

RESEARCH ARTICLE

‘Wicked’ solutions for ‘wicked’ problems: Responsible innovations in social enterprises for sustainable development

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Abstract

Social enterprises create innovative solutions to address social issues and achieve Sustainable Development Goals (SDGs). This paper examines the innovative social entrepreneurial processes using the theoretical foundation of responsible innovation (i.e., anticipation, reflexivity, inclusion and deliberation, responsiveness, and knowledge management). The data collected from three case study organisations reveals that social enterprises at the initiation stage address only a few SDGs. However, innovation development and implementation processes lead to products and services diversification and geographical expansion which broaden the SDG focus. During this process, enterprises iteratively conduct activities associated with different dimensions of responsible innovation and operate within ethics, values and rights-based boundaries. Based on these findings, this paper proposes a process model combining SDG literature with responsible innovation. The managerial implications of using responsible innovation perspective to achieve SDGs are also highlighted.

Key words: responsible innovation; social challenges; social enterprises; sustainable development goals

Introduction

The 17 Sustainable Development Goals (SDGs) that the United Nations General Assembly adopted in 2015 outline the 2030 agenda for sustainable development. The 17 SDGs were developed to address challenges in the areas of poverty, inequality, climate, environmental degradation, prosperity, and peace and justice (United Nations, 2015). These goals were built up on the back of the Millennium Development Goals and seek to complete what they did not achieve. SDGs, therefore, are considered a plan of action for people, the planet, prosperity and partnerships for the future (United Nations, 2015). However, finding solutions for the sustainable challenges or the so-called ‘wicked’ problems outlined in the United Nation’s SDGs require actions and cooperation of governments, businesses, civil societies and even individuals. Specifically, Section 67 of the United Nation’s SDGs outlines the role of business: ‘We call upon all businesses to apply their creativity and innovation to solving sustainable development challenges’ (United Nations, 2015, p. 34). Hence, the ways which different types of businesses develop sustainable innovations merit further examination to identify effective solutions, learn from available practices and scale-up the impact.

Social enterprises are one of the business types that aim to achieve SDGs through innovations. These organisations address social needs or pursue social objectives (Guo & Bielefeld, 2014). These social needs often result from ‘wicked’ problems such as poverty, lack of water and sanitation, issues associated with gender empowerment and inequality, and climate change. The

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aim of the social enterprises is to address these ‘wicked’ problems and achieve social impact using innovative practices (Guo & Bielefeld, 2014). Addressing ‘wicked’ problems, however, requires innovations which challenge the existing structures (Boons, Montalvo, Quist, & Wagner, 2013). Yet, innovations that require structural changes can be costly. At the same time, profit-driven and highly capital intensive ways of producing new technologies and innovations can threaten the sustainability of systems and even achievement of SDGs (Lehoux, Pacifico Silva, Pozelli Sabio, & Roncarolo, 2018). Therefore, responsible and cost-effective ways of innovating business practices that create significant impact are essential to achieve SDGs.

This study uses responsible innovation as the theoretical foundation and studies ways which social enterprises create innovative solutions. Responsible innovation practices generate solutions to ‘wicked’ problems and create ‘right’ impacts for the society (Lubberink, Blok, Van Ophem, & Omta, 2017, 2019). These practices are grounded on socio-ethical values (Lubberink et al., 2019; Stilgoe, Owen, & Macnaghten, 2013) and the principles of ‘avoiding harm’ and ‘doing good’ (Voegtlin & Scherer, 2017). Similar to responsible innovation, social enterprises aim to address social challenges in a sustainable and innovative manner and generate social and/or environmental impacts while creating profit from economic activities (Geissdoerfer, Vladimirova, & Evans, 2018). The social enterprises also create socio-ethical value for their target beneficiaries (Lubberink et al., 2019). Even though there are a number of similarities between responsible innovation and social entrepreneurial process, this conceptual foundation has rarely been used to study responsible innovations which facilitate the achievement of SDGs in social enterprises.

This study answers the research question of:

How and in what ways do social enterprises use responsible innovation practices to achieve SDGs?

The study uses the responsible innovation framework of Stilgoe, Owen, and Macnaghten (2013) and its later adoptions to business context by Lubberink et al. (2017, 2019). Using detailed qualitative secondary data collected from three social enterprises, this study demonstrates the various ways which social enterprises are being responsible during the innovation development and implementation process. The findings are used to develop theoretical and practical implications.

Literature review

Innovation

Innovation is the process of conceptualisation, generation and management of new ideas (Trott, 2016). Innovations can be incremental (i.e., gradual) or transformative (i.e., radical) (Garcia & Calantone, 2002). Incremental innovation involves a gradual enhancement of technological processes, operations, business practices and products (Garcia & Calantone, 2002; Trott, 2016). In contrast, transformative innovation involves a radical shift in thinking, radical (re)design of products, cutting-edge technologies, new forms of value creation and the development of new business models (Garcia & Calantone, 2002; Trott, 2016).

In organisations, innovations can be developed as a continuous or a discontinuous activity (Garcia & Calantone, 2002). That is, some organisations continuously invest in research and development and focus on product, service or process development as a regular organisational function. In these organisations, innovation process can be considered continuous. In contrast, some other organisations invest in research and development whenever it is required and in these organisations innovations process is discontinuous.

The different types of innovations in social enterprises are often linked to three distinct but inter-related umbrella concepts: social innovation, sustainable innovation and responsible innovation. Table 1 summarises the key similarities and differences between these three concepts.

Table 1. Comparison of concepts: social, sustainable and responsible innovation

	Social innovation	Sustainable innovation	Responsible innovation
Explanation	New social practices aimed at prompting social change	Innovations that place equal emphasis on: economic, environmental and social dimensions	Steering innovations into desirable directions to ensure 'right' impacts are created for the society
Theoretical grounding	Social change or public good	Sustainability (economic, environment and social)	Ethics, values and human rights
Outcomes	Social actions and change (e.g., new institutions, new social movements, new social practices, different structures of collaborative work, improved quality of life)	Intentional changes to realise social and environmental value in addition to economic returns (e.g., changes to organisation's philosophy and values, products, processes or practices)	Ethical acceptability, sustainability and societal desirability of new innovations

Source: Compiled by the author from Adams et al. (2016), Bos-Brouwers (2010), Cajaiba-Santana (2014), Pol and Ville (2009), Stilgoