Transitions to sustainibility at the bottom
Mónica Ramos-Mejía

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The role of grassroots ecopreneurs

Mónica Ramos-Mejía

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TRANSITIONS TO SUSTAINABILITY AT THE BOTTOM

THE ROLE OF GRASSROOTS ECOPRENEURS

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Mónica Ramos-Mejía
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in Bogota, Colombia

This thesis has been approved by

Promotor: Prof. dr. J.T.A. Bressers
Co-Promotor: Dr. M.L. Franco-García
Co-Promotor: Dr. J.M. Jáuregui-Becker

Members of the Graduation Committee:

Chairperson:	Prof. dr. T.A.J. Toonen	University of Twente
Secretary:	Prof. dr. T.A.J. Toonen	University of Twente
Promotor:	Prof. dr. J.T.A. Bressers	University of Twente, BMS-CSTM
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Member:	Prof. dr. M. Skutsch	Universidad Nacional Autónoma de México, CIGA

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Colophon

Cover image: Natural fibre hand-made basket. As the business models this thesis studies, this basket is knitted by several hands, who give different colours and textures to the final product (Author's photo).
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UNIVERSITY OF TWENTE.

Faculty of Behavioural, Management and Social sciences (BMS)
Department of Governance and Technology for Sustainability (CSTM)
Enschede, The Netherlands

E-mail (for correspondence): eme_ramos@yahoo.com

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Acronyms

BMC	Business model canvas
CBOs	Community-based organisations
CSTM	Department of Governance and Technology for Sustainability at University of Twente (The Netherlands)
DPM	Department of Design, Production and Management at University of Twente (The Netherlands)
IRM	Institutional Responsibility Matrix
MLP	Multi-level perspective
NGOs	Non-governmental organisations
NIKOS	Department of Entrepreneurship, Strategy and Innovation Management at University of Twente (The Netherlands)
PC3	Product Co-creation Centre
SAC	San Agustin Calvario, Puebla, Mexico
SNM	Strategic niche management
UT	University of Twente

Chapter 1. Introduction

1.1 Product Co-creation Centre

Sound evidence of environmental degradation, ecosystem depletion and increasing inequality worldwide has motivated world leaders to call for a green economy in the context of sustainable development and poverty eradication (UN, 2012, 2015). This implies a more resource-efficient equitable growth, which is able to improve human well-being and social equity, while significantly reducing environmental risks and ecological scarcities (UNEP, 2012). This new economic paradigm has brought about several logics, discourses and practices at the global, national and local level, as well as at different domains, such as the financial, institutional, regulatory and cultural domain (Bailey & Caprotti, 2014; Luederitz, Abson, Audet, & Lang, 2016).

It has also been argued that grassroots entrepreneurs contribute to the green economy on the ground, because they bring about inclusive and resource-efficient technological innovations and promote more inclusive mechanisms to deliver products and services (Pansera & Sarkar, 2016; Sarkar & Pansera, 2017). However, researchers have found that still much support is needed to social and environmental enterprises as the grassroots foundations of a more sustainable development (Creech et al., 2014). This needed support consists of access to research organisations to develop and test products and technologies, access to information, access to advisors and mentors, access to finance and access to channels to communicate their success.

In recent years some initiatives aiming at covering these gaps have emerged, such as Africa Funded (www.africafunded.nl/incubation), BoP Innovation Centre (bopinnovationcenter.com), Enablis (www.enablis.org), Global Fairness Initiative (www.globalfairness.org), Green Business Initiative (www.gbi.org.pk), Product Co-creation Centre (www.utwente.nl/en/bms/cstm/research/sus-prod-con/#key-academic-projects-in-progress), SEED (www.seed.uno), Skoll Foundation (www.skoll.org), among others. These initiatives usually provide technical and organisational support, access to broader networks of investors and, sometimes, seed funding in the form of awards.

The author of this doctoral thesis has developed her research project in one of the initiatives mentioned above, specifically at the Product Co-creation Centre (PC3). PC3 offers a specialised programme where deprived potential social entrepreneurs with no technical or business expertise interact with a team of experts to co-create (innovate) products and services from an initial idea to a physical prototype according to a (co-created) sustainable business model (J. M. Jauregui-Becker, M.-L. Franco-Garcia, & A. J. Groen, 2013).

PC3 is a joint alliance of three departments at the University of Twente (UT), i.e. the Department of Design, Production and Management (DPM), the Department of Governance and Technology for Sustainability (CSTM) and the Department of Entrepreneurship, Strategy and Innovation Management (NIKOS). PC3's interdisciplinary approach aims at enabling local innovation, based on sustainability principles, social entrepreneurship rationale and design methodologies. The research that is carried out throughout this project investigates the development of suitable models to boost the sustainable development of under-privileged regions from the bottom up. PC3's mission is therefore twofold. On the one hand, it can be regarded as a business pre-incubator which focuses on opportunity recognition, conceptual product development and sustainable business model creation. On the other hand, it seeks to understand the ways in which innovative business models may contribute to sustainable development.

This doctoral dissertation is an academic result of this twofold mission. This document presents and discusses an action research process[1] that took place from October 2014 until October 2016. During these two years the author led the design and implementation of a PC3 in Santa Rosa del Sur, a small town in the rural area of Bolívar in northern Colombia, where great sustainability challenges are found. It is a region characterised by long lasting violence and migration. Main economic activities include coca plantation and gold mining in river banks, which bring about environmental degradation and biodiversity loss because of large deforestation and heavy-chemical pollution. Additionally, these economic activities have social consequences such as informal jobs, violence and short-term mentality[2]. However, within this context, there are some community leaders who stand out because of their alternative ideas about the socio-economic future of this region. These leaders have promoted other economic activities based on environmental awareness and community development. Ten of these community leaders have been involved in this research project, who represent a core network that promotes a more equitable and environmentally friendly economic development in the region[3]. This network has a broad geographical scope, covering 18 municipalities from three different administrative provinces, in an area of around 11700 Km^2. (See Annex 1 for learning about the journey to and from PC3 of each participant).

Throughout the design and implementation of a PC3 in Santa Rosa del Sur I have played the role of both practitioner and researcher. Therefore, the reader will find a continuous dialogue between practice and theory. In terms of practice, on the one hand, the research objective was to design a support system for grassroots innovators interested in developing feasible business models that contribute to sustainable development on the ground. On the other hand, in terms of theory, the research objective was to understand the ways in which PC3 contributes to transitions to sustainability at the grassroots level. The following sections present, first, the theoretical background of the thesis and the

[1] This process is further explained in Section 1.3.
[2] Chapter 3 discusses this in detail.
[3] Section 5.2.3 explains the characteristics of this core network further.

conceptual debate it aims at contributing to, and second, the research rationale underlying the action research process I have undertaken.

1.2 Theoretical background and conceptual debate

It has been argued that promoting a more sustainable development requires deep transformations intended to change sociotechnical systems of production and consumption into greener and more inclusive ones (J. Grin, J. Rotmans, & J. Schot, 2010; Markard, Raven, & Truffer, 2012). Within this approach, known as sustainability transitions, the notion of sociotechnical experimentation has played a central role. This consists of the introduction of alternative technologies and practices into real-life settings, in order to purposively re-shape social and material realities into more sustainable ones, thanks to real-world actors who are willing to participate and commit, despite the conditions of uncertainty and ambiguity that such experiments may entail (F. Sengers, Wieczorek, & Raven, 2016).

The introduction of alternative technologies and practices requires a focus on both technological and social innovations. However, the domain of innovation studies and the domain of social innovation are currently separate (van der Have & Rubalcaba, 2016). Recent systematic reviews of large bodies of academic literature have suggested diverse research avenues to forge bridges between the two. This dissertation follows one of these avenues, specifically the one that explores the process of value creation, in order to identify who gains from innovation and how (van der Have & Rubalcaba, 2016) and in order to understand novel ways in which social innovators (e.g. social entrepreneurs, local communities or engaged citizens) organise themselves, coming up with sustainable business models (F. Sengers et al., 2016).

As it will be discussed in Chapter 4, a closer look at the questions *which transformation?*, *for whom?*, and *by whom?* (Scoones, Leach, & Newell, 2015) is still needed in order to understand the kind of sustainability that socio-technical innovations bring about. These questions are particularly relevant in the developing world, where countries exhibit a mixture of well- and ill-functioning institutions, in a context of market imperfection, clientelist and social exclusive communities, patriarchal households and patrimonial and/or marketized states (P. Bevan, 2004; G. Wood & Gough, 2006). It has been argued that the sustainability-driven innovation that takes place in such contexts provides alternative development pathways and new models of social change (Berkhout, Angel, & Wieczorek, 2009; Berkhout et al., 2010; Sarkar & Pansera, 2017).

In this sense, some have argued that 'sustainability sits at the nexus of poverty, the natural environment and innovation' (Khavul & Bruton, 2013, p. 287). Others, that 'sustainability

will emerge as a source of innovations at the Bottom of the Pyramid'[4] (Prahalad, 2010, p. 17). Both statements highlight the emergence of novel solutions from the bottom-up; grassroots innovations that are able to tackle today's challenges related to social inclusion and ecosystem depletion.

These solutions are usually brought into the market by *grassroots ecopreneurs*, 'defined as grassroots entrepreneurs moved by social and environmental concerns, coming up with simple and eco-friendly solutions in their quest to resolve everyday life problems' (Sarkar & Pansera, 2017, p. 327).

Grassroots ecopreneurs are also considered social innovators, because they promote more sustainable practices that embrace change in social relations in order to solve relevant problems that critically affect humanity (Cajaiba-Santana, 2014; Sarkar & Pansera, 2017; van der Have & Rubalcaba, 2016). Grassroots ecopreneurs do not only understand immediate social/environmental needs, 'but also the larger social system and its interdependencies, so they can introduce new paradigms at critical leverage points that lead to cascades of mutually reinforcing changes in social arrangements' (Alvord, Brown, & Letts, 2004, p. 262).

Additionally, although the innovativeness of these ecopreneurs usually lies on the social dimension, their businesses are in most (if not all) cases socio-technical in nature (Witkamp, Raven, & Royakkers, 2011). These innovations are driven by values of solidarity and equity, at the same time that are able to deal with market principles. In this way, grassroots ecopreneurs are active designers of the value-exchange structure due to their understanding of native roles, identities and social structures that shape value within this structure (Mezias & Fakhreddin, 2012).

The action research process that this document describes, explores the dynamics of sustainability-driven innovation at the grassroots level, in order to uncover the ways in which grassroots ecopreneurs contribute to shaping alternative development pathways for their communities. The research rationale underlying this dissertation is described below.

1.3 Research rationale

It has been argued that action research can open up spaces where alternative ideas, practices and social relations may contribute to more fundamental system changes towards sustainability at the local level (Wittmayer, Schäpke, van Steenbergen, & Omann, 2014). Action research has been defined as 'a participatory process concerned with developing practical knowing in the pursuit of worthwhile human purposes. It seeks to

[4] Prahalad and Hart have used the term 'the bottom of the economic pyramid' (BoP) to refer to more than 4 billion people who live on less than $ 2 per day, whom the formal market of goods and services does not reach (Prahalad & Hart, 2002)

bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities' (Reason & Bradbury, 2008, p. 4).

Even though this definition is not definite, it highlights the particularities that make action research a specific form of research, rather than just another form of qualitative research. First, its participatory nature means that conventionally called 'research subjects' or 'recipients' engage in the process as co-creators of knowledge and action. Second, the research dynamics foster systemic cycles of action and reflection, bringing awareness among participants with the potentiality to transform. Third, it is a solution-driven process, which aims not only at generating new knowledge, but also at action-oriented targets (Herr & Anderson, 2005).

In the context of sustainability science, action research has been more often referred to as transdisciplinary research, characterized by its focus on societally relevant problems, its intention to enable mutual learning among researchers and non-researchers from different disciplines and within and outside academia, and its objective to create knowledge that is solution-oriented, socially robust (Brandt et al., 2013; Lang et al., 2012). This sort of research 'aims at bridging the gap between problem solving and scientific innovation' (Lang et al., 2012, p. 40) in the same way design research does (Gregor & Baskerville, 2012).

Considering that this research project has a twofold and interdependent objective (i.e. to design a support system and to understand the ways in which such support system contributes to transitions to sustainability at the grassroots level), design research provides appropriate methodological tools to undertake this action research. It has been argued that design research fosters knowledge flows to social science research by introducing novel artefacts that generate revised social realities (Gregor & Baskerville, 2012). In fact, as a socio-technical experiment, this research project consists of introducing a support system into a real-life setting, in order to purposively re-shape social and material realities. Therefore, design research methodologies are suitable for this doctoral research project.

Design research methodologies are rarely used in social science research, given the explanatory nature of such research. However, it has been argued that prescription-driven research, based on the paradigm of design sciences, can contribute to finding solutions to problems social scientist care about (Van Aken, 2004). As sustainability science is a problem-driven solution-oriented field (Lang et al., 2012), design methodologies offer a suitable complement for research purposes. The results of prescription-driven research are field-tested and grounded technological rules to be used as design exemplars of problem solving by both academics and practitioners (Van Aken, 2004, p. 221).

The design process is a solution driven, iterative process based on heuristics, which attempts to understand system behaviour when a specific intervention takes place. The purpose is not to design one single solution, but many alternatives for action (Gregor, 2009). This has to do with the divergent nature of design (Dorst, 2011). The logic of design, contrary to that of optimisation, is that the process generates an overview of possible solution pathways and then narrows this set down by bringing constraints, which are usually implicit for stakeholders and therefore can only be assessed after the designs are generated (people may find constraints when they are able to visualise the solution).

This research process highlights the insider's perspective rather than the observer's on the problem-solving process. Therefore, prescription-driven research is highly participatory, in the same way action research is (Reason & Bradbury, 2008). Here, the researcher is the designer, co-creating with all stakeholders involved. Research in itself becomes a design process.

The action research process I have conducted as my PhD project follows a prescription-driven research aiming at designing and testing a suitable support system for grassroots innovators interested in developing feasible business models that contribute to sustainable development on the ground. Using Van Aken's words, this research is about uncovering the generative mechanisms that link immaterial interventions such as PC3 with immaterial outcomes such as business models for sustainability (2004, p. 241).

In this process, reflexivity has been an important component for me to find and make transparent the frameworks in which my findings make sense (Engward & Davis, 2015). Additionally, issues of positionality during the research process have been made explicit, as we researchers are also positioned in specific ways within power structures (Cloke, Cooke, Cursons, Milbourne, & Widdowfield, 2000; England, 1994; S. Hall, 1992), which may affect the suitability of particular research methods and, therefore, interpretations (Chacko, 2004; Mompati & Prinsen, 2000; Moser, 2008). This is particularly relevant given the fact that sustainability science is normative in nature, as it follows a transformational agenda (Lang et al., 2012), bringing about issues of quality criteria related to scientific credibility vs. practical applicability (Herr & Anderson, 2005).

This doctoral thesis follows a recursive argument. The PC3 programme is presented following a step-by-step Design Research Methodology (DRM) which stands, at the same time, as its core rationale. DRM (Blessing & Chakrabarti, 2009) has been developed to guide solution-oriented research in a structured and rigorous way. The following section explains such process.

1.4 Design Research Methodology

DRM suggests four research stages (Figure 1.1) in order to systematically explore three core design research questions: What a successful product means, how a successful product is created and how we improve the chances of being successful (Blessing & Chakrabarti, 2009, p. 13). Following these stages allows researchers to design more relevant and scientifically rigorous products. Here, 'products' do not only refer to physical artefacts, but also to services, methods, procedures, etc.

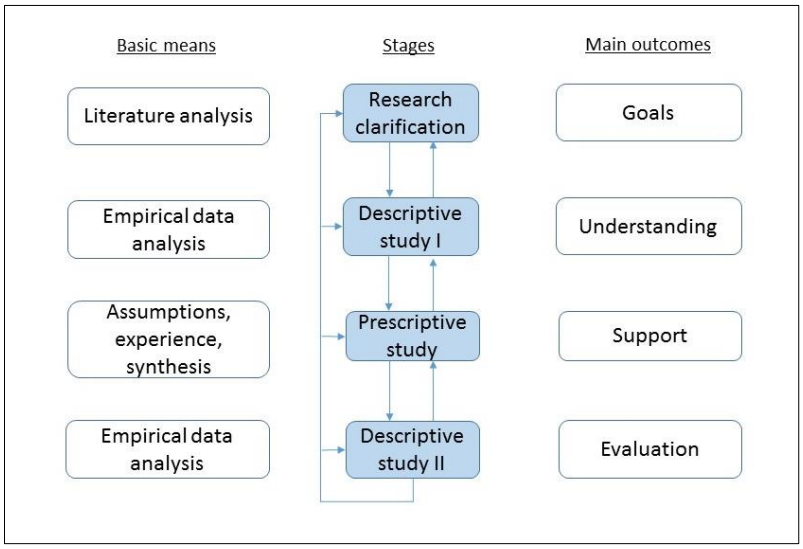


Figure 1.1 DRM framework (Taken from Blessing and Chakrabarti, 2009, p.15)

The aim of the *research clarification* is to determine a realistic and worthwhile set of goals that the intended support system or tool has to fulfil. Also, specific requirements and boundary conditions need to be specified, based on literature review. The first step of applying this methodology to this doctoral research consists of exploring the literature related to the general problematic that PC3 intends to solve in order to identify the factors that influence task clarification and the support system success. As a result, specific requirements and guiding research question will be formulated (see Chapter 2).

The purpose of *descriptive study I* is to describe the existing situation. Both literature review and empirical research are conducted in order to achieve a sufficient understanding of the factors that affect the existing situation, which could be addressed by the support system. My research in this stage focuses on understanding the characteristics of the setting where the support system will be applied and reviews the relevant literature in such type of settings.

The *prescriptive study* consists of suggesting a solution or support system to the problems described in the first stage, based on the specific characteristics found in the *descriptive study I*. In the case of this research, this step results in the implementation process of a PC3 in a real-life setting, discussed in Chapter 5.

Finally, the *descriptive study II* consists of evaluating the results of the prescriptive study after applying it in a specific setting. It seeks to analyse the impact of the support system and its ability to realise the intended results. In other words, this *second descriptive study* includes verification and validation processes. Verification consists of assessing whether the support system indeed contributes to the objectives initially suggested. The validation consists of measuring the degree of success after the support system has been implemented. For this doctoral research, this stage will discuss the ways in which PC3 addresses and affects the key factors that allow ecopreneurs to contribute to transitions to sustainability at the grassroots level (See Chapter 6).

This thesis documents a research project type 5 (Blessing & Chakrabarti, 2009, p. 18)[5], because it undertakes a review-based research clarification, a comprehensive descriptive study I, a comprehensive prescriptive study and an initial descriptive study II. This means that the second descriptive study corresponds to the evaluation of one single support system. A more in-depth research project would have implied the design and evaluation of more than one support system, in order to properly assess the ability of different supports to realise the desired situation. This falls beyond the scope of a single PhD research project, in terms of both time and resources.

1.5 Summary of contents

This dissertation is structured as follows. Chapter 2 explores the main factors that PC3 should consider and defines specific requirements for the support system. Based on the literature coming from three different academic fields (entrepreneurship in the context of sustainable development, value creation, and experimentation for sustainability transitions) the chapter defines a theoretical reference model of the support system. Chapter 2 also explains the research methods used for collecting and analysing data throughout the DRM stages.

Chapter 3 aims at understanding the problems the research deals with and the ways in which they are addressed by the actors involved. Specifically, this chapter describes the existing situation of Santa Rosa del Sur (the real-life setting where the project takes place), in terms of its sustainability challenges and the status of the entrepreneurial and value creation activity. Additionally, this chapter describes the conceptual and empirical progress achieved by PC3 by the time this research project started.

[5] The authors identify seven types of design research projects, according to the focus of each stage, i.e. review based, initial or comprehensive. The first level exhibits a review-based Research Clarification and a comprehensive Descriptive Study I. The seventh level, in turn, consists of a review-based Research Clarification while all other three stages are comprehensive studies, usually showing iterations between them (Blessing & Chakrabarti, 2009, p. 18)

Chapter 4 contributes to the understanding of the existing situation. It explores the particularities of transformation processes of production-consumption systems unfolding in contexts of poverty.

Having defined the main requirements the support system should meet (Chapter 2) and having reviewed the related literature and studied the characteristics of the existing situation (Chapters 3 and 4), Chapter 5 proposes a possible solution. Here, I describe and discuss in depth the process of designing and implementing a PC3 in Santa Rosa del Sur.

Chapter 6 evaluates the impact of the support system and its ability to realise the desired situation. It focuses on two components of the PC3 project. First, it discusses the learning model that was developed. Second, it analyses the co-creation process of business models for sustainability. As a result, the last section of the chapter suggests a revisited reference model of the support system.

Chapter 7 summarises the exploration that this research project has undertaken in the attempt to provide answers to the specific research questions formulated in Chapter 2. Finally, it presents some concluding remarks and suggests further research avenues and policy implications.

Figure 1.2 represents how each chapter corresponds to DRM stages and shows the outline of the thesis.

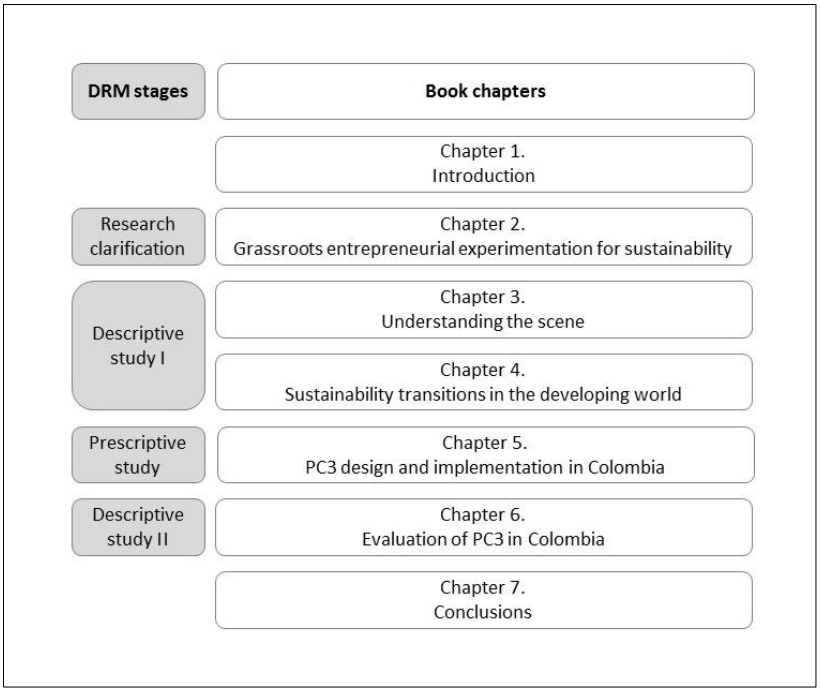


Figure 1.2 Thesis outline

Chapter 2.

Grassroots entrepreneurial experimentation for sustainability

As mentioned in the previous chapter, PC3's interdisciplinary approach aims at enabling local innovation, based on sustainability principles, social entrepreneurship rationale and design methodologies. The research that is carried out throughout this project investigates the development of suitable models to boost the sustainable development of under-privileged regions from the bottom-up. PC3's mission is therefore twofold. On the one hand, it can be regarded as a business pre-incubator which focuses on opportunity recognition, conceptual product development and sustainable business model creation. On the other hand, it seeks to understand the ways in which innovative business models may contribute to sustainable development.

This chapter explores the main factors that PC3 should consider and defines specific requirements or conditions related to them, based on the literature coming from three different academic fields: entrepreneurship in the context of sustainable development, value creation, and experimentation for sustainability transitions. The result will be a theoretical reference model of the support system.

2.1 Entrepreneurship in the context of sustainable development

As a result of the Rio+20 summit there is agreement among country leaders and international agencies on the need of a 'green economy in the context of sustainable development and poverty eradication', which refers to a more resource-efficient equitable growth, where economic, social and environmental impacts of human activity are equally relevant. This has been often referred to as an 'inclusive green economy' (UNEP, 2012). It has been argued that moving towards such economy requires creative social and environmental entrepreneurs, known as *ecopreneurs*, who are able to organise, create and manage ventures that deliver social, environmental and economic value (Creech et al., 2014; Pansera & Sarkar, 2016). In fact, the agreed 2030 Agenda for Sustainable Development defines specific green-economy targets in the Goal 8 'Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all'. This optimistic understanding of the role of entrepreneurs in sustainable development has been previously addressed in the literature (J. K. Hall, Daneke, & Lenox, 2010; York & Venkataraman, 2010). Researchers have found that social and environmental entrepreneurs can establish a different way of thinking and acting that modifies existing paradigms prompting deep social and institutional change, creating opportunities for developing a more just and environmentally sustainable economic system (Alvord et al., 2004; Pacheco, Dean, & Payne, 2010).

However, research conducted by the Global Entrepreneurship Monitor (GEM), has found that 'a large group of people in the *Base of the Pyramid* (BoP) have entrepreneurial skills, but no means to exploit them and develop their own products and businesses' (Juan M Jauregui-Becker et al., 2013, p. 10). Similarly, Berner, Gomez, and Knorringa (2012) argue that the most vibrant entrepreneurial activity in developing countries can be found in poorer areas, where the resource allocation processes that take place either through the market or through public expenditure (or both) do not reach. They argue that entrepreneurs in these areas are often 'survival entrepreneurs', who run a business in order to diversify their portfolio of resources and security, but are not interested in, and often not capable of, developing a growth-oriented enterprise. This suggests that there is room for capacity development initiatives that support grassroots innovation and entrepreneurship.

Researchers have found that much support is needed to social and environmental enterprises as the grassroots foundations of the green economy, namely in the form of access to research organisations to develop and test products and technologies, access to information, access to advisors and mentors, access to finance and access to channels to communicate their success (Creech et al., 2014).

In sum, according to the literature, it could be argued that a key factor to develop a support system that enables local innovation for sustainability refers to the sort of support offered to ecopreneurs. Therefore, the first requirement that this design research process should meet is:

PC3 supports grassroots ecopreneurs, in order to enable new technologies or novel social practices that promote sustainable development.

Consequently, the guiding research question to meet this requirement would be:

What are the characteristics of a transformative learning model that contributes to promoting sustainable innovation?

2.2 Value creation

Scholars have found evidence of social and environmental entrepreneurs around the world who organise their ventures in novel ways (Boons & Lüdeke-Freund, 2013), coming up with business models able to create value 'across a wide spectrum' (Sarkar & Pansera, 2017, p. 334). Therefore, businesses are seen as actors that might greatly contribute to sustainable development, because they are able to create social and environmental value, besides the economic one (Creech et al., 2014; Pansera & Sarkar, 2016). The ways in which an organisation creates and delivers value has been described as its business model (Osterwalder, Pigneur, & Tucci, 2005).

From the research perspective, the business model is an adequate unit of analysis for studying businesses' contribution to sustainability because it integrates several disciplines, it goes beyond the resource-efficiency technological approach, it presents a systems perspective and it uncovers both the environmental and social aspects of business activities (Desai, 2014; Schaltegger, Hansen, & Ludeke-Freund, 2016; Seelos, 2014). Through its different components, the business model shows who, and in which ways, gains from the innovations that entrepreneurs bring into the market (van der Have & Rubalcaba, 2016).

Thus, PC3's second requirement should relate to the sort of business models it helps designing, i.e. *business models for sustainability*. Following Schaltegger et al. (2016, p. 6)

> A business model for sustainability helps describing, analyzing, managing and communicating (i) a company's sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers its value, (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries.

Specifically, the second requirement is stated as follows:

PC3 supports grassroots ecopreneurial ventures which create novel business models for sustainability.

In order to meet this requirement two guiding research questions are formulated:

How do ecopreneurs create novel business models for sustainability?
What are the characteristics of such business models?

2.3 Experimenting for sustainability transitions

Beyond educating the new generations of professionals, universities have been recognised as critical actors in innovation systems, who should develop science and technology able to contribute to economic growth as well as to solving pressing social needs (Brundenius, Lundvall, & Sutz, 2009; Núñez Jover, Armas Marrero, Alcázar Quiñones, & Figueroa Alfonso, 2014). Following this call, universities (mainly in the developing world) have undertaken university-led technology-based inclusive innovation projects, which consist of developing novel products and services that improve the living conditions of the poor and marginalised (Grobbelaar, Tijssen, & Dijksterhuis, 2017). This projects are usually led by university faculty, with collaboration of students at various extents, involving the poor in the innovation process as end users (often during the development and implementation phases, but not during the design phase), following a user-centred design paradigm (Dell'Era & Landoni, 2014).

In the last two decades, a new form of collaborative initiatives between science (academia) and society (local governments, communities and/or firms) have emerged, which consists of socio-technical experiments that aim to support sustainability transitions (Luederitz, Schäpke, et al., 2016; F. Sengers et al., 2016). These initiatives are characterised by five core elements: (1) the introduction of new technologies or novel social practices into society; (2) the context of system innovation; (3) the normative orientation towards sustainability; (4) the inclusion of diverse social actors in order to foster social learning, i.e. following a transdisciplinary research approach (Lang et al., 2012); (5) the practice-based approach, which consists of deliberately trying out something new in a dynamic real-life social context with the purpose of contributing to a societal transformation (F. Sengers et al., 2016). Additionally, this sort of experiments are 'research endeavours', in the sense that they produce evidence of unsustainable technologies and/or social practices and of possible solutions to them (Luederitz, Schäpke, et al., 2016, p. 3).

These two sorts of 'engaged scholarship' differ in nature, as the former is solution-based, attempting to deliver products or services, while the latter is experiment-based, aiming at system transformation. This key difference suggests the third requirement that this action research process should meet:

PC3 is a collaborative and participatory experiment between university and grassroots ecopreneurs that tries out new technologies and novel social practices in a real-life setting, triggering more sustainable socio-technical systems.

