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THE DIFFUSION PROCESS OF THE MANDALLA PROJECT AS A SOCIAL INNOVATION FOR CEARÁ'S SEMIARID REGION

O Processo de Difusão do Projeto Mandalla como uma Inovação Social para o Semiárido Cearense

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Josimar Souza Costa Autor
Coordenador dos cursos de Administração, Bacharelado em Negócios e do Curso Superior Tecnológico em Inteligência de Negócios na Universidade de Fortaleza
Professor do Mestrado Profissional em Administração (MPA).
Doutor em Administração de Empresas (UNIFOR)
Mestre em Administração e Controladoria (UFC).
Diretor de Relações Institucionais da Associação Nacional dos Cursos de Graduação em Administração (ANGRAD).
josimarscosta@gmail.com
https://orcid.org/0000-0002-7128-8908

José Carlos Lázaro da Silva Filho
Vice-diretor da FEAAC/UFC;
Professor Associado da Universidade Federal do Ceará
Pos-Doutorado no Zentrum Technik und Gesellschaft
Doutor pela Technische Universität-Berlin (Alemanha),
mestrado em Administração na área de Gestão de CT pelo PPGA da Universidade Federal do Rio Grande do Sul (2000).
E-mail: lazaro@ufc.br
ORCID https://orcid.org/0000-0002-8227-5491

Daniel Felipe Victor Martins Autor
Doutor em Administração de Empresas pela Universidade de Fortaleza
Mestrado em Filosofia pela Universidade Federal de Pernambuco
Professor da Universidade Federal Rural de Pernambuco (UFRPE),
E-mail: dfvicmar@gmail.com
ORCID: https://orcid.org/0000-0001-7797-5576

Bruno de Souza Lessa
Professor do Programa de Pós-Graduação em Administração da Universidade de Fortaleza. Mestre em Administração e Controladoria pela Universidade Federal do Ceará (UFC). Doutor em Administração pela Universidade Federal do Rio Grande do Sul (UFRGS). Pós-doutor em Administração pela Universidade de Fortaleza (Unifor).
E-mail: brunolessa@unifor.br
ORCID: http://orcid.org/0000-0002-1696-394X

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Abstract

This article analyzes the Mandalla Project as a case of Social Innovation (SI) in Ceará's semiarid region. Grounded in a territorial-development perspective, we conceptualize SI as the creation or modification of products, services, or programs that alter the civil society *status quo* while improving quality of life. Drawing on a concurrent mixed-methods design that prioritizes qualitative evidence, we combine in-depth interviews, documentary analysis, and supportive quantitative indicators. Neumeier's (2012) process model guides the analysis, complemented by success conditions drawn from Butkevičienė (2009). Findings indicate that the Mandalla system exhibits the core SI dimensions, novelty, intangibility, uncertainty, and ubiquity, while progressing through problematization, expression of interest, and design/coordination toward a critical mass of adopters. Evidence also supports the relevance of cultural acceptance, economic sustainability, technological feasibility, knowledge sharing, individual entrepreneurship, social capital, and bottom-up initiatives. We conclude that Mandalla constitutes a successful SI pathway for food security and rural livelihoods in the Brazilian semiarid, although broader, universalized technical assistance is required to scale and sustain results.

Keywords: social innovation; territorial development; diffusion; bottom-up initiatives; agroecology; semiarid Brazil; food security.

Resumo

Este artigo analisa o Projeto Mandalla como um caso de Inovação Social (IS) no semiárido cearense. Com base em uma perspectiva de desenvolvimento territorial, concebe-se a IS como a criação ou modificação de produtos, serviços ou programas que alteram o *status quo* da sociedade civil, com melhoria na qualidade de vida. Emprega-se um desenho de métodos mistos concomitante, com prioridade qualitativa, combinando entrevistas em profundidade, análise documental e indicadores quantitativos de apoio. O modelo processual de Neumeier (2012) orienta a análise, complementado pelas condicionantes de sucesso de Butkevičienė (2009). Os achados indicam que o sistema Mandalla apresenta as dimensões centrais da IS , novidade, intangibilidade, incerteza e onipresença, , avançando das fases de problematização, expressão de interesse e delineamento/coordenação até a formação de massa crítica de adotantes. Evidencia-se, ainda, a relevância de aceitação cultural, sustentabilidade econômica, viabilidade tecnológica, compartilhamento de conhecimento, empreendedorismo individual, capital social e iniciativas *bottom-up*. Conclui-se que a Mandalla configura uma trajetória bem-sucedida de IS voltada à segurança alimentar e aos meios de vida rurais no semiárido brasileiro, embora a universalização da assistência técnica seja necessária para ampliar e sustentar resultados.

Palavras-chave: inovação social; desenvolvimento territorial; difusão; iniciativas *bottom-up*; agroecologia; semiárido brasileiro; segurança alimentar.

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INTRODUÇÃO

Na perspectiva constitucional brasileira, a matéria trabalhista se insere no rol dos direitos e garantias fundamentais sociais em consonância com a ordem social brasileira. Indubitavelmente, os direitos laborais encontram-se amplamente dispostos e reconhecidos na dogmática constitucional brasileira.

Environmental degradation in the Brazilian semiarid region poses a major challenge for the national government, which must develop urgent public policies for environmental preservation and protection. Such efforts aim to rationalize the use of land and natural resources, increase agricultural productivity, and ensure the environmental sustainability of the region.

