And yet in relation to scale, it is regarded that available (few) resources are scattered, as different actions have little relations among themselves, and there are overlapping and blind spots. The institutions have their own logic of practice and the result of their actions tend to attack only one side of problems. The lack of integral solutions (concerted among actors and continued and chained over time) nullifies the efforts, wasting most of the invested resources. [Authors' translation]
> (RTS 2005)

Furthermore, to transform ST into public policies was seen as key not only to mobilise important state resources (from knowledge to funding and public procurement) but also in order to achieve a certain level of stability or even irreversibility on long term policies. If this was to be achieved ST will have to be turned into the motor of social development policies at the national level (RTS 2005).

This was a question of how to balance the social experimentation of grassroots and the requirements for scaling up experiences. So, it was important to identify and connect the diversity of ST initiatives around Brazil and to select certain experiences that could be scaled up (Instituto de Tecnología Social 2004a). Central to this vision was the concept of re-application of technologies. The notion of re-application was aimed to promote certain technologies and artifacts at a large scale. According to Fonseca (2011), the re-application of technologies implies: (a) reproduction adequate to the local space; (b) appropriation by local population; and (c) assessment of results for new re-applications.

Driving S&T capabilities towards the solutions of pressing social and environmental problems was one of the key (yet difficult to achieve) ideas for the translation of ST into public policy. At the same time, as the experience of the ITS and Banco do Brazil Fund's Social Technology Prize[14] was already showing, there were a widespread creative capabilities among social organisations and NGOs, and thus Social Technology was not the monopoly of scientific institutions. Grassroots innovations was therefore considered as a creative force based in local solutions, sometimes retrieving community knowledge in ways that contrasted with expectations arising from linear conceptions of R&D (see below). For ST funding institutions and policy makers one of the roles for the STN was to provide recognition, support and technical validation to these initiatives, and translating those initiatives into systematic schemes or models that could be later re-applied elsewhere.

The complex challenge of how to translate known ST into public policies and how to develop new solutions required a strong effort of coordination and advocacy among heterogeneous actors, including NGOs, social movements, policy makers from public and semi-public institutions and stakeholders in local communities. It also required network members to challenge incumbent policies and practices in S&T institutions and several layers of state bureaucracies that were not used to negotiating knowledge with local actors or were reluctant to assume the risks of unproved technologies (Lassanje Jr. and Pedreira 2004). Key to this strategy was the vision of public participation in S&T and the mobilisation of actors and resources in order to create new public policies for Social Technology. Activists hoped to mobilise the grassroots around the issue of autonomous technological development and to create new forms of empowerment that challenged incumbent S&T actors and practices. In order to achieve that, the strategy of the STN was to create a powerful and hybrid network between semi-public companies, public institutions, universities, social movements, NGOs and other local actors, such as local governments.

3. Spaces for Social Technologies

From the beginning, the STN involved a heterogeneous mixture of civil society organisation and public and semi-public institutions. The spaces of ST constituted an effort to mobilise social actors and communities, fostering participation in grassroots innovation while at the same time requiring the protection of the

[14]The ITS was responsible for the creation of the Center for Reference for Social Technology which surveyed Social Technologies, whilst BBF had created the ST's Prize in 2001 and subsequently the Bank of Social Technologies (Dagnino 2013).

public policy umbrella. In this section we describe how the construction of these spaces helped to expand the STN, and how this expansion also took the STN to its institutional limits.

3.1 Building the STN

Following a call from Luiz Gushiken, the then Head of the Social Communication Office of the Lula Administration, a group of public and semi-public institutions (including the Bank of Brazil Foundation, the State Oil company Petrobras, FINEP (a state funding S&T agency), the Ministry of Science and Technology, SEBRAE and the Secretary of Communication and Strategic Management of the Presidency of the Republic) started to organise a series of meetings that would eventually lead to the creation of the STN.

The first of these meetings was held in July 2004 in Brasilia and was attended by thirty participants. These ncludied NGOs from the North East region of Brazil (RTS 2005). This meeting revisited the discussion on the concept of Social Technology and began a debate about the possibility to devise alternative strategies of development. At the same time it was argued that the network would not get legal status as an institution. This was a decision that would have further consequences in the long term for the organisation, and it would finally come to play a role in the suspension of the STN (see Section 5 below). Thus the network was proposed as open, democratic, dialogic and inclusive in order to encourage the participation and collaboration of heterogeneous actors (RTS 2011). After a series of further meetings (including the First International Conference and Show of Social Technologies)[15] that helped to identify experiences, debate common goals and discuss best practices and operative mechanisms,[16] the STN was created in January 2005 with 100 participants (RTS 2005).