Two guiding research questions have been formulated to meet this requirement:

What are the characteristics of a model of collaboration and participation between university and grassroots ecopreneurs in a real-life setting?
In which ways does this model trigger system transformations in such setting?

2.4 Reference model

Research clarification, the first step of the DRM (Blessing & Chakrabarti, 2009), consists of defining specific requirements for the intervention to be designed. According to the literature reviewed above, there are three key factors that PC3 needs to address in order to enable local innovation based on sustainability principles and entrepreneurship rationale. These factors refer to the sort of support offered to ecopreneurs, the sort of business models it helps designing, and the sort of 'engaged scholarship' it develops.

Therefore, the intended support method should be a collaborative and participatory experiment between university and grassroots ecopreneurs, which consists of trying out new technologies and novel social practices in a real-life setting, in order to create

business models that lead transitions towards sustainability. This theoretical reference model is graphically represented in Figure 2.1.

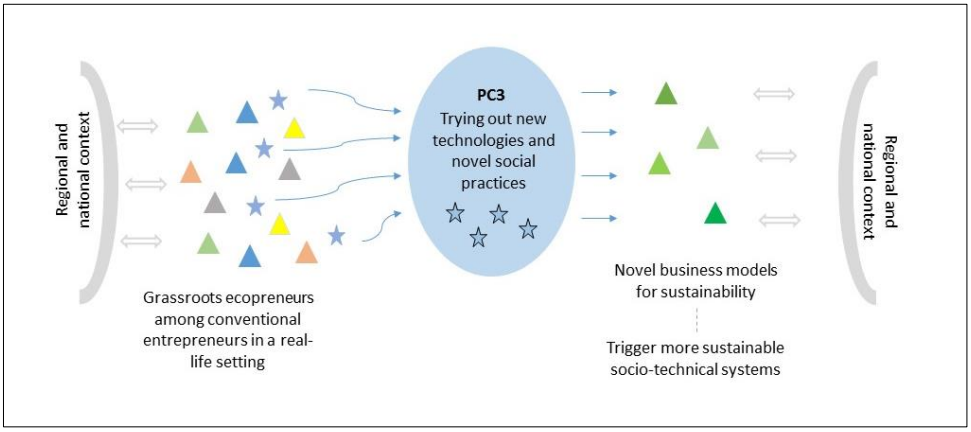


Figure 2.1 Reference model

Figure 2.1 exhibits a real life setting immersed in a specific regional and national context, where some grassroots ecopreneurs (stars in Fig. 2.1) coexist together with conventional entrepreneurs (triangles in Fig. 2.1). These ecopreneurs join PC3 in order to try out new technologies and novel social practices in collaboration with university. The result of this experimentation process are novel business models for sustainability (triangles on the right-hand side of Fig. 2.1) which trigger more sustainable socio-technical systems in such specific context. This is the theoretical reference model on which my research project is based.

In order to explore the ways in which this model could be deployed, five research questions have been formulated to guide the design research process. As mentioned in the previous chapter, PC3 research goal is twofold. On the one hand, in terms of practice, it seeks to design a support system for grassroots innovators interested in developing feasible business models that contribute to sustainable development on the ground. On the other hand, it aims at understanding the ways in which PC3 contributes to transitions to sustainability at the grassroots level. Table 2.1 summarises the relationships between this twofold research goal, the research questions and the requirements defined above.

Requirements	Research questions	Practice-driven	Theory-driven
PC3 supports grassroots ecopreneurs, in order to enable new technologies or novel social practices that promote sustainable development.	RQ1. What are the characteristics of a transformative learning model that contributes to promoting sustainable innovation?	✓	
PC3 supports ecopreneurial ventures which create novel business models for sustainability.	RQ2. How do ecopreneurs create novel business models for sustainability?		✓
	RQ3. What are the characteristics of such business models?		✓
PC3 is a collaborative and participatory experiment	RQ4. What are the characteristics of a model of	✓	

Requirements	Research questions	Practice-driven	Theory-driven
between university and grassroots ecopreneurs that tries out new technologies and novel social practices in a real-life setting triggering more sustainable socio-technical systems.	collaboration and participation between university and grassroots ecopreneurs in a real-life setting?		
	RQ5. In which ways does this model trigger system transformations in such setting?		✓

Table 2.1 Relationship between research goal, research questions and design requirements

These requirements are the basis of the prescription-driven research (Van Aken, 2004) that I undertook as my PhD project. The following section explains the specific research methods I have used throughout the process.

2.5 Research methods

I have so far explained that this research project is an experiment that takes place in a real-life setting in the form of action research for which DRM will be the guiding methodology. The sort of research that is carried out throughout the experiment is exploratory in nature, rather than explanatory, so I do not aim at verifying theoretical hypothesis related to causal links, but to revealing insights that can inspire new ideas for further study (Yin, 2009). To contribute towards a more nuanced and empirically informed understanding of the dynamics of sustainability-driven innovation at the grassroots level, an ethnographic approach has been taken in order to uncover the ways in which grassroots ecopreneurs contribute to transitions to sustainability on the ground.

Ethnographic research uncovers intersections between the lived experience of actors, their social relations and practices in specific contexts (Lofland & Lofland, 1995). Understanding those dynamics is key to inform the research agenda and action in the nascent field of socio-technical experimentation for sustainability in the developing world (F. Sengers et al., 2016). Additionally, ethnographic researchers have made explicit the 'recognition that fieldwork is personal, emotional and identity *work*' (Coffey, 1999, p. 2), which is essential for being an action researcher and a designer of a social intervention (such as PC3).

Empirical data has been collected using a mixture of qualitative methods. I have carried out interviews, focus groups, direct observation and ethnographic work. I have registered all data in a field diary, which in the end shows the chronological design and implementation processes of the PC3 programme in Colombia. These notes are diverse, including the discussions and relevant events at UT, in Santa Rosa, all interactions between the two, and my own observations and reflections. The subsequent transcription of these notes allowed me to write memos (memoing), making sense of my data in an organised way (Charmaz, 2001). Similar to the case of grounded theory strategies, in this exploratory study I did not have previous concepts for which I was looking empirical evidence, but searched for patterns or themes that could surface (Yin, 2009). These

emerging themes constitute the main contribution of my research to both theory and practice (see Chapters 5 and 6).

I systematically organised the collected data according to specific events. Table 2.2 describes the codes I have used to name the collected data.

Code	Date	Description
Ix_(date)	(date)	Data with this code refers to interviewee's comments made on the date specified in the code. 'x' refers to the initial field work (0), field work 1, field work 2 or field work 3.
ID_(date)	(date)	Data with this code refers to internal discussions among the PC3 team at UT.
OBS_(date)	(date)	Data with this code refers to my own observation, made on the date specified in the code.
PP_070415	April 7th, 2015	Participant's profile. Refers to the form they filled in during the introductory workshop, where they wrote down their personal information and described their profile.
REF_(date)	(date)	Data with this code refers to my own reflections, registered on the date specified in the code.
SS_(date)	(date)	Data with this code refers to participants' comments during the skype session that took place on the date specified in the code.
W0_070415	April 7th, 2015	Introductory workshop that took place in Santa Rosa del Sur. Data with this code refers to participants' comments.
W1_301015	October 30th, 2015	Evaluation workshop that took place in Santa Rosa del Sur. Data with this code refers to participants' comments.
W2_311015	October 31st, 2015	Training workshop that took place in Santa Rosa del Sur. Data with this code refers to participants' comments.
W3_260416	April 26th, 2016	Evaluation workshop that took place in Santa Rosa del Sur. Data with this code refers to participants' comments.
W4_191016	October 19th, 2016	TEDx planning workshop that took place in Santa Rosa del Sur. Data with this code refers to participants' comments.

Table 2.2 Naming of empirical data

Another important data source has been the business model canvas (BMC) that each ecopreneur worked on. The BMC is a strategic management and entrepreneurial tool, used to describe, design, challenge, invent, and pivot a business model[6]. This tool identifies nine aspects that the entrepreneur should define in order to have a clear picture of the business model. These aspects are value proposition, customer segments, channels, customer relationships, revenue streams, key resources, key activities, key partners and cost structure. Additionally, the canvas offers specific questions per aspect, which guide the shaping process of the business model (See Annex 2).

These canvases were systematically filled in at three different moments of the process (October 2015, when the first implementation phase finished; February 2016, after having met the external experts; and April 2016, as a requisite to 'graduate' from the programme)[7], which allowed the analysis of the aspects that evolved over time. On the one hand, from the ethnographic perspective I could understand the ways in which each

[6] www.strategyzer.com

[7] Each phase of the implementation process is discussed in detail in Chapter 5.

ecopreneur negotiated the value proposition, the business infrastructure, the customer interface and the financial model of each venture. On the other, canvases themselves registered the ways in which ecopreneurs framed and defined each dimension of the business model.

The qualitative analysis has consisted of an inductive and critical activity of immersing myself in the empirical data, searching for relevant topics according to the twofold goal of this research. Because of the iterative nature of action research, the analysis process did not take place once all data was collected. The design process required constant interaction between action and reflection, which can be seen in the evolution of the reference model (Figures 2.1, 5.1 and 6.1).

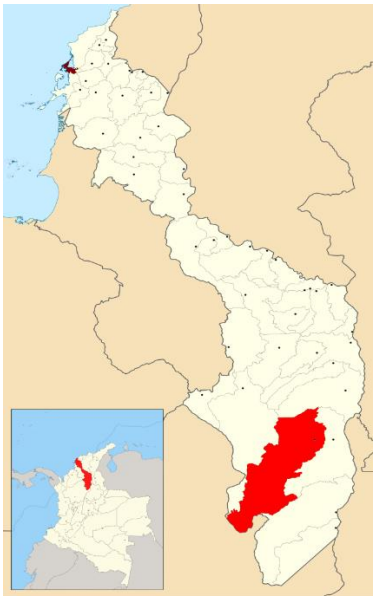
In sum, this doctoral research (which is a solution-oriented research project) combines qualitative methods coming from social sciences with design methods, thus contributing to further complementarity between social science and design science research.

Chapter 3. Understanding the scene

This chapter describes the starting point of my doctoral research, in terms of both practice and theory. In this way, the chapter contributes to the Descriptive Study I, which aims at thoroughly understanding the problems the research deals with and the ways in which they are addressed by the actors involved. Specifically, this chapter describes the existing situation of Santa Rosa del Sur (the real-life setting where the project takes place), in terms of its sustainability challenges (Section 3.1) and the status of the entrepreneurial and value creation activity (Section 3.2). Additionally, this chapter describes the progress achieved by PC3 by the time this research project started (Section 3.3). By doing so, it will be clear that further research is needed in order to better understand the particularities of transformation processes of production-consumption systems unfolding in contexts of poverty. Chapter 4 will expand on this.

3.1 Santa Rosa del Sur (Colombia)

Santa Rosa del Sur is a municipality located in the southern part of the Province of Bolívar in the Caribbean region of Colombia (Map 3.1). Its origin is very recent, since the first inhabitants arrived in the 1940s from other regions of Colombia, running away from the political violence of that time. Later, in 1984, the settlement was officially recognised as municipality, with an area of 2800 Km^2. During the following decade there was a new wave of migration towards this region, given the increasing activity of coca cultivation, which ignited a vibrant illegal economy in the region. Consequently, huge social problems emerged, such as heavy violence, corruption, family disintegration, prostitution, drug addiction, alcoholism and so on (Santa-Rosa-del-Sur, 2012).



Map 3.1. Location of Santa Rosa del Sur in Colombia

The new millennium brought important investment from the national government as well as international aid, which funded large programmes aiming at illicit crop substitution, based on a solidarity rationale. In consequence, community-based organisations were supported through several economic development programmes.

Despite some relative success in promoting income-generation activities, service provision in this region has remained very poor for its nearly 40000 inhabitants. Specifically, according to the Municipal Development Plan 2012-2015 (Santa-Rosa-del-Sur, 2012), close to 43% of households have access to water supply (not suitable for drinking) and 37% to sanitation; education quality is lower than the national average, the drop-out rate is close to 15%, and not even 5% of young people goes into technical/higher education programmes; 19% of the population is undernourished; only 27% of population has health care insurance; in rural areas electricity access is close to 10% and in nearly 90% of households wood is used for cooking; 46% of houses are assessed to be qualitative insufficient; there is not public transport provision, but private informal providers. Not surprisingly, the Unsatisfied Basic Needs Index for Santa Rosa del Sur was calculated AS 76% in the year 2011.

In environmental terms, Santa Rosa del Sur faces complex problems, such as large deforestation for cattle breeding and gold mining (see Image 3.1). Even though there is not clear data available, rural communities claim that water availability has reduced dramatically, there is evidence of soil erosion in large areas and several plant and animal species have become very rare[8] (Santa-Rosa-del-Sur, 2012). Additionally, gold mining in river banks brings about heavy-chemical pollution because of uncontrolled use of mercury and cyanide.

Image 3.1. Main causes of deforestation: gold mining, coca cultivation, cattle breeding

Gold mining is the main income-generation activity in the region. Even though cultivation of cash crops such as coffee and cocoa has increased, farming activities show very low productivity. As a result, 55% of the population lives under the poverty line[9]. Additionally, these economic activities are mainly informal, which means that the vast majority of the working population does not have access to social security (Santa-Rosa-del-Sur, 2012).

[8] Santa Rosa del Sur is one of twelve municipalities located in Serranía de San Lucas, a mountainous biodiversity-rich ecosystem, which hosts several endemic species (www.parquesnacionales.gov.co)
[9] USD 1.25 a day

3.2 Entrepreneurship and value creation

According to the Municipal Development Plan 2012-2015, people from Santa Rosa exhibit very low entrepreneurial competences, manifesting in low organisation capacity, poor leadership and low enterprise-creation rate (Santa-Rosa-del-Sur, 2012, p. 104).

As mentioned above, in the first decade of 2000 both national governmental and development aid programmes attempted to create income-generation alternatives to coca growing, based on a solidarity rationale. This strategy funded the creation and strengthening of some productive associations, such as Aprocasur (cocoa producers), Asocafé (coffee producers), Asocalima (beans producers), Asocavilla (sugar cane producers), Coagrosur (microfinance), among others (I_1_031115). However, only 2% of registered business are community-based organisations (Santa-Rosa-del-Sur, 2012).

The leaders of these few organisations stand out because of their alternative ideas about the socio-economic future of this region. These community leaders have promoted economic activities based on environmental awareness and community development. For nearly ten years these leaders specialised in designing development projects that could benefit their organisations. Therefore, despite the fact that these organisations were based on productive activities, their organisational capacity developed towards a project-based mentality rather than an entrepreneurial one, making them dependent upon external resources without overcoming the lack of business development capacities (I_0_180315; I_1_031115).

Additionally, the main activity of 83% of registered business is commerce (Santa-Rosa-del-Sur, 2012). It means that the vast majority of businesses consists of buying goods in Colombian major cities and then selling them in Santa Rosa at a higher price. This sort of economic activity creates some economic value for middlemen, but does not create social nor environmental value for the region.

3.3 PC3 as a sustainability experiment

This section describes the configuration of the setting that made possible to set up a PC3 in Santa Rosa as a sustainability experiment. Additionally, it explains the progress achieved by PC3 at UT by the time this research project started.

3.3.1 Opening up the possibility to implement a PC3 in Santa Rosa

During the second semester of 2014 I worked with one of the community-based organisations as the field study supervisor of some groups from the Minor Sustainable Development in Developing Countries at UT. As field-study supervisor, this work allowed me to become familiar with the region and to create trust among us. At the beginning of 2015 I presented PC3 to one of the community leaders mentioned above, who became

interested in this programme. Some important conclusions were drawn from this first meeting (I_0_180315):

- The entrepreneurship rationale according to which PC3 works might be useful to strengthen community-based organisations in this region, because these organisations are used to working according to a development-project logic.
- An experiment like PC3 should benefit the organisation rather than the individual person who joins the programme, because their main objective is community development.
- As it would be a pilot project, participants should be community leaders, so that they could replicate the process later with other organisations. Community leaders have experience in working with communities and have also shown legitimacy to introduce new ideas and practices into the region.
- Both men and women of different ages should attend, in order to have diversity of ideas and leadership styles.
- It should be important that the group remains working together during the whole process (which implies that all participants should be located in Santa Rosa), in order to create sustained dynamics that bring about trust and creativity.
- We agreed to try out introducing PC3 to Santa Rosa del Sur, which means that the experimental nature of the project was clear.

3.3.2 Previous PC3 experiences

As mentioned in the introductory chapter, PC3 is a joint alliance of three departments at the University of Twente: the Department of Design, the Department of Governance and Technology for Sustainability (CSTM) and the Department of Entrepreneurship, Strategy and Innovation Management (NIKOS). As such, PC3 is nurtured by diverse student initiatives, both at the undergraduate and postgraduate level. By the time this doctoral research started, much progress had been achieved, but no project like this one had taken place.

In 2013 a student from business administration completed his bachelor's dissertation 'Inventory of social entrepreneurial methods/tools for PC3 implementation. The business perspective'. His qualitative study with social entrepreneurs attempted to explore the research question 'Which factors, under the criteria of social entrepreneurship, can be identified as contributors for an enterprise to successfully serving the BoP market and how can these be integrated into a business model targeting the BoP market?' (Lansink, 2013). As a result, he identified four key factors for economic success of social ventures serving BOP markets: internal business processes, disposition towards learning and innovation, market knowledge and healthy financial management.

The following year, a student from the Minor Sustainable Development in Developing Countries carried out research for her bachelor's assignment in San Agustín Calvario

(SAC), Puebla, Mexico. She developed a co-creation process aiming at the social inclusion of elderly people in SAC and at helping them achieve some economic independence (Crespo Rosas, 2013). The process was based on the main asset of the elderly: their memories related to the history of SAC. The resulting product was 'the storyteller ecological bag' to be sold in Puebla, a well-known city for tourism in Mexico (see Image 3.2). Several actors participated throughout the co-creation process: BUAP[10] students, who taught the elderly how to do appliqué, University of Twente students who created the business model, and a group of female community leaders who were willing to manage the business.

Data collected from this work allowed to identify four key social factors: culture homogeneity, clear vision, proactive personality and gender sensitivity (Crespo Rosas, 2013). These key social factors complement the economic factors identified by Lansink (2013).

Image 3.2. The storyteller ecological bag

That same year, a student of Industrial Design Engineering did her bachelor assignment in Cape Town (South Africa), where she trained BOP entrepreneurs on product development at a *hubspace* (see Image 3.3). Her work suggests that design methods help entrepreneurs with no formal education nor business development experience to generate and refine ideas, to focus on their plans, to gain a longer term vision, recognize strengths and weaknesses, and to creatively examine business models (Hendrikse, 2014).

[10] Benemérita Universidad Autónoma de México

Image 3.3. Hubspace Khayelitsha

As a result, by trying out and researching on the different components of PC3, by the time this doctoral dissertation started there was clarity on the contents and methods PC3 needed to work on. Additionally, the empirical data gathered by these students was used to test the initial model formulated by the PC3 team, which Figure 3.1 graphically represents.

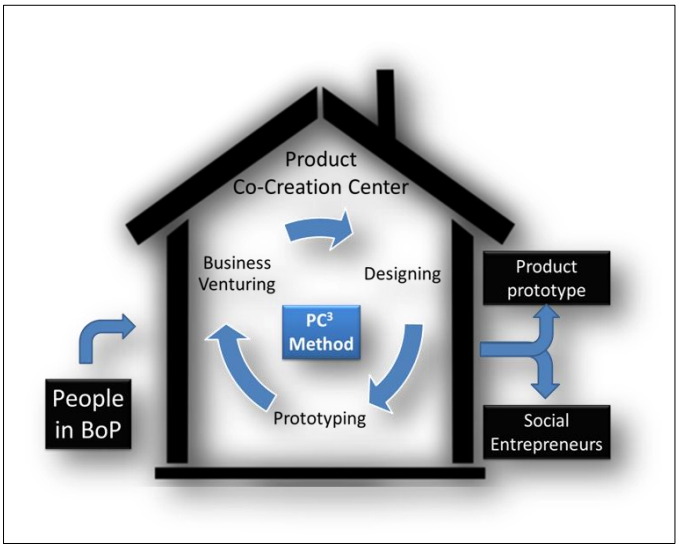


Figure 3.1. PC3 model, taken from J. M. Jauregui-Becker, M. L. Franco-Garcia, and A. Groen (2013)

This model consists of a co-creation process, i.e. the process of creating something new among a group of individuals, in this case a group of non-experienced social entrepreneurs together with product development experts (Jauregui-Becker, Franco-Garcia, & Groen, 2012). This co-creation process results in the professionalization of entrepreneurs and the creation of new product and service ideas with market potential (J.M. Jauregui-Becker et al., 2013).

This model is solution-based, attempting to deliver sustainable products or services in BOP markets (see Section 2.3). However, the case in Colombia aims at transformation of production-consumption systems via an experiment-based model. This was an unexplored challenge within PC3, so further research was needed in terms of transformative learning models in adulthood and in terms of system transformation in contexts of poverty. The following section explores the former and Chapter 4 the latter.

3.3.3 Transformative learning in adulthood

In this section I attempt to describe the state-of-the-art theories of learning in adulthood[11]. In order to do so, I follow Engeström's central questions about learning activities: "(1) Who are the subjects of learning, how are they defined and located? (2) Why do they learn, what makes them make the effort? (3) What do they learn, what are the contents and outcomes of learning? (4) How do they learn, what are the key actions or processes of learning?" (2001, p. 133).

To answer the first question for the PC3 case based on previous PC3 experiences, PC3's target is innovative individuals living in deprivation. These individuals are young adults with poor formal education, who have already proven their entrepreneurial character, mainly because they have characteristics of leadership, autonomy, self-confidence, resourcefulness, risk-taking, courage, persistence and flexibility (Stevenson & Jarillo, 1990). They live in deprived regions, lacking access to products and services, which undermines their well-being (Prahalad & Hart, 2002).

Second, according to theorists of experiential learning, the living experiences of the adult learner are the source of the adult's motivations to learn (Knowles, 1980; Lindemann, 1961; Merriam, Caffarella, & Baumgartner, 2007). PC3 programme's participants are active innovators looking for solutions to improve their own and their communities' living conditions. Therefore, the answer to the second question in the case of the PC3 programme would be that the lived experience of scarcity, exclusion or insecurity is the driver of these innovators to engage with transformative learning processes.

Third, answering to the question *what do they learn, what are the contents and outcomes of learning?*, PC3 is an interdisciplinary programme that brings together sustainability principles, entrepreneurship rationale and design methodologies. Each one of these three pillars has its own learning objectives, which have been collectively defined by the PC3 members at UT according to their teaching experience in each field.

[11] This section is part of the 'Circularity rationale as the basis of transformative innovation' paper, accepted for publication in the journal Management Research Review (MRR).

Design learning objectives

- Apply systems engineering methods to model the problem space in terms of stakeholders, actors, situations and user scenarios with the goal of creating requirements that contextualize sustainability factors to consider in the design of products and services.
- Develop expertise in exploring the solution space through the application of ideation processes that combine brainstorming techniques that encourage both divergent and convergent thinking.
- Learn and develop expertise in applying problem solving techniques that enable continuous learning cycles as a medium for generating new knowledge.
- Understand and learn techniques to manage and control the development process of product and services between the conceptual design phase up to commercialization.

Entrepreneurship learning objectives

- Recognise business opportunities as well as the mechanisms needed to create social and environmental value through these opportunities.
- Appraise the surrounding entrepreneurial ecosystem, which may support/undermine the product or service development.
- Formulate and evaluate value propositions, both individually and with peers.
- Use and compare business model canvases.

Sustainability learning objectives

- Include integrity values all along the business development in the areas of human rights, labour, environment and anti-corruption.
- Identify the environmental aspects along the product life cycle in order to prevent negative impacts.
- Select clean technologies to manufacture/transport products and/or provide services.
- Embed social inclusiveness within business models.
- Apply system thinking to understand sustainability challenges which go across the business facilities and contribute positively to them.

Finally, in relation to the fourth question about how they learn and what the key actions or processes of learning are, we follow constructivist learning theory, 'which understands learning as construction of meaning from experience' (Clark & Rossiter, 2008). This meaning-making may occur through reflection (Boud & Walker, 1990; Kolb, 1984; Mezirow, 1991) and through contextual interaction (Hansman, 2001; Lave & Wenger, 1991).

In sum, the four topics discussed above constitute the theoretical basis to answer the research question *what are the characteristics of a transformative learning model that*

contributes to promoting sustainable innovation? Two more research questions need further theoretical exploration:

- What are the characteristics of a model of collaboration and participation between university and grassroots ecopreneurs in a real-life setting?
- In which ways does this model trigger system transformations in such setting?

In order to answer these questions it is necessary to first understand the characteristics of transitions to sustainability in developing countries. Chapter 4 examines the extent to which the conceptual elements of the sustainability transitions theory embrace the reality and complexity of BOP settings, where exclusive socio-technical systems strengthen the privileges of a few while undermining the well-being of many (Ramos-Mejía, Franco-Garcia, & Jauregui-Becker, 2018).

Chapter 4.

Sustainability transitions in the developing world

This chapter describes the particularities of transformation processes of production-consumption systems unfolding in contexts of poverty[12]. In this way, the chapter contributes to the Descriptive Study I, which aims at understanding the existing situation. In order to get such understanding, illustrative cases from the sustainability transitions literature have been analysed, based on concepts and frameworks coming from development studies.

4.1 Introduction

The transitions to sustainability approach has proved to be useful for academics, policy makers and practitioners to understand and promote socio-technical transformations that allow more sustainable ways of production and consumption (J. Grin, J. Rotmans, & J. W. Schot, 2010; Markard et al., 2012; Smith, Voß, & Grin, 2010). This approach has spread widely, with abundant examples from practice, mainly in European countries, in areas such as energy, transportation and food, often aiming at climate change alternatives. These transformations intend to change sociotechnical systems of production and consumption into greener and more inclusive ones, through deep structural changes which involve diverse degrees of cooperation and conflict among all actors involved (Newig, Voß, & Monstadt, 2007; Shove & Walker, 2007; Smith & Stirling, 2007). Despite increasing attention to the politics of these transformations in the transitions literature (Avelino, Grin, Pel, & Jhagroe, 2016; Geels, 2014; Jesse Hoffman, 2013), a closer look at the questions *which transformation?*, *for whom?*, and *by whom?* (Scoones et al., 2015) is still needed in order to understand the kind of sustainability these transformations bring about.

These questions are particularly relevant in the developing world, where countries exhibit a mixture of well- and ill-functioning institutions, in a context of market imperfection, clientelist and social exclusive communities, patriarchal households and patrimonial and/or marketized states (P. Bevan, 2004; G. Wood & Gough, 2006). The existence of ill-functioning institutions is the main feature that characterises what we call 'developing countries' in this paper. This 'illness' consists of the fact that both formal and informal institutions in the developing world are contested and personalised at various extents, undermining the well-being of many and strengthening the privileges of a few, and therefore, reproducing patterns of social exclusion.

[12] The content of this chapter was published as Ramos-Mejía, M., *et. al.* 2018. Sustainability transitions in the developing world: Challenges of sociotechnical transformations unfolding in contexts of poverty. Environmental Science and Policy, 84, 217-223 http://dx.doi.org/10.1016/j.envsci.2017.03.010. Here it is transcribed without changes.

Most sustainability transitions scholars have implicitly focused on the environmental sustainability of production-consumption systems, while overlooking their 'socio-institutional' sustainability (Romijn, Raven, & de Visser, 2010). The socio-institutional dimension of sustainability refers to the ability of societies to tackle the 'illness' mentioned above, i.e. to counteract processes of poverty reproduction and capability deprivation (Sen, 2000). Sustainability policy and practice in the developing world needs to include eradicating poverty as a focus (UN, 2012, 2015). In fact, some have argued that 'sustainability sits at the nexus of poverty, the natural environment and innovation' (Khavul & Bruton, 2013, p. 287) and others that 'a just transition would consist of a dual commitment to human well-being (with respect to income, education and health) and sustainability (with respect to decarbonisation, resource efficiency and ecosystem restoration)' (M. Swilling, Musango, & Wakeford, 2016).

In this paper we intend to uncover patterns of poverty reproduction that transitions frameworks have so far overlooked, in order to include sensitivity to poverty alleviation within sustainability transitions analyses. We understand poverty as a multidimensional phenomenon that causes capability deprivation and undermines people's well-being (Bebbington, 1999; Sen, 1981; Sen, 2000). We aim at highlighting some elements which connect the transitions to sustainability approach to some fundamental concepts related to poverty alleviation and well-being. Poverty alleviation refers to the expansion of human capabilities for all, i.e. 'the ability of human beings to lead lives they have reason to value and to enhance the substantive choices they have' (Sen, 1997, p. 1959), which can only be realised in the context of well-functioning institutions committed to social security (Nussbaum, 2001; Sen, 1982). Specifically, in this paper we examine the question *to what extent the conceptual elements of the sustainability transitions theory embrace the reality and complexity of exclusive socio-technical systems in poverty contexts, i.e. systems that strengthen the privileges of a few while undermining the well-being of many?*

While the paper is mainly theoretical, we use cases that have been discussed in the transitions literature in order to illustrate our argument.

This chapter is structured as follows. Section 4.2 explores notions of landscape and regime in poverty contexts. This exploration builds on the Institutional Responsibility Matrix (IRM) (G. Wood & Gough, 2006), which pictures 'the institutional landscape within which people have to pursue their livelihoods and well-being objectives'. Section 4.3 illustrates the poverty reproduction challenges that niche structuration processes deal with in the developing world. Finally, section 4.4 discusses the implications of our conceptual contribution for a research agenda on sustainability transitions in developing countries.