The state of Ceará is fully inserted in this context. Its territory covers 148,825.6 km², equivalent to 9.6% of the Northeast Region and 1.75% of Brazil's total area. Ceará borders the Atlantic Ocean to the north, Pernambuco to the south, Rio Grande do Norte and Paraíba to the east, and Piauí to the west. According to the delimitation officially defined by the Ministry of National Integration in 2005, 86.8% of its area lies within the semiarid zone.

The climate is predominantly tropical hot and semiarid, characterized by irregular rainfall distribution, which causes recurrent water scarcity. The soils are relatively fertile, and the dominant vegetation is the caatinga, which covers about 69.2% of the state's total area. Ceará also has an extensive coastline and mountainous areas, with peaks exceeding 1,000 meters in altitude. Since 2009, the state has comprised 184 municipalities, with Fortaleza as its capital (IPECE, 2009).

The historical prevalence of drought and hunger in the state mirrors the broader reality of Brazil's Northeast. In response, the government has invested in programs aimed at mitigating these challenges, such as the construction of water reservoirs, cloud seeding to induce rainfall, and food distribution initiatives (Nelson & Finan, 2009). However, persistent economic constraints have underscored the need for job creation and income generation in rural areas through competitive and socially, culturally, politically, and economically sustainable activities (Gariglio, 2010; Sachs, 2004).

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In this sense, the State's efforts to implement public policies aligned with sustainability and social inclusion have incorporated low-cost, culturally sensitive, and socially embedded technologies, often referred to as social technologies (Lassance Jr. & Pedreira, 2004; Maciel & Fernandes, 2011; Rodrigues & Barbieri, 2008). Within this perspective, in 2007 the government of Ceará launched an exemplary initiative of this kind: the Mandalla Project. This project represents a form of social innovation grounded in an integrated system of agricultural and agroindustrial production, including small livestock farming. Its purpose is to foster social transformation by disseminating knowledge and promoting socially and environmentally sustainable entrepreneurship, empowering communities for responsible production and educating them toward conscious consumption (DHSA, 2011).

Social Innovation (SI) has increasingly attracted interest from academia, policymakers, and civil society, given its association with improvements in individuals' quality of life and its substantial contribution, estimated at around 75%, to the success of innovation processes (Butkevičienė, 2009; Dawson & Daniel, 2010; Pot & Vaas, 2008). Historical examples of SI can be traced to Benjamin Franklin's community-based initiatives, which introduced small yet transformative modifications to social organization in order to solve local problems (Mumford, 2002). Within the field of innovation economics, Schumpeter was among the first to highlight, albeit implicitly, the role of social innovations in enhancing the economic effectiveness of technological innovations (Butkevičienė, 2009; Cavalli, 2007; Moulaert et al., 2005).

Social innovations can take various forms, including microcredit programs, consumer cooperatives, fair-trade movements, social technologies, and organic production systems such as the Mandalla Project (Costa et al., 2013; Mulgan, 2006). Considering the specificities of the semiarid context and its inherent challenges, particularly the pursuit of better living conditions in rural areas through environmental sustainability, this study assumes that Social Innovation, represented by the Mandalla Project in Ceará, aligns with the core principles of public policy designed for the region.

Accordingly, this research addresses the following question:

What outcomes have resulted from the implementation of a successful social innovation project in the semiarid region of Ceará?

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To answer this, the study aims to analyze the results of the Mandalla Project from the perspective of the diffusion process of social innovation within the semiarid context of Ceará. To achieve this, the research draws on qualitative data gathered through field studies and documentation related to the project, complemented by secondary data for measurement and validation. The combination of qualitative and quantitative data enables a more comprehensive understanding of the research problem by integrating findings from both methodological perspectives (Creswell, 2009b; Tashakkori & Teddlie, 2010).

This study seeks to contribute to a broader understanding of the process of social innovation diffusion among smallholder farmers in Brazil's Northeast. Beyond advancing theoretical and practical discussions on social innovation, this work also aims to generate outcomes relevant to government, society, and academia. For government actors, it will provide insights into how social innovations can inform public policy for coexistence with the semiarid environment. For society, it is expected to support initiatives that improve the quality of life of rural families. For academia, it will contribute to deepening theoretical debates on social innovation in semiarid regions.

Theoretical Framework

The innovation process

Social transformations retain the classical characteristics of innovation, aiming to solve problems through the combination of public and private, scientific and tacit knowledge (Dosi, 1988). Innovation has been extensively examined from multiple perspectives (Bessant & Tidd, 2008), encompassing analyses that range from innovation management (Burns & Stalker, 1961; Pettigrew et al., 2003) to the behavior of individuals and groups within organizations (Osborne & Brown, 2011; Paulus & Nijstad, 2003).

The Greek origin of the term "innovation" carried a pejorative meaning due to its use in religious contexts as early as the 1400s. In the 1430s, the concept became associated with deviant behavior and disobedience to established order, following the dispute between Puritan Henry Burton and King Charles I regarding church doctrine and discipline. This negative connotation persisted throughout the 17th and 18th centuries, appearing in hundreds of religious documents that used "innovation" in their titles (Godin, 2012).

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The term later acquired a political meaning, still negative, around 1548, when King Edward VI dissolved the English Parliament on charges of "innovation." During the English and French Revolutions, the word became synonymous with violent and bloody methods of establishing a "utopian republic." In the 19th century, it gained a social-revolutionary connotation, used to describe "social innovators" who sought to subvert the capitalist and property-based order, such as the French socialists during the 1830 Revolution. Only in the 20th century did the concept assume its economic orientation, being used to characterize technological innovation (Godin, 2012).