The structure of the Network comprised an Executive Secretary with a staff of five, a Coordinating Committee, which included representatives from the Network's funders, and up to four networks enablers from NGOs and social movements, and a representative from academia.[17] The Committee's main tasks were to select and coordinate the re-application of technologies, assess its implementation and set goals of communication and dissemination of the STN. A further layer of decision making was the forum of the STN which involved all the other members and participants and had a consultation role.

From the beginning it was established that the Network would not limit its task only to the communication and dissemination of ideas but would also implement actions and develop social technology programmes. Its aim was also to coordinate the capacities of State Institutions (i.e. large scale projects and funding) and NGOs and Social Movements (i.e. creativity, plurality, local knowledge and implementing capacity) (RTS

[15]Interestingly, Anil Gupta had participated in this conference. He was invited to discuss issues of IP and grassroots innovations (RTS 2005).

[16]There were a lot of debates around the aims, organisation and direction of the STN. Issues discussed included should a network be a public policy or not (the idea of network was supported by social organisations and even members of the National Government), and can social technology be a tool for alternative development or it is bound to be limited to social aid? However, the method of discussion was to create consensus in each meeting and advance further into other issues on the basis of gained ground (RTS 2005).

[17] In its last annual report (RTS 2011) funders included: Caixa Económica Federal, Bank do Brazil's Foundation, Petrobras, FINEP, SEBRAE, and four national Ministries: Ministry of Science and Technology; Ministry of Social Development and Fight Against Hunger; Ministry of National Integration; and Ministry of Employment. The social organisations were: the Semi-Arid Association; the Brazilian National Association of Non-Governmental Organisations; the Amazonia Task Group; and Cerrado Network. Finally, the academy was represented by the Forum of Deans of extension's activities at Public Universities in Brazil and the communication was in charge of the Secretary of Social Communication of the Republic.

2005). These requirements called for a very delicate balance and coordination between 'social diversity' of grassroots and the 'need for scale', as well as between funders, network coordinators and stakeholders (all of which have, in fact, very different backgrounds).

From 2005 until 2012 the network reached out to other actors and really spread the idea of Social Technology, thus extending the original frame of knowledge and allowing new ideas and problems to be included. During its seven-year trajectory, the STN, incorporated a total of 928 institutional affiliations, of which a large majority were NGOs and social organisations (546), followed by private foundations (110), while there were only 63 public research institutions and universities. By 2012 the Network had reached institutions from Peru, Colombia and Venezuela and its ideas had triggered discussions in Argentina and Uruguay (see below). Activities of the Network included the promotion of major events, such as two International Conferences of ST and two National Forums (2006 and 2009) in which issues were discussed such as agro-ecology and food security, sustainable development and ST adapted for the different regions of Brazil, as well as more confrontational issues like agro-extractivism (RTS 2011; RTS 2009b). At the time, the STN had constant participation in other forums and activities including, for example, S&T meetings oriented towards the discussion of themes such as university extension, Solidarity Economy meetings, Social Development and Public Policy encounters, innovation congress, including a presentation at the World Social Forum in 2010. Finally, there was an increase of activities and links between organisations that discussed ST ideas and frames, including incipient forms of socio-technical collaboration between social organisations that were not necessarily connected with the network.

As a result, civil society organisations and public institutions in Brazil and other parts of South America[18] started to reflect upon and to experiment with ST's ideas and frames. These 'network effects' were hard to measure (Barros 2013) but seemed to indicate that at some point the STN managed to create some momentum and to spread ST beyond its original institutional arrangement. As Larissa Barros, the former Chair of the ST, argued, the STN had succeeded in creating a debate around S&T and social development which included actors that are traditionally regarded as outsiders such as social movements and NGOs (Barros 2013). This was especially the case around those social movements and networks with closer affinities with the vision of alternative sustainable development, such as agroecology and Solidarity Economy. These same movements still continued to work and debate ST even when the original STN remains suspended.

On the other hand, the relation with mainstream science and technology institutions remained ambivalent. While ST was enthusiastically adopted by Knowledge Extension Units at Federal Universities, attempts to introduce the debate into S&T forums like the National Week on Science and Technology received lukewarm and condescending answers (Barros 2013). Even with the institution of a National Secretary of Science and Technology for Social Inclusion during the Lula Administration, there was never a clear federal policy for promoting ST in Brazil, although the term 'Social Technology' has appeared in a few documents released by different state organisations.

[18] For example in Argentina the president of the National Institute of Industrial Technology argued about the need to foster the formation of Social Technologist (Saber Cómo 2011).

3.2 Social Technology and Public Policies

From the beginning both public institutions and social actors were keen to promote new public policies on ST. The construction of public policies was assumed to guarantee continuity of efforts and to avoid isolated and partial initiatives. Overall, the idea of building public polices was aligned with the aim of promoting alternative forms of sustainable development based on ST. Therefore, there was a very conscious effort, first to identify experiences and problems, and then to translate grassroots initiatives into re-applying technologies able to gain scale. Even more, initially the executive directorate also hired a consultant to be in charge of the evaluation of projects.

At the same time, through debates at the Forum and the Coordinating Committee, it was decided to prioritise ST projects which favour income generation among beneficiaries, an issue with coincided with the overall aim of social policies in Brazil. The STN also selected as priorities the regions of the Semi-arid and Amazonia Legal and urban peripheries. At the same time, the STN selected a wide range of technologies for its reapplication. These included water collection, solid recycling, small agroecological farm methods, forestry techniques, fish farming, cashew nuts processing plants, small oil processing plants, social housing techniques, platforms for cooperative incubation, pedagogical techniques. Some of these projects, like the water collection systems that came to be a core aspect of the One Million Cisterns Program (P1MC), grew to quite a large scale and became a national endeavor for Social Development State agencies. During its existence the STN helped to manage funds for developing social technology experiences amounting to over than R$ 440million (approximately US$ 200million) (RTS 2011: 3).

One of the particularities of the hybrid institutional arrangement of the STN was that,since it did not have a legal status, it did not fund any projects (or events) directly. There was no central management and instead it was the responsibility of funding institutions to implement the projects in collaboration with the social organisations and NGOs. Thus, for example, some smaller programmes like the Basic Sanitation Technology for rural areas was funded by only one institution, the Bank of Brazil's Foundation. However, more complex and larger programmes were generally funded complementarily by several different institutions. For instance, the total investment on the PAIS Programme (agroecological small farms) of approximately R$ 113million (approximately US$ 50million) was jointly funded by BBF, SEBRAE, Petrobras, the Ministry of National Integration, the Ministry of Social Development and the Ministry of Science and Technology (RTS 2011: 16). Coordination between different funders was not easy to achieve and there were questions of which institutions enjoyed most the symbolic benefits of their association with each project. Other difficulties of coordination involved different expectations around what results should be expected and what should be the pace of implementation of technologies (Barros 2013). In a general sense this was a product of the clash of different rationales and organisational cultures, mainly between the more rigid public structures (i. e. the national ministries) and the more fluid patterns of the emerging social organisations.

At face value, during its existence, the STN had a huge success in mobilising public funds for technology and social development. Nevertheless, to what extent the longer-term goal of building long-term public policies was achieved remains a matter of debate. Banco do Brazil's officials recognised that the STN was able to put ST on the public policy agenda (even if, as we stated above, this has happened more in terms of discourse than in actual terms, and not under a structured, coordinated public policy strategy). And yet, since the funding was obtained on project basis, ultimately the STN was caught, as other grassroot

innovation (GI) movements, in the dilemma of working on project based solutions to situations that ultimately required more structural answers, i.e. public policies (Smith *et al.* 2014; Costa and Dias 2013).

As it will be shown in the next section, attempts overcome these issues through the construction of long term public policies within the National Government were caught between the limitations of the institutional structure of the STN and the inertia of incumbent elites in the state.

4. Illustrative Examples

In a similar way to other examples of grassroots innovations networks and movements, STN started by surveying and acknowledging a wide reservoir of local ingenuity. Grassroots technologies were mainly mapped by the Bank of Brazil's Foundation and documented at the Bank of Social Technologies. In 2013 the Bank of Social Technologies reached 696 examples (de Oliveira 2013). However, only a handful of these technologies were selected for re-application and funding by the RTS. From those cases we analyse two of the most representative cases, the One Million Cisterns Program (P1MC)and its subsequent variants, and the agro-ecologicalproduction method known as the PAIS Programme. These cases are relevant not only due to their scale of implementation but also because they show alternative forms of linking grassroots participation, poverty reduction and technological to that of mainstream STI institutions.

4.1 The PAIS Programme

The STN have supported a wide variety of agro-ecological farming and food production methods (Faria *et al.* 2011). However, one of the best known and widespread examples of ST has been the Sustainable and Integrated Agro-Ecological Production (PAIS). The PAIS Programme is a low cost technology designed to be implemented in small farms (up to 2ha) and favour the use of local materials and knowledge, while avoiding the use of pesticides and external inputs. As the Programme's description highlights, PAIS:

> Is a solution for the production of healthy food that seeks the achievement of food security and the generation of a marketable surplus capable of ensuring a supplementary income? This is a sustainable model of production that combines the creation of small animal farms, cultivation of short-cycle vegetable species and cultivation of agroecological garden with long-cycle or permanent vegetable species. The model also seeks the production and use of local materials and recycling of available biomass.
> (RTS 2009a: 9).