4.2 Transitions in developing countries: contextualising notions of landscape and regime

Developing countries exhibit a mixture of well- and ill-functioning institutions, in a context of market imperfection, clientelist and social exclusive communities, patriarchal households and patrimonial and/or marketized states (P. Bevan, 2004; G. Wood & Gough, 2006). In this context, both formal and informal institutions are contested (i.e. exhibit problems of legitimacy) and personalised (i.e. in the hands of elitist groups) at various extents, undermining the well-being of many and strengthening the privileges of a few (reproducing patterns of social exclusion). This institutional scenario differs from the one in European countries, where the transitions to sustainability has widely spread, both in theory and in practice. In the following sections we make use of the Institutional Responsibility Matrix suggested by development scholars, in order to explain in which ways the institutional scenario differs in different regions of the world. Then, we will highlight the implications of these differences for approaching socio-technical landscapes and regimes in the developing world.

4.2.1 Institutional Responsibility Matrix

In Wood and Gough's view (2006), even though poverty eradication is a universal goal, 'one size fits all' policy solutions to poverty eradication do not make sense. They call for context-specific means to achieve it, because in a hostile political economy where inequality and arbitrary exercises of power prevail, the extent to which people (individually and collectively) enact their capabilities depends on the extent to which local institutions are able to guarantee social security (Nussbaum, 2001; Sen, 1982; Wood, 2003).

As we will explain below, both state and non-state institutions in the developing world fail to provide social security at various degrees, reproducing informal social security or insecurity. This way of characterising institutions has led G. Wood and Gough (2006) to suggest three types of institutional settings: 'welfare', 'informal security' and 'insecurity'.

This typification is derived from a theoretical framework that comprises four components: 1) The institutional conditions, which include the character of markets, legitimacy of the state, societal integration, culture and values and the position of the country in the global system. 2) The institutional responsibility matrix (IRM)[13], which describes

[13] This matrix shows the permeability between state, market, community and household institutions and its manifestations at both the domestic and the supranational level. The purpose of highlighting such permeability is to make clear that the state cannot disentangle itself from deep social and political structures and function to compensate for them (G. Wood & Gough, 2006, pp. 1702-1703).

> the institutional landscape within which people have to pursue their livelihoods and well-being objectives, referring to the role of government, community (informal as well as organized, such as NGOs and Community Based Organizations), private sector market activity and the household, in mitigating insecurity and well-being, alongside the role of matching international actors and processes. (p. 1701)

3) The welfare situation of the population, measured by, for example, the Human Development Index. 4) The pattern of stratification and mobilisation, which refers to the existing distribution of power in a society and the range of societal inequalities. These four components are interrelated and shape the dynamics of each other.

The authors argue that both formal and informal institutions in developing countries are contested and personalised at various extents, so that 'people have to engage in wider strategies of security provision, risk avoidance and uncertainty management' (p. 1697). These strategies usually prioritise survival and security in the present, continuously postponing long-term sustained well-being, i.e. the 'Faustian bargain' (Wood, 2003). In contrast, in welfare settings people rely on legitimated states and regulated labour and financial markets that provide for all citizens minimum conditions for reproduction.

In informal and insecurity settings, the role of the state, the market, the community and the household (IRM components) is always ambiguous. Therefore, individuals and communities develop a portfolio of strategies and livelihoods, in order to face insecurity and uncertainty. On the one hand, in 'informal security' settings people rely heavily on community and family relationships to pursue their livelihoods and meet their well-being objectives, which results in problematic inclusion or adverse incorporation, because these relationships are usually hierarchical and asymmetrical, reproducing social structuration via patron-client relations. On the other hand, in 'insecurity' settings, local warlords and their clients block the reproduction and emergence of relatively stable informal mechanisms that mitigate insecurity for all (G. Wood & Gough, 2006, p. 1699).

G. Wood and Gough (2006) acknowledge that this classification is not confined to national boundaries and that different parts of the population of one single country might experience different institutional settings, which might also change over time[14].

4.2.2 Understanding socio-technical landscapes and regimes in developing countries

Transition studies have widely used the 'Multi-level Perspective' as a framework for understanding major shifts in socio-technical systems (Geels, 2002; Smith et al., 2010). According to this perspective, changes in the system come about through the interaction of three levels: 1) Landscape, which refers to the exogenous environment defined by macro-economic, political scenarios and deep cultural patterns. 2) Regime, which

[14] For instance, in the case of (sudden) change in the ruling government.

includes all elements that shape patterns in socio-technical systems, such as infrastructure, sunk investments in machines, regulation and standards, cognitive routines, lifestyles. 3) Niche, which refers to protective spaces where novelties emerge (Kemp, Schot, & Hoogma, 1998). Bringing the insights into diverse types of institutional settings discussed in the previous section, in the following paragraphs we will propose a description of these levels in the developing world.

First, the socio-technical landscape would then consist of a combination of informal security and insecurity aspects. At the macro level, informal security landscapes are characterised by peasant economies within peripheral capitalism, while predatory capitalism prevails in insecurity landscapes. Exploitation, exclusion, domination and oppression are the dominant social relationships. Political systems are based on patron-clientelism and on particularised power (G. Wood & Gough, 2006). Table 4.1 describes in more detail the socio-economic and political characteristics of these landscapes, according to the institutional typification discussed in section 4.2.1.

Setting		
Welfare	Informal security	Insecurity
- Capitalist economy based on technological progress	- Peasant economies within peripheral capitalism	- Predatory capitalism
- Social relationships are mediated by formal and legitimate rules	- Social relationships are mediated by informal rules and exhibit exploitation, exclusion, domination	- Social relationships are mediated by informal rules and are often characterised by oppression
- States are autonomous and legitimate	- States are weak and hardly differentiated from other power systems	- States are weak, illegitimate and sometimes criminal

Table 4.1 Characteristics of socio-technical landscapes in welfare, informal security and insecurity settings.

Second, moving onto the characteristics of socio-technical regimes, the elements so far identified in the transitions literature need to be carefully explored in order to understand regime dynamics in the developing world. These regime elements have been summarised in guiding principles, technologies, industrial structure, user relations, policy and regulations, knowledge and cultural meanings (Geels, 2002). Following the IRM analysis, in developing countries states are often illegitimate; markets (e.g. labour and financial) are mostly informal in interaction with formal ones; community organisations are often clientelist and at the same time providers of services to meet basic needs (e.g. water supply and sanitation, transport, education, healthcare, housing); and households are usually patriarchal, increasing the vulnerability of women and girls.

As a result, understanding socio-technical regimes in the developing world means embracing high levels of social complexity. For instance, understanding technology and industrial structure is not straightforward, because in informal security and insecurity settings firms are not necessarily the basic production unit: formal firms coexist with

other production units such as informal family-based businesses and community organisations. Legal formal firms often import technology (rather than developing it) and it is often adapted by indigenous knowledge. Additionally, despite the existence of regulations and standards, issues such as corruption undermine their objectives (in developing countries regulatory frameworks partially exist and are often illegitimate). In relation to infrastructure, which in developing countries is uneven centrally planned and insufficient, it is usually not a matter of the adequacy of the infrastructure itself, but about the interests and power of the actors involved. The question about culture and lifestyle adaptation to technical systems would then need to be considered in terms of gender, class and other social characteristics, and differentiate rural from urban contexts. In Table 4.2 we suggest a comparison between the characteristics of regime elements in 'welfare', 'informal security' and 'insecurity' settings. The characteristics of these elements in informal and insecurity settings are what makes problematic (in terms of poverty reproduction) the use of frameworks such as the MLP when trying to understand or promote sustainability transitions in the developing world.

Setting		
Welfare	Informal security	Insecurity
- Centrally planned infrastructure	- Uneven centrally planned infrastructure. Locally developed (insufficient) infrastructure	- Generalised lack of infrastructure
- Technology is developed in research centres, often linked to industrial needs - Knowledge is captured and developed in research centres	- Firms import technology - Technological solutions are usually adapted by indigenous knowledge	- Indigenous knowledge and technologies are not appropriate anymore because of environmental changes and global pressures
- Firms constitute the basic production unit (firms are main providers of goods and services)	- Formal firms coexist with other production units such as informal family-based businesses and community organisations	- Basic production units are informal and often based on family/community organisations
- Legal property rights	- Formal and informal property rights. Informal collective property rights	- Informal or inexistent property rights
- Legitimate regulatory frameworks	- Regulatory frameworks partially exist or are illegitimate - Enforcement is weak	- Regulatory frameworks are inexistent. Strongman's rules
- Modern lifestyles based on technology and individual freedom	- Urban and rural lifestyles differ widely - Households are patriarchal limiting individual freedom (especially for women)	- Urban and rural lifestyles differ widely - Households are patriarchal limiting individual freedom (especially for women)
- People have access to formal labour markets as their main source of livelihood	- People develop a portfolio of livelihoods (resources based on access to in/formal markets and household/community	- People develop a portfolio of livelihoods (resources based on access to in/formal markets and household/community

Setting		
Welfare	Informal security	Insecurity
	strategies or other forms of social differentiation)	strategies or other forms of social differentiation)

Table 4.2 Characteristics of socio-technical regime elements in welfare, informal security and insecurity settings.

Some cases that have been described in the transitions literature are useful to illustrate how these characteristics manifest in actual systems of provision in developing countries.

When analysing the socio-technical dimensions of the regime of informal transport in developing cities, Frans Sengers and Raven (2014) describe regime's guiding principles as 'paratransit' using existing infrastructure; technologies are said to be characterised by being locally-adapted by 'human infrastructure'; industrial structure is informal, based on the 'war over the penny'; user relations and markets are flexible, in the sense that little is fixed (certain) so that customers have to 'haggle' for a fare; the regime is unregulated showing *de facto* control and rent seeking behaviour of officials and strongmen; there is locally adaptive knowledge; cultural patterns are described as marginalising and not modern.

Analysing the energy regime in Mozambique[15], researchers have found that the manipulation of utilities and the development of electricity infrastructure has enabled the dominant political party to achieve its own political objectives, benefitting companies with links to political and economic elites. According to them, 'there is now arguably a greater concern with maintaining relationships of patronage and rent-seeking than with providing services to citizens' (Power et al., 2016, p. 14).

When the transitions literature has looked at regime actors and networks such as firms, industry associations, policymakers, local administrations, it has been assumed that their roles are univocal, mainly because research has focused on the developed West (Farla, Markard, Raven, & Coenen, 2012)[16]. However, the role of regime actors in developing countries is always ambiguous, as Frans Sengers and Raven (2014) case illustrates.

In their study on Bangkok's motorcycle taxi industry when introducing a high-tech platform used as taximeter (2014), they reveal how policymakers were interested in the new technology as a tool of bargaining power, rather than as a technology that would bring about societal benefit in terms of mobility. Also, they explain that motorcycle taxi drivers are socially differentiated young uneducated males who have migrated from poor

[15] G. Wood and Gough (2006) and Philippa Bevan (2004) have argued that Mozambique's institutional scenario exhibits characteristics of an insecurity setting, evidencing 'a combination of predatory capitalism; variegated forms of oppression; inadequate, insecure livelihoods; shadow, collapsed and/or criminal states; diffuse and fluid forms of political mobilization reproducing adverse incorporation and exclusion; and political fluidity if not outright chaos' (G. Wood & Gough, 2006, p. 1707).

[16] Studies of socio-technical transitions in developing Asia have focused on settings where formality prevail (Berkhout et al., 2009; Jolly & Raven, 2015). Little attention has been paid to settings of informal security and insecurity.

rural areas and cannot find any other livelihood. In both cases, we argue, besides their formal role of 'policymakers' and 'drivers', actors deploy survival strategies to secure provision, avoid risk and manage uncertainty.

We have so far used examples documented in the transitions literature to call attention to the fact that socio-technical landscapes and regimes in the developing world are highly institutionally heterogeneous and dynamically unstable. Therefore, the frameworks used to address and analyse socio-technical transformations in these regions should be able to reveal institutional nuances.

To clarify, the setting differentiation we have proposed (welfare, informal security and insecurity settings), does not suggest that in developing countries there are three types of clearly defined socio-technical systems which are in interaction[17]. Rather, we suggest that socio-technical systems in the developing world exhibit a mixture of institutional characteristics which can be seen as pockets[18]. For instance, in Latin American and South Asian countries researchers have found welfare pockets within broad informal security settings (G. Wood & Gough, 2006). Thus, we argue, the context for innovation in developing countries is a loose scenario where different pockets or *layers* (Rip, 2012) can be present or absent at various intensities.

On the one hand, the concept of pockets refers to the presence of a type of institutional setting within another type of institutional setting. On the other, the concept of layer emphasises 'that the context influences the dynamics of innovation journeys in different ways, not that there are different levels in the context' (Rip, 2012, p. 159). These two concepts are useful for exploring the roots of weak and fragmented innovation systems in developing countries. In these contexts, innovation does not only lead to failure in technological catching up (Intarakumnerd & Chaminade, 2011), but also to deepening inequalities (Cozzens, 2007).

Some transitions scholars have found degrees of informality, loose regulations and regime gaps in developing countries as opportunities for the emergence of highly novel innovations (Berkhout et al., 2010). Following our argument, these gaps might represent institutional pockets, exhibiting patterns of informality and insecurity. Therefore, we suggest caution with this optimistic view. As we will explain in Section 4.3, special attention has to be paid in the way socio-technical innovations may align to (rather than challenge) poverty reproduction patterns.

[17] Smith *et al*. discuss that the MLP is challenged by the complex reality of existing plural regimes and niches in interaction (2010, p. 443).

[18] Scholars studying geography of poverty have used the term 'pockets of poverty' for the last four decades. See for example Alkire, Roche, and Sumner (2013), where they bring evidence of the existence of poverty within prosperity in the Global South.

4.3 Contextualising niche structuration and development processes

Niches are limited and protected domains where new technologies can be tested and adjusted before facing the open market. This protection can be intentional, in order to construct a desirable path, which has been called 'strategic niche management' (SNM) (Kemp et al., 1998). Niches may also be formed as a consequence of socio-economic exclusion or created in deliberate opposition to mainstream regimes (G. Seyfang & Smith, 2007).

The SNM approach has highlighted six key processes for niche structuration and development (Kemp et al., 1998; Raven, 2012; Gill Seyfang & Longhurst, 2014; Smith & Raven, 2012). For policy purposes, focus on these processes should allow juvenile novelties to develop further and become more stable so that when a window of opportunity opens, the likelihood of generating change at the system level increases. These processes are: 1) Visions and expectations are negotiated and articulated by a growing number of actors. 2) A network of different stakeholders takes shape, increasing resources. 3) A shared learning process among actors takes place. 4) There are intermediary organisations and actors who carry localised knowledge to other localities, promoting and strengthening institutional practices among the niche. 5) There is evidence of niche, regime and landscape dynamics. 6) Niche protection not only serves as a shield, but also prompts innovation development and empowers actors.

As explained in section 4.1, in 'informal security' and 'insecurity' settings, societal functions that are the main focus of sustainability transitions research, such as transport, energy, water supply and sanitation, etc., are usually not collectively fulfilled but individually achieved through diverse survival strategies. Here, we argue, the survival nature of such strategies may shape the way niche structuration processes create and unfold. We will discuss these processes in specific examples documented by transitions scholars. Attention will be paid to the poverty reproduction challenges that each of these processes deal with, in order to bring to the fore our argument about the need for sustainability transitions researchers to uncover the poverty reproduction patterns in processes of socio-technical change in developing countries. In other words, the need to enquire about the quality of sustainability these processes possess.

First, in relation to expectations, G. Wood and Gough (2006) highlight a paradoxical situation in which people in developing countries desire public goods at the same time that there is unwillingness to invest in them.

In the case of the taximeter experiment in Bangkok explored by Frans Sengers and Raven (2014), 'after they [the drivers] were assured that they would not have to pay up in case of theft and that they would be compensated for potentially lower fees, they were willing to participate' (ibid. p. 463). In relation to the bureaucrats, they supported the experiment because 'at least those people in power didn't look at it as a threat' (p. 462). We argue,

therefore, that in informal security and insecurity settings, expectations and willingness to change through socio-technical innovations strongly relate to the ways in which people's survival strategies might reconfigure.

Second, networking is a highly sensitive aspect in constructing niches in the developing world. As we mentioned in Section 4.1, communities are exclusive and shaped by patron-client relationships (G. Wood & Gough, 2006). In this context, networking activities are based on and facilitated by the same patron-client relationships.

In the case of the taximeter experiment in Bangkok, Frans Sengers and Raven (2014) mention that the organisation of motorcycle taxi drivers which 'seeks social justice and political bargaining power in their battle against the extortion of motorcycle taxi drivers' (p. 460) 'was not directly involved in the experiment ... [because] it might have spelled trouble in dealing with some of the bureaucrats, government officials and local police chiefs who do not view the association as a legitimate stakeholder to deal with' (p. 463). Nevertheless, the entrepreneurs who were running the experiment achieved the association to back the experiment, by sending 'a charismatic Thai friend and colleague to the association headquarters ... with ... a device (to demonstrate how the taximeter worked), an iPad (to show a movie clip of the experiment) and a bouquet of red roses' (p. 463).

Here, the way the network around the new technology is shaped does not challenge the clientelistic nature of the regime, but reproduces it in a subtle way. Therefore, if researchers are interested in looking at sustainability transitions in developing countries, they need to analyse not only whether a network of different stakeholders takes shape, but also in which ways this network develops, because 'clientelist, or even reciprocal, systems of informal rights deliver dependent rather than autonomous security' (G. Wood & Gough, 2006, p. 1698).

Third, because niche structuration requires a shared learning process among actors, it is important to ask whether such knowledge refers to the new technology itself or to the ways in which informal security and insecurity patterns are not reproduced.

In the example at hand, the experiment took place for a few months in a wealthy area in Bangkok (Frans Sengers & Raven, 2014). The lessons, therefore, were related to that particular configuration. Users and drivers were pleased about being able to trust in technology for a fare, rather than having to negotiate it. The device also gave drivers a sense of modernity, which they felt proud of. The entrepreneurs responsible for the experiment acclaimed success, and fascination with the implemented technology was internationally spread. The experiment showed evidence of learning and existence of enthusiasts promoting its development elsewhere. However it is contested to what extent this process promotes a sustainable niche.

On our view, the conclusions derived by local and international actors were quite obtuse. They were focused on the technology itself and its effects on the modernisation of urban transport. However, they did not take into account social aspects which are related to a broader notion of sustainability. In this learning process, important sustainability questions were overlooked: What if the experiment had been run in a poorer area of the city? In which ways the relationship between taxi drivers and the head of the territorial group (who manages the queue of motorcycles and appoints new drivers) have changed? How is the benefit of a reliable fare weighted against other mobility issues such as safety and pollution? Is the informal privatisation of public services being legitimised?

Fourth, the role of knowledge intermediaries in the developing world is key when looking at poverty reproduction patterns within socio-technical change. Beyond new knowledge and capabilities required for developing greener systems of provision (Berkhout et al., 2010), new visions and framings of innovation are required to counteract patterns of social exclusion (Fressoli et al., 2014). Here, the role of community-based organisations, non-governmental organisations (NGOs) and social movements is particularly relevant, especially in rural areas (Kilelu, Klerkx, & Leeuwis, 2013; Kilelu, Klerkx, Leeuwis, & Hall, 2011; Klerkx et al., 2011). Given the reach of such organizations, they have been referred to as systemic intermediaries (IYang, Klerkx, & Leeuwis, 2014). Grassroots intermediaries are shown to play a role governing the local level, voicing and shaping the aims, values and means of local transformations (Balanzo, 2016).

Fifth, in relation to the dynamics between niche, regime and landscape, it has been argued that closer attention to relations and translations between levels is needed, 'as socio-technical elements, but not entirely alternative practices, translate from niches into regimes and components of each appear in the other' (Smith, 2007, p. 447). In this translation process, both power and creativity are involved (J. Hoffman & Loeber, 2016).

For instance, in the case of Bus Rapid Transit in Bangkok, where buses constitute an affordable option for lower classes, 'in a situation where old routines of regulating traffic proved obdurate and where a growing number of middle-class car drivers wielded considerable power, the struggle for road space and a transition to infrastructural systems based on a different logic provided a significant challenge' (Ghosh et al., 2016, p. 133).

Similarly, Romijn et al. (2010) discuss how successful systems of local provision of electricity in rural India that had improved living standards in rural areas, especially for poor women and marginal farmers, were overthrown by relatively well-off and better politically linked villagers:

> the systems could not cater for the energy preferences of some of the relatively well-off villagers, who wanted use electricity for fans, radios, irons, and so on. In some cases, wealthy persons who lost their privileged access to the bulk of

> irrigation water and had to share more equally with their poorer neighbours under the conditions of the project actively lobbied for grid connection and discontinuation of the stand-alone systems. Due to their political connections and power, they persuaded/intimidated other villagers to support them. For example, such political scheming led to the ultimate demise of the Hosahalli system even though it had become more or less competitive with government-supplied services (ibid. p. 331)

Hence, in the context of ill-functioning institutions, more powerful actors who benefit from unsustainable socio-technical systems would tend to impede translation processes, due to their ability to lobby discourses which weaken, delegitimate or eliminate attempts at translating.

Sixth, in relation to protection processes, specifically about empowerment processes, we follow Smith and Raven (2012) argument about 'empowerment to stretch and transform' socio-technical regimes. According to them, empowered niches can influence processes of institutional reform by bringing about evidence of more sustainable alternatives.

In the case of the motorbike taximeter in Bangkok, the technological 'success' empowers both bureaucrats and drivers through a sense of modernity. However, modernity does not necessarily translate into sustainability. On the contrary, the knowledge society has brought increasing inequalities at all levels (Bortagaray & Ordóñez-Matamoros, 2012; Cozzens, 2007). This 'sense of modernity' empowers actors to fit and conform to the incumbent regime, rather than to stretch and transform it.

Studying the strategies that niche actors develop in order to advance more sustainable mobility innovations in India and Thailand, Ghosh et al. (2016) observe a combination of strategies at different dimensions of regime change. In technological, infrastructural and cultural dimensions, niche actors tried stretch-and-transform strategies, while in public policy and political power dimensions they deployed fit-and-conform strategies. We argue that empowerment to stretch and transform is needed to counteract poverty reproduction patterns. As in the case of the metering motorbike mobility in Bangkok, 'to undermine the reproduction of certain informal institutions such as paying informal site rent and the associated chain of privilege and corruption' (idid. p. 129). Otherwise, this socio-technical change might 'constitute an (un)sustainable mobility pathway' (Frans Sengers & Raven, 2014, p. 465).

In conclusion, after having explored six key processes of niche structuration in developing countries, we argue that it is not enough for researchers to look for evidence of whether these processes take place or not, but to enquire deeper about the institutional settings underlying such processes, which shape in several ways the quality of the processes that create and unfold. In other words, transitions scholars need to enquire about the kind of sustainability these processes possess. Sustainability transitions, in contrast with socio-technical transitions alone, must take into account the quality of change processes, so that

informal security and insecurity regimes can be challenged and transformed. A socio-technical transition approach that does not take this into account could claim a technology's success in the developing world, while overshadowing reproduction of informal and insecurity socio-technical systems.

4.4 Discussion and conclusion

From the previous section, it could be argued that the main challenge of sustainability transitions in developing countries is to avoid reproducing ill-functioning institutions that continue benefitting the privileges of a few, while undermining the well-being of many. In these contexts, socio-institutional sustainability is as important as environmental sustainability. Romijn et al. (2010) have argued before that the main challenge for sustainability transitions studies consists of connecting the environmental sustainability agenda with the agendas of poverty reduction, local community development and capacity building. On our view, socio-institutional sustainability should be at the centre of transitions studies in developing countries. Here, the role of socio-technological innovation is not only about becoming more resource-efficient, but about reconfiguring power balance within production-consumption systems.

We understand, however, that this is not an easy nor simple endeavour. Therefore, in the following paragraphs we suggest four areas of further reflection, which might inspire future research pathways. First, we discuss about the values and principles that lead socio-technical transformations; second, we tentatively explore what the implications of a loose layered scenario might pose for innovation; thirdly, we discuss the need of new conceptual frameworks; and finally we discuss some methodological challenges. Opening up this avenue of research might greatly contribute to a better understanding of the sort of policies required to move towards a just and environmentally sustainable future for all.

First, looking at the values and principles that underlie transformation processes helps to understand the criteria according to which different pathways to sustainability are either promoted or blocked at various extents by diverse actors and networks. Attention to these values helps to 'specify versions of sustainability in terms of the particular properties and flows of goods and services valued by particular social groups or in the pursuit of particular goals' (Leach, Scoones, & Stirling, 2010, p. 42). Besides efficiency, other values have been brought into the sustainability transitions debate, such as social justice, social inclusion and autonomy (Smith, Fressoli, & Thomas, 2014); generosity, which refers to an ethics of sufficiency and cooperation, and nature restoration, meaning reconnection with the various dimensions of nature (Mark Swilling & Annecke, 2010).

For instance, a transition led solely by principles of resource efficiency might result in a low-carbon world in which socio-economic inequalities prevail, i.e. an 'unjust transition' (Mark Swilling & Annecke, 2010). On the contrary, innovations based on values of solidarity and sufficiency might bring about broaden access to services, reduced

ecological footprints, discouragement of consumerist behaviour, capacity development and empowerment of socially excluded groups (Gill Seyfang & Longhurst, 2014; G. Seyfang & Smith, 2007).

The latter kind of innovations have mainly been found in grassroots innovations (G. Seyfang & Smith, 2007), a specific sort of socio-technical niche able to develop bottom-up solutions to sustainability problems. It has been argued that grassroots innovators frame and translate sustainability challenges in a way that fits into their understanding of their own world, creating context-specific solutions (Middlemiss & Parrish, 2010; Frank Moulaert, Martinelli, Swyngedouw, & Gonzalez, 2005). As a result, grassroots innovations constitute 'innovation spaces for bottom-up forms of socially just and environmentally sustainable technological futures' (Smith et al., 2014, p. 122).

However, most grassroots innovation cases documented in the literature take place in 'welfare' settings. Thus, more research is needed in 'informal security' and 'insecurity' settings, aiming to analyse the dynamics of alternative and inclusive innovations, mainly related to basic services such as water supply and sanitation, energy, transport, housing, health care, education, food and information and communication.

Second, as we argued above, the context for innovation in developing countries is a loose 'layered' scenario where different institutional 'pockets' can be present or absent at various degrees. It means that in the same way that there are pockets of ill-functioning institutions, where social exclusion patterns prevail, there should also be pockets of 'better-functioning' institutions, where social justice is pursued. In which ways, then, could transitions researchers discover such 'better-functioning' pockets, able to transform production-consumption systems into more social and environmentally sustainable? How do actors and networks look like and behave in 'better-functioning' pockets? What are their capabilities? What sort of support or protection do they require? How do different types of pockets interact with each other? How does this interaction affect innovation journeys? What if the diversity of institutional pockets relates also to an epistemological diversity? What sort of governance arrangements are suitable for a 'layered' scenario? What are the characteristics of the different layers? Indeed, further research in developing countries is needed in order to attempt to answer these questions.

Such attempt calls for new conceptual frameworks able to highlight the nuances that different institutional settings exhibit. The insights from development studies that we have brought into this paper have identified the problematic areas that transitions scholars should pay attention to, in order to uncover poverty reproduction patterns in socio-technical transformations. New conceptual frameworks should be able to target, or at least take into account, these 'problematic areas' in order to better address transitions in developing countries. The challenge appears to be that of comprehensively approaching the more complex social aspects, particularly those of governance, while still keeping track of the material, technological side. Enriching science and technology studies

with conceptual frameworks from development studies, organisations studies, political science, anthropology, geography, among others, might contribute to this endeavour[19].

Finally, gathering empirical data in these contexts needs researchers and research methods able to deal with the subtleties present in social interaction in the developing world (Mompati & Prinsen, 2000). Issues of positionality emerge in research encounters, because we, as researchers, are also positioned in specific ways within power structures (Cloke et al., 2000; England, 1994; S. Hall, 1992). Here, the researcher's gender, age, ethnicity, etc., may affect the suitability of particular research methods and, therefore, interpretations (Chacko, 2004; Moser, 2008).

[19] Recent work of Balanzo (2016) is an example of this.

Chapter 5. PC3 design and implementation in Colombia

Having defined the main requirements the support system should meet (Chapter 2) and having reviewed the related literature and studied the characteristics of the existing situation (Chapters 3 and 4), I have developed a sufficient understanding to propose a possible solution, i.e. the Prescriptive Study. This chapter discusses the process of designing and implementing a PC3 in Santa Rosa del Sur. As any other action research project, this was an iterative, adaptive and somehow messy process (Herr & Anderson, 2005).

Section 5.1 synthesises the insights obtained from the descriptive study, in order to generate a revised reference model for PC3. Then, the following sections (5.2, 5.3 and 5.4) explain in detail the process of taking this model into practice.

5.1 Insights obtained from the Descriptive Study I

The results of the Descriptive Study I offer a deep understanding of the relevant factors to address in a support system targeted to potential entrepreneurs with no technical or business expertise, aiming at co-creating (innovate) products and services and their corresponding business model (for sustainability) in a context of poverty. According to the insights obtained from the initial descriptive study, I have revised the reference model, creating a more complex support system, based on three main findings (Figure 5.1).

First, it is clear that (potential) entrepreneurs are not found in isolation. They are located in a specific setting, which affects and is affected by their strategies to run a successful venture. In the case of Santa Rosa del Sur, it is about a setting that exhibits a mixture of *informal security* and *insecurity* characteristics. These characteristics are summarised here:

- State is weak and hardly differentiated from other power systems.
- There is a mixture of well- and ill-functioning institutions. (The latter refers to the fact that both formal and informal institutions are contested and personalised at various extents, undermining the well-being of many and strengthening the privileges of a few, and therefore, reproducing patterns of social exclusion).
- People have to engage in wider strategies of security provision, risk avoidance and uncertainty management. These strategies usually prioritise survival and security in the present, continuously postponing long-term sustained well-being.
- Systems of provision are based on informal rights, which deliver dependent rather than autonomous security. It means problematic inclusion or adverse incorporation.
- The economy exhibits a combination of peasant economy features and predatory capitalism.

More specifically, the entrepreneurial landscape could be characterised as follows:

- Regulatory frameworks partially exist or are illegitimate. Enforcement is weak
- Existence of formal and informal property rights
- Insufficient infrastructure
- Technological solutions are usually adapted by indigenous knowledge
- Formal firms coexist with other production units such as informal family-based businesses and community organisations
- Urban and rural lifestyles are widely differentiated

Second, the focus of PC3 should not only be on resource-efficient innovation, but on the socio-institutional dimension of sustainability, seeking to reconfigure power balance within production-consumption systems. Consequently, values of solidarity and sufficiency should be at the centre of the support system.

Third, the co-creation process should be based on participants' own translation of sustainability challenges in order to produce context-specific solutions. In contrast to the initial model (Figure 2.1), the change towards sustainability should not be expected to happen as a result of this process, but because of the new sort of relationships and strategies that entrepreneurs forge and deploy in the process of producing such context-specific solutions.

The diagram in Figure 5.1 graphically represents the ways in which the findings just mentioned are included into the reference model, in order to design a more accurate support system.

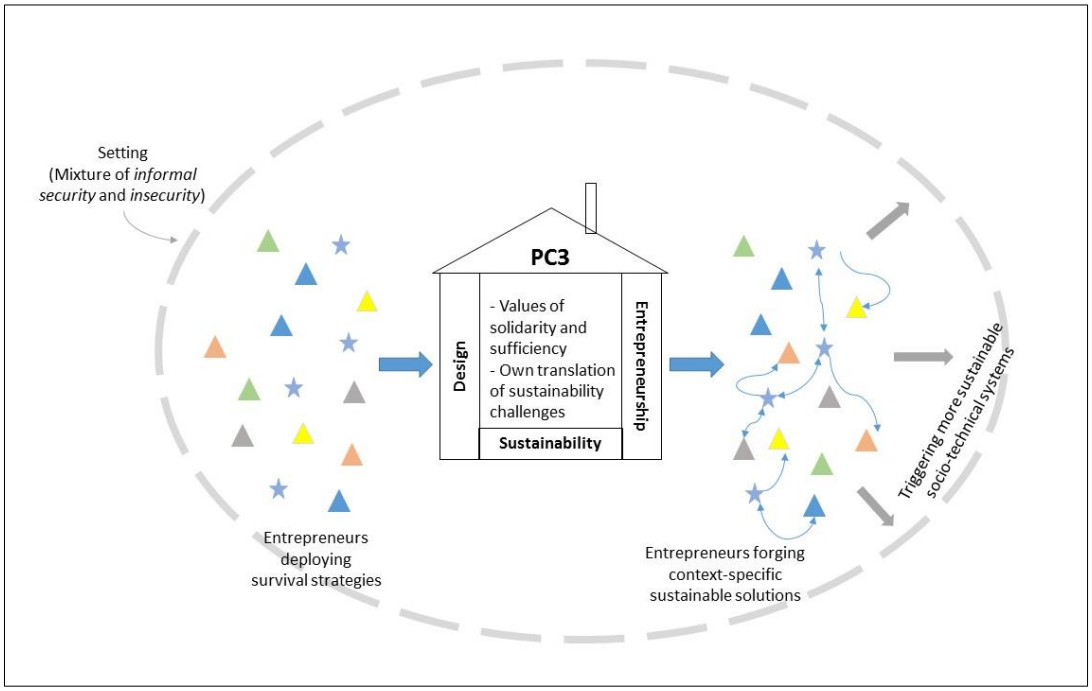


Figure 5.1 Revised reference model according to insights from Descriptive Study I

In Figure 5.1, the dashed line surrounding the support system represents that conventional entrepreneurs (triangles) and ecopreneurs (stars) are embedded in a specific context, characterised by a mixture of informal security and insecurity institutional settings. In this institutionally diverse context, both conventional entrepreneurs and ecopreneurs deploy survival strategies (usually prioritising survival and security in the present, continuously postponing long-term sustained well-being).

Then, ecopreneurs (stars) join PC3. The initial reference model showed PC3 as a black box (Figure 2.1). Considering the insights from Descriptive Study I, I now know that PC3 consists of a co-creation process based on participants' own translation of sustainability challenges, where values of solidarity and sufficiency guide the process. Additionally, the PC3 programme is based on three pillars, i.e. sustainability principles, social entrepreneurship rationale and design methodologies.

Finally, the right-hand side of the diagram shows the outcome of PC3. Different from Figure 2.1, where the result consisted of novel business models for sustainability, the outcome here consists of new relationships and strategies that ecopreneurs forge and deploy in the process of producing context-specific solutions. It is this process that triggers more sustainable socio-technical systems.

5.2 PC3 implementation: Phase I

5.2.1 Preparation

As we had agreed to try out introducing PC3 to Santa Rosa del Sur (Section 3.3.1), the team located at UT worked on an implementation plan during January and February 2015. The collective understanding was that 'PC3 is like dough: it can be adapted to each context. But its main ingredients are always business development, co-creation and sustainability' (ID_260115). As we thought that all participants were going to be farmers, the agreed rationale for this case was 'from collectors to entrepreneurs' (ID_270115). We then suggested a web-based proposal, divided into three specific phases, following iterative cycles of training-assignment-feedback/coaching (Image 5.1).

Image 5.1 Proposal of an implementation model for the Santa Rosa case

The implementation proposal followed a 'train the trainers' model. The objective was to train community leaders as business development facilitators, who would then work with local people interested in developing their own sustainable businesses. This plan consisted of a two-month phase of preparation and contextualisation, four months for training the facilitators and a final phase of eight months during which local entrepreneurs would develop their business models in collaboration with the facilitators. During the final phase, the role of the team at UT would consist of guiding and monitoring the facilitators' job. Figure 5.2 graphically represents the implementation model.

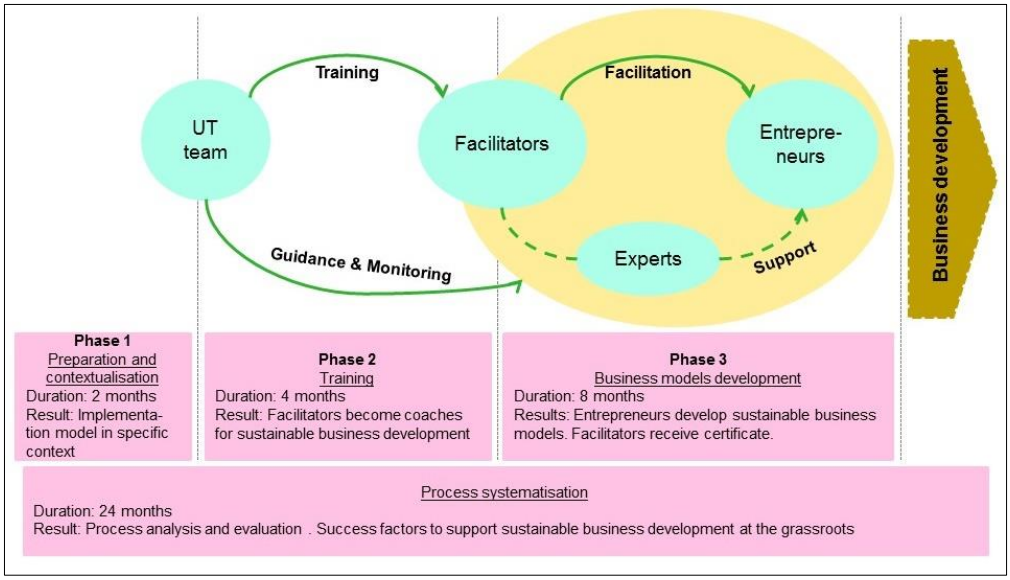


Figure 5.2 PC3 implementation model in Colombia

5.2.2 Learning model and contents

The preparation phase also included the definition of the learning model and the contents on which people were going to be trained. The challenge here was to take into consideration the fact that participants were adults with poor formal education experience, and that PC3 targets a transformative rather than a 'knowledge-transfer' goal (see Section 3.3.3).

Learning model[20]

According to the elements identified in Section 3.3.3, PC3's learning model should consider context and socio-demographic characteristics; should make clear the interconnections between sustainability principles, entrepreneurship rationale and design methodologies; and should include actions and processes of reflection and contextual interaction. In our view, Kolb's Experiential Learning Cycle (Kolb, 1984) suited as the basis for PC3's learning model. As Figure 5.3 shows, the learner relates to her/his context through concrete experience and active experimentation, embraces new knowledge through abstract conceptualization, and consciously reflects on the experience through reflective observation.

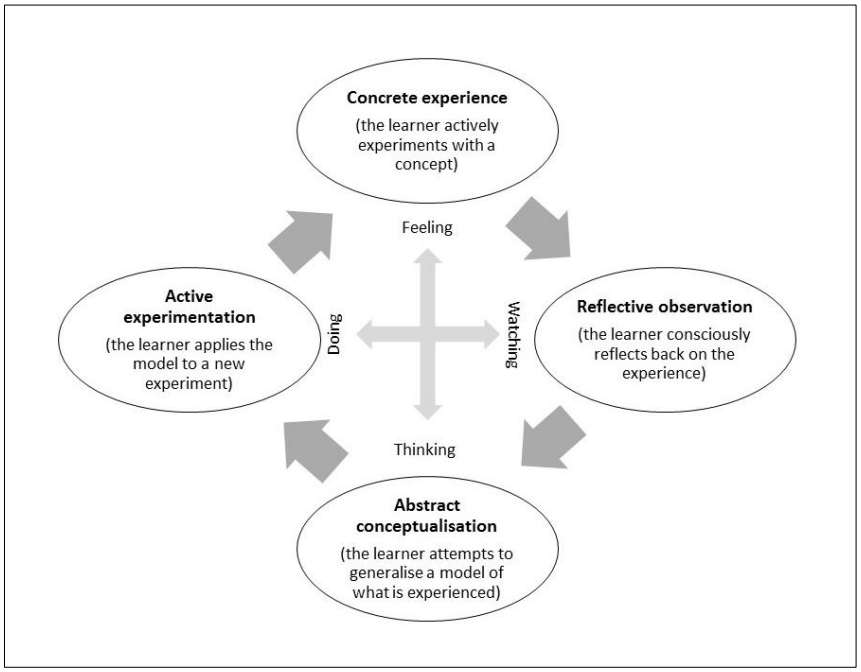


Figure 5.3 Kolb's Experiential Learning Cycle (1984)

Then, PC3's learning model follows this cycle. In a series of internal workshops, the PC3 team at UT defined the learning model as a cycle of confrontation, observation, practice and application, based on group and collaborative learning, motivated by enquiry with appropriate coaching. Each participant must work on a specific sustainability issue and collaboratively with an outsider to the training (we call this person, the *teammate*). Each process within the learning cycle is explained below.

[20] This section is part of the 'Circularity rationale as the basis of transformative innovation' paper, accepted for publication in the journal Management Research Review (MRR).

- Confrontation

When addressing a new topic, PC3's participants are confronted with a real life challenge they have to solve. They are asked to solve them prior to teaching them how to do it. The goal of doing so is to encourage them to understand what the related problems are, as well as to help them realise that new knowledge is useful for solving these problems. After they have tried to solve the problem, all groups present the challenges they encountered. They are told that the following lecture will show them how to address those challenges.

- Observation

Through a short lecture, an instructor presents specific concepts and theories. The focus is set on the 'whys' of the content, aiming at achieving a holistic comprehension of the topic rather than merely knowing it. These 'whys' are enriched with brief historic facts and causal relationships. Several examples are presented and used to relate the previously identified challenges with solution approaches.

- Practice

A workshop is carried out in order to have participants practicing how to apply the knowledge gained during the lecture. The problems are solved in groups using poster papers and markers to write down their solutions. In order to facilitate the application of the taught methods, each of the challenges solved in the workshop is divided into three smaller problem chunks. As a consequence, the workshops are carried out in three phases. The three phases are executed following the same protocol:

i. A problem chunk is presented in one presentation sheet to all participants.
ii. Each group can immediately start working out their solution.
iii. The facilitator goes from group to group with small hints to keep the participants discussing the solution. At certain point in time, all groups stop and share what they have worked out by sticking their poster paper in the walls of the lecture room.
iv. The facilitator randomly selects groups and asks them to quickly analyse and share their thoughts. The facilitator also poses questions to all participants and asks them to provide and share their answers with the group.
v. The facilitator presents concluding remarks.

- Application

The goal of the last step is to asses if participants are capable of solving a real-life problem by themselves. Here, each participant works with her/his teammate in order to explore ways of applying the new knowledge. They do so by applying specific instruments such as the business model canvas, circular economy tools and Design Process Unit models

(Jauregui-Becker & Wits, 2012). This process is observed by a coach who gives support if needed and enquires about the reasons why some decisions are made instead of others.

Contents

The contents of the training were also defined. However, this was not a collective effort in the same way as the implementation and learning models design had been. For this purpose, I held a working session with the responsible person of each discipline, based on the learning objectives previously defined (Section 3.3.3).

For the sustainability module, four main components were defined (ID_090215): leadership for sustainability, i.e. sustainability as criteria for decision making; concepts, methods and tools related to prevention, i.e. how to prevent ecological damage in business activity; concepts, methods and tools related to ecological remediation; and finally, the social dimension of sustainability, particularly inclusive businesses and vulnerability.

The innovation and design module was defined based on two main components. On the one hand, organisations and management of the design process; and tools that support the design process, on the other (ID_230215).

The business development module was designed according to the 4S Model, a model empirically tested at NIKOS (Groen, De Weerd–Nederhof, Kerssens–van Drongelen, Badoux, & Olthuis, 2002). This model suggests four main topics, i.e. strategy, which includes the business model and marketing; social networks, which refers to relationship with stakeholders; skills and capabilities, i.e. personal and team development; and scale, which explores the financial landscape (ID_240215). Table 5.1 summarises the programme's contents.

Sustainability	Innovation and design	Business development
- Leadership for sustainability	- The design process	- Strategy and business model
- Eco-design: products'/services' features; footprint; life cycle assessment	- Quality function development (QFD) - Charts - Function analysis	- Stakeholders - Personal development and team building - Finance
- Clean technologies	- Design process units	
- Inclusive business	- Creativity: design thinking	

Table 5.1 Training contents

Having a clear definition of the implementation model, in April 2015 I conducted the first on-site workshop in Santa Rosa del Sur. The following section describes the process and findings of this workshop.

5.2.3 Introductory workshop

The contact person invited community leaders to join the workshop in which the 'programme to become a facilitator for sustainable business creation' was going to be introduced. In the end, ten people voluntarily attended the workshop. (See Annex 1 for learning about the journey to and from PC3 of each participant).

In the first part of the workshop we identified and discussed the main sustainability challenges by using a World Café as the participatory research method (see Image 5.2)[21]. Two major challenges were identified: first, a local economy based on predatory activities such as gold mining, exploitation of forests for timber and coca cultivation. Second, extremely poor services in rural areas, including water supply and sanitation, health care, energy, transport and education. Table 5.2 presents all sustainability challenges that participants called attention to and the dimension (economic, environmental o social) each challenge affects most.

Sustainability challenges	Econo mic	Environ mental	Social
Informal jobs. With few exceptions, people work without any formal work contract, which means that they do not benefit from social security and that they are vulnerable to losing their job suddenly.	✓		✓
Predatory economic activities. Most people in the region get their income from activities such as gold mining, timber commerce and coca cultivations. These main economic activities are carried out in a predatory way, depleting the resources they depend on.	✓	✓	✓
Inefficient agricultural practices. Agricultural practices are rudimentary, producing poor yields while using too much resources. Agricultural productivity is then very low.	✓	✓	
Low productive transformation. Farmers sell raw materials, adding no value to their products.	✓		✓
Fruit, vegetable and meat that is produced locally is taken to the big city. The same products are bought over there and brought back to Santa Rosa to be sold much more expensive.	✓		
Very low quality housing in rural areas. Houses are too small for families, built with weak structure, usually without proper floor and a rudimentary roof. Most people in urban areas rent a house instead of owning it. Land in urban areas is owned by a few people.	✓		✓
Lack of proper water supply in rural areas. People bring water from nearby streams, which are often polluted with heavy chemicals coming from mining and coca fields. Drinking water is not available in rural nor urban areas. In rural areas, when possible, people boil water before consumption. In urban areas people depend on bottled water for drinking.	✓	✓	✓
Transport system fully informal. There is not public transport system. Private owners of motorbikes, cars or 'jeeps' offer the service. This	✓		

[21] The world Café is a participatory research method used to generate insights about a specific topic by dividing a group into smaller ones, so everyone has the opportunity to contribute. Each group discusses a subtopic for 20 minutes and then moves to the next table to continue discussing another subtopic. In this way, knowledge about each subtopic builds upon previous discussions. At the end, the resulting discussion for each subtopic is shared and discussed with the whole group, in order to get conclusive insights.

Sustainability challenges	Economic	Environmental	Social
results in uncertain provision of the service, high rate of accidents and insecurity. Fees are always negotiated.			
Few access roads. Most existing roads have been built by mine owners or illegal armed groups. These roads do not meet security standards and do not get maintenance.	✓		
Very little higher education offer. When young people finish school they need to move to a major city for higher education. People who do not have the economic means nor the social network to do so have little chance of further education.	✓		✓
Schools in rural areas are often closed. Most rural teachers depend from the province rather than from the municipal level. Usually because of corruption, they are allocated to schools but never show up.	✓		✓
Very few job opportunities. As there is a very low rate of business creation, there are very few new vacancies. Most people end up working at mines and coca fields.	✓		✓
Presence of illegal military groups. Since the 1990s, this region has been ruled at various extents by different guerrilla and paramilitary groups. This has brought about a culture of violence and little trust in the state.	✓		✓
Illegal economic activities, such as coca cultivation and gold mining, bring high flows of cash into the region. This phenomenon increases the prices of food, rent, transport, etc., making the cost of living very expensive.	✓		
Rural areas lack of basic services such as water supply and sanitation, health care, energy, transport and education.	✓	✓	✓
Solid waste goes to open fields without any treatment, which pollutes the environment and threatens human health.	✓	✓	
Gold mining pollutes air and water with heavy chemicals, such as cyanide and mercury, which severely threatens human health.		✓	
Exploitation of timber resources is carried out illegally, deforesting native forests. No one does any sort of compensation activity for ecosystems. Additionally, the mining industry requires much timber, which also fosters deforestation.		✓	
Local culture is characterised by macho culture, consumerism, stigmatised peasants and not respect to nature.		✓	✓
Both in rural and urban areas there are inadequate and/or insufficient sanitation systems. This constitutes a threat to human health. Additionally, waste water goes into rivers (which actually happens all around Colombia)		✓	
The culture of showing-up includes hunting and capturing wild animal species. The more endangered the species is, the better trophy it represents.		✓	
Lack of urban planning together with lack of public transport encourages the use of private vehicles. Additionally, because some people have plenty of money and interest in showing-up, there are too many motorbikes and big cars. This brings about air pollution and very noisy urban areas.			
There is evidence of child labour, especially because young girls from rural areas come to town to work as maids for richer families. This strengthens economic elites and deepens social differentiation.			✓
Families are no longer protected environments for youngsters nor elderly. There is high rate of teenage pregnancy, school dropouts and abandoned elderly.			✓
Inexistent health care services in rural areas, increasing vulnerability. In urban areas health care services are poor quality. The ones who can afford it travel to major cities for medical treatment.			✓

Sustainability challenges	Econo mic	Environ mental	Social
Besides school, there is little offer for sports and recreation. As a result, young children spend their spare time in front of a computer without any supervision. Parents think children are safe at home.			✓
High rates of malnourishment.			✓
No electricity in rural areas. This increases malnourishment and makes difficult for school children to do homework.	✓		✓

Table 5.2 Results from World Café (W0_070415)

Based on the results from the first part of the workshop, we discussed the meaning and implications of sustainable businesses, the challenges and trade-offs that have to be dealt with when balancing the social, environmental and economic dimensions of the business activity and the entrepreneurial opportunities that emerge from this perspective.

The participants were motivated with the entrepreneurial approach, which they found relevant in a context where the prevalent attitude consists of complaining and claiming all solutions to the government instead of taking action. Additionally, the existing community-based organisations such as cooperatives and associations have become experts in writing and executing development projects for international aid organisations, neglecting the entrepreneurial dimension of these organisations.

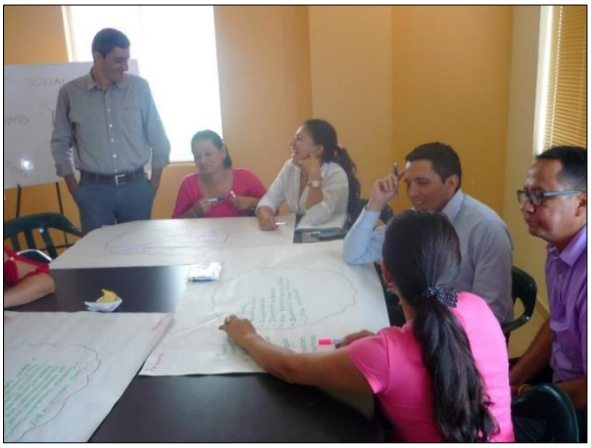


Image 5.2. World Café (Santa Rosa del Sur, April 7th 2015)

Finally, PC3 was presented and the implementation proposal (Figure 5.2) discussed. It was clear to them that this was an experiment in which their active participation and feedback was expected. They proudly called themselves 'guinea pigs', with a sense of importance and enthusiasm, hoping to bring new positive opportunities to the Sur de Bolivar region.

I explained the rules of the game, which were formally described in a Participation Agreement (Annex 3). The main points of the agreement were:

- Commit to participate during the whole programme duration
- Contribute to the action-research process

- Provide all required data, knowing that UT treats these data as confidential
- Work on business ideas that positively contribute to social and environmental dimensions
- Build a team to work on such business ideas
- There is not economic contribution from UT nor from participants to develop the PC3
- The duration of the action-research process is three years, time during which participants should be available to be contacted and provide feedback

Additionally, participants filled in a registration form that contained questions about their education level and their business background, i.e. business experience and self-image as entrepreneur (Annex 4). Table 5.3 summarises the participants' profiles.

Topic	Result			
Age and gender	3 women; age average 27 years old 7 men; age average 40 years old			
Schooling	2 completed secondary education 2 completed technical education 6 did some university education			
Self-image (multiple choice question)	Innovator	4		
	Creative	6		
	Able to change my environment	5		
	Entrepreneur	8		
	Business (wo)man	3		
	Social animator	3		
	Pioneer	1		
	Visionary	4		
	Promoter	2		
	Leader	6		
	Fighter	5		
Entrepreneurial experience		Yes	No	
	Have you had your own business?	7	3*	
	Have you failed in any business before?	6	4**	
	* None of the women ** Only one of the male participants reported not to have failed in any business before			
Main dream/ambition (open question)	To have my own business	3		
	To have a successful career	2		
	To improve the living conditions of my family and my community	7		
	Be happy	1		
	Be able to transcend	1		
	To grow as a person	1		
Business idea (open question)	Agribusiness	6		
	Rural energy	1		
	Food market	1		

Topic	Result	
	Housing	1
	Eco-tourism	1

Table 5.3 Participants' profile

To conclude the workshop, we agreed to virtually meet every second Tuesday, from 7:00 to 10:00 h, starting on May 12th, 2015. To close the session, a participant made a final remark: 'You know, when this group of leaders gets together, it's because something big will happen in Sur de Bolivar'.

In the following visits to Santa Rosa I could understand what this statement really meant. I will now explain it, in order to help the reader properly understand the magnitude of this programme, despite the appearance that 'only 10 participants' could generate.

Six of the participants were managers of community-based organisations, which bring together close to one thousand families. Additionally, these organisations have a broad geographical scope, covering 18 municipalities from three different administrative provinces, in an area of around 11700 Km^2. This means that what these leaders do have a noticeable social and economic impact in the region. Their life stories are not different from the life story of any other person in this region: their parents migrated from another region in Colombia into Sur de Bolivar looking for a more peaceful environment (running away from the political violence of 1950s) and some economic opportunities. They went to school when there was a teacher available and learned farming and mining activities from their parents. When they became young adults they came into the coca and/or mining business (four owned coca fields, one owned a gold mine and one emigrated to the capital city). During the time they were involved in these activities they found themselves in good economic condition, but they all lost relatives and close friends by the violence that this sort of activities bring about. In early 2000 they had the opportunity to join programmes aiming at eradicating coca plantations voluntarily and manually. They were among the first ones who joined and became leaders in the process. Even though their attitudes and interests were against what was considered 'normal' at that time, they continued fighting and managed to organise or revive these community-based organisations. Their continues fight for peace and inclusion has become an example for many in the region. Because they share their origin, people look after them (I_291015; I_021115; I_031115; I_041115; I_051115; I_211116; I_251116).

It is also important to note that they work together in several ways. Some of these organisations are members themselves of other ones and provide services to each other. Along these interconnections the other participants (i.e. the ones who are not managers) are found. As a result, this group of 10 participants is actually a core network that promotes a more equitable and environmentally friendly economic development in the region.

As a way to strengthen this network, the teammates that the participants chose to work with, were members of these organisations. In consequence, the PC3 programme in Santa Rosa had an impact not only on ten ecopreneurs, but on several hundreds of families by creating different layers of radiation. Figure 5.4 graphically represents the way each business idea connects with all six community-based organisations (CBOs) mentioned above (connecting, in this way, with hundreds of families).

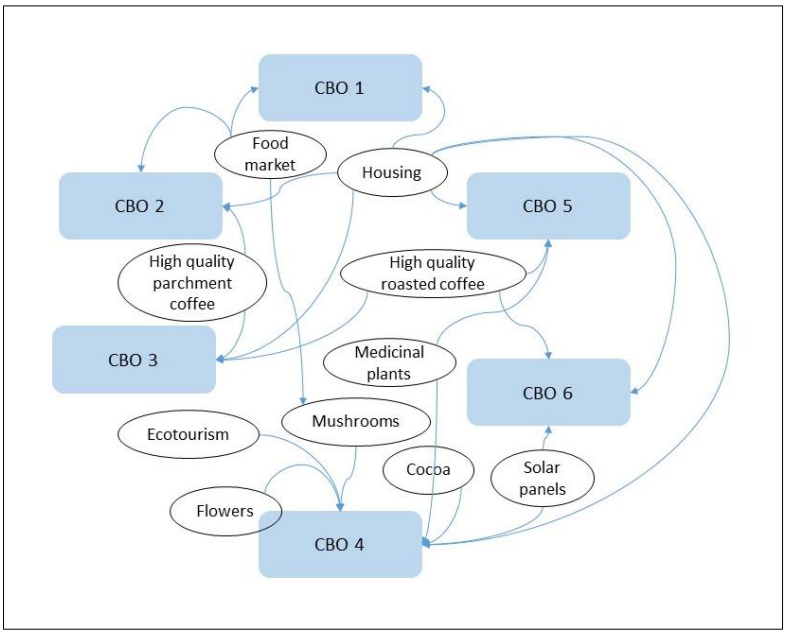


Figure 5.4 Relationships between business ideas and existing CBOs

5.2.4 Training phase

This section discusses the training process, which is graphically represented as Phase 2 in Figure 5.2. From May until October 2015 we developed an on-line training that consisted of a combination of video lectures and virtual workshops (Image 5.3). Several challenges had to be addressed during this process, namely related to virtual work, contextualisation of contents and expectations, leadership and normativity, and co-creation and interdisciplinarity. Below I discuss each of these challenges in detail. Here, the continuous dialogue between action and reflection will be clear.

Image 5.3 On-line training using diverse technological solutions

Virtual work

Our initial idea consisted of going through all contents (Table 5.1) via three-hour skype sessions following similar dynamics to on-site lectures. Very soon we proved ourselves wrong. After the first two sessions we noticed it was difficult to keep a participatory session, with fluent interactions with and among participants (see Table 5.4). We then decided to try video lectures in order to present the main contents in a brief but comprehensive way (SS_260515). Then, skype sessions were used for feedback and mentoring.

We recorded eight video lectures with the support of the digitalisation department (LISA) at UT (Image 5.4). To the team at UT, even though this technological solution was challenging, because they felt nervous and sticking to the concise script was difficult, they felt 'as if it had taken down all technological and language barriers' (ID_280515; ID_160615). Additionally, the videos would become teaching resources during the following phase of the training, when the current participants would facilitate sustainable business development locally.

Image 5.4 Recording at the filming room at UT

Participants in Santa Rosa reported that using these technological solutions had been challenging at the beginning, because they were not familiar with the technology and because of low internet capacity in the region. However, after this experience they felt much more confident with using email, skype and exploring related videos in YouTube '*These are the technological tools that are out there. We have to learn to do the best of them'* reported one of them during an on-site workshop (W1_301015). In the end they felt more capable in technological terms.

Skype session #	Topic	Date (year 2015)
1	Product design	May 12th
2	Business development	May 26th
3	Sustainability	June 9th
4	Product design	June 22nd
5	Sustainability	July 21st
6	Sustainability	July 28th

Skype session #	Topic	Date (year 2015)
7	Product design	August 4th
8	Product design	August 18th
9	Business development	September 15th
10	Business development	October 6th

Table 5.4 Skype sessions

Thus, the training programme consisted of a combination of video lectures and virtual workshops. Following the experiential learning cycle (See Section 5.2.2), the purpose of video lectures was to give participants information about specific topics (*observation*), while virtual workshops were about collaborative exercises and discussions to apply the information given in the videos to each participant's business model (*confrontation* and *practice*). Before each virtual workshop, participants had worked on specific real-life business challenges with their teammates, applying concepts and instruments from the training (*application*).