In 1939, Joseph Schumpeter developed the theoretical framework that still underpins the concept of innovation today, linking it to economic development as a dynamic process of technological creation. Innovation drives the continuous replacement of processes, products, and business models, constituting a process of "creative destruction" that emerges from the actions of entrepreneurial individuals. These actions disrupt equilibrium and stimulate market reconfiguration in terms of price and quantity (Schumpeter, 2010).

Innovation involves three interconnected processes: invention, innovation, and diffusion. Diffusion goes beyond the gradual adoption of new technologies by the population; it embodies the cumulative process of improvement and adaptation. The underlying premise is that enhancements that facilitate adoption and use are embedded in the generated innovations, enabling their dissemination (Biggs, 1990). Although the notion of "social innovation" predates the economic sense of the term, some authors argue that Schumpeter was the first to implicitly recognize its social dimension as a mechanism to ensure the economic effectiveness of technological innovations (Butkevičienė, 2009; Cavalli, 2007; Zafirovski, 2005)

Definition and Approaches to Social Innovation

The sociologist William Ogburn was arguably the first to distinguish between technical and social invention, asserting that "the use of the term invention does not apply only to technical inventions [...] it is also used to denote innovations in other cultural fields, such as the invention of a religious ritual or an alphabet" (Ogburn, 1985, p. 66). The social dimension of innovation appeared explicitly in scientific literature for the first time in the works of Taylor (1970) and Gabor (1970), who used the term "social innovation" (Cloutier, 2003).

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From an academic standpoint, Social Innovation (SI) remains a diffuse concept, encompassing various theoretical and methodological approaches. Based on Moulaert et al. (2005) and a systematic literature review conducted across the Web of Knowledge, Scopus, and Emerald databases, five major research axes of social innovation were identified.

These are: political, cultural, practical development, social entrepreneurship, and organizational innovation, illustrated in Figure 1.

In the political axis, the central concern of social innovation lies in urban governance. The goal is to develop models capable of overcoming socioeconomic polarization and contemporary social exclusion. This approach emphasizes the role of civil society as an agent of social cohesion within urban communities through democratic governance regimes (Gerometta, Hausermann, & Longo, 2005; Moulaert et al., 2005).

The cultural axis addresses social innovation in the intellectual and creative domains. This perspective associates SI with the arts and creativity, focusing on generating and implementing new ideas that enable the achievement of shared goals through interpersonal relationships. Such innovations may occur in any setting, encompassing the restructuring of work processes, improvement of collaboration methods, or the adoption of new practices and business relationships (Mumford, 2002; Moulaert et al., 2005).

The practical development axis takes a territorial approach, offering a broad perspective on the application of social innovation. It highlights social structures as catalysts for change at regional, local, and community levels. In this sense, social innovation refers to the creation or modification of a product, service, or program that alters the status quo of civil society by improving participants' quality of life (Christiaens, Moulaert, & Bosmans, 2007; Moulaert & Sekia, 2003; Moulaert et al., 2005).

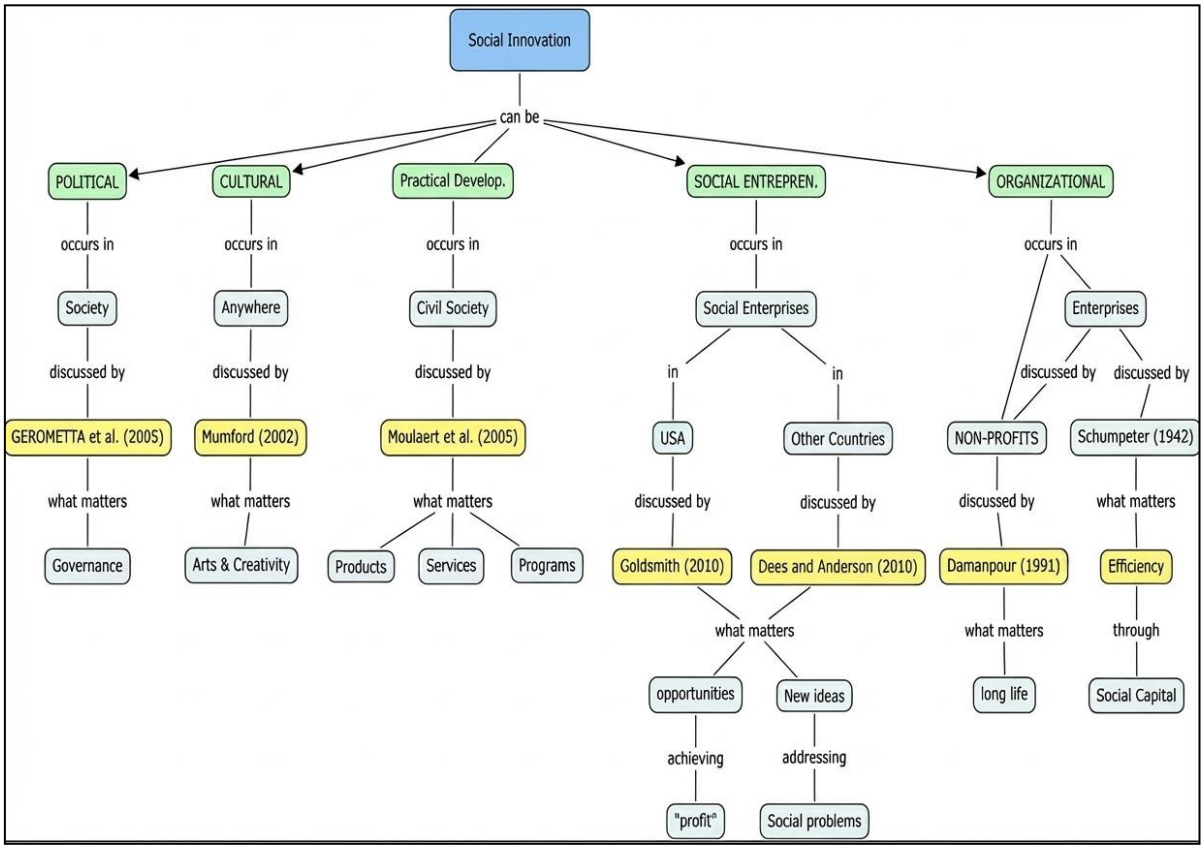
The social entrepreneurship axis views SI as the emergence of opportunities or new ideas that address social problems while generating financial returns for social enterprises. This perspective, rooted in the North American research tradition, focuses on entrepreneurship as a source of wealth creation for socially oriented ventures (Dees & Anderson, 2006; Goldsmith, Georges, & Burke, 2010).