The design of PAIS was based on a previous project named Mandalla due to its shape of concentric rings.[19] Based on that design, the technology was then upgraded through the use of localised drip-irrigation and the incorporation of a central henhouse. Farmers who use the technology receive a kit for re-application that include components of a water irrigation system, wire fences, seed, small plants and even hens, along with a user's manual and a training course. The idea is that the design of the garden allowed farmers a simple routine of circulation from the henhouse through the rest of the crops while also promoting a rational use of land, water and organic fertilizers. The design also sought to promote the diversity of crops, including the possibility of selecting those vegetables which were best adapted to the soil or have better commercialisation prospects. In 2004, PAIS was selected by BBF, SEBRAE and the Ministry of Integration for reapplication in twelve states. While BBF funded the re-application kits, SEBRAE and the Ministry of Integration funded the training and the creation networks of technical assistance, along with municipalities (Faria *et al*. 2011). Later others funders such as Petrobras, Banco Nacional do Desenvolvimiento (BNDES) and the Ministry of Science and Technology were also included. In 2011 the

[19]See note 7 for the previous history of Mandalla.

STN affirmed that the general investment in PAIS was over R$113million with an approximately unitary cost of R$10,000 (RTS 2011).[20]

PAIS was praised as a 'silent revolution' in sustainable farming by the magazine SEBRAE Agronegocios (Sebrae Agronegocios 2007a) and regarded as a tool which combined a simple technology with direct results and had the potential to be included in the rising market of organic products in Brazil (SEBRAE Agronegocios 2007b). Today PAIS units are often found on small rural properties in several regions of Brazil. The strong point of the technology lies in the capacity to promote income generation and foster association between farmers. As some authors described (Costa *et al.* 2013; Penna, 2009) a family could make a surplus of between US$200 and US$400 which could be sold into local fairs or bought by public procurement schemes, such as the National Fund for Education Development within the National Programme of Food for Education (Fundação Banco do Brasil 2013). This represents a significant increase in family income. However, at the same time, PAIS was regarded as a 'static' technology with enough flexibility to allow a choice in crops, but not too much, in the different components of the kit[21] (Faria *et al.* 2011). In this sense, as will be seen in the next sub-section, PAIS was very different to other, much more dynamic technologies that were focused on empowerment, such as P1MC.

4.2 The One million Cisterns Programme

A second illustrative technology supported by the STN is the One Million Cisterns Programme. P1MC as it became widely known, aimed to build a massive number of water cisterns in a large semi-arid region in Northeast Brazil with a population of around 25 million. This region is characterised by low rainfall and scarce groundwater sources. Water scarcity and poverty were usually attended by an instrumental state approach which favoured huge infrastructure projects for massive agriculture schemes combined with aid solutions, like water-tank trucks (*caminhões-pipa*) and the provision of food aid, for the poor. These aid schemes ultimately reinforced local patronage and increased inequalities (Alves da Silva R 2003) and became an important part of local politics since water, food and money have traditionally been used to buy votes for politicians.

The programme was originally devised by the Semi-Arid Association as an answer to these practices, as well as other paternalistic schemes of aid in the region, known as the 'industry of drought (*indústria da seca)*. The Semi-Arid Association, a network of more than 700 institutions, social movements, NGOs and farmers' groups, itself has its origins in the popular mobilisation against the 'industry of drought and later become an important actor of the STN. Instead of relying on water supplied by water tanks provided by local political patrons, the Semi-Arid Association proposed to build simple cement-layered containers that collect rainwater from the roof, with a capacity of around 16,000 litres, enough to sustain a family's needs through the region's drought season. This proposal was part of a significant change in how these organisations approached one of the region's core problems: instead of seeking ways to 'fight' or even 'eliminate' the drought, they began designing strategies for 'living with the drought. This shift in the

[20]It is assumed that there may be as many 10,000 PAIS units in 18 states in Brazil (Centro de Informação e Assessoria Técnica (CIAAT) 2013) but as Faria *et al.* (2011) suggested, it is difficult to know how many of those are still active.

[21]Even though there are recorded cases of users that modify some aspects of the technology, e.g. allowing free range hens instead of the closed henhouse, or modifying crops (Faria *et al.* 2011).

rationale led to a change of the problems that should be considered as objects of intervention, and thus created a whole new branch of possible actions that could be implemented.

With the start of the Lula Administration in 2003, the Semi-Arid Association found the opportunity to insert this programmeme into national development policies to be funded by the Ministry of Social Development. Later, in 2005, the Programme also became part of the re-applied technologies of the Social Technology Network.

Since its start in 2003 almost 600,000 water cisterns were built and put in place by local inhabitants with the support of the STN and the Ministry of Social Development (MSD 2013). The main feature of the technology is that it is built by its 'users' (farmers/masons, a common archetype of the Brazilian semi-arid). The self-building aspect of the cisterns is intended to foster relationship-building in the community through the process of learning to build, to use and modify the technology, indicating a strong link with the empowering and participatory framing. The water system empowers local people in the building process while also providing autonomy from local governments and water suppliers.