Contextualisation of contents and expectations

The team at UT was experienced in teaching the contents they were responsible for in a Dutch higher education context. Shortly after starting, it was clear we needed to contextualise the contents of each area as well as our expectations.

In relation to contents, participants felt as we were talking to them about 'another world' (SS_090615). On the one hand, this was interesting to them because they could learn about other ways of doing things, i.e. it was an eye-opening experience. But on the other hand, it was clear that in their context people and organisations act differently, driven by other purposes. Example of this is, for instance, the fact that government officials are often rent-seekers, governments are unreliable, what the law says is different from what happens in reality, people seek their own individual benefit (OBS_210715; SS_210715; SS_280715; W1_301015). To solve this, the teachers involved did further research, in order to bring examples more familiar to participants that could bridge theory and practice in more contextualised ways (SS_220615; SS_210715; SS_280715; SS_150915).

Additionally, participants were used to a distant and hierarchal relationship between the teacher and the student. During the first session of each topic, the teacher had to repeat several times to be called by their first name, rather than 'doctor', aiming at constructing a more equal relationship. Additionally, they had to make an effort to invite participants to contribute with their own ideas and perspectives, which later became fundamental for the co-creation process (ID_270715; SS_120515; SS_260515; SS_090615).

Finally, the most contested challenge was related to our expectations of participants' response to the process. Participants were supposed to do homework and write reflection reports, so that we could assess their progress. Despite this 'obligation', they never submitted any document. The team at UT was disappointed and confused. Ideas like *'we*

don't know what we're doing here; we don't know if they're learning, if they're connecting the dots themselves' and *'I'm not sure if we're working with the right people'* were mentioned (ID_270715; ID_150915).

However, participants were indeed working on their tasks, but without properly sitting together to do homework. Their team work actually consisted of incidental, open-ended conversations, resulting in informal, not written, tentative discussions (SS_280715; SS_040815; W1_301015).

Being in-between, I could see the gap between both perspectives. To my Dutch counterparts, *'the process wasn't working as expected, so we should've stopped'* (ID_270715). To my Colombian counterparts, *'the process was extremely interesting, because they were learning about concepts and processes that invited them to think in a different way*' (W1_301015). Despite these differences, it was clear that this was an experiment, in which unexpected circumstances and results were likely to happen, and the team supported the process until the end.

Leadership and normativity

Related to the discussion above is the realisation of my role as leader of the process. Beyond being a researcher, I was the creator of this process, which meant that none of it had happened if it had not been for me. As a researcher, this was an awkward position, as it challenged conventional ideas related to the objectivity of research activity. First, it became clear that as an action-oriented process, PC3 is normative, promoting specific values and beliefs (REF_080515). For instance, discussions about the business activity were framed in terms of social and environmental value creation (SS_210715; SS_280715); service provision by private enterprises was believed to be a solution, in contrast to the belief that the solution lies solely on the social policy realm (SS_210715; SS_180815).

Second, the validity of this sort of research depends to a great extent on the usefulness of the results to the people involved. I frequently felt I was responsible for the success of the process and fear of failure was often present. To me, the emotional component of the process was significant, going through feelings of enthusiasm, frustration, motivation, inspiration, disappointment (REF_100415; REF_210715; REF_100915). Clearly, I was not an objective observer, but an engaged participant (Coffey, 1999). Therefore, the documentation of the process included much detail about my own reactions and reflections.

Third, my role as well included a translation or bridging component. Being familiar with both Dutch and Colombian culture, I often explained to the other part what certain attitudes, comments and actions meant or the reason why they emerged (SS_070715; SS_210715; REF_210715; REF_061015). Here, the documentation process was very

important to keep clarity, to avoid misunderstanding between the group in UT and the group in Colombia.

Co-creation and interdisciplinarity

As discussed above (Section 5.2.1), the original idea for PC3 implementation in Colombia consisted of a 'train the trainers' model. Under this scheme there is little room for co-creation, because the underlying rationale is based on knowledge transfer instead of knowledge dialogue (REF_210715). However, participants did not feel uncomfortable with it; on the contrary, they highly valued the new concepts and tools they learned during the process. The following are some of their assessing statements (W1_301015):

> *I've learned a new way of organising my ideas. It's been an eye-opening experience to me.*
>
> *I've learned a lot throughout this training. All topics have been very relevant to me, at the professional and personal levels (…) These topics have made me question myself in the way we do business in this region.*

Additionally, the group at UT also alleged to have learned from the participants in Santa Rosa, because of the way they reacted to some contents and examples (SS_280715; SS_040815; SS_150915; SS_061015). *'I learned a lot from their questions and the ways in which they frame the issues they bring into the discussion'* was mentioned by a trainer after an on-line session.

As a result, the training phase developed a common language and brought about a working scenario in which each part respected and valued the knowledge of its counterpart.

As mentioned earlier, PC3 is an interdisciplinary venture of three different departments at UT. However, when the PC3 implementation in Colombia started, it was not clear what the implications of interdisciplinary work were. In consequence, we organised the contents and the training dynamics keeping the disciplinary boundaries, making each department responsible for its part, i.e. CSTM for sustainability, Design for product design and NIKOS for business development (ID_270715; REF_210715). Additionally, each person had to be accountable to its own department, which meant that each teacher had to negotiate her/his dedication to PC3 in a different way, balancing PC3 interests with the department's interest (ID_070715; ID_270715; REF_100915). An example of this is the following statement, mentioned during an internal meeting.

> *In the end, contributing to PC3 Colombia seems more like a favour, because it does not fit any of the categories I should spend my time on. I do it even if it's voluntarily,*

because I'm committed to it. But for other people, despite how interesting it may be, it just doesn't count, so they won't join PC3 (ID_070715).

In the second phase, the training component was over and the work of PC3 participants focused on their business models. Here, the team of teachers was able to transcend its own disciplinary boundaries. At the same time, co-creation processes became more frequent. In the following section I will expand on this.

5.3 PC3 implementation: Phase II

Towards the end of the training we started planning the second phase. According to the implementation plan (Figure 5.2), the participants of Phase I would become coaches of other entrepreneurs in order to facilitate the development of sustainable businesses. However, participants mentioned that they did not feel ready to take this role, because *'being a coach implies much commitment and responsibility'*, *'it demands much time'*, *'you have to push a lot if you want to succeed'*. They did not feel confident enough, because, according to them, *'they were not even ready for their own business ideas, so how could they coach others?'* (SS_180815). Therefore, we decided to do another on-site workshop in order to evaluate the first phase and discuss how to proceed, taking into account what was more meaningful to them and why (ID_061015).

5.3.1 Beyond the training: everyday life in Santa Rosa del Sur

As mentioned earlier, the team in The Netherlands was not sure about the commitment and the progress achieved by the participants in Santa Rosa, because there was not any formal proof of their work, such as a written homework or report (ID_270715; ID_061015). Thus, my visit to Sur de Bolivar in October and November 2015 was important to examine the extent to which participants had internalised the concepts and tools discussed throughout the training phase.

This visit took place right after regional and local government elections, so social interactions were mainly about politics. As community leaders, PC3 participants were constantly positioning themselves in relation to highly contested topics related to the development of the region (OBS_301015). Here, the discussions that had taken place during the training phase were particularly relevant and they used my presence in Santa Rosa to legitimate their arguments in front of others, such as the elected mayor, school teachers, leaders of recently-finished electoral campaigns (OBS_291015; OBS_311015: OBS_041115). One of the participants said to me *'it's good idea you come with me to see this person, so that he'll know what I'm up to'* (OBS_311015).

When the training started, each participant had to choose a business idea and a team to develop it with (Section 5.2.2). Then, all contents that were studied had to be applied into each case. In this way, the process created another layer of radiation (Figure 5.4). During

my visit to Santa Rosa I met all teammates and observed the ways in which our participants translated the PC3 process and how the teamwork dynamics were (Image 5.5).

Image 5.5 Some of the teammates

First, all teammates had great admiration for their leaders. To them, the work they had done so far had been inspiring, eye-opening, motivating and had enabled them to think of their businesses in a different way, more aligned to their own beliefs (I_1_311015; I_1_041115; I_1_051115; OBS_291015; OBS_311015; OBS_021115; W1_301015), as it can be seen in the following quotation.

> *'I'm really grateful with [the PC3 participant]. His support has helped me to keep going. Thanks to the work we've done together this business is taking the direction I've always dreamed of.'* (I_1_051115)

The life experience of our participants had much in common with their teammates as explained in Section 5.2.3 and Annex 1. They all had left illegal economic activities voluntarily, after realising the long-term damage they were doing to society and to the environment. At the same time, they all had experienced the change from having much money and little peace, to having decent money and much work to do. These experiences kept them inspired (I_1_311015; I_1_041115; I_1_051115). They treated themselves as equals and often referred to their own previous challenges in order to make a point (OBS_291015; OBS_041115; I_1_031115).

> *My wife and I used to work at the mine. We had money but lived in very poor conditions. Our house was always made of plastic. I now have this small farm. We've worked hard but have well-being. The work we've done together with [the PC3 participant] has helped us to organise the farm. It's beautiful and productive now. I do my job well and take good care of wild animals and plants. (…) Young people should know that it's better to start poor and make money than starting with much money and losing everything, which is what happens there [pointing at an abandoned gold mine]* (I_1_041115)

Finally, they felt they were working on something big. They felt that working on innovative business ideas (i.e. ideas no one else has worked on before in this region) with support from well-known community leaders and a foreign university was a right mix to bring high positive impact to the region. They wanted to show young people other ways to make a living, different from gold mining and coca cultivation (OBS_291015; OBS_311015; OBS_011115; OBS_021115; REF_301015; W1_301015).

In sum, the training implied for PC3 participants not only learning new concepts and management tools, but also a means to strengthen their role as community leaders, using new concepts and methods to communicate and work with others, reifying their visions of a sustainable region.

5.3.2 Redesigning the following phase

The training phase was too time-consuming for some of the participants, especially to those who had to travel frequently because of their jobs. However, seven out of ten initial participants managed to attend the evaluation workshop (W1_301015).

They highlighted three main aspects they valued throughout the process. First, they found very useful the tools they learned to think and organise ideas. They reported they have had often used them to work with their teammates and in other scenarios (see Figure 5.4). Second, they found out that doing collaborative teamwork was productive and motivating. Third, they understood that a business is like a system of gears, in which everything has a function and has to be synchronised.

They mentioned that learning new concepts and tools kept them motivated. At the same time, being in contact with people from abroad gave them good reputation, which allowed them to bring their visions and ideas to the fore with more confidence. Finally, they considered that having the opportunity to be part of PC3 meant a big responsibility towards the families they represent and to the Sur de Bolivar region.

In relation to the following phase, they insisted they did not feel ready to coach other people. They suggested they continued working on the same business ideas with their teammates, as they felt those processes were still open and there were many aspects of the businesses that needed more exploration. We agreed, then, to continue as they suggested. Each participant honestly evaluated whether they could continue participating in the second phase. In the end, there were six dropouts (see Annex 1). However, as mentioned earlier, all participants were connected among them and the main CBOs, so the programme did not lose the layers of radiation it had started with; it just reconfigured. Figure 5.5 shows the new configuration of relations between the remaining business ideas and the CBOs.

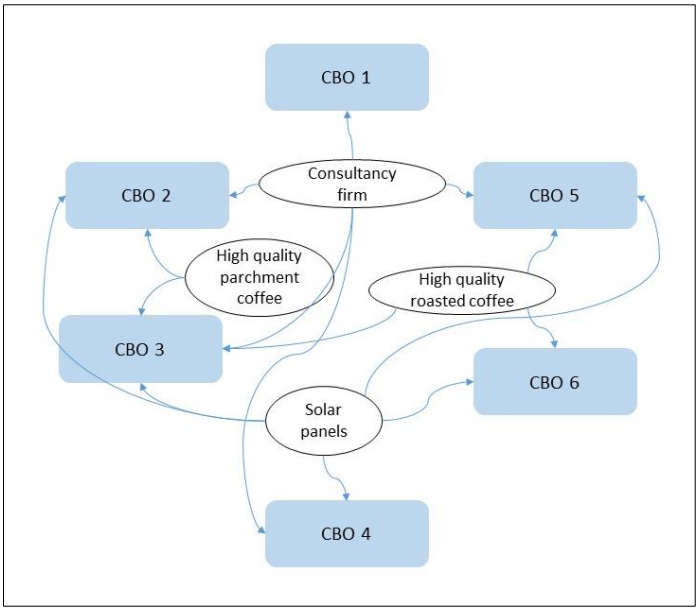


Figure 5.5 New relationships between business ideas and existing CBOs

Thus, the four remaining participants (one woman and three men) would work on defining the business model of each venture during the second phase. The following section discusses this process in detail.

5.3.3 Co-creating business models for sustainability

To the vast majority of business people in Sur de Bolivar, doing business means making money by buying cheap and selling expensive (Section 3.2). Thus, concepts like value creation and tools like the business model canvas (BMC) resulted striking to the participants (I_1_301015). They reported they could reframe their ideas using the concept of value creation and that they could use the BMC like a map to guide conversations (W1_301015). The following statement is a case in point.

> *I've worked with my teammates using the methods we've learned. We can better organise our ideas and bring them into practice. I've seen that what we've learned works and makes my job easier.* (W1_301015)

The second phase, then, consisted of exploring more in depth the ways in which each business idea could create social, environmental and economic value. As at the beginning, this new phase started with an on-site workshop. Here, they explored the challenges of defining the business model, tried structuring a pitch about each business idea and the dynamics of giving feedback among them started (W2_311015). Each business idea is described in Table 5.5.

Business idea	Description
Solar energy systems for rural areas	This idea started as a shop of solar panels in town. Throughout the training process, it was clear that a shop, i.e. the activity of buying there and selling here, adds very little value. Additionally, this shop would only benefit the ones

Business idea	Description
	who could afford solar panels. Therefore, a model of collaboration with municipalities and CBOs was being developed.
Roasted coffee	Because Colombian coffee is highly demanded in the international market, they idea was to export high quality coffee that was produced locally, but already roasted, in order to avoid middlemen. The idea consisted of developing something that differentiated Sur de Bolivar coffee from any other Colombian coffee.
High-quality parchment coffee	Get ready to obtain green labels such as Rain Forest Alliance, in order to sell certified coffee, which has a 'premium' price, bringing a better income to farmers.
Consultancy firm	International aid organisations are interested in working with CBOs from Sur de Bolivar. Many of these organisations have very poor managerial practices, so in the end they are not eligible for managing their own projects and an outsider NGO is brought to do that. A consultancy firm can help them improve their administrative performance.

Table 5.5 Description of business ideas

Additionally, we agreed that the working scheme would remain the same, i.e. they would continue working with their teammates and there would be an on-line feedback session every second week.

The evolution of their business models and the transdisciplinary work underlying it are described below.

Co-creation and transdisciplinarity

Back in The Netherlands, the PC3 team discussed the findings of my visit and defined a new model of interaction, according to the expectations of the people in Colombia (ID_111215). In this second phase the role of the PC3 team at UT consisted of complementing the job of the four leaders by providing feedback, information and tools that could help them organise their ventures. Additionally, as none of us was an expert on the business area they were working on, we decided to look for such experts in order to put them in contact to discuss the business model each of them was designing (ID_151215). Figure 5.6 graphically represents the revised PC3 implementation model in Colombia.

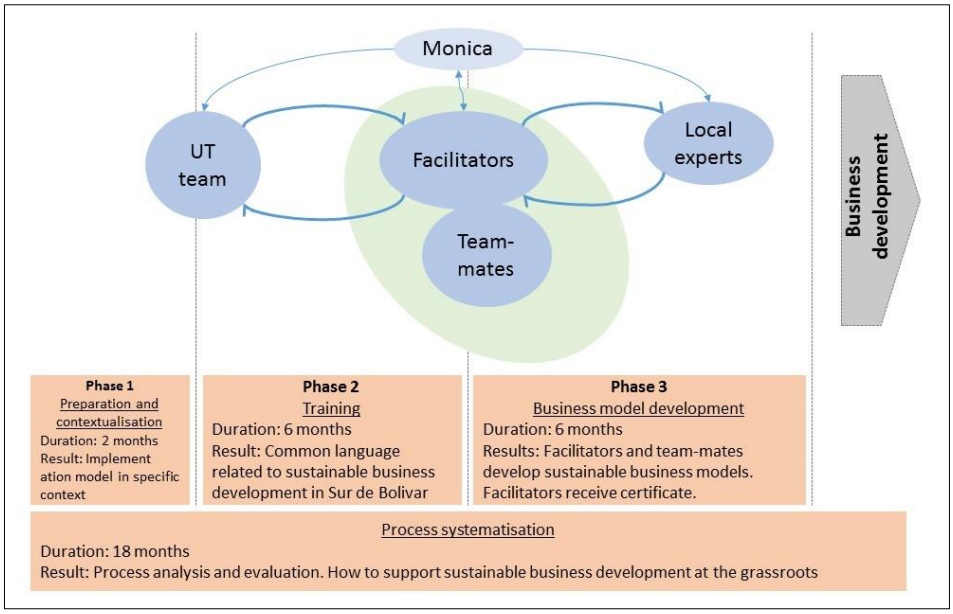


Figure 5.6 Revised PC3 implementation model in Colombia

This model (Figure 5.6) is different from the previous implementation model (Figure 5.2) because the 'train the trainers' scheme changed. The people who did the training were no longer going to be facilitators of others' business ideas. They were going to work as ecopreneurs themselves, developing their own business models with their teammates. Different from Figure 5.2, this figure does not show a new group of ecopreneurs coming into the programme. Additionally, UT plays a facilitation role rather than carrying out guidance and monitoring. In the new model UT's role is complemented by local experts directly supporting each ecopreneur.

From November 2015 to April 2016 we held five skype sessions with the group in Santa Rosa and four working sessions with the team at UT, in order to discuss the progress of each BMC. During this period of time, there was room for discussion and feedback among and between groups. On the one hand, at UT, the team came together to analyse each case. As expected, each participant had a disciplinary view on the BMC, but as the conversation progressed, all knowledges built upon the others, transcending disciplinary boundaries (ID_210116; ID_250216; REF_210116).

On the other hand, the team in Santa Rosa started sharing their views and suggestions in a more fluent way. The pitching practice motivated them to constructively comment on the other's performance (SS_101215), which later became more frequent when discussing the components of the BMC for each case (SS_020216; SS_160216; SS_150316). Additionally, they met twice or three times with their teammates prior to each skype session. Here, the BMC became a facilitator of the conversation, which allowed them address diverse aspects of the business activity in an organised and integral way.

This canvas tool is useful because we all can see the whole picture of the business, so we can plan better, reducing mistakes and costs. It helps us to be more competitive. (W3_260416).

Because of administrative matters (as discussed in Section 5.2.4), in the end I was responsible for conducting all virtual encounters during the second phase. As a result, my role as bridge and translator became more prominent. I was taking questions and suggestions from one group to the other, facilitating the co-creation of all business models. Throughout this phase I took good care of the transparency of my notes, verifying that my interpretation of their ideas corresponded to what they meant.

Additionally, we invited three different experts to join this experiment. They contributed with a new sort of knowledge, i.e., practice-oriented knowledge outside academia. Their outsider view introduced also a balancing component into the co-creation process, because they addressed practical issues that had not been mentioned before. Meetings with experts took place in February 2016. They all were Colombian working on well-known companies in the corresponding sector. According to PC3 participants, it was a valuable experience because they had a sort of conversation they had not had before, characterised by technical aspects and real-life practicalities, mainly related to commercial and legal issues. Additionally, in these conversations they managed to get a more clear picture of their role in the value chain of each sector (SS_150216; SS_160216).

Business models

All community leaders who joined the programme started with a business idea in mind that they would develop along the programme together with their teammates. Throughout the first phase we expected them to become facilitators or *coaches* of other entrepreneurs. As they did not feel ready to take this role, in the second phase they played the role of ecopreneurs themselves being coached by the team at UT and the external experts mentioned above.

Three out of four had previous experience as entrepreneurs (PP_070415) and all of them were driven by the social and environmental benefit that their business ideas would bring about. They all aimed at improving the living conditions of the communities in Sur de Bolivar, especially in the rural area, and all of them wanted to demonstrate that it was feasible to develop sustainable businesses in this region. Table 5.6 summarises the driver of each person to work on her/his business idea.

Business idea	Ecopreneur's driver
Solar energy systems for rural areas	'If farmers manage to have a comfortable life in rural areas, they won't want to leave to the city'. 'Electricity provision in rural areas is needed to increase the love to the land'. 'If you have a fridge, you can keep more fruit and vegetables, improving your nutrition'. 'When they brought a solar panel to the school, they bought a freezer. (…) It was the first time children saw solid water'. (SS_210715; SS_180815)

Business idea	Ecopreneur's driver
Roasted coffee	'It's important that young people see that businesses that do good can bring good revenue. There's more than gold and coca in this region'. 'This company is contributing to bringing peace to the region'. (SS_150316)
High-quality parchment coffee	'Coffee farmers can take good care of Serrania de San Lucas'. 'They deserve a fair price (…) They do many environmental conservation activities' (W2_311015)
Consultancy firm	'Community organisations need to develop their capacity to manage their own resources so that they can become more autonomous' (SS_160216)

Table 5.6 Ecopreneurs' drivers to develop their business ideas

Additionally, at the beginning they had a simple idea of the business (see Table 5.5). Throughout the process they developed new perspectives, redefining their business models into more complex ones, which would create social, environmental and economic value in a more significant way (See Image 5.6). For instance, the rural energy idea consisted of opening a solar energy equipment store in town, i.e. a business of 'buying cheap and selling expensive', characterised by little value creation. Throughout the process, this idea became a rural energy community-based social enterprise, funded with both private and public capital.

Image 5.6 Ecopreneurs working on the business model canvas

Another example is the company selling roasted coffee. The initial idea consisted of exporting already roasted coffee. After much discussion and exploration they changed the market segment, targeting the local market for which capacity development of local actors became an important component. In the case of the consultancy firm, the initial idea consisted of facilitating the application to international aid funds to small not-experienced community organisations by supporting them on the legal and administrative component. In the end, they changed the nature of the relationship with their clients, refocusing on capacity development. Finally, the company selling high-quality parchment coffee transformed its business infrastructure in order to be more independent from coffee trade corporations (Annex 5, in Spanish, shows the evolution of each BMC).

The modifications and redefinitions just mentioned did not happen suddenly nor arbitrarily. On the contrary, it was a process of constant negotiation among teammates fuelled by the PC3 team at UT. As mentioned earlier, PC3 is a normative endeavour that

promotes business models for sustainability (see the reflection on leadership and normativity presented in Section 5.2.4). In this way, PC3's methods based on design thinking aimed at motivating them to explore new perspectives which would help them find alternatives to create more significant social and environmental value.

Throughout the process these entrepreneurs remained working on the same gap that they had recognised as a business opportunity at the beginning. The way to exploit such opportunity is what evolved, finding alternative business infrastructures, customer interfaces and financial models, keeping values of solidarity and respect to nature at the heart of their business models.

This represented an innovation process in the context of Santa Rosa. In contrast to other commercial entrepreneurs in this region, they were not profit driven, nor sought to exploit the circumstances that make the region more unsustainable. For instance, some commercial entrepreneurs reported that the mining activity is a good source of clients because they need to buy everything in town to take it to the mine (I_4_211016; I_4_251016). On the contrary, PC3 entrepreneurs were attempting to build pathways to discourage mining, i.e. to transform the local economic system.

The transformative intention became more evident towards the end of the process. They realised that these new ways of organising their ventures could create room for other social relations and promote other business practices (W3_260416). They started feeling they wanted to tell others about their ideas (SS_160216); they were now empowered to discuss with other about business matters and were interested in disseminating their ideas (W3_260416).

Empowerment

By analysing their new business models, they realised they did not need donors but business partners. Therefore, together with Santa Rosa's mayor, they arranged a meeting with the USA ambassador in Colombia. The objective of this meeting was to invite them to invest in Santa Rosa's social enterprises. A few months later, USAID's director in Colombia personally visited Santa Rosa (SS_160216; OBS_241016).

Additionally, as they were interested in telling others about the PC3 experience, I suggested the possibility of organising a TEDx event[22]. They watched some TED talks and felt motivated about having a video on the internet that they could share with others (SS_160216; W3_260416).

[22] A TEDx event is a local gathering where live TED-like talks and videos previously recorded at TED conferences are shared with the community. TEDx events are fully planned and coordinated independently, on a community-by-community basis. The content and design of each TEDx event is unique and developed independently, but all of them have features in common (https://www.ted.com/participate/organize-a-local-tedx-event/before-you-start/what-is-a-tedx-event).

Image 5.7 TEDxSantaRosaDelSur

Once the TEDxSantaRosaDelSur license was approved, they started recruiting other speakers. This activated a network of community leaders beyond the PC3 team (SS_020616; SS_210616; SS_020816; SS_270916). The event took place on November 25th, 2016 (www.ted.com/tedx/events/19543). Since then it has had 65 *Likes* on Facebook (www.facebook.com/tedxsantarosadelsur/) and over one thousand views in total on the TEDx Talks YouTube channel. Therefore, it has served as dissemination tool, reaching an audience that would have been hard for these leaders to reach via other means (See Image 5.7).

5.4 PC3 design and implementation in Colombia: Recapitulation

As mentioned at the beginning of this chapter, the experience of designing and implementing a PC3 in Santa Rosa del Sur was an iterative, emergent, and adaptive process. According to PC3 previous experience and the team's understanding of the context, we suggested an implementation model (Figure 5.2). Because of constant cycles of action and reflection along the process, we managed to adjust the goal of the project and the required activities to achieve it, according to the group's capacities and expectations. From a 'train the trainer' scheme, in which participants were supposed to become facilitators of sustainable business development working with other entrepreneurs, we moved towards a co-creation process in which participants played the role of ecopreneurs themselves while the PC3 team at UT facilitated the development of their business models (Figure 5.6).

The implementation process took place in two distinct phases. The first one was training-based, in which the virtual and interdisciplinary work, the contextualisation of contents and expectations and the normative component were the main challenges we faced. As a result, each part found value in the knowledge of its counterpart, developing a common

ground that resulted useful and inspiring for both the group in Santa Rosa and the one in Enschede.

The second phase was about co-creation. Throughout this phase, the team at UT, some experts from outside the project, each ecopreneur and their teammates contributed to shape the business model of each venture. The result were alternative business infrastructures, innovative customer interfaces and financial models, keeping values of solidarity and respect to nature at the heart of their value-creation models. Additionally, the four ecopreneurs who completed the whole process felt empowered to share their ideas and take the lead on sustainable business development in the region.

According to the reference model that guided the Prescriptive Study (Figure 5.1), three main factors had to be taken into account for the PC3 implementation in Colombia. First, given the fact that entrepreneurs are not in isolation, it was important to take the characteristics of the context into account, i.e. a setting that exhibits a mixture of *informal security* and *insecurity* characteristics. Second, the focus should have been not only on resource-efficient innovation, but on the socio-institutional dimension of sustainability, seeking to reconfigure power balance within production-consumption systems, based on values of solidarity and sufficiency. Third, it was important to consider participants' own translation of sustainability challenges in order to produce context-specific solutions. The following chapter discusses to what extent and the ways in which these factors were addressed in the attempt to develop a support system for grassroots ecopreneurs interested in developing feasible business models that contribute to sustainable development on the ground.

Chapter 6. Evaluation of PC3 in Colombia

The previous chapter has discussed the process of defining and trying out the support system (Prescriptive Study). I will now proceed to 'investigate the impact of the support and its ability to realise the desired situation' (Blessing & Chakrabarti, 2009, p. 16). This study corresponds to the Descriptive Study II, the last stage of the DRM. In order to do so, I examine the effect of PC3 from both the practice and the theory perspective. The former focuses on the usefulness of the support system, while the latter assesses its applicability.

Two research questions have guided the practice component of this project (see Table 2.1). First, *what are the characteristics of a transformative learning model that contributes to promoting sustainable innovation?* Second, *what are the characteristics of a model of collaboration and participation between university and grassroots ecopreneurs in a real-life setting?* Section 6.1 explores both questions.

In turn, Section 6.2 discusses the theory-driven research questions: *How do ecopreneurs create novel business models for sustainability?; what are the characteristics of such business models?; in which ways does a model of collaboration and participation between university and grassroots ecopreneurs trigger system transformations in a real-life setting?*

To sum up, Section 6.3 suggests a revisited reference model following the insights obtained in the previous sections.

6.1 PC3's transformative learning model

In November 2015 there were two on-site workshops, in which I evaluated the PC3's learning model according to Engëstrom's central questions discussed in Section 3.3.3. These guiding questions have helped me exploring research questions 1 and 4: *RQ1.* W*hat are the characteristics of a transformative learning model that contributes to promoting sustainable innovation?* And *RQ4.* W*hat are the characteristics of a model of collaboration and participation between university and grassroots ecopreneurs in a real-life setting?* (see Table 2.1). Here I will discuss whether the learning model described in Section 5.2.2 led to the expected outcomes.[23]

Engeström's four central questions about learning activities are: (1) Who are the subjects of learning, how are they defined and located? (2) Why do they learn, what makes them make the effort? (3) What do they learn, what are the contents and outcomes of learning? (4) How do they learn, what are the key actions or processes of learning?" (2001, p. 133). These questions have guided the design process of the PC3's learning model (Sections

[23] This section is part of the 'Circularity rationale as the basis of transformative innovation' paper, accepted for publication in the journal Management Research Review (MRR).

3.3.3 and 5.2.2). Now, these questions will be specifically answered for the Colombian case.