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Conceptual Map of Social Innovation Research Axes

Source: Prepared by the authors based on Moulaert et al. (2005).



Finally, the organizational innovation axis encompasses two main perspectives. One focuses on innovation within businesses, emphasizing efficiency through the enhancement of social capital (Schumpeter, 2010). The other concerns nonprofit organizations, emphasizing their continuity and intergenerational sustainability (Damanpour, 1991).

According to Botero (2011), the definition of social innovation challenges the traditional notion of innovation, product, process, market, and organization, suggested in the Oslo Manual. While the literature presents multiple definitions, three elements recur consistently: novelty, intangibility, and uncertainty. Table 1 summarizes these characteristics, which help classify social changes as innovations.

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Table 1

Characteristics of Social Innovation

Característica	Definição	Autores
Novelty	New subjective perception among actors regarding behavioral or attitudinal change.	Moulaert et al. (2005)
Intangibility	New ideas, projects, knowledge, or social relationships that create social value, serve the public good, and improve people's lives, leading to social change.	Moulaert et al. (2005)
Uncertainty	High uncertainty in implementation; organizations and individuals respond differently, leading to potential abandonment or full adoption.	Danziger (2004)
Ubiquity	Can occur anywhere, NGOs, government, business, foundations, communities, or individuals.	Minks (2011)

Source*: Adapted by the authors from Butkevičienė (2009).*

In this framework, novelty refers to a new subjective perception among actors regarding behavioral change, which may take the form of an idea, method, or practice that makes sense to society. Initially, these changes are intangible, such as knowledge creation, but they may eventually result in tangible benefits (Moulaert et al., 2005). Despite these benefits, as with any innovation, the reactions of individuals and organizations to change entail a high degree of uncertainty that influences implementation and success (Danziger, 2004).

These intrinsic characteristics of social innovation are not static; they unfold through sequential stages that facilitate implementation. According to Neumeier (2012), the process of social innovation includes four stages: problematization, expression of interest, design and coordination, and evaluation. Throughout these stages, innovations may evolve in unforeseen directions and generate new collaborative networks. The final stage often reveals an inflection point that determines success or failure.

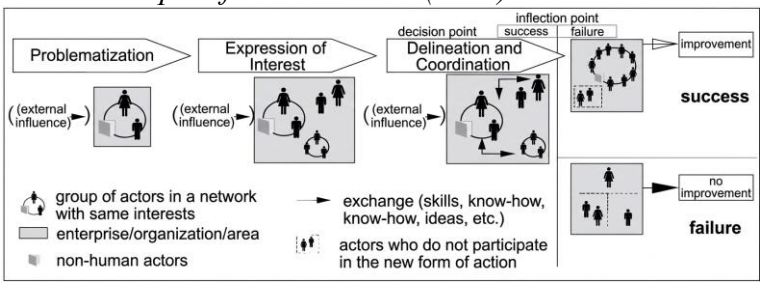
Successful implementation occurs when a critical mass of actors imitates or adopts the new practice, leading to group acceptance and tangible improvements. Conversely, if adoption remains limited to the initial group and no visible improvement occurs, the innovation is deemed unsuccessful. Figure 2 illustrates this process.

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Figure 2

Process of Social Innovation
Source: Adapted from Neumeier (2012).



The process depicted in Figure 2 demonstrates that, to achieve success, social innovation must meet several contextual conditions, including cultural, economic, and technological aspects. As a dynamic process, it is influenced by external variables that can affect results positively or negatively. These variables often stimulate resistance among actors and organizations toward full adoption of new practices (Butkevičienė, 2009). Table 2 presents the key factors conditioning the success of social innovations, along with their conceptual definitions.