P1MC was one of the most successful experiences with which the STN was involved, particularly in terms of scale. It was paradigmatic in the way most of the Social Technology framing in terms of participation and negotiations of knowledge between local people and technicians was embodied in it. The model of horizontal participation in the construction of the Cistern was explicitly positioned as an alternative to aid schemes and big infrastructure programmes, both of which excluded poor farmers from the decision making process. Participation empowered the people and strengthened the link with the mobilisation of the Semi-Arid Association in the search for alternative forms of development. Furthermore, this participation shaped a learning process that led to the creation of technological variants such as *Uma Terra, DuasÁguas* (one land, two waters), a scaling up of the cistern which seeks to collect water for farming production, and combines with other technologies such as PAIS (Barbosa 2010).

However, the insertion of this model into a government programme became problematic in early 2012 when the Brazilian Government announced a plan to speed up the implementation of the programme through the purchase of 300,000 plastic water cisterns at almost twice the price of the original cement scheme. Focused on outcomes, this policy change disregarded the process of participation and empowerment that was central to the design of the program and emphasised the number of cisterns built as the main success indicator. Private, profit-oriented firms displaced social movements and NGOs as the main partner of the Brazilian Federal Government in this programme (Dias 2012). Furthermore, early attempts to introduce the plastic cisterns showed design problems, as the plastic cisterns bent and folded due to the intense heat of the region.

The narrowing scope of the model by the Brazilian Government led, on 20 December, 2011, to a public rally of about 15,000 farmers in the city of Petrolina (Pernambuco) marching against the plastic cistern initiative (Passos 2011). Protestors claimed that changes in management disempowered people from participation in the construction. Another element of the controversy included concern that introduction of the plastic cisterns would enable the local political elites to regain power over controlling water, by controlling the market in water cisterns. By the time this occurred, however, the seed of empowerment had already been planted. Banners waved at the rally contained phrases such as, 'We do not want water at any price. We want to participate'. While the government's approach was built around the artefact and

the accomplishment of policy goals, the user's approach was mostly concerned with the process and the inclusive dynamics it generated. At the end, access to clean water seemed to be tightly interwoven with empowerment and the strengthening of community bonds.

The cistern example shows how the Semi-Arid Association and the STN managed to draw power from mobilisation in order to re-negotiate a model of innovation and social inclusion. For almost a decade this model was very successful in building several hundreds of thousands of cisterns and empowering the population of the Semi-Arid region. However, as the Government attempted to strip the program of its empowerment element and focus instead on inclusion as outcome, the mobilisations by the movement pushed the Government to reinstate the self-build cistern programme. Though they continued to install some plastic cisterns for some time, in the end the P1MC was transformed into a national public policy through the Programme Water for Everyone of the MSD (Costa and Dias 2013).

5. Path Construction and the Social Technology Network

In less than a decade the STN was able to put the idea of Social Technologies in the public agenda in Brazil, even if in a reduced fashion. Social movements and NGOs around the country appropriated the ideas and values of the STN and started to discuss Social Technologies. The STN was able to recognise hundreds of social technologies and to support experimentation in the re-application of a few at a massive scale, covering the huge territory of Brazil. In the universities, 250 research groups have stated that they work with social technology and related themes, according to the data available on Brazil's National Council of Technological and Scientific Development's General Directory of Research Groups.[22]

More importantly, at its suspension in 2012, the debate around ST went well beyond the original extension of the STN and is still strong in 2014, reaching other networks and movements like the Agroecology Movement and the Network of Extension Units in Federal Universities in Brazil. In that sense, the STN was able to create a specific framework of knowledge around ST, a sense of identity and a long lasting debate that goes beyond the network itself. But, what does the demise of the STN mean in terms of strategies for grassroots innovation movements and alternative pathways of development? In this section we explore this question focusing on the issue of public policies, politics of knowledge and forms of social inclusion.

5.1 The Limits of the Network Strategy

In 2009, about five years after its creation, the STN had its Second National Forum of Social Technology and the Second International Conference on Social Technology in Brasilia. This was an opportunity to discuss the achievements of the STN so far as well as to look at the challenges they now faced (Barros 2009). For example De Paula (2009) stated that the STN had already overcome the initial stages in the developing of an identity, had received significant support from funders and development agencies and was able to introduced ST into the public agenda. According to De Paula, it was now time to forge new alliances with local development and sustainable movements and to focus on the construction of a new agenda of development. This was a question of how to gain momentum and strengthen the influence of the STN, by extending the scale of experimentation and transforming its projects into long-term public policies. However, this was not an easy task, since as the STN grew the complexity of the network also increased, leading to further requirements, i.e. in terms of communication, participation and funding (RTS 2009b).