First, we had stated that PC3's participants should live in deprived contexts and should be young adults with poor formal education, who had already proven their entrepreneurial character. In fact, Colombian participant's age average was 39 years old; they all come from this region, where they have experienced scarce access to basic services, such as health, education, drinking water, sewage, transport, housing, etc. Additionally, when asking them about their profile, we found out that they consider themselves as 'innovator', 'creative', 'entrepreneur', 'able to change my environment', 'leader' (PP_070415).

Second, from the discussion above we know that the living experiences of the adult learner are the source of the adult's motivations to learn (Knowles, 1980; Lindemann, 1961; Merriam et al., 2007). In this case, participants reported that their motivations to join and stay in the programme were mainly related to the responsibility they were given by the families they represent to learn new concepts and ideas, so then they could work together on the development of the region (W1_301015). This is clearly seen in the following quote:

> *(I'm motivated by) the transformative power of knowledge. We, the people who are here, have a responsibility, because we're leaders of many families of farmers. This knowledge is not to keep it with us, it's to be shared and used for the community's well-being. We can use this knowledge to bring our ideas forward.* (W1_301015)

We could argue, therefore, that the answer to Engeström's question *what makes them make the effort* (2001, p. 133) is related to the living experience of being a community leader, having the opportunity to engage with new knowledge through the PC3 programme.

Third, in relation to the question about what they learn, which includes contents and outcomes of learning, each of the pillars of the PC3 programme (sustainability principles, entrepreneurship rationale and design methodologies) has its own learning objectives. Table 6.1 summarises what participants reported they had learned throughout the process (W1_301015). Their answers were classified according to each learning objective, resulting in a frequency analysis[24].

[24] Each learning objective was translated into specific questions which were answered individually and discussed in groups during the workshop. The responses were translated back into the learning objectives and the frequency analysis was undertaken. For this purpose, high frequency referred to the totality; medium frequency, to the majority (more than half); low frequency, to the minority (less than half); and not mentioned means that no one responded to it.

Contents	Learning objectives	Frequency			
		High	Medium	Low	Not mentioned
Design	Apply systems engineering methods to model the problem space in terms of stakeholders, actors, situations and user scenarios with the goal of creating requirements that contextualize sustainability factors to consider in the design of products and services.	✓			
	Develop expertise in exploring the solution space through the application of ideation processes that combine brainstorming techniques that encourage both divergent and convergent thinking.	✓			
	Learn and develop expertise in applying problem solving techniques that enable continuous learning cycles as a medium for generating new knowledge.		✓		
	Understand and learn techniques to manage and control the development process of product and services between the conceptual design phase up to commercialization.			✓	
Entrepreneurship	Recognize business opportunities as well as the mechanisms needed to create social and environmental value through these opportunities.	✓			
	Appraise the surrounding entrepreneurial ecosystem, which may support/undermine the product or service development.	✓			
	Formulate and evaluate value propositions, both individually and with peers.		✓		
	Use and compare business model canvases.		✓		
Sustainability	Include integrity values all along the business development in the areas of human rights, labour, environment and anti-corruption.	✓			
	Identify the environmental aspects along the product life cycle in order to prevent negative impacts.	✓			
	Select clean technologies to manufacture/transport products and/or provide services.			✓	
	Embed social inclusiveness within business models.		✓		
	Apply system thinking to understand sustainability challenges which go across the business facilities and contribute positively to them.			✓	

Table 6.1 Accomplishment of learning objectives

From Table 6.1 it can be argued that all learning objectives, from all disciplines, were met to some extent. From the design perspective, the main learning was related to understanding the problem space and exploring the solution space. The contribution of this rationale to business development, together with the achievement of the entrepreneurship learning model related to opportunity recognition and social and environmental value creation, will be discussed in Section 6.2.1.

Being able to appraise the surrounding business ecosystem and its effect on the product/service development was another entrepreneurial learning objective highly achieved. It was complemented with the sustainability perspective, which looks at the ways the product/service development affects the social and environmental landscape. Finally, the usefulness of the product-life-cycle concept was understood by all participants.

The learning objectives that were only achieved by the minority of the participants were related to the management and control of the development process of products (from the conceptual design to commercialisation), the familiarity with clean technologies and the application of system thinking.

Thus, these results verify that the learning model that was used indeed supports the objectives initially defined.

Besides the learning objectives, PC3 has considered itself to be successful when it develops transformative ideas or practices throughout the process. In this case I have found evidence of transformative learning. Participants reported that this programme had helped them to think differently about businesses and about the problems they face; they felt more confident about promoting values of justice and environmental care within businesses; they believed that the sort of business models that they had developed through the PC3 programme were a pioneering effort to improve people's well-being in the region (W1_301015; OBS_031115_7; W3_260416). The following quote was mentioned by a participant at the evaluation workshop in April 2016.

> *We used to have a very linear idea of doing business: 'it costs me this, I sell it for this, this is my revenue'. We now understand it's much more than that. All parts of a business have to be synchronised like a gear. And we can see all actors who participate. It's a holistic view of the business*. (W3_260416)

Finally, in relation to the fourth question about how they learn, I have mentioned that this learning model follows constructivist learning theory, 'which understands learning as construction of meaning from experience' (Clark & Rossiter, 2008, p. 63). The constructivist literature discusses that this meaning-making may occur through reflection (Boud & Walker, 1990; Kolb, 1984; Mezirow, 1991) and through contextual interaction (Hansman, 2001; Lave & Wenger, 1991). According to my findings, the latter is the case for PC3. Each participant had teammates throughout the programme, with whom they had to discuss and create new solutions to a specific real-life business challenge. This interaction allowed them realise the value of new knowledge and at the same time strengthened their role as innovative leaders (W1_301015; OBS_291015_5; OBS_041115_9; W3_260416)). An example of meaning-making through contextual interaction can be found in the following quote:

In this region the mind-set of doing business is complicated; people want easy money. But I say to them [my teammates] that I've realised that a business is like a young tree: at the beginning you don't get fruit; you have to water and fertilise it; but after looking after it properly, you will indeed harvest fruit. (OBS_291015_1)

So far I have answered Engëstrom's central questions about learning activities, based on the results obtained in the application of the PC3 programme in Colombia. The purpose of this has been to describe a new situation (*descriptive study II*) after the application of a suggested solution (*prescriptive study*). It could be argued, then, that the suggested learning model is indeed a possible solution for PC3. Consequently, answering RQ1 and RQ4, a transformative learning model that contributes to promoting sustainable innovation from the bottom-up is characterised by a cycle of confrontation, observation, practice and application. This cycle creates room for collaboration between university and grassroots ecopreneurs in a real-life setting, because the former facilitates confrontation and observation processes while the latter bring about new ideas and solutions by practice and application. These processes and their results get fine-tuned at every iteration of the cycle.

6.2 Co-creating business models for sustainability

6.2.1 Opportunity exploitation inspired by design thinking

Commercial entrepreneurs find a gap or a missing link between what people need/want and what is provided to them, and creatively combine diverse resources to create new products and services (Ardichvili, Cardozo, & Ray, 2003), in order to economically exploit this opportunity (Austin, Stevenson, & Wei-Skillern, 2006; Shane & Venkataraman, 2000). This rationale has enabled the emergence of ventures that profit from and reproduce a consumerist and unsustainable society. In contrast, social and eco- entrepreneurs recognise social and ecological problems, and creatively combine diverse resources in order to contribute to the solution of such problems. Different from commercial entrepreneurs, eco- and social entrepreneurs are not driven by the economic return such venture will eventually bring, but by the desire to help or contribute (Belz & Binder, 2017; Corner & Ho, 2010; Dorado, 2006; Neck, Brush, & Allen, 2009) (See Table 5.6).

Researchers exploring motivations for social entrepreneurship, i.e. the reasons that drive some entrepreneurs to create social value, have found that empathy is a key driver to them. Some argue that empathy is developed by pull factors, such as life events, (social) awareness since childhood, ideology or spiritual imperative (Yitshaki & Kropp, 2016). Others allege that empathy is an emotional antecedent to social entrepreneurial motivations, such as altruism, nurturance, social justice and sense of obligation (Ruskin, Seymour, & Webster, 2016). In both cases, empathy is understood as an emotional skill that social entrepreneurs have developed prior to the entrepreneurial process. This is a

dynamic process that combines prior knowledge (Shane, 2000) and prior experiences (Corner & Ho, 2010), tracing 'paths of meaning' between past experiences and present actions (Yitshaki & Kropp, 2016, p. 557).

According to recent findings in neuroscience, the presence of 'mirror neurons' in the human brain implies a human's biological disposition to empathic behaviour (Iacoboni, 2009). If we are indeed 'hard-wired for empathy' (Keysers, 2011), strengthening empathic skills among people with entrepreneurial intentions should result in more social start-ups and ventures.[25]

As the PC3 process is characterised by a strong emphasis on design thinking, below I explore whether this approach has had any effect on the entrepreneurial process.

Design thinking consists of an abductive reasoning (Dorst, 2011), characterised by two main elements. First, iteration between the 'problem and solution space'. Second, an ideation process based on 'divergence and convergence'. Throughout these iterative processes, designers are encouraged to develop and practise empathy, connecting with the people and their problems at a fundamental level (Brown & Katz, 2011). Observations based on empathy allow designers to frame the (usually open and complex) problems they are dealing with from an open perspective, in order to generate, develop and test ideas which will eventually be implemented as real products and services that alleviate/solve such problems.

According to the results obtained by the PC3 process in Santa Rosa, I would argue that the continuous iteration between the problem and solution space, creating 'paths of meaning' (Yitshaki & Kropp, 2016) in collaboration with their teammates, driven by values of environmental awareness and social equity, allowed entrepreneurs to redefine the ways in which the business opportunity could be exploited (See the discussion about business models in Section 5.3.3). This process is explained below.

First, the entrepreneur who had the idea of a shop to sell solar energy equipment realised that he could bring together the community in need to set up a rural energy community-based enterprise. Through the process, he understood that the community would be better served if they owned themselves a rural energy enterprise, rather than each family finding its own solution individually, according to what they could (or could not) afford.

[25] This suggests a debate on the combined effects of nurture and nature. Evolutionary psychology has brought empirical evidence to suggest that nature has to be taken into account if we want to understand human behaviour (Buss, 2008). It is not about biological determinism, but about understanding those natural predispositions of an individual's way of thinking and acting. Entrepreneurship scholars exploring this field have found evidence of the combined effect of endogenous and exogenous factors. For instance, researchers have suggested that individuals with higher testosterone level and family business background are more likely to go into an entrepreneurial career (White, Thornhill, & Hampson, 2007)

Similarly, the team of entrepreneurs interested in roasting high quality coffee for exportation discovered the opportunity to boost the local market for high quality roasted coffee through a network of local cafes. In the process of iteration between the problem and solution space, they understood that they could address the solution at the local rather than at the international level.

In the case of the consultancy firm, they realised that the problem of not-experienced community organisations to apply to international aid funds was not only lack of financial capacity, but little capacity to manage their own organisations, making them vulnerable to rent-seeking NGOs. Then, they brought capacity development to the heart of their venture. Finally, the company selling high-quality parchment coffee understood that having their own certification would give them more autonomy and negotiation power before coffee trade corporations. Table 6.2 summarises the transformation of each product/service.

Initial idea	Final idea
Solar energy equipment shop	Rural energy community-based enterprise
Roasted coffee exports	Network of cafes, selling high-quality low-price coffee to locals
High-quality parchment coffee	Certified coffee (own certification)
Consultancy firm	Strategy consultancy firm focused on capacity building

Table 6.2 Product/service transformation

This evidence seems to suggest that design thinking provides useful methods for ecopreneurs to explore diverse alternatives for opportunity exploitation. On the one hand, it provides useful solution-finding iterative methods. On the other hand, it reinforces values of solidarity and environmental care, given the fact that empathy is the foundation of such methods. In sum, it could be argued that design thinking promotes a more human, empathic, collaborative, iterative, experimental way of working, which facilitates the creation of business models for sustainability.

6.2.2 Value creation

The ways in which an organization creates and delivers value has been described as its business model (Osterwalder et al., 2005). Particularly in the context of sustainability, Schaltegger et al. (2016, p. 6) have suggested a specific definition of a business model *for* sustainability:

> (It) helps describing, analyzing, managing and communicating (i) a company's sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers its value, (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries.

Through its different components, the business model shows who, and in which ways, gains from the innovations that entrepreneurs bring into the market (van der Have & Rubalcaba, 2016), uncovering both the environmental and the social aspects of business activities (Desai, 2014; Schaltegger et al., 2016; Seelos, 2014).

Scholars have found evidence of social and environmental entrepreneurs around the world who organize their ventures in novel ways (Boons & Lüdeke-Freund, 2013), coming up with business models able to create value 'across a wide spectrum' (Sarkar & Pansera, 2017, p. 334). The four business models developed throughout the PC3 process are a case in point.

This section discusses the ways in which the value proposition, the business infrastructure, the customer interface and the financial model contribute to simultaneously create social, environmental and economic value (See Annex 5).

Value proposition

Sustainability is at the heart of the value proposition of all four business models. It includes elements of community ownership and empowerment and elements of environmental protection. Each venture offers to its clients a product or service characterised by a prominent social and environmental component, as can be read below.

> High-quality environmentally friendly coffee, differentiated by its organoleptic features given by the protected ecosystem where it is grown. Produced by small-holder farmers. Fair Trade certified.

Business infrastructure

The local community represents a key partner to all four ventures. The community is not seen as provider of neither raw materials nor economic resources, but as an actively engaged actor with the business. Therefore, capacity development is a key activity to all four ventures, aiming at decreasing the community vulnerability to middlemen or corrupted officials.

Additionally, ecopreneurs attempt to show to the local government the benefit of their business infrastructure, so that they could become a partner, or at least not an obstacle, to the venture.

Examples of this are the high-quality parchment coffee association and the solar energy community-based enterprise.

Customer interface

In the attempt to define the customer interface, PC3 ecopreneurs challenged conventional social relations in order to become more inclusive and diminish social differentiation.

For instance, the roasted coffee company changed the market segment, targeting the local market for which capacity development of local actors became an important component. These actors included bakery managers and street vendors alike. In the case of the consultancy firm, they changed the nature of the relationship with their clients, refocusing on capacity development.

Financial model

The financial model of the vast majority of businesses in Sur de Bolivar consists of buying cheap and selling expensive. Beyond economic value for the trader, this model creates little value in other realms. Understanding the interconnections between the different components of the business model, PC3 ecopreneurs realised that there were alternative solutions to the financial model.

An example of this is the rural energy community-based social enterprise. Its configuration allowed money flows between the community, the company that provides the equipment and the local government, creating an affordable and financially sustainable system of energy provision.

To conclude, the business models developed throughout the PC3 process create organisational settings in which access to resources increases at the community level, rather than the individual level, at the same time that the socio-political capabilities of the community (F. Moulaert, MacCallum, Mehmood, & Hamdouch, 2013). Additionally, environmental protection is promoted in all business activities.

6.2.3 Experimenting with business models for sustainability

The business models described above were developed by four community leaders, motivated by social and environmental concerns, coming up with context-specific solutions. In this sense, they are grassroots ecopreneurs (Sarkar & Pansera, 2017) creating ventures that are based on values of social equity and environmental care, at the same time that are able to deal with market principles.

This section explores in detail the design process of the four business models resulted from the PC3 process in Sur de Bolivar. By paying attention to both framing narratives (expressions of sense-making) and practices (shared behavioural routines) related to the definition of the value proposition, the business infrastructure, the customer interface and the financial model, I have studied the strategies that these ecopreneurs have

deployed to negotiate and shape business models for sustainability in a context of 'informal security' (Ramos-Mejía et al., 2018).

Chapter 4 argued that the role of socio-technological innovation in developing countries is not only about becoming more resource-efficient, but about reconfiguring power balance within production-consumption systems. The context for innovation in developing countries is a loose 'layered' scenario where different institutional 'pockets' can be present or absent at various degrees. Therefore, actors, in this case grassroots ecopreneurs, adjust their behaviour to each pocket, deploying specific strategies to bring their visions and ideas into reality, in order to create change.

Leading businesses transition into a more sustainable field requires ecopreneurs acting as change agents, at the same time that perform a diverse array of practices to secure the societal and environmental impact of their ventures. Thus, change agency relates to practice in the sense that ecopreneurs manoeuvre to bring about transformations and strive to sustain it.

Before I continue, I would like to clarify what I mean by businesses as a field and what change agents are.

I follow here the sociological notion of field (Bourdieu, 1984) which refers to a social arena with an inherent rationale and specific relational protocols. In this arena actors occupy diverse positions from which they manoeuvre to either conserve or transform the structure of forces within the arena. Thus, the ecopreneurs who are the focus of this research are actors capable to play a role in transforming the forces that rule the field of doing business in an informal-security setting (such as Sur de Bolivar).

The notion of change agents requires clarification too. Change agents have been defined as 'leaders, groups, coalitions and others that can initiate and drive positive changes towards the achievement of a development goal' (Ling & Roberts, 2012, p. 11). This definition highlights the potential of actors to ignite institutional change (DiMaggio, 1988).

In his study of farmers' organisations in Colombia, Balanzo (2016) identified five distinct strategies these organisations deploy in order to act as change agents: (1) perform innerwise; (2) extend a practice field; (3) bypass bottlenecks and re-scale; (4) broker a knowledge cycle; (5) take part in the public sphere.

First, actors perform innerwise when their behaviour intentionally reflects specific values and drivers, demonstrating consistency and reflecting a specific identity. The second strategy consists of creating alliances to collaborate and nurture a practice field in order to extend and deepen it. Third, bypassing bottlenecks and re-scaling is a strategy based on shifting a negotiation position, usually by framing issues at a different scale, calling

attention from a wider spectrum of actors. The fourth strategy, broker a knowledge cycle, refers to acquiring new knowledge and translating it into understandable concepts for all and step-by-step protocols for practice. Finally, actors act beyond the practice field, engaging in public deliberation in order to access wider fora.

Additionally, Balanzo suggests a conceptual model to address agency. Even though his main focus are knowledge-related strategies, he also identifies some practice-related strategies. Specifically, here I use the notion of 'practice work' as a conceptual approach to address 'those arrays of activity enacting, making possible, sustaining in time and shaping the rationale and values of a practice field' (Balanzo, 2016, p. 40). This notion is useful for conceptualising the findings of this research, because it allows addressing the layered ways in which an actor 'goes about' practice in the attempt to create change in a specific field (Balanzo, 2016, p. 153). According to his findings, practice work takes place via (1) enactment, (2) intermediation and (3) normalisation.

Enactment refers to the incorporation of a specific set of practices. It could be illustrated by the popular quotation ´be the change you want to see´. Intermediation refers to those activities aiming to get resources such as capital, knowledge, technology, capacities, etc., in order to support novel practices. Lastly, normalisation consists of lobbying and/or supporting rules to guide or stabilise a field of practice. It refers to activities that build bridges to regulation.

Following this conceptual approach, below I analyse the strategies that PC3 ecopreneurs have deployed to negotiate and shape their business models. In order to do so, I have identified an array of activities that ecopreneurs recursively performed along the PC3 process. These activities are:

1) Joining the PC3
2) Leading teamwork
3) Working collaboratively among participants
4) Joining other trainings related to standards and best practices
5) Lobbying to include the objective of their businesses in the municipality's development plan
6) Opposing to join already established profit-driven producer associations
7) Partnering with other organisations
8) Supporting other organisations
9) Inviting new actors to become partners
10) Organising TEDxSantaRosaDelSur
11) Positioning themselves by using PC3

Each of these activities represents in itself both a practice work and a change agency strategy. Table 6.3 describes the strategic interactions that each activity listed above generates.

		Practice work		
	Strategies	Enactment	Intermediation	Normalisation
Change agency	Perform innerwise	2, 10	5	
	Extend a field	9	1	10
	Bypass and re-scale	6, 9, 11	3, 7, 8, 9, 11	
	Broker a knowledge cycle	2	1, 7	4, 5
	Take part in building the public sphere		8	5

Table 6.3 Interactions between strategies related to practice work and to change agency

As it can be learned from Table 6.3, most of the activities that PC3 ecopreneurs have deployed to negotiate and shape their business models are found in the intersection of doing practice work via intermediation, i.e. connecting different actors to get resources, and bypassing and re-scaling, which refers to finding alternative paths to avoid bottlenecks, even if it requires re-scaling the issue they are dealing with. These activities include working collaboratively among participants, partnering with other organisations, supporting other organisations, inviting new actors to become partners and positioning themselves by using PC3. This suggests that PC3 introduces novel ways of framing sustainability-related issues in the realm of businesses, which allows ecopreneurs shifting positions to bypass bottlenecks and alter the scale of the issues they care about as community leaders.

It can be illustrated by the rural energy venture case. At the beginning of the programme, when the ecopreneur presented his business idea as a solar energy equipment shop, he could not position his point about access to energy leading to well-being of rural communities. By engaging in the process of shaping the business model, he could move beyond the financial and commercial realms of the business towards the realms of social inclusion, well-being in rural areas and energy governance.

Table 6.3 also shows that most activities serve more than one purpose. For instance, inviting new actors to become partners (number 9 in Table 6.3) is an activity that creates three strategic interactions. It allows doing practice work via enactment and intermediation, while acting as change agents who extend the practice field and bypass bottlenecks and rescale. This means that when PC3 participants teamed-up with new actors they had the chance to incorporate more sustainable practices at the same time that jumped into new scales. An example of this is the roasted coffee venture. When they left aside the idea of exporting coffee and redefined their business model as a network of local cafés selling high-quality roasted coffee, they engaged local actors into the process of positioning locally produced coffee and made them aware of the environmental and social characteristics that make this high-quality coffee so special. In other words, the process of shaping the business model contributed to embedding the coffee value chain into the local context, beyond coffee farmers.

Interestingly, only by joining PC3 (number 1 in Table 6.3) participants started doing practice work via intermediation (connecting different actors to get resources) at the same time that acted as change agents by extending a field of practice. It suggests that the

PC3 process itself created opportunities for participants to access resources, independently from the results of such process.

These strategic interactions that emerged with the performance of recurrent activities motivated by the PC3 process seem to suggest that an important contribution of PC3 is the fact that it creates room for ecopreneurs to deploy change-making strategies. It is not just about trying out several configurations in the business model, but also about creating an opportunity (perhaps an excuse) for these ecopreneurs to lead businesses transition into a more sustainable field of practice, and in this way start building the foundations of more sustainable production-consumption systems.

6.2.4 Concluding remarks

According to the discussion above, it could be argued that the PC3 process has brought about change in two complementary ways. On the one hand, business models were co-created following design thinking methods that allowed grassroots ecopreneurs find alternative solutions to simultaneously create social, environmental and economic value. On the other hand, through the process of negotiating and defining the value proposition, the business infrastructure, the customer interface and the financial model, grassroots ecopreneurs acted as change agents, actively engaging in practice work to create and sustain the practice field of sustainable businesses, opposing the practice field of predatory businesses. Via practice work, grassroots ecopreneurs were able to ignite transformations within production and consumption systems from the bottom-up.

It could be argued, therefore, that sustainability experiments in the developing world, like PC3, create room for ecopreneurs to deploy change-making strategies, acting as social innovators that build the foundations of more sustainable production-consumption systems at the grassroots.

The study of these interactions between strategies that occur along the experimental innovation process may constitute an alternative to SNM. This agency-based approach contributes to better understanding of more diverse and somehow messy processes of sustainable socio-technical changes in the developing world (as it has been previously suggested by Smith and Raven (2012)).

6.3 Revisiting the reference model

As mentioned in the introductory chapter, PC3's mission is twofold. On the one hand, it can be regarded as a business pre-incubator which focuses on opportunity recognition, conceptual product development and sustainable business model creation. On the other hand, it seeks to understand the ways in which innovative business models contribute to sustainable development.

So far, it has been argued that PC3 as a support system should take into account three main factors: First, the context (i.e. a setting that exhibits a mixture of *informal security* and *insecurity* characteristics), because entrepreneurs are not in isolation; second, the socio-institutional dimension of sustainability, seeking to reconfigure power balance within production-consumption systems; and third, participants' own translation of sustainability challenges in order to produce context-specific solutions.

According to the insights obtained from the previous sections, these three factors are revisited, in order to generate a more accurate reference model of the support system. Figure 6.1 graphically represents the adjusted reference model.

The triangles and stars on the left-hand side represent the fact that conventional (commercial) and non-conventional (socio-environmental) entrepreneurs coexist. But some stand out because of their alternative visions of the future, based on values of solidarity and environmental protection (the stars in the figure).

Additionally, PC3 keeps constant interaction with the everyday reality that ecopreneurs live. In Figure 6.1 this is represented by the dashed line of the PC3 house. The purpose is to keep loose borders through which local translations of sustainability challenges can permeate. Additionally, disciplinary boundaries are kept loose in order to facilitate knowledge dialogue between disciplines and between academics and practitioners.

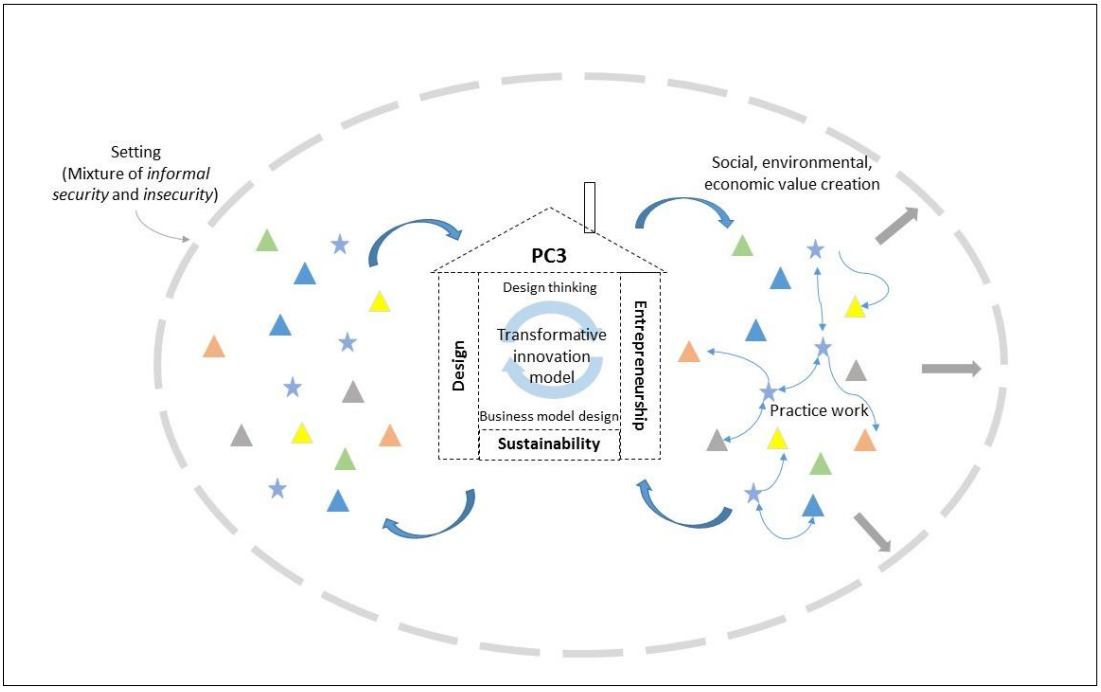


Figure 6.1 Revisited reference model

The PC3 programme itself (the house) exhibits three main characteristics: an interdisciplinary approach, the use of design thinking methods and the focus on business model design. First, its interdisciplinary approach that combines sustainability principles,

social entrepreneurship rationale and design methodologies. This combination creates the 'transformative learning model', which consists of a cycle of confrontation, observation, practice and application. This learning model is complemented by design thinking methods, which promote a more human, empathic, collaborative, environmentally aware, iterative, experimental way of working, facilitating the creation of business models for sustainability.

The work on business models seeks to explore context-specific solutions, in order to create social, environmental and economic value in innovative ways. This exploration allows PC3 participants to become change agents by means of practice work. The combined effect of innovative business models for sustainability and the work done by ecopreneurs as change agents ignites transitions to sustainability at the grassroots level in a setting of informal security (solid arrows on the right-hand side of Figure 6.1).

Chapter 7. Conclusions

This document has presented and discussed the action research process in which I led the design and implementation of a PC3 in rural Colombia, playing the role of both practitioner and researcher. This dissertation is, therefore, the result of a continuous dialogue between practice and theory. This dialogue has been guided by the DRM, which facilitates iterative processes of action and reflection in order to design more relevant and scientifically rigorous products.

In terms of practice, on the one hand, the research objective consisted of designing a support system for grassroots innovators interested in developing feasible business models that contribute to sustainable development on the ground. On the other hand, the guiding theory-driven research question has been about the ways in which PC3 contributes to transitions to sustainability at the grassroots level.

In order to achieve both interdependent objectives, specific research questions have been formulated, according to the design requirements identified in the first stage (See Table 2.1). The following section summarises the exploration that this research project has undertaken in the attempt to provide answers to such specific research questions. Afterwards, Sections 7.2 suggests further research avenues and Section 7.3 discusses policy implications of this doctoral research.

7.1 Supporting grassroots ecopreneurs: The PC3 case

Chapter 2 has defined three design requirements necessary to create a support system for grassroots ecopreneurs. In order to learn how to meet each requirement, specific research questions were explored throughout the design and implementation of PC3 in Santa Rosa del Sur. Table 7.1 presents the requirements and their related research question.

Requirements	Specific research questions
R1. PC3 supports grassroots ecopreneurs, in order to enable new technologies or novel social practices that promote sustainable development.	RQ1. What are the characteristics of a transformative learning model that contributes to promoting sustainable innovation?
R2. PC3 supports ecopreneurial ventures which create novel business models for sustainability.	RQ2. How do ecopreneurs create novel business models for sustainability?
	RQ3. What are the characteristics of such business models?
R3. PC3 is a collaborative and participatory experiment between university and grassroots ecopreneurs that tries out new technologies and novel social practices in a real-life setting triggering more sustainable socio-technical systems.	RQ4. What are the characteristics of a model of collaboration and participation between university and grassroots ecopreneurs in a real-life setting?
	RQ5. In which ways does this model trigger system transformations in such setting?

Table 7.1 Relationship between design requirements and specific research questions

First, using DRM as the methodological framework, Section 6.1 has analysed the ways in which potential entrepreneurs with no technical or business expertise learn how to develop innovate sustainable products and business models for sustainability. The findings from this analysis suggest that a transformative learning model that contributes to promoting sustainable innovation could be based on experiential learning, following a cycle of confrontation, observation, practice and application of contents related to product design, entrepreneurship and sustainability science. This cycle creates room for collaboration between university and grassroots ecopreneurs in a real-life setting (which refers to RQ4), creating an iterative, solution-driven, dialogue between the two. In this cycle university facilitates confrontation and observation processes while grassroots ecopreneurs bring about new ideas and solutions by practice and application. The results from these processes get fine-tuned at every iteration of the cycle. This is an innovative training model for sustainable development, because it is interdisciplinary and builds on real-life experience and sustainability challenges of grassroots innovators. Additionally, it makes room for testing alternative economic paradigms on the ground, where ecopreneurs' rationale can shift from linear towards more iterative and cyclical approaches.

Second, in relation to RQ2 and RQ3, Section 6.2 analysed both the business model of each venture and the ways in which each ecopreneur came up with it. Findings from this analysis suggest that ecopreneurs find alternative framings and solutions to create social, environmental and economic value through the value proposition, the business infrastructure, the customer interface and the financial model. Additionally, along the process of negotiating and defining the business model, ecopreneurs act as change agents, actively engaging in practice work.

This leads to RQ5. Throughout the process I have found evidence of the fact that PC3 creates room for ecopreneurs to deploy change-making strategies, by means of practice work. This suggests that PC3 has created a scenario in which grassroots ecopreneurs act as social innovators, building the foundations of more sustainable production-consumption systems from the bottom-up.

This scenario is what was called a sustainability experiment in Chapter 2. PC3 in Sur de Bolivar brought together real-world actors who were voluntarily willing to participate and commit, despite the unknown outcomes of this process (F. Sengers et al., 2016). Throughout the process, ecopreneurs used the concepts, tools and the status that PC3 provided to them as resources to bring new technologies and social practices into the local landscape, with the deliberate intention to ignite change towards sustainability.

Similarly, the PC3 team at UT voluntarily committed to run this experiment, despite the uncertainties it entailed. Diverse challenges were faced along the process, bringing new knowledge and new perspectives to the PC3 approach. Through this research endeavour,

the PC3 team at UT tried out innovative academic methods, strengthening its capacity to do transdisciplinary research.

Therefore, RQ4 would be explained in terms of an 'engaged scholarship' characterised by voluntary participation and commitment, openness to new knowledge and to trying out unconventional ideas, disposition to learn via action and reflection, and commitment to the process rather than to the expected outcomes, caring for the means rather than for the end.

7.2 Further research avenues

This dissertation has described and discussed a specific research case (PC3), which took place in a specific setting (Sur de Bolivar, Colombia). Despite its specificities, this action-research process contributes to the debate on social and environmental entrepreneurship, social innovation and sustainability transitions in the developing world, linking the field of innovation studies with that of social innovation. The prescription-driven research conducted along this PhD project has been able to formulate field-tested and grounded technological rules to be used as design exemplars of problem solving by both academics and practitioners. Thus, this thesis is a contribution to academic research in management with an emphasis on solution finding (Van Aken, 2004).

According to the findings reported above, I have proved the usefulness and the applicability of the support system designed so far. However, further research is needed in order to assess the ability of this support system to realise the desired situation in relation to other possible support systems[26].

Below I suggest further research avenues that could better inform collaborative experimentation processes between universities and grassroots innovators aiming at fostering more sustainable systems of production and consumption.

First, from a methodological perspective, this research project has evidenced that the application of design research methods facilitates a transdisciplinary approach. Since this approach has been argued to be a key component of sustainability science (Brandt et al., 2013), further research using design science methods is needed. Sustainability science is solution-oriented in the same way design science is. Therefore, developing sustainability experiments that create room for these two to be intertwined would contribute to produce more relevant academic knowledge as well as to more rigorously do 'critical reflections on practice … helping the way in which … practice is represented and communicated' (Mosse, 2005, p. 171).

[26] Design methods aim at finding a set of alternative solutions, rather than a single optimal solution. (See Section 1.3)

Second, despite a few exceptions (Ghosh *et al.*, 2016), little attention has been paid to the role of actors involved in sustainability experiments in the developing world, i.e. change agents that aspire to lead sustainability transitions within settings of informal security or insecurity (Ramos-Mejía et al., 2018).

This PhD dissertation has contributed to fill this gap, by paying attention to ecopreneurs developing business models for sustainability. It has been illustrated how change agency relates to practice, specifically in the creation or maintenance of emerging sustainable fields of practice. This agency-based approach pays attention to the interaction of bottom-up strategies, which may provide a more adequate framework than a strategic management view, in order to support nascent sustainable innovations in developing countries. Table 7.2 compares SNM, which uses a managerial focus, with the 'interaction of bottom-up strategies approach', which uses an agency-based focus (see Section 6.2.3).

Strategic niche management	Strategic Interaction
Shielding	- Inclusion - Information and transparency - Community resources - 'Shielding from within'
Nurturing - Learning - Articulation of expectations - Networking	- Grassroots and 'expert' knowledge interact to build a shared sustainability discourse - Local visions of future prevail - Networking among equals (weakens patron-client relationships)
Empowering	- Stretch and transform - Local voices - Local leadership - Local resources

Table 7.2 Comparison of SNM (managerial focus) with Strategic Interaction (agency-based focus) approach

The left column of Table 7.2 summarises the processes that the SNM approach deliberatively support. In turn, the 'interaction of bottom-up strategies approach' (right column) focuses on bottom-up innovation processes that challenge power imbalance at the grassroots level.

Third, the findings discussed above seem to suggest a strong link between design thinking, empathy development and the way ecopreneurs find alternatives to opportunity exploitation. This link needs further exploration in order to inform entrepreneurship policy and programmes, which aim at empowering ecopreneurs as key actors in the achievement of a more sustainable future.

Fourth, in the case of being an 'engaged scholar', an action researcher and designer of a sustainability experiment, much attention has to be paid to the fact that 'field-work helps

to shape, challenge, reproduce, maintain, reconstruct and represent our selves and the selves of others' (Coffey, 1999, p. 9). The iterative processes of action and reflection that design methods suggest are useful for making explicit these selves, not only at the time of writing (or reporting), but throughout the whole experimentation process.

Finally, the solution-focus approach that I have used in this doctoral research (i.e. prescription-driven research) has contributed to better inform policy makers and practitioners about ways to support grassroots innovators as leaders of sustainability transitions at the local level. The final reference model obtained after the design process constitutes a design exemplar to be used and further tested in practice (see Section 6.3). This thesis suggests that policy and programmes targeting grassroots ecopreneurs should encourage activities that create more strategic interactions as the ones suggested in Table 6.3, in order to create opportunities for ecopreneurs to become change agents by means of practice work. In terms of methods and contents, an interdisciplinary approach that combines sustainability principles, social entrepreneurship rationale and design methodologies, complemented by design thinking methods, promotes a more human, empathic, collaborative, environmentally aware, iterative, experimental way of working, facilitating the creation of business models for sustainability.

7.3 Policy implications

Below I will discuss what I have learned through my doctoral research experience in relation to what supports or hinders grassroots ecopreneurs to become leaders of sustainability transitions in the developing world. These policy suggestions are directed to both NGOs and government agencies supporting ecopreneurial ventures as building blocks of a more inclusive and resource-efficient economy in the developing world.

First, it is important to take into account that ecopreneurs are not found in isolation. Grassroots ecopreneurs live in a specific institutional setting in which they deploy survival strategies. The strategies these ecopreneurs deploy open up spaces to challenge exclusive social relations and environmental degradation patterns. In this way, it is the ecopreneur her/himself who understands such setting and who knows the ways around some of its barriers. Policy, therefore, should be open and flexible enough so that ecopreneurs can adapt it to the setting. In other words, the support given to them implies a resource with which ecopreneurs can strategise in such ways that they challenge poverty-reproduction patterns and environmentally unsustainable practices. The support is a means for grassroots ecopreneurs to strengthen their role at the local level. It is not an end. Support should not try to 'take over' and make local initiatives dependent or even just become showcases for the prestige of politicians or external organisations.

This is a challenge in terms of measuring programme results or success. Programme success is usually linked to percentage of ventures that financially survive in the market. Without doubting that this is indeed a desirable outcome, I would argue that there is much

more than that. Through the process of defining and negotiating the value proposition, the business infrastructure, the customer interface and the financial model, ecopreneurs have the chance to trigger transformations from the bottom-up, even if the venture does not succeed in the market in the end. Surely, the more successful ecopreneurial ventures, the better. However, if ecopreneurs' ventures fail[27], they could still have contributed to raising awareness of ways towards sustainable production-consumption systems. How to measure and evaluate this awareness raising and learning remains an open discussion, in order to promote larger investments in supporting grassroots ecopreneurs.

Second, programmes like PC3 that are based on a co-creation logic need to be open to properly understand and address (and even embrace) the institutionally diverse setting. In the dialogue between practical and scientific knowledges there must be room for interpretation and re-interpretation of local realities as well as diverse socio-technical pathways. This asks from all actors involved constant reflection on the ways the knowledge dialogue takes place throughout the co-creation process. Even though the action research project I have carried out has brought evidence of design methods being helpful for this, other innovative participatory methods could be tried out too.

This practice-theory interaction is better nurtured if a varied sort of actors are engaged throughout the process. It is important that ecopreneurs build a team of locals, who contribute to the venture with different capacities and resources. The ecopreneur shares her/his ideas and beliefs with them, in order to shape the business model. Additionally, it is important to promote dialogue with other actors, such as experts in the field, legal or financial advisors, activists, scholars, in order to enrich ecopreneurs' perspectives and broaden out the portfolio of pathways they may follow.

Another aspect that is worth highlighting is the experimental logic of the co-creation process. This means that programmes targeting ecopreneurs should be flexible enough to undertake unexpected activities (like the TEDxSantaRosadelSur in my case), as long as it is about empowering and creating room for ecopreneurs to try out new technologies and social practices that trigger changes towards sustainability. In this way, these programmes would function as a sort of protection spaces that empower to 'stretch and transform' rather than to 'fit and conform' (Smith & Raven, 2012) (see Section 4.3).

Finally, the case documented in this thesis has brought evidence of the fact that ecopreneurs create value in a wide spectrum of dimensions. This suggests that policy that supports entrepreneurship in general should consider paying more attention to ecopreneurial ventures than to conventional ventures. While the former develops new tools and models to transform markets by re-examining consumption-production patterns and creating new roles of companies in society, the latter develops new models

[27] The literature on entrepreneurship has brought evidence that entrepreneurs fail several times before succeeding with their venture in the market. It would not be surprising, then, that ecopreneurs had to try even more times before finding the right business model.

to react to today's social and environmental pressures in order to reduce unsustainabilities, but without fostering system transformations[28]. Currently, main private and public programmes in Colombia that support entrepreneurial activity focus on job creation, innovation, growth potential, without mentioning any sustainability-related criteria[29]. I do not mean that these are not important, but that these policies overlook the significant impact that ventures in which sustainability is at the heart of the value proposition may have.

[28] Here I follow Andrew Hoffman's ideas presented as keynote titled 'The twin challenges of our field' at the Sustainability, Ethics and Entrepreneurship Conference in Washington DC, March 2018.

[29] See for example the last report of Innpulsa Colombia, the national organisation that promotes innovation, entrepreneurship and enterprise development, as key factors to improve productivity and competitiveness of private sector in Colombia (https://www.innpulsacolombia.com/sites/all/themes/sitetheme/assets/informe_iNNpulsa2017.pdf).

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Annexes

Annex 1. Participants' journeys

Participant 1 (female, 28 years old)
She was finishing her studies on accounting at the Colombian public open university when the training started. Because this university is based on distance learning courses, she was enthusiastic about the virtual learning model we suggested. She had had experience working with communities and was especially interested in developing business that supported rural women, as she considered they were the most vulnerable population in Sur de Bolivar. At the beginning she had the idea that ecotourism would be a good economic activity to achieve this objective. As women in the farm are the ones who cook and look after the plants and animals that are consumed by the family (rather than sold at the market), they could get some income from these daily activities, as long as they were trained to do it in such a way that tourists liked them. However, throughout the process she found it difficult to find some rural women who would become their teammates. On the one hand, they were on the countryside, quite far from the main town. On the other one, the women she contacted were not interested enough in this business idea. Consequently, at the beginning of the second phase of the PC3 programme, she decided to change the business idea she was going to work on. She found two male teammates who were already supporting community-based organisation in administrative and financial terms and became interested in the consultancy firm venture (see Table 5.6).

Participant 2 (male, 33 years old)
He was *raspachín* (coca-leaf collector) in the 1990s. It was hard work and every time more dangerous due to the paramilitary control of coca trafficking in this region. He and his brother decided to join the coffee farmers association in order to become beneficiaries of the national programme for illegal-crop voluntary substitution. Their father had been coffee farmer so they knew how to grow coffee. This experience from his childhood allowed him to get a job as technician at the association. Here, he realised he was good at teaching other people what he knew what to do. Later, the manager post was vacant and he was asked to apply for this job. He thought it was impossible for him to get it because he 'only knew how to grow coffee and drive a motorbike' (I_041115). However, he applied and the job was given to him. At that moment he realised he could always learn new things as well as develop new skills he never thought of, such as giving a speech in front of hundreds of people. So PC3 meant to him an opportunity to learn something new, which he thought could benefit the families he represented. He went through the whole PC3 process, improving the business model to sell high quality parchment coffee. After finishing, he registered at the Colombian open university to finish the three school years he had missed before, because he had left school to work as *raspachín*.

Participant 3 (male, 49 years old)
He grew up in a relatively wealthy family, because they owned several gold mines. However, when paramilitary groups arrived in Sur de Bolivar he had to run away. After several years of 'exile', he managed to come back. His idea was to resume the gold mining activity. However, at his return, when he visited his family's land he realised how magnificent nature was (I_080415). He changed his mind and decided to create a conservation trust together with 20 neighbouring families. At the introductory workshop he thought it was an opportunity for exploring innovative business ideas for those families who decided to join his conservation effort despite any economic benefit of doing so. He joined the PC3 programme with some of these families as teammates. Throughout the programme they explored ways in which they could strengthen an existing business of high-quality roasted coffee, bringing benefits for conservationist families.

Participant 4 (male, 46 years old)
35 years ago his family arrived in Sur de Bolivar, where they bought a piece of land. As a teenager, he joined activist groups claiming for peace and equality. In the 1990s his family had no choice but to cultivate coca and towards the end of that decade he had to leave the region. Several years later he convinced his family to join the programme for illegal-crop voluntary substitution. They joined the cacao farmers organisation and he managed to come back to the region. At some point they became beneficiaries of a cattle ranging programme in which they were given a solar panel, a battery and a transformer, in order to set electric fences. However, the equipment was not installed so he had to learn himself how to do the installation. In this process he met a technician who knew about solar energy and together decided to become partners to set up a shop in Santa Rosa del Sur to sell the solar energy equipment. This partnership failed, but he continued with his idea. Later he led a small project to set up a solar energy system for a community-based organisation in San Pablo, in alliance with a private company from Medellin, funded by USAID. The success of this project encouraged him to find new partners for the solar energy equipment shop. This new partner and the leader of the CBO in San Pablo became then his teammates throughout the PC3 process.

Participant 5 (female, 26 years old)
She was born in Santa Rosa. At school she was an environmental activist. She joined the PC3 programme because she was interested in learning about environmental ventures. She dropped the programme very soon, because she became the election campaign manager of a candidate to be the municipal mayor. The elections took place in October 2015, but the candidate she had worked for did not win. She then registered at the open university for distance courses on environmental management.

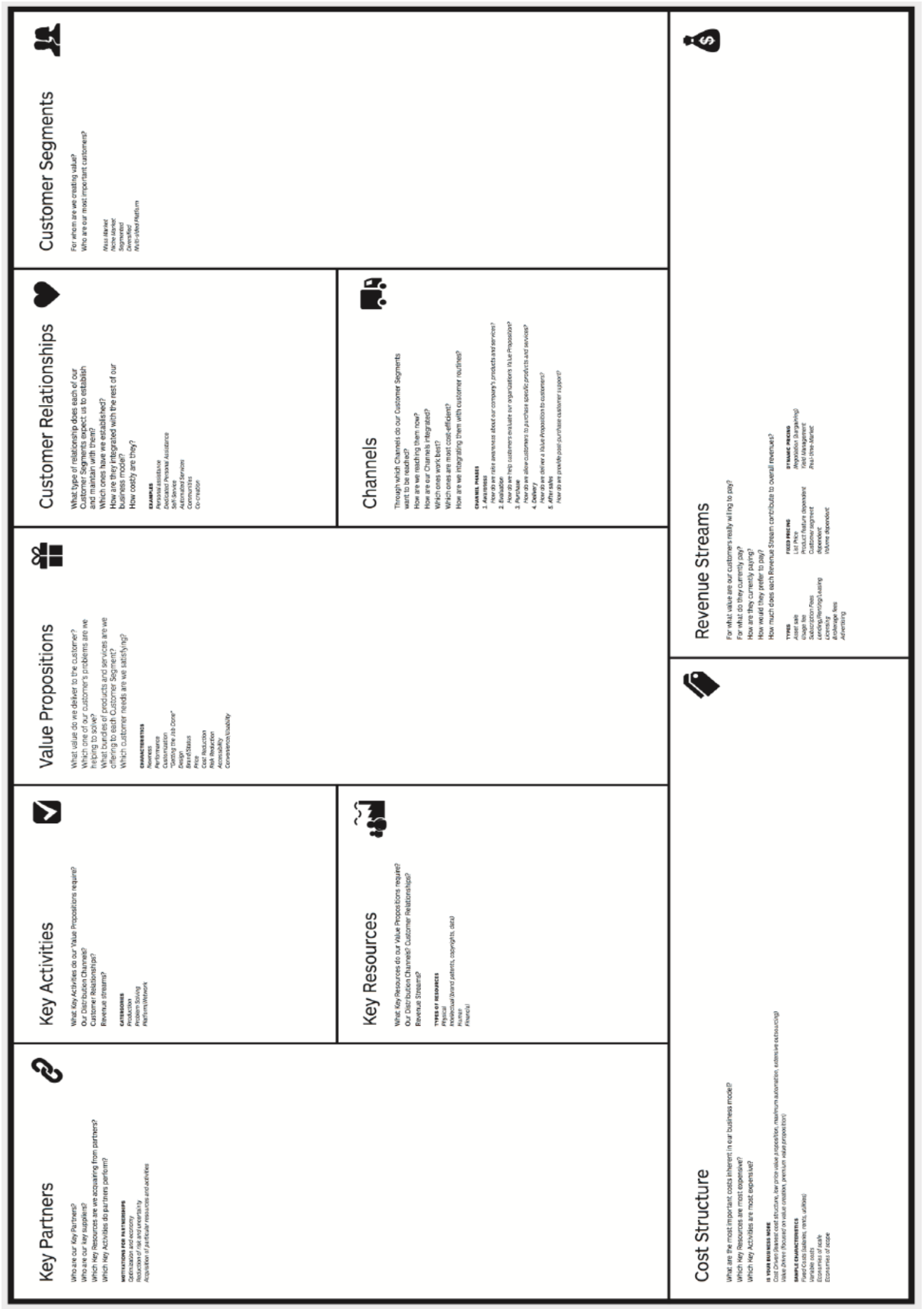
Participant 6 (female, 28 years old)
She arrived in Santa Rosa del Sur after the coca boom, when many development projects based on illegal-crop substitution were taken place (around 2010). She came from the most productive cacao region in Colombia. She was hired by the cacao farmers association as a technician to support them on certification processes (Rain Forest Alliance, first and UTZ later). She joined the PC3 programme because she was interested in developing sustainable agribusinesses (mushrooms, chicken) with cacao farmers. She attended the first phase of the PC3 training, but then she decided not to continue because she was offered another job in another region.

Participant 7 (male, 36 years old)
Without being a community leader himself, he had been the right-hand man of a community leader who was killed by the paramilitary group. As in the case of participant 5, he dropped the programme very soon to actively participate in the municipal election campaign. As his candidate was not elected, he resumed his job at the cacao farmers association.

Participant 8, 9 and 10 (males, 46, 34 and 33 years old)
The case of these three participants is very similar, so is their journey. They all were managers of community-based organisations when the PC3 programme started. They had led their organisations through the crop substitution process and played an important role during the implementation of 'peace and development programmes'[30]. Even though they found PC3 very useful for their jobs, they did not manage to attend all skype sessions, because they were frequently lobbying in Cartagena (the capital city of the province of Bolivar) or in Bogota (Colombian capital city). However, they kept their interest throughout the process. When they were indeed in Santa Rosa, they used to pass by the office where the participants gathered for the skype session, in order to get updated on what they were doing. Also, they joined all on-site workshops that took place in Santa Rosa. They used to comment and contribute to the work done by each of the participants, emphasising the importance of community development and autonomy. Their role became a sort of motivator of the PC3 process. They were present at the graduation ceremony (April 27th, 2016) where they explicitly mentioned they much regretted not having been able to carry on the whole process themselves.

[30] See https://www.programadesarrolloparalapaz.org/el-pdp/historia.

Annex 2. The Business Model Canvas



(Taken from Strategyzer.com)

Annex 3. Participation Agreement

PRODUCT CO-CREATION CENTRE PARTICIPATION AGREEMENT

The parties

Product Co-creation Centre of University of Twente, hereinafter referred to as “the Centre”

and

_____ ___, born the _____, address _____ ___, hereinafter referred to as “Participant”

agree

1. Carry out the training and the facilitation processes for sustainable business development.
2. Researchers and students from the Centre and participants will collaborate through action-research and result dissemination processes.
3. The participant shall provide all necessary information and participate in any activity that allows data collection.
4. Data provided by any participant will be treated as confidential and will not be disclosed to third parties.
5. The participant shall be committed to actively participate during both the whole training process and the whole facilitation process.
6. The participant is expected to have ambition to develop sustainable businesses which benefit the communities and the environment.
7. The Participant is expected to choose a business idea, define the business

ACUERDO DE PARTICIPACIÓN DEL CENTRO DE CO-CREACIÓN DE PRODUCTOS

Las partes

Centro de Co-creación de Productos de la Universidad de Twente, en adelante “el Centro”

y

_____ ___, nacido el _____, con domicilio en _____, en adelante “el participante”

acuerdan

1. Llevar a cabo los procesos de entrenamiento y facilitación para la creación y desarrollo de negocios sostenibles.
2. Los investigadores y estudiantes del Centro y los participantes colaborarán a través de investigación-acción y de procesos de difusión de resultados.
3. El participante proveerá toda la información requerida y participará en toda actividad que permita recolección de información.
4. La información suministrada por cualquier participante será considerada confidencial y no podrá ser compartida con terceras partes.
5. El participante se compromete a participar activamente durante la totalidad del proceso de entrenamiento y del proceso de facilitación.
6. Se espera que el participante tenga la ambición de desarrollar negocios sostenibles que beneficien las comunidades y el medio ambiente.
7. Se espera que el participante seleccione una idea de negocio, defina el modelo

model, develop a business plan if necessary and to start its company or new business activity.

8. The Participant will focus on building a multidisciplinary entrepreneurial team for which they intend to attract additional team members in order to bring together all competences needed for the business development.

9. The participant will receive a certificate from the Centre after successfully completing the whole programme.

10. Neither the Centre nor the participant will contribute with money to carrying out the training and the facilitation processes for sustainable business development.

11. The participant will be available for research purposes for at least three more years after the signature date of this agreement.

In accordance with the above and agreed, in the exercise of the powers they hold the undersigned, have signed this Agreement in duplicate at the place and date indicated

de negocio, desarrolle el plan de negocios si es necesario y dé inicio a la empresa o línea de negocio.

8. El participante se enfocará en construir un equipo multidisciplinario emprendedor, para lo que atraerá personas adicionales al equipo con el fin de completar todas las competencias requeridas para el desarrollo del negocio.

9. El participante recibirá un certificado de parte del Centro después de haber culminado exitosamente todo el programa.

10. Ni el Centro ni el participante contribuirán con dinero para llevar a cabo los procesos de entrenamiento y facilitación para la creación y desarrollo de negocios sostenibles.

11. El participante estará disponible para propósitos de investigación por lo menos tres años más después de la firma de este acuerdo.

De conformidad con todo lo expuesto y acordado, en el ejercicio de las atribuciones de que son titulares los firmantes, suscriben por duplicado el presente Acuerdo en el lugar y fecha indicados.

_____

PRODUCT CO-CREATION CENTRE
University of Twente
Drienerlolaan 5
7522 NB
ENSCHEDE
The Netherlands

_____

NOMBRE
DIRECCIÓN

ACKNOWLEDGMENT OF RECEIPT AND ACCEPTANCE

UNIVERSITY OF TWENTE

SIGNATURE	
NAME	
TITLE	
DATE	

ACUSE DE RECIBIDO Y ACEPTACION

PARTICIPANTE

FIRMA	
NOMBRE	
CARGO	
FECHA	

Annex 4. Participants' profile form

FICHA DEL PARTICIPANTE

NOMBRE: _____

LUGAR Y FECHA DE NACIMIENTO: _____

DOCUMENTO DE IDENTIDAD: _____

SEXO: Femenino _____ Masculino ____

NIVEL DE ESCOLARIDAD: Primaria ___ Secundaria ___ Técnica ___ Universitaria ___

¿HA TENIDO O TIENE SU PROPIO NEGOCIO? Si _____ No _____

¿HA TENIDO ALGÚN NEGOCIO NO EXITOSO? Si _____ No _____

SE CONSIDERA: Innovador _____ Creativo _____ Capaz de cambiar su entorno _____

Emprendedor _____ Persona de negocios _____ Animador social _____

Pionero ___ Visionario ____ Gestor ____ Líder ____ Luchador ____

¿CUÁL ES SU PRINCIPAL SUEÑO O AMBICIÓN?

_____
_____
_____

DATOS DE CONTACTO:

CORREO ELECTRÓNICO _____
TELÉFONO/CELULAR _____
SKYPE _____
FACEBOOK _____
LINKED IN _____
TWITTER _____

Annex 5. Evolution of business model canvases

October 2015

	Café pergamino de alta calidad	**Café tostado**	**Energía solar para las áreas rurales**	**Ecoturismo**
Propuesta de valor	Café especial Producción limpia y amor por la conservación de la Serranía de San Lucas	Empresa ejemplar Producción limpia Precio justo Asesorías para las tiendas	Mejoramiento calidad de vida Mejor educación en escuelas Mayor productividad ganadera gracias a cercas eléctricas	Contacto con la naturaleza Aromáticas libres de químicos Flores
Segmentos de cliente	Empresas comercializadoras de microlotes de café especial de alta calidad	Tiendas de café	Comunidades, alcaldías, asociaciones de productores	Empresas Personas con consciencia ambiental y amor por la naturaleza
Canales	Ferias de café especial	Visitas a tiendas de café locales	Presentar proyectos	Redes sociales Visitas institucionales
Relaciones con clientes	Seriedad Cumplimiento Honestidad	Interacción directa Sentido de pertenencia	Comunicación por teléfono Visitas	Inscripción Correo electrónico
Fuentes de ingresos	Precio premium del café	Capital privado Venta del café	Recursos públicos (FAZNI y administraciones locales) y aporte de los beneficiarios	Boleta de entrada
Recursos claves	Certificaciones Personal técnico	Equipo tecnificado Personal calificado	Personal técnico calificado Recursos públicos	La granja Personal capacitado
Actividades claves	Capacitación en producción de café especial Comercialización	Producción café tostado Distribución Publicidad	Presentar proyectos Difundir experiencias exitosas	Organizar lo que se quiere ofrecer
Socios claves	Productores Gobierno local	Productores de café	Administraciones municipales Empresa proveedora de equipos Campesinos	
Estructura de costos	Certificación Asistencia técnica Adecuación fincas	Proceso de tostado del café	Elaboración de los proyectos	

February 2016

	Café pergamino de alta calidad	Café tostado	Energía solar para las áreas rurales	Firma de consultoría
Propuesta de valor	Café de alta calidad amigable con el medio ambiente, con propiedades organolépticas especiales por microclima, cosechado por pequeños productores. Certificado Fairtrade	Café de alta pureza de la región	Sistemas de energía solar (kits integrales) montados por las comunidades organizadas	Administración operativa y logística de grandes proyectos de cooperación
Segmentos de cliente	Paladares exquisitos	Tiendas de café de la región	Comunidades, alcaldías, asociaciones de productores	Comunidad no organizada
Canales		Visitas a tiendas de café locales	Presentar proyectos Participar en eventos comunitarios	Contacto directo
Relaciones con clientes	Seriedad, cumplimiento, disponibilidad Alianzas Relación directa con el productor	Interacción directa Emisoras locales	Visitas a alcaldías Acompañamiento procesos comunitarios de base	Confianza Relaciones directas con los clientes
Fuentes de ingresos	Precio premium del café	Capital privado Venta del café	Recursos públicos (FAZNI y administraciones locales) y aporte de los beneficiarios	Ventas
Recursos claves	Certificaciones		Personal técnico calificado Personal experto en elaboración de proyectos	Capital de inversión Personal capacitado
Actividades claves	Capacitación en producción de café especial Participación en ferias internacionales	Producción café tostado	Excelentes relaciones con alcaldías y movimientos sociales Difundir experiencias exitosas	Logística Comunicación interna
Socios claves	Productores Gobierno local Compañías comercializadoras		Administraciones municipales Empresa proveedora de equipos Asociaciones de productores	Proveedores Colaboradores

	Café pergamino de alta calidad	Café tostado	Energía solar para las áreas rurales	Firma de consultoría
Estructura de costos			Elaboración de los proyectos Gestión comunitaria Lobby	

April 2016

	Café pergamino de alta calidad	Café tostado	Energía solar para las áreas rurales	Firma de consultoría
Propuesta de valor	Café de alta calidad amigable con el medio ambiente, con propiedades organolépticas especiales por microclima, cosechado por pequeños productores. Certificado Fairtrade	Café de alta pureza de la región	Sistemas de energía solar (kits integrales) montados por las comunidades organizadas. Hidrosolar es el puente entre las asociaciones comunitarias y el contratista técnico	Administración operativa y logística de grandes proyectos de cooperación
Segmentos de cliente	Paladares exquisitos	Tiendas de café de la región Autoservicios Personas individuales	Comunidades, alcaldías, asociaciones de productores	Comunidad no organizada
Canales		Visitas directas Emisoras locales	Presentar proyectos Participar en eventos comunitarios	Contacto directo
Relaciones con clientes	Seriedad, cumplimiento, disponibilidad Alianzas Relación directa con el productor	Interacción directa Fidelización	Visitas a alcaldías Acompañamiento procesos comunitarios de base	Confianza Relaciones directas con los clientes
Fuentes de ingresos	Precio premium del café	Capital privado Venta del café	Recursos públicos (FAZNI y administraciones locales) y aporte de los beneficiarios	Ventas
Recursos claves	Certificaciones	Equipos	Personal técnico calificado Personal experto en elaboración de proyectos	Capital de inversión Personal capacitado
Actividades claves	Capacitación en producción de café especial Participación en ferias internacionales	Producción café tostado	Excelentes relaciones con alcaldías y movimientos sociales Difundir	Logística Comunicación interna

	Café pergamino de alta calidad	**Café tostado**	**Energía solar para las áreas rurales**	**Firma de consultoría**
			experiencias exitosas	
Socios claves	Productores Gobierno local Compañías comercializadoras	Productores Gobierno local Supermercados	Administraciones municipales Empresa proveedora de equipos Asociaciones de productores	Proveedores locales Colaboradores
Estructura de costos		Costos fijos Costos variables	Elaboración de los proyectos Gestión comunitaria Lobby	

Summary

This document presents and discusses an action research process that took place from October 2014 until October 2016. During these two years the author led a socio-technical experiment that consisted of designing and implementing a Product Co-creation Centre (PC3) in Santa Rosa del Sur, a small town in rural Colombia, where great sustainability challenges are found. It is a region characterised by long lasting violence and migration. Main economic activities include coca plantation and gold mining in river banks, which bring about environmental degradation and biodiversity loss because of large deforestation and heavy-chemical pollution. Additionally, these economic activities have social consequences such as informal jobs, violence and short-term mentality. However, within this context, there are some community leaders who stand out because of their alternative ideas about the socio-economic future of this region. These leaders have promoted innovative ventures based on environmental awareness and community development.

These leaders are understood here as *grassroots ecopreneurs*, who contribute to the green economy on the ground, because they bring about inclusive and resource-efficient technological innovations and promote more inclusive mechanisms to deliver products and services (Creech et al., 2014; Hall, Daneke, & Lenox, 2010; Pansera & Sarkar, 2016; York & Venkataraman, 2010). They are also considered social innovators, because they promote more sustainable practices that embrace change in social relations in order to solve relevant problems that critically affect humanity (Alvord, Brown, & Letts, 2004; Pacheco, Dean, & Payne, 2010).

Ten grassroots ecopreneurs have been involved in this research project. They represent a core network that promotes a more equitable and environmentally friendly economic development in the region. This network has a broad geographical scope, covering 18 municipalities from three different administrative provinces, in an area of around 11700 Km^2.

As a socio-technical experiment (Sengers et al, 2016), this research project consisted of introducing a support system into a real-life setting, in order to purposively re-shape social and material realities. In order to do so, design research methodologies have been used.

Design research methodologies are rarely used in social science research, given the explanatory nature of such research. However, it has been argued that prescription-driven research, based on the paradigm of design sciences, can contribute to finding solutions to problems social scientist care about (Van Aken, 2004). As sustainability science is a problem-driven solution-oriented field (Lang et al., 2012), design

methodologies offer a suitable complement for research purposes. This research process highlights the insider's perspective rather than the observer's on the problem-solving process. Therefore, prescription-driven research is highly participatory, in the same way action research is (Reason & Bradbury, 2008). Here, the researcher is the designer, co-creating with all stakeholders involved. Research in itself becomes a design process. Specifically, I have used the Design Research Methodology (DRM) which has been developed to guide solution-oriented research in a structured and rigorous way (Blessing & Chakrabarti, 2009).

Throughout the research process I have played the role of both practitioner and researcher. Therefore, the reader will find a continuous dialogue between practice and theory. In terms of practice, on the one hand, the research objective was to design a support system for grassroots innovators interested in developing feasible business models that contribute to sustainable development on the ground. On the other hand, in terms of theory, the research objective was to understand the ways in which PC3 contributes to transitions to sustainability at the grassroots level.

In order to achieve both interdependent objectives, five specific research questions have been explored. These questions are: (1) What are the characteristics of a transformative learning model that contributes to promoting sustainable innovation?; (2) How do ecopreneurs create novel business models for sustainability?; (3) What are the characteristics of such business models?; (4) What are the characteristics of a model of collaboration and participation between university and grassroots ecopreneurs in a real-life setting?; and (5) In which ways does this model trigger system transformations in such setting?

The findings from this doctoral research project suggest that, first, a transformative learning model that contributes to promoting sustainable innovation could be based on experiential learning, following a cycle of confrontation, observation, practice and application of contents related to product design, entrepreneurship and sustainability science. This cycle creates room for collaboration between university and grassroots ecopreneurs in a real-life setting, creating an iterative, solution-driven, dialogue between the two. In this cycle university facilitates confrontation and observation processes while grassroots ecopreneurs bring about new ideas and solutions by practice and application. The results from these processes get fine-tuned at every iteration of the cycle. This is an innovative training model for sustainable development, because it is interdisciplinary and builds on real-life experience and sustainability challenges of grassroots innovators. Additionally, it makes room for testing alternative economic paradigms on the ground, where ecopreneurs' rationale can shift from linear towards more iterative and cyclical approaches.

Second, that ecopreneurs find alternative framings and solutions to create social, environmental and economic value through the value proposition, the business

infrastructure, the customer interface and the financial model. Additionally, along the process of negotiating and defining the business model, ecopreneurs act as change agents, actively engaging in practice work. This illustrates how change agency relates to practice, specifically in the creation or maintenance of emerging sustainable fields of practice. An agency-based approach like the one I have developed, pays attention to the interaction of bottom-up strategies, which may provide a more adequate framework than a strategic management view (Kemp et al, 1998), in order to support nascent sustainable innovations in developing countries.

Third, socio-technical experiments such as PC3, create room for grassroots ecopreneurs to deploy change-making strategies, by creating a scenario in which grassroots ecopreneurs act as social innovators. In this way, they are enabled to build the foundations of more sustainable production-consumption systems from the bottom-up.

And fourth, a model of collaboration and participation between university and grassroots ecopreneurs that could trigger system transformations refers to an 'engaged scholarship' characterised by voluntary participation and commitment, openness to new knowledge and to trying out unconventional ideas, disposition to learn via action and reflection, and commitment to the process rather than to the expected outcomes, caring for the means rather than for the end.

The findings just mentioned above, have policy implications for both NGOs and government agencies supporting ecopreneurial ventures as building blocks of a more inclusive and resource-efficient economy in the developing world. These implications relate to taking into account the institutional characteristics of the entrepreneurial setting, by being open and flexible enough so that ecopreneurs can 'use' the support that is given to them as a resource with which they can strategise in such ways that they challenge poverty-reproduction patterns and environmentally unsustainable practices.

Support models based on a co-creation logic need to be open to properly understand and address (and even embrace) the institutionally diverse setting. In the dialogue between practical and scientific knowledges there must be room for interpretation and re-interpretation of local realities as well as diverse socio-technical pathways. This asks from all actors involved constant reflection on the ways the knowledge dialogue takes place throughout the co-creation process.

Another implication for practice refers to the fact that entrepreneurial programmes usually target single individuals. My findings suggest that it is important that ecopreneurs build a team of locals, who contribute to the venture with different capacities and resources. The ecopreneur shares her/his ideas and beliefs with them, in order to collaboratively shape the business model.

Finally, policy that supports entrepreneurship should consider paying more attention to ecopreneurial ventures than to conventional commercial ventures. While the former develop new tools and models to transform markets by re-examining consumption-production patterns and creating new roles of companies in society, the latter develops new models to react to today's social and environmental pressures in order to reduce unsustainabilities, but without fostering system transformations. In the specific case of Colombia, currently main private and public programmes that support entrepreneurial activity focus on job creation, innovation and growth potential, without mentioning any sustainability-related criteria. Without implying that these criteria are not important, these policies overlook the significant impact that ventures in which sustainability is at the heart of the value proposition may have.

Resumen

Este documento presenta y discute un proceso de investigación-acción que se llevó a cabo entre octubre de 2014 y octubre de 2016. Durante estos dos años, la autora lideró un experimento socio-técnico que consistió en diseñar e implementar un Centro de Co-creación de Productos (C3P) en Santa Rosa del Sur, un pueblo en la Colombia rural, donde existen grandes retos de sostenibilidad. Esta región se caracteriza por largos procesos de violencia y migración; allí las principales actividades económicas incluyen cultivo de coca y minería de oro, lo que genera degradación ambiental y pérdida de biodiversidad, debido a la extensa deforestación y a la contaminación por metales pesados. Así mismo, estas actividades económicas traen consecuencias sociales negativas, tales como empleo informal, violencia y mentalidad cortoplacista. Sin embargo, en este contexto algunos líderes comunitarios se destacan por sus ideas alternativas sobre el futuro socioeconómico de la región, debido a que ellos han promovido iniciativas económicas que se basan en ambiental y el desarrollo comunitario.

Estos líderes son entendidos en esta tesis como "eco-emprendedores de base", quienes contribuyen a la Economía Verde en lo local, porque desarrollan innovaciones tecnológicas inclusivas y eco-eficientes, así como promueven mecanismos inclusivos de suministro de productos y servicios (Creech et al., 2014; Hall et al., 2010; Pansera & Sarkar, 2016; York & Venkataraman, 2010). Ellos son considerados también "innovadores sociales", porque promueven prácticas sociales que acogen cambios en las relaciones sociales con el fin de solucionar aquellos problemas relevantes que afectan a la humanidad críticamente (Alvord et al., 2004; Pacheco, et al., 2010).

Diez eco-emprendedores de base participaron en este proyecto de investigación doctoral. Ellos representan el núcleo de una red que promueve un desarrollo económico más equitativo y ambientalmente amigable en esta región. Esta red tiene influencia en 18 municipios de tres departamentos administrativos diferentes, con una cobertura geográfica de cerca de 11700 Km^2.

Como experimento socio-técnico (Sengers et al., 2016), este proyecto de investigación consistió en la introducción de un "sistema soporte" en un escenario real, con el fin de reconfigurar, intencionalmente, las realidades sociales y materiales. Para tal fin, a lo largo de esta investigación se usaron metodologías de investigación del Diseño.

Las metodologías de investigación del Diseño raramente se usan en la investigación de las ciencias sociales, pues estas últimas son de carácter explicativo, a diferencia del Diseño, que tiene carácter prescriptivo. Sin embargo, se ha argumentado que la investigación de carácter prescriptivo, basada en el paradigma de las ciencias del diseño, puede contribuir a encontrar soluciones a los problemas de los que se ocupan los científicos sociales (Van Aken, 2004). Debido a que la sostenibilidad como ciencia es un campo motivado por problemas y orientado a las soluciones (Lang et al., 2012), las metodologías del Diseño

ofrecen un complemento adecuado para estos propósitos de investigación. El proceso de investigación orientado a la solución subraya las perspectivas de los actores internos, en vez de las de los observadores externos, haciéndolo altamente participativo, al igual que la investigación-acción (Reason & Bradbury, 2008). Aquí, el investigador es el diseñador, co-creando con todos los grupos de interés involucrados. Este proceso de investigación es un proceso de diseño en sí mismo. Específicamente, en esta investigación doctoral he utilizado la Metodología de Investigación de Diseño (MID), la cual ha sido desarrollada para guiar investigaciones que son orientadas a la solución, de manera estructurada y rigurosa (Blessing & Chakrabarti, 2009).

A lo largo de esta investigación la autora ha asumido el papel de *practitioner* y de investigadora, por lo que el lector encontrará en este documento un diálogo constante entre práctica y teoría. Por un lado, en términos de la práctica, el objetivo de investigación era diseñar un "sistema soporte" para innovadores de base interesados en desarrollar modelos de negocio viables, que contribuyeran al desarrollo sostenible en lo local. Por el otro lado, en términos teóricos, el objetivo de investigación era comprender de qué maneras el C3P contribuye a las transiciones hacia la sostenibilidad desde la base.

Con el fin de alcanzar estos objetivos interdependientes, cinco preguntas de investigación específicas fueron exploradas. Estas preguntas son: 1. ¿Cuáles son las características de un modelo de aprendizaje transformador que contribuya a la promoción de la innovación para la sostenibilidad?, 2. ¿Cómo los eco-emprendedores crean nuevos modelos de negocio para la sostenibilidad?, 3. ¿Cuáles son las características de estos modelos de negocio?, 4. ¿Cuáles son las características de un modelo de colaboración entre la universidad y los eco-emprendedores de base en un escenario real? y 5. ¿De qué manera este modelo gatilla transformaciones sistémicas en dicho escenario?

Los resultados de esta investigación doctoral sugieren que, primero, un modelo de aprendizaje transformador que contribuya a la promoción de la innovación para la sostenibilidad puede basarse en la educación experiencial, siguiendo un ciclo de confrontación, observación, práctica y aplicación de contenidos relacionados con diseño de producto, emprendimiento y sostenibilidad. Este ciclo genera espacios de colaboración entre la universidad y los eco-emprendedores en un escenario real, creando un diálogo entre ambos, de carácter iterativo y orientado a la solución. En este ciclo, la universidad facilita los momentos de confrontación y observación, mientras que los eco-emprendedores de base traen nuevas ideas y soluciones mediante la práctica y la aplicación. Los resultados de este proceso se van afinando con cada iteración del ciclo. Este modelo de aprendizaje es novedoso en el área del desarrollo sostenible, porque es interdisciplinario y se construye con base en las experiencias reales y los retos de sostenibilidad que estos eco-emprendedores enfrentan diariamente en lo local. Adicionalmente, este modelo abre espacios para probar paradigmas económicos alternativos en lo local, donde la racionalidad deja de ser lineal, para convertirse en una más iterativa y cíclica.

Segundo, los resultados de esta investigación doctoral también sugieren que los eco-emprendedores de base encuentran marcos y soluciones alternativas que crean valor social, ambiental y económico, a través de la propuesta de valor, la infraestructura del negocio, la interfaz con el cliente y el modelo financiero. Adicionalmente, mediante el proceso de negociar y estructurar el modelo de negocio, los eco-emprendedores de base actúan como agentes de cambio, a través de "trabajar la práctica" activamente. Este proceso ilustra cómo la agencia de cambio se relaciona con la práctica, específicamente en la creación y el mantenimiento de campos de práctica sostenible emergentes. Un enfoque basado en la agencia, como el que se ha desarrollado en esta investigación, hace énfasis en las estrategias que vienen desde la base, enfoque que puede ser de mayor utilidad que el de gestión estratégica de nichos (Kemp et al., 1998), con el fin de apoyar innovaciones para la sostenibilidad nacientes en países en desarrollo.

Tercero, experimentos socio-técnicos como el C3P abren oportunidades para que los eco-emprendedores de base desplieguen estrategias de generación de cambio, a través de la creación de un escenario en el que estos emprendedores pueden actuar como innovadores sociales. Así, son habilitados para construir las bases de sistemas de producción y consumo más sostenibles, desde la base.

Y cuarto, un modelo de participación y colaboración entre la universidad y los eco-emprendedores de base que pueda gatillar transformaciones sistémicas en un escenario real se refiere a un modelo de "academia comprometida", caracterizado por participación voluntaria y compromiso, apertura a nuevo conocimiento y a la experimentación con ideas no convencionales, disposición a aprender mediante la acción y la reflexión y compromiso con el proceso, en vez de con los resultados esperados, cuidando los medios, en vez de los fines.

Los resultados mencionados anteriormente tienen implicaciones de política, tanto para agencias gubernamentales como para organizaciones no gubernamentales que apoyan iniciativas eco-emprendedoras como ladrillos de una economía más inclusiva y eco-eficiente en el mundo en desarrollo. Estas implicaciones se refieren a que es importante tener en cuenta las características institucionales del escenario de emprendimiento, siendo lo suficientemente abierto y flexible para que los eco-emprendedores puedan "usar" el apoyo que se les da como un recurso estratégico para debilitar patrones de reproducción y pobreza, así como prácticas ambientalmente insostenibles, en lo local.

Aquellos modelos de apoyo a eco-emprendedores de base que se basan en lógicas de co-creación deben ser abiertos para ser capaces de entender (y acoger) la diversidad institucional de los escenarios de emprendimiento. En el diálogo entre conocimientos prácticos y científicos debe haber espacio para interpretar y reinterpretar las realidades locales, así como los diversos caminos socio-técnicos. Esto implica que todos los actores

involucrados deben reflexionar constantemente sobre las formas como el diálogo de conocimientos ocurre a través del proceso de co-creación.

Otra implicación para la práctica se refiere a que usualmente estos programas se dirigen al emprendedor, de manera individual. Los resultados de esta investigación sugieren que es importante que los eco-emprendedores de base construyan equipos locales, con personas que pueden contribuir a la iniciativa con distintas capacidades y recursos (locales). De esta manera, el (la) eco-emprendedor(a) comparte sus ideas y creencias con ellos, con el fin de darle forma al modelo de negocio colaborativamente.

Finalmente, las políticas y programas que apoyan el emprendimiento deberían hacer más énfasis en las iniciativas eco-emprendedoras, que en las comerciales. Mientras que las primeras desarrollan herramientas y modelos nuevos para transformar los mercados a través de reexaminar los patrones de producción y consumo y de crear nuevos papeles para las empresas en la sociedad, las últimas reaccionan a las presiones sociales y ambientales de hoy, con el fin de reducir las "insostenibilidades", pero sin buscar transformaciones sistémicas. En el caso colombiano específicamente, los programas públicos y privados que existen actualmente se enfocan en el potencial de las iniciativas emprendedoras para generar empleo, innovar y crecer económicamente, sin tener en cuenta variables de desempeño relacionadas con la sostenibilidad. Sin implicar que estos criterios no son relevantes, estos programas están pasando por alto el impacto significativo que podrían tener los emprendimientos en los que la sostenibilidad está en el centro de la propuesta de valor.

Samenvatting

Dit proefschrift presenteert en bespreekt een proces van actieonderzoek dat plaats vond van oktober 2014 tot oktober 2016. Gedurende deze twee jaren heeft de auteur een socio-technisch experiment geleid dat bestond uit het ontwerpen en toepassen van een Product Co-creation Centre (PC3) in Santa Rosa del Sur, een kleine stad op het platteland van Colombia, waar grote duurzaamheidsproblemen bestaan. Het is een regio die wordt gekenmerkt door langdurig geweld en migratie. De belangrijkste economische activiteiten omvatten cocaplantages en goudwinning aan de rivieroevers, die milieuverslechtering en verlies aan biodiversiteit ten gevolge hebben door grootschalige ontbossing en zware chemische verontreiniging. Bovendien hebben deze economische activiteiten sociale gevolgen zoals informeel werk, geweld en een korte termijn oriëntatie. Echter, onder deze omstandigheden zijn er toch sommige leiders in de gemeenschap, die opvallen doordat ze alternatieve ideeën hebben over de sociaaleconomische toekomst van deze regio. Deze leiders hebben innovatieve ondernemingen opgezet die gebaseerd zijn op milieubewustheid en gemeenschapsontwikkeling.

Zulke leiders worden hier beschouwd als "grassroots ecopreneurs", die bijdragen aan een groene economie vanaf de basis, omdat ze inclusieve en hulpbronefficiënte technologische innovaties teweegbrengen en meer inclusieve mechanismen doen ontstaan om producten en diensten aan te bieden (Creech et al., 2014; Hall, Daneke, & Lenox, 2010; Pansera & Sarkar, 2016; York & Venkataraman, 2010). Ze worden ook beschouwd als maatschappelijke vernieuwers, omdat ze meer duurzame praktijken stimuleren die veranderingen in sociale relaties omvatten om problemen op te lossen die uiteindelijk de mensheid kunnen bedreigen (Alvord, Brown, & Letts, 2004; Pacheco, Dean, & Payne, 2010).

Tien van zulke grassroots ecopreneurs zijn betrokken geweest bij dit onderzoeksproject. Zij vertegenwoordigen een kernnetwerk in de regio dat een meer gelijke en milieuvriendelijke ontwikkeling in de regio bevordert. Dit netwerk heeft een grote geografische omvang en omvat 18 gemeenten uit drie verschillende administratieve provincies in een gebied van ongeveer 11.700 km^2.

Als socio-technisch experiment (Sengers et al, 2016), bestond dit onderzoeksproject uit het introduceren van een ondersteuningssysteem in een real-life setting, om doelbewust sociale en materiële omstandigheden te veranderen. Om dit te kunnen doen zijn de methodologieën van "ontwerpend onderzoek" gebruikt.

De methodologieën van ontwerpend onderzoek worden niet vaak gebruikt in sociaalwetenschappelijk onderzoek, gegeven de verklarende aard van zulk onderzoek. Echter, het is wel beweerd dat aanbevelingsgericht onderzoek, gebaseerd op het paradigma van ontwerpende wetenschap, kan bijdragen aan het vinden van oplossingen

voor problemen die voor sociale wetenschappers belangrijk zijn (Van Aken, 2004). Omdat duurzaamheidswetenschap een probleemgedreven en oplossingsgericht veld is (Lang et al., 2012), bieden ontwerpmethodologieën een geschikte aanvulling voor onderzoeksdoeleinden. Zulk onderzoeksproces benadrukt het insidersperspectief op het probleemoplossingsproces meer dan het beschouwersperspectief. Hierbij is de onderzoeker ook de ontwerper, die met alle belanghebbenden samen de oplossingen schept. Het onderzoek zelf wordt een ontwerpproces. Meer specifiek heb ik de Design Research Methodology (DRM) gebruikt, die is ontwikkeld om oplossingsgericht onderzoek te begeleiden op een gestructureerde en strikte wijze (Blessing & Chakrabarti, 2009).

Gedurende het onderzoeksproces heb ik de rollen van praktijkvrouw en onderzoekster gecombineerd. Daarom zal de lezer een voortdurende dialoog vinden tussen praktijk en theorie. In termen van de praktijk, aan de ene kant, was het onderzoeksdoel om een ondersteuningssysteem te ontwerpen voor 'grassroots innovators', die geïnteresseerd zijn in het ontwikkelen van haalbare bedrijfsmodellen die bijdragen aan duurzame ontwikkeling aan de basis. Aan de andere kant, in termen van theorie, was het onderzoeksdoel om de manieren te begrijpen waarop PC3 bijdraagt aan transities naar duurzaamheid op het grassroots niveau.

Om deze twee interdependente doelen te bereiken, zijn vijf specifieke onderzoeksvragen verkend. Deze vragen zijn: (1) Wat zijn de kenmerken van een transformatief leermodel dat bijdraagt aan duurzame innovatie?; (2) Hoe scheppen ecopreneurs nieuwe bedrijfsmodellen voor duurzaamheid?; (3) Wat zijn de kenmerken van zulke bedrijfsmodellen?; (4) Wat zijn de kenmerken van een samenwerkings- en participatiemodel tussen universiteit en grassroots ecopreneurs in een real-life setting? en (5) Op welke manieren brengt dit model transformaties in zulke setting teweeg?

De bevindingen van dit proefschrift suggereren, op de eerste plaats, dat een transformatief leermodel dat bijdraagt aan duurzame innovatie kan worden gebaseerd op experimenteel leren, een cyclus volgend van confrontatie, observatie, praktijk en toepassing van inhoud die gerelateerd is aan productontwerp, ondernemerschap en duurzaamheidswetenschap. Deze cyclus schept ruimte voor een samenwerking tussen universiteit en grassroots ecopreneurs die nieuwe ideeën en oplossingen ontwikkelt door praktijk en toepassing. De resultaten van deze processen worden verfijnd bij elke herhaling van de cyclus. Dit is een innovatief trainingsmodel voor duurzame ontwikkeling, omdat het interdisciplinair is en voortbouwt op de real-life ervaringen en de duurzaamheidsuitdagingen van grassroots innovators. Daarnaast schept het ruimte om alternatieve economische paradigma's in de werkelijkheid te testen, waarbij de rationale van de ecopreneurs heen en weer kan gaan tussen lineaire en cyclische benaderingen.

Ten tweede, vonden we dat ecopreneurs alternatieve beschouwingswijzen en oplossingen vinden om sociale, ecologische en economische waarden te scheppen door hun kernactiviteit, de bedrijfsinfrastructuur, de wijze van communicatie met de klanten en het financiële model. Daarop aanvullend, samen met het proces van onderhandelen en definiëren van het bedrijfsmodel, handelen ecopreneurs als veranderingsmakers, die zich actief bezighouden met het werk in de praktijk. Dit illustreert hoe veranderingsactie verbonden is met de praktijk, speciaal in het scheppen of het onderhouden van zich ontwikkelende praktijkvelden. Een actiegerichte benadering zoals degene die ik heb ontwikkeld, besteedt aandacht aan de interactie tussen bottom-up strategieën, die een meer adequaat raamwerk kunnen opleveren dan een strategisch management visie (Kemp et al., 1998), om zo prille duurzame innovaties in ontwikkelingslanden te ondersteunen.

Ten derde blijkt dat socio-technische experimenten zoals PC3 ruimte scheppen voor grassroots ecopreneurs om veranderingsstrategieën toe te passen, door een scenario te scheppen waarin grassroots ecopreneurs als sociale innovators handelen. Op deze manier zijn ze in staat om van onderaf de basis te leggen voor meer duurzame productie-consumptie systemen.

Ten vierde blijkt dat een samenwerkings- en participatiemodel tussen universiteit en grassroots ecopreneurs dat systeemveranderingen teweeg zou kunnen brengen, gerelateerd is aan een “betrokken wetenschap”, die wordt gekarakteriseerd door vrijwillige participatie en commitment, openheid naar nieuwe kennis en het uitproberen van onconventionele ideeën, een neiging om via actie en reflectie te leren en een commitment met het proces meer dan met de verwachtte uitkomsten, meer gevend om de middelen dan om het doel.

De bevindingen die zojuist hierboven zijn vermeld hebben beleidsimplicaties voor zowel Ngo’s als overheidsorganisaties die ondernemingen van ecopreneurs ondersteunen als bouwstenen van een meer inclusieve en hulpbron-efficiënte economie in ontwikkelingslanden. Deze implicaties omvatten het in de beschouwing betrekken van de institutionele kenmerken van de ondernemingsomgeving, door voldoende open en flexibel te zijn om het voor ecopreneurs mogelijk te maken de gegeven ondersteuning daadwerkelijk te gebruiken op zo’n manier dat zij er strategisch mee om kunnen gaan om armoede-reproductie patronen en ecologisch onduurzame praktijken te veranderen.

Ondersteuningsmodellen die gebaseerd zijn op een medescheppingslogica moeten openstaan om institutioneel diverse omgevingen te kunnen begrijpen en er mee om te kunnen gaan (en ze zelfs te omarmen). In de dialoog tussen praktische en wetenschappelijke kennis moet er ruimte zijn voor interpretatie en herinterpretatie van plaatselijke werkelijkheden zowel als voor diverse socio-technische paden. Dit vraagt van alle betrokken actoren een voortdurende reflectie op de manier waarop de kennisdialoog plaatsvindt gedurende het hele medescheppingsproces.

Een andere implicatie voor de praktijk heeft betrekking op het feit dat ondernemingsprogramma's meestal op individuen zijn gericht. Mijn bevindingen suggereren dat het belangrijk is dat ecopreneurs een team van plaatselijke betrokkenen om zich heen verzamelen, die bijdragen aan de onderneming met hun verschillende capaciteiten en hulpbronnen. De ecopreneur deelt haar of zijn ideeën en overtuigingen met hen, opdat ze in samenwerking het bedrijfsmodel vormgeven.

Tenslotte zou beleid dat ondernemerschap ondersteunt moeten overwegen om meer aandacht te schenken aan ondernemingen van ecopreneurs dan aan conventionele commerciële ondernemingen. Terwijl de eerdergenoemde nieuwe middelen en modellen ontwikkelen om markten om te vormen door consumptie-productie patronen opnieuw te bezien en door nieuwe rollen van ondernemingen in de samenleving te scheppen, ontwikkelen de later genoemde alleen nieuwe modellen om te reageren op de milieu-uitdagingen van vandaag, maar zonder systeemtransformaties te bevorderen. In het specifieke geval van Colombia, zijn de huidige private en publieke programma's die ondernemingsactiviteiten ondersteunen gericht op het scheppen van werkgelegenheid, innovatie en economisch groeipotentieel, maar zonder enig duurzaamheidscriterium te vermelden. Zonder te willen beweren dat deze eerdere criteria niet belangrijk zijn, zien deze beleidsprogramma's het belangwekkende effect over het hoofd dat ondernemingen kunnen hebben waarin duurzaamheid in het hart van de activiteit zit.