Table 2

Determinants of Successful Social Innovation

Aspect	Definition	Authors
Cultural acceptance	Overcoming cultural barriers is a decisive factor for successful innovations.	Dawson & Daniel (2010); Howaldt & Schwarz (2010); Moulaert et al. (2005)
Economic sustainability	The economic dimension motivates initiation and continuity of social innovation processes.	Howaldt & Schwarz (2010); Murray, Mulgan, & Caulier (2011)
Technological feasibility	Social innovation assumes technical feasibility and contextual adaptability.	Howaldt e Schwarz (2010)
Knowledge sharing	Both explicit and tacit knowledge foster social innovation.	Andersen (2008)
Individual entrepreneurship	Acts as a generator and facilitator of change.	Andersen (2008)
Social capital	Informal organizational features that enhance cooperation and network efficiency.	Coleman (1988); Balestrin & Verschoore (2008); Granovetter (1985); Putnam (2000)
Bottom-up initiatives	Creative grassroots actions are more effective, though top-down efforts can complement and stimulate them.	Butkevičienė (2009); Moulaert et al. (2005); Neumeier (2012)

Source: Compiled by the author based on Butkevičienė (2009).

All the aspects outlined in Table 2 are essential for sustaining innovation, whether social, business-oriented, or bifocal (Pol & Ville, 2009). Continuity depends on overcoming cultural

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barriers and addressing economic and technological constraints, ensuring that innovation leads to persistent improvements in the quality of life of social actors involved.

Method

Adler and Clark (2011, p. 16) suggest that "social research methods can help us explore, describe, and explain aspects of the social world, as well as evaluate whether specific programs or policies actually work." Building on the theoretical understanding of Social Innovation (SI), this section details the path followed in the study by describing the applied methodology. The research adopts as its reference the framework proposed by Neumeier (2012), depicted in Figure 2, which outlines the process underlying successful SI.

Aligned with the study's objectives, the investigation examines the lived experiences reported by interviewees regarding their agroecological projects. This indicates an exploratory and descriptive design (Bordens & Abbott, 2011; Rubin & Babbie, 2011). It also seeks to identify plausible relationships that allow the phenomenon to be modeled (Bordens & Abbott, 2011; Rubin & Babbie, 2011). The study is descriptive insofar as it documents and characterizes the complexity of the phenomena, the influence of individual traits, divergent opinions on key issues, and how such differences shape outcomes (Jackson, 2011), as well as the processes by which data are collected (Bordens & Abbott, 2011).

Research design provides direction for the investigator throughout the inquiry, indicating the decisions necessary to conduct the study (Creswell, 2009b). To understand the phenomenon holistically, the present work adopts a pragmatist philosophical stance, employing all applicable approaches, quantitative and qualitative (Cherryholmes, 1992; Morgan, 2007).

Historically, quantitative and qualitative approaches have been treated as distinct paradigms, and the researcher's choice has been conditioned by the object and purpose of the study. Over recent decades, however, this view has shifted, affecting purposes, worldviews, and methods in social and behavioral research (Tashakkori & Teddlie, 2010). The combination of these approaches, known as mixed methods (Castro et al., 2010), offers an alternative that enables their joint use, even without fully reconciling potential paradigm conflicts (Yin, 2011).

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Mixed methods align with a pragmatic paradigm, privileging results over strict allegiance to a given worldview. The term pragmatism was coined to express a maxim of logic whereby concepts are analyzed according to their conceivable practical consequences that would confirm or disconfirm them (Peirce, 1905). Pragmatism also values democracy, freedom, equality, and progress and is thus oriented toward answering research questions that address real-world problems (Feilzer, 2010; Creswell & Plano Clark, 2011). Its flexibility, eschewing commitments to antecedent or consequent phenomena in favor of actionable possibilities (Dewey, 1931), supports the adoption of elements from other paradigms (Cherryholmes, 1992). Constraining a research project to a single paradigm can be simplistic, as paradigms may complement one another as data emerge (Morrow, 2007). That said, treating quantitative and qualitative data in separate domains remains a common challenge in mixed-methods research (Bryman, 2007). A defining feature of such studies is maintaining the integrity of a single study while answering questions that require complementary evidence and methods from both traditions (Yin, 2006, 2011).

Currently, the field of mixed methods is expanding across disciplines (Creswell, 2009a). Several scholars have worked to define, document, and classify mixed-methods designs (Yin, 2011). A widely accepted typology is that of Tashakkori and Teddlie (1998), which distinguishes three types: equal-status designs (sequential or concurrent), dominant/less-dominant designs (sequential or parallel), and multilevel designs.

In this study, we adopt a concurrent design, following Creswell and Plano Clark (2011), who argue that it is the best choice when seeking to leverage triangulation and integrate analyses. We prioritize the qualitative strand. Qualitative methods, especially the case study, are recommended as powerful tools when the phenomenon is highly complex and the theoretical scaffolding is limited (Dul & Hak, 2008; Bennett & Elman, 2006). Quantitative data were incorporated into the qualitative strand from collection through analysis, playing a supportive role (Creswell, 2009b).

A final aspect concerns theorization, that is, whether a comprehensive theoretical perspective permeates the entire project (Creswell, 2009b). In this investigation, although the SI field remains diffuse, we adopt the territorial development axis (Moulaert et al., 2005), using Neumeier's (2012) model as the guiding framework.

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This model represents the combination of quantitative data to complement a predominantly qualitative approach, without the need for robust statistical techniques, within a simultaneous data-collection process (Creswell, 2009b; Tashakkori & Teddlie, 2010), and explores social innovations through a case study.

A case study is an empirical approach that examines a real-life phenomenon when the boundaries between phenomenon and context are not clearly evident; the researcher has limited control over events and primarily seeks to answer "how" and "why" questions (Yin, 2009). It focuses on describing, understanding, and predicting a unit (an individual or a bounded system) (Woodside, 2010; Yin, 2009). According to Yin (2009), case studies are empirical by nature, addressing contemporary phenomena in a known context and taking single or multiple forms (Flick, 2009). The decision to employ a single-case design here is justified by the topic's specificity and the clearly defined features that enable robust, reliable evidence gathering to reveal underlying structures of social innovation (Yin, 2009).

Data were collected through face-to-face, semi-structured interviews guided by the framework in Neumeier (2012, see Figure 2) and Butkevičienė (2009). The study population comprises 164 Mandalla Projects listed in the 2011 Annual Report of the Secretariat for Agrarian Development. As Yin (2009) notes, case-study data may come from multiple sources, including documents, archival records, and interviews. In this study, in-depth interviews serve as the primary qualitative data source, complemented by documents such as annual reports. Interviews were recorded using a digital audio device, totaling 17 hours and 23 minutes, conducted in March and April 2013 with ten interviewees.

During data organization and preparation, interviews were transcribed, physical documents scanned, and field notes typed. Sources were then arranged by type, followed by thorough data reading (Creswell, 2009). The coding phase ensued, grouping material into blocks or segments before assigning interpretive meaning (Rossman & Rallis, 2003).

Data Treatment and Analysis

After transcription, data were analyzed using content analysis with ATLAS.ti, version 7.0. The conceptual framework guiding the study identified constructs of interest; data were

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examined to ascertain how these constructs manifested. The analysis was not restricted to a priori categories; it also incorporated the characteristics and success factors of SI.

Data analysis comprised open, axial, and selective coding (Strauss & Corbin, 1990). Drawing from the analytical frames in Butkevičienė (2009) and Neumeier (2012), the resulting categories were: novelty, intangibility, uncertainty, cultural acceptance, economic sustainability, technological feasibility, knowledge sharing, (individual) entrepreneurship, social capital, bottom-up initiatives, problematization, expression of interest, design and coordination, and improvement in quality of life.

The Mandalla Project

De Broadly, the project's primary function is to generate social transformation through the democratization of knowledge and the promotion of sustainable ventures, "empowering responsible production and educating for conscious consumption" (DHSA, 2011). The Mandalla Project's mission is to transform the potential of individuals and communities into economically viable, socially responsible, and environmentally sustainable enterprises, empowering responsible production and educating for conscious consumption. In doing so, it contributes to eradicating extreme poverty and hunger, combating desertification and deprivation, and mitigating peripheral urban sprawl, among other consequences (Labad & Rodrigues, 2006).

The size of a mandala varies with available land. On a 2,500 m² plot (¼ hectare), irrigated by a "sapo"-type pump, up to 64 crop varieties, 10 animal species, and as many as 450 diverse fruit trees can be cultivated (DHSA, 2011). Where space is limited, the mandala can be built smaller, even in household backyards. Figure 3 illustrates the structural features of the mandala, with outer production sectors and a central water source.

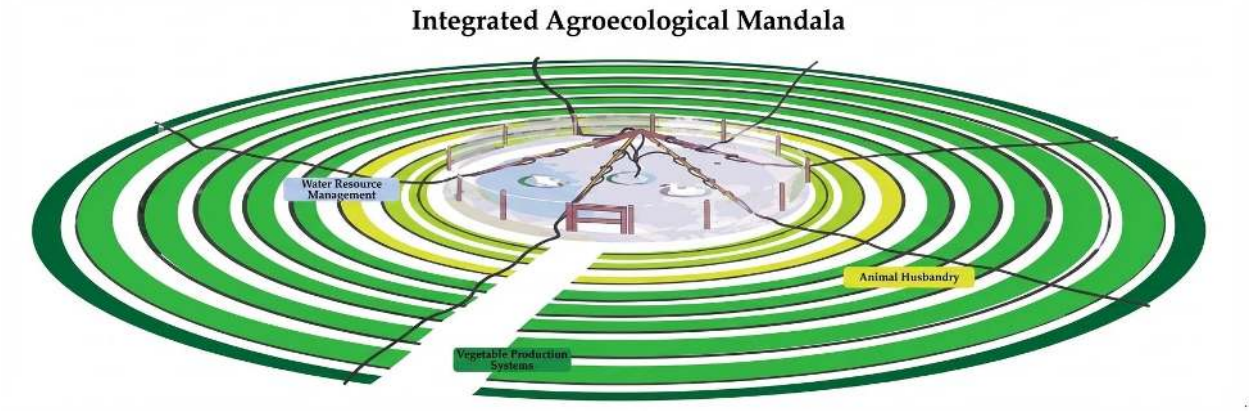
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Figure 3

Illustrative model of a mandala (mandalla)

Source: Labad and Rodrigues (2006, p. 179).



Fonte: Labad e Rodrigues (2006, p. 179).

Within this circular arrangement (Figure 3), a rural family can manage a little over two hectares, securing basic natural food supplies and earning approximately R$ 5,000 per month by selling surpluses through associative and productive arrangements, following permaculture principles (Labad & Rodrigues, 2006). Beyond a planning method for human-scale systems, the "mandala" offers a systemic lens for visualizing the world and the interrelations among its components, characterizing an environmentally sustainable, socially just, and financially viable system.

Findings and Discussion

Characterizing Social Innovation

The questionnaire was completed by 63 smallholder farmers drawn from a universe of 164 Mandalla projects listed by Ceará's Secretariat for Agrarian Development in 2012. Of these respondents, 52 (82.5%) were male. Regarding age, the vast majority (88.9%) were between 46 and 55 years old, with the remainder between 18 and 45. The prevalence of respondents in the 46–55 age bracket is largely explained by the Secretariat's selection criteria for project participation.

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The Notion of Novelty

Novelty is a defining characteristic of Social Innovation (SI): "the new" may be something never done before or simply a new way of effecting social change (Minks, 2011). In this study, novelty is observed in smallholders' shifting perceptions toward a more sustainable relationship with the environment, aligning with Moulaert et al.'s (2005) definition. This claim is exemplified by Interviewee E9 in Table 3.

Table 3

Evidence of Novelty in the Interviews

Interview	Interviewee Statement
E9	"Implementing the mandala requires specific training for smallholder farmers, where agroecological soil management is taught (…) it is the crucial point in changing beneficiaries' attitudes."

Source: Field data (2013).

Table 3 highlights an inflection point in farmers' behavior regarding soil management and, by extension, sustainable coexistence with the semiarid environment. This attitudinal shift is consistent with Edwards's (2010) view of social transformation, wherein something radically better emerges once old patterns and structures are broken. Minks (2011) argues that, to qualify as true social innovation, the idea must be radically new. In the survey results, 82.5% of respondents fully agreed that the Mandalla was "a novelty," while only 4.8% disagreed (fully or partially).

The Notion of Intangibility

Here, intangibility is understood as the creation of social value that improves people's lives (Bignetti, 2010; Moulaert et al., 2005). Table 4 presents supporting evidence from Interviewee E3.

Table 4

Evidence of Intangibility

Interview	Interviewee Statement
E3	"(…) now I don't have to worry about the weekly market. I go to the garden and get what I need: chicken, fish, scallions, and whatever is available."

Source: Field data (2013).

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As Table 4 suggests, improved quality of life is visible in E3's statement, reflecting subsistence security. At the same time, greater interaction among social groups generates significant social value for the community, as noted by Phills Jr., Deiglmeier, and Miller (2008). Consistently, 87.3% of surveyed farmers fully agreed that their quality of life had improved.

4.1.3 The Notion of Uncertainty

During Mandalla implementation, uncertainty, as characterized by Danziger (2004), is a dominant feature. In the survey, 55% of respondents fully agreed they had doubts about the project's success, while only 12% disagreed (partially or fully). More broadly, reliance on water in irrigation projects often generates apprehension among farmers in Brazil's Northeast. This concern was reinforced by recent droughts, which increased perceived implementation risk. Table 5 summarizes field evidence corroborating this climate of uncertainty.

Table 5
Evidence of Uncertainty

Interview	Interviewee Statement
E5	"(…) I didn't want to get into this, but my family encouraged me. So I trusted them, and thank God I did."
E7	"(…) I was always sure this invention wouldn't work (…) this idea of a productive backyard, who has ever seen that work (…) and on top of that the government would want to charge us."
E8	"We could never guarantee success. We handed over the rod, the line, and the bait; then we taught them how to fish. Managing the deltas and the crops is what determines success."
E9	"(…) it was hard at first to get people to understand they would receive financing to pay back later."
E10	"(…) I believed from the start, especially knowing SDA would provide ongoing support."

Source: Field data (2013).

With the exception of E10, interviewees' statements in Table 5 clearly reveal insecurity about the venture's future. Such uncertainty is pivotal in determining whether the innovation is fully adopted or abandoned (Danziger, 2004).

The Notion of Ubiquity

Ubiquity implies that social innovation can emerge in any setting, from institutions to individuals (Minks, 2011). In this study, SI arises among individuals who organize into associations, catalyzed by a fostering agent, the Secretariat for Agrarian Development (SDA), which financed infrastructure and training to enable farmers to work with mandalas.

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The Mandalla Project as Social Innovation

In this work, social innovation is defined as the creation or modification of a product or service that alters the status quo of civil society while improving quality of life (Christiaens, Moulaert, & Bosmans, 2007; Moulaert & Sekia, 2003; Moulaert et al., 2005). To delimit the SI construct, we selected the dimensions novelty, intangibility, uncertainty, and ubiquity, given their recurrence in the scholarly literature. The evidence indicates that the Mandalla Project may indeed be considered a social innovation, as it embodies these core features. Moreover, participants' perceptions confirm organizational changes within beneficiary communities, with consequent improvements in quality of life. It is worth noting that quality of life is defined differently across disciplines (Land, Sirgy, & Michalos, 2012); in this study, we adopt an objective, measurable standard of living.

In short, the Mandalla Project demonstrates the characteristics of novelty, immateriality, uncertainty, and ubiquity that are intrinsic to social innovation. Given that these characteristics unfold within a dynamic process, Figure 4 aligns our findings with Neumeier's (2012) social innovation process model presented in the theoretical framework.

Figure 4

Alignment of the Mandalla Project with the Social Innovation Process
Source: Adapted from Neumeier (2012) with field data (2013).

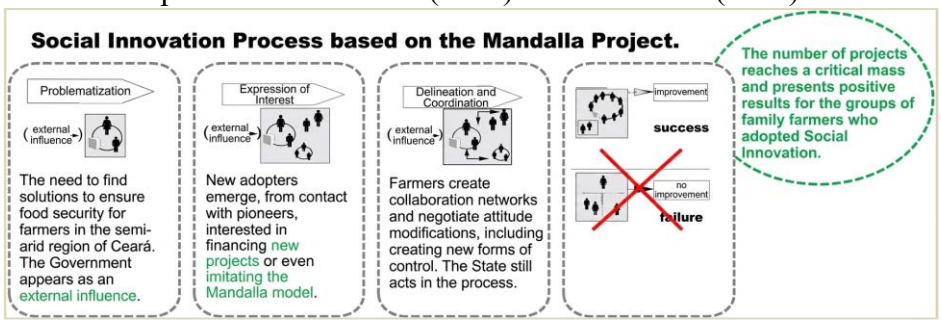


Figure 4 illustrates how Neumeier's (2012) process model maps onto the Mandalla evidence, from the government's role in introducing an agroecological production system as an option for addressing food security in Ceará's semiarid region to the formation of a critical mass of adopters signaling SI success. Beyond aligning with Neumeier's model, the project also satisfied all success conditions proposed by Butkevičienė (2009). Accordingly, Figure 5 proposes an analytical framework for assessing successful social innovations.

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Figure 5

Analytical Framework for Assessing a Successful Social Innovation
Source: Prepared by the author. Adapted from Butkevičienė (2009) and Neumeier (2012).

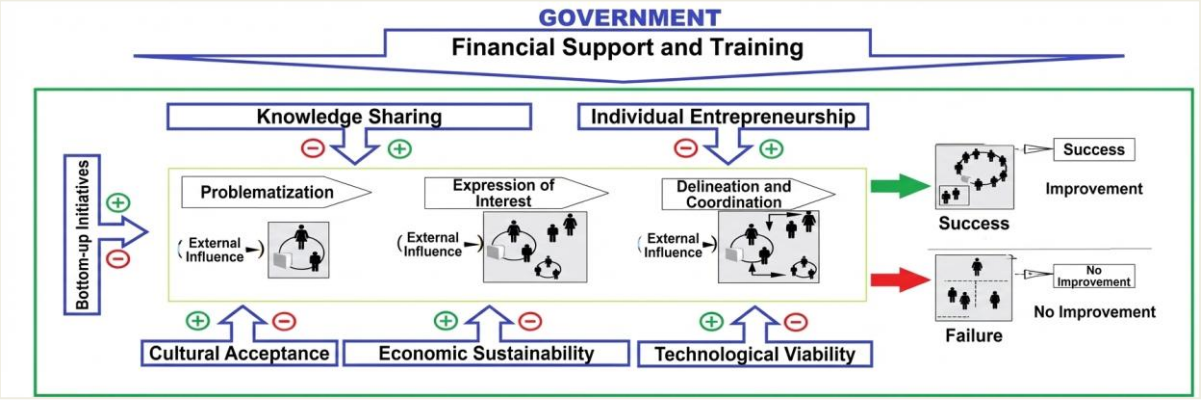


Figure 5 depicts the SI process and the conditioning factors that catalyze success, informed by the empirical study of mandalas. Green boundaries represent the innovation system environment; blue rectangles denote success factors exerting positive or negative effects throughout the process. In this case, the government acted as financier and capacity-building agent, enabling the innovation to take root.

It bears emphasizing that conditioning factors influence the process end-to-end. Bottom-up initiatives have the most pronounced effect during problematization, when ideas emerge from actor groups' needs. In addition, external influences from other actors and organizations continue to shape attitude and behavioral change among the groups involved. Having characterized the mandalas as SI, the next section presents the tangible and intangible results of the Mandalla Project.

CONCLUSION

Social innovation (SI) has become a widely studied field and is increasingly employed across academic research. In this study, SI was understood, within a territorial-development perspective, as the creation or modification of a product, service, or program that alters the status quo of civil society while improving participants' quality of life.

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This work examined the outcomes of the Mandalla Project through the lens of social innovation in Ceará's semiarid context. The first objective was to analyze the initiative using Neumeier's (2012) SI framework. Before applying that framework, the Mandalla system was characterized as SI based on the dimensions of novelty, intangibility, uncertainty, and ubiquity. Within this perspective, the Mandalla Project fits squarely within the domain of social innovation and can be seen as having undergone an SI process that led to its success.

Applying Neumeier's (2012) model, the interviews indicated the presence of all proposed stages. In the problematization stage, the key social issues were food security and the human–environment relationship. Initially, some farmers adopted the project; as implementations progressed and generated value for early adopters, others sought to imitate or obtain financing, signaling the expression of interest stage. Next, smallholder groups with active projects began sharing experiences and oriented their efforts toward marketing production surpluses, now sold as agroecological or organic products to increase economic returns. The formation of a critical mass and perceived improvements in using mandalas, as well as in selecting new adopters, justify the projects' continuity and, consequently, their success.

The Mandalla Project was then assessed against the success conditions proposed by Butkevičienė (2009): cultural acceptance, economic sustainability, technological feasibility, knowledge sharing, individual entrepreneurship, social capital, and bottom-up initiatives. All were evidenced in the data, enabling the proposal of a succinct analytical model.

Notwithstanding the project's significant outcomes, these actions are still insufficient to address the entrenched social exclusion and deprivation observed in Ceará's semiarid region. Greater results could be achieved if the State were to universalize technical assistance and rural extension across the countryside. Public policies that foster initiatives like Mandallas should be replicated and scaled to alleviate hardship among semiarid families while generating sustainable economic development.

This research contributes to the SI field by discussing multiple approaches to a still diffuse concept. By illuminating this debate, it helps clarify common characteristics and supports the pursuit of future consensus. Concurrently, it draws on practice to capture the existence of a social innovation process.

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Future research should include interviews with senior government officials to identify the degree of alignment, or distance, between policy proposals and achieved results. Comparative studies across other semiarid regions in Brazil are also recommended to enable cross-regional analysis.

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