As a result of these debates, at least three courses of action were outlined. First, the network widened its focus from income generation to a set of goals around sustainability, including: sustainable food production; sustainable water and forestry management; clean energy production; sustainable social housing; income generation through sustainable business schemes; and learning and education (RTS 2011:10). Secondly, there was a clear aim to create a regional space for STN, especially with regard to the Mercosur.[23] By 2009 the STN had already gained members from other South American countries such as Colombia and Venezuela. Attempts to include the STN debate into the regional agendas of South American blocks included a discussion about STN at the Social Mercosur meeting in 2010 and a series of meetings held along with academic supporters in Argentina and Uruguay. There were also some talks about the

[22] http://dgp.cnpq.br.

[23]Mercosur refers to the community of nations of South America including Argentina, Brazil, Uruguay and Paraguay.

creation of a Social Technology Prize within the Mercosur region (de Oliveira 2013). Moreover, in 2012 some public institutions led by the National University of Quilmes created the Technologies for Social Inclusion Network (Red TISA) in Argentina. Another important, though short-lived, experience in Argentina was the orientation from 2009 to 2012 of some policies and efforts from the National Institute of Industrial Technology (INTI) towards the design of Social Technology.

A third strategy was aimed at institutionalisation of ST in order to consolidate its experience into public policies. One such initiative was the proposal of a National Law for Social Technologies in 2008. The proposed law aimed at the creation of a national policy of social technologies and the creation of a national institute of social technology.[24] Also, in 2011 some of the funders within the Coordinating Committee aimed at the creation of a national inter-ministry panel of public policies on ST which would include open public participation (SEBRAE Agronegocios 2007b; de Oliveira 2013). However, although these initiatives are still being supported by BBF, they have not yet been implemented as law or public policy.

Plans for the expansion of the STN showed that the maturity and strength of the idea and vision of the ST was not matched by the formal structure of the network and its level of insertion into the State. Some actors in the STN become aware that that the expansion of the network and the creation of new spaces for ST depended on the integration of projects and the creation of national public policies (see(Castillos Fernandez & Suarez Maciel, 2011) (Castillos Fernandez & Suarez Maciel, 2011)(SEBRAE Agronegocios, 2007b) (SEBRAE Agronegocios, 2007b). Meanwhile, the policy of increasing the scale of experiences required further funds but also more coordination, technical support, etc. All of this has put some extra pressure on funders and implementing institutions in terms of assessment and brought the issue of who got the symbolic rewards.[25]

As the STN grew in partners and experiences it was increasingly clear that the original informal arrangement between NGOs, social movements and funders was becoming inadequate. There were tension between the need of insertion into the public agenda and the will to keep mobilisation capabilities. However, it was not clear how to solve the institutional challenge. Ultimately differences about how to formalise the hybrid structure of the STN and how to give the network a more stable form of governance were impossible to overcome, and in 2012 the STN was suspended by its Coordinating Committee.

5.2 From Network to Public Policies

The question of how to build public polices for Social Technologies which ultimately lead to alternative forms of sustainable development was an early goal of the STN and remains an issue of discussion until today. In a broader context, this was a question of how to challenge monopolies of public policy which have been colonised by a market driven agenda during the 1990's in Latin America. Following the rise of social movements like *Movimentodos TrabalhadoresSem Terra* (MST), the Social World Forum, among others, and their incipient alternative frame of development, local actors found the impulse to challenge

[24]The law was proposed by Rodrigo Rollemberg of the Socialist Brazilian Party (PSB) in 2008 in the Chamber of Representatives but was never approved. A second presentation was made, now in the Senate House, in 2011 but its approval is still pending.

[25] As it will be shown in the illustrative examples, funding for enlarging the scale was not necessarily the problem. On the contrary, the enlargement of the STN produced two kind of difficulties. First, there was the problem of how to manage the networks and how the funders got symbolic recognition for their investment. A second issue, was the problem of how to gain scale without disrupting the empowerment aims of the STN.

incumbent bureaucracies and traditional form of policy making. This idea was also present in the Workers Party's (PT) vision for 2003 (Samuels 2004).

The alliance between social movements, NGOs and state agencies was a hybrid institutional experiment which sought to create new and bolder public polices of social development and new forms knowledge democratisation. In that sense, the success of the STN depended on two linked goals, the aim to mobilise and empower social organisation to participate in social technology and the subsequent drive to create long term public policies. For a while, this alliance had a great success in the diffusion of the frame of ST to almost a thousand organisations and the mobilisation of more than R$440million in resources for the re-application of technologies. But, as the STN started to grow it also faced the limits of its own institutional arrangement and the increasing resistance to its policy demands and other activities by incumbent actors.

The loose, informal structure of the STN started to crumble under crossed pressures, different expectations and different forms of assessment. Since the STN lacked any formal capacity to manage projects, this tension grew with the increment in scale of the projects they proposed. Furthermore, as the P1MC example showed, this tension quickly became a clash between claims of participation and network creation and claims of accountability and efficient ways delivering of technological solutions. The broad framework and ideas and wide array of institutions that once allowed the STN to grow rapidly shaped the Network in an arena where different interests, rationales and political projects frequently clashed.

At the same time, the dispersal of funding from donors and the fact that these funds were provided on a programme to programme basis conspired against the early goal of avoiding partial solutions and seeking long term public policies. Furthermore, as evidenced by the trajectory of P1MC, the more technocratic emphasis of the Dilma Administration proved to disturb the shaping of 'human-scale public policies"' such as P1MC. Overall, the suspension of the STN by the Cordinating Committee came at the moment when the debate around ST was growing and including more and more organisations. This was a moment when the network was apparently showing signs of expansion and increasing 'networks' effects' (Barros 2013) which suggested the development of dynamics of social moment. Meanwhile, the idea of Social Technology was also being picked up by other social movements like the ones related to agroecology or Solidarity Economy. Furthermore, it was also a crucial time since the debate inside the network started to point out the need of additional, more established, public policies. However, just when the debate started to heat up, funders and civil society representatives were unable to get a suitable institutional arrangement and as a result the STN was suspended in 2012. As Larissa Barros put it, 'it failed because it got it right'. Meaning that it was its own success as network that pushed it over the limit. Meanwhile, the strategy of institutionalisation has not been successful yet, since neither the Law of Social Technology nor the inter-ministerial committee led by the Ministry of Science and Technology has been approved so far.

Interestingly, despite the suspension many of the projects like P1MC, PAIS Programme and others continued to receive funding through the different supporting institutions. Furthermore, Banco do Brazil continues supporting the Social Technology Prize[26] and the database of ST and has started to build centers of demonstration for ST, partnering with a few universities and municipalities.

[26]FINEP has also kept a Prize for Social Technology in its annual contest call for innovation, see www.finep.gov.br.

As the momentum of the STN seems to be lost, there remains the question of whether the STN had have been able to overcome the tension between insertion and mobilisation while at the same time promoting more long term public policies.[27]

5.3 Questioning S&T and Creating a New Politics of Knowledge

A second space where the STN achieved mixed results was around the issue of democratisation of knowledge. From the beginning the debate about ST focused on the need to re-orient domestic S&T capabilities and put them to better use for the resolution of local social needs. At the same time, the STN seek the empowerment of social movements as active agents in the development of technologies and S&T policies. Both actions combined represented a powerful critique of the political economy of S&T. However, this process of questioning incumbent's elites also presented the dilemma of how to engage with mainstream S&T institutions and actors while criticizing its goals, practices and values.

The STN was able to enroll the network of federal universities with extension activities and received significant support from the Ministry of Science and Technology and the entrepreneur funding agency FINEP. These institutions carved up a small niche for ST that, however, represented an intense experiment of grassroots participation and technological creativity that lead to the implementation of huge social programmes.

However, the amount of funding was very small when compared with funding for mainstream S&T.[28] It was mostly used for low tech initiatives and did not require important R&D capabilities. Neither did it interest mainstream scientific groups.[29] Thus the amount of support from Universities and R&D groups was small, leading to the disconnection of ST from mainstream S&T agenda and capabilities. Ultimately, ST as policy was insulated from mainstream S&T, thus reaching a position very similar to that previous appropriate technologies had occupied in Brazil (Brandao 2001) and other parts of Latin America. For STN advocates, '… future expansion of ST, is in part, related with the chance of altering the incumbent policies of S&T in the country and turn [ST] into public policies' (Castillos *et al.* 2011: 40). [Authors' translation]

Indeed, the challenge to enroll S&T actors raised further questions about institutional change such as how to create an endogenous agenda of S&T for social inclusion, how to balance the requirements of scientific relevance with those of local social needs, how to enable social organisations to engage with the restricted areas of expertise of S&T. Some of these issues were already present in the debate of the STN, but during its short life the practicalities of this sea change had not even begun to be considered.

And yet, along with other international initiatives, the STN helped to install the debate about S&T for social inclusion among policy makers and STS's scholars. The experience of the STN inspired directly or indirectly practitioners in several parts of Latin America, such as Argentina and Uruguay.

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[27]There was some discussion about whether the strategy of institutionalisation of the STN, namely creating an inter-ministerial committee about ST, will eventually be fruitful. While, officials at Banco do Brazil still remained committed and hopeful about this initiative, others like Renato Dagnino (Dagnino 2013) regarded this a non-policy making event and pushed forward the problem without having a solution in sight.

[28] For instance, the funding allocated to social inclusion in the Ministry of Science and Technology (where ST was included along with other programmes) was only 2 per cent of its budget (De Brito Cruz and Chaimovich 2010).

[29] See (Dagnino 2013) for a similar point about the politics of knowledge of the STN.

5.4 What Kind of Social Inclusion?

From the beginning, the goal of the STN was to combine concrete technological solutions to tackle issues of poverty with democratic participation and autonomous management of the initiatives. In this context, the question of social inclusion was deeply embedded in the constitution and framing of the STN. But what kind of inclusion was promoted by the STN? In order to tackle this issue, the STN experimented with at least three framings of inclusion (Smith *et al.* 2014): (a) inclusion as ingenuity through the acknowledgement and assessment of grassroots technological solutions; (b) inclusion as empowerment by encouraging participation and appropriation of technologies in the field, but also by encouraging a future on the agenda of S&T; and (c) inclusion as structural transformation by fostering the debate on alternative forms of development. At the same time, these framings had been built as part of a hybrid alliance whose actors attributed different meanings to inclusion over time. So, during the first years there was a general consensus that inclusion needed to be framed as outcome, for instance in the form of income generation, and also as a process in terms of empowerment, capacity building and strengthening communication and learning through the network.

However, as the network grew and new challenges of insertion into public policies were presented, this accord shifted over time. As we have seen in the case of P1MC, when public institutions pushed for an increment of scale in the re-application of technologies they faced tensions with civil society organisations and stakeholders in the field that resisted this reduced form of implementation. As Costa and Dias (2013: 237) pointed out, to scale up initiatives in a very short time risked harming the process of mobilisation and disrupting the characteristics of social technology, transforming the original vision in a much simpler scheme of 'simple implementation' of technologies. The issue of scaling up not only divided different interest and goals within the STN, but it was also symptomatic of the difficulties in transforming incumbent elites within the State. This was a problem that ST advocates had envisioned from the beginning and yet they struggled to find alternatives. Thus, in a similar fashion, to larger tensions between the commitments toward democratisation and economic redistribution within the PTs government, and public institutions, in the case of the STN, were tempted to favour inclusion as outcome over empowerment and participation through process. It was only when social movements and NGOs committed to the aim of inclusion as empowerment that they could resist the tendency to simplify the idea of inclusion.

6. Conclusions

Born at the beginning of the Lula Administration, the STN carried much of the expectative and challenges of the new Government about social inclusion and participation that were mixed with a long standing practice of mobilisation and a will to experiment with alternative models of development. The STN was in that sense an interesting example of hybrid networks that combined a new direction in public and semi-public institutions with the capacity of NGOs and social movements to translate new ideas and vision about technology and social development (Ely *et al.* 2013).

For a while, the STN was very successful in creating a large network of support and reapplication of technologies which tapped into new public resources. It also helped to create an alternative framing of sustainable development and social inclusion which highlighted the role of technology. As a result, social movements, NGOs and practitioners realised they can also be part of the discussions about pathways of development while at the same time experimenting with their own solutions. However, at the same time STN faced at least two challenges that have resulted from its very achievements.

The first challenge was related to the difficulties in widening the space for engagement with S&T mainstream institutions. After a decade of S&T and market driven innovation, the STN again managed to place technology and participation on the agenda of development. This action helped to open up a new debate on the directions of S&T research and innovation. However, this movement was not enough to mobilise further support from public laboratories and universities beyond extension activities. Thus, the process of learning and tinkering with scientific knowledge was limited and remained marginal in relation with mainstream activities of S&T.

The second challenge points to internal tensions in the network and beyond in terms of mobilisation and inclusion into public policies. As the STN grew and some of its projects gained visibility, differences between scaling up and empowerment also increased. Some projects, as P1MC resisted a reduced inclusion into public policies, and gained more space as result of mobilisation. However, this was not the case of the rest of the STN where tensions between the plurality of civil society actors and the constraints of public policy eroded the structure of the network.

The suspension of the STN showed the difficulties and the limits of this kind of strategy and the difficulties that alternative grassroots innovation face when dealing with mainstream institutions. Even with the support of powerful institutions within the government and a wide array of NGOs and social movements, the STN struggled to overcome these challenges. This difficulty highlights that the underlying differential of power between grassroots movements and incumbent elites in Brazil (and South America in general) is still huge.

And yet, despite these shortcomings, what the STN achieved is huge, not only in terms of re-application of technologies but fundamentally by opening the space for a new debate on the democratisation of technological development in at least two ways. First, by expanding the limits of social development to include the technological dimension, and second by questioning pristine notions of conventional technological change and innovation and proposing social technology as a new agenda for science,

technology and development. In this sense, the STN has contributed to redraw the frontiers of citizenship, democracy and development, and this is certainly not a small feature at all.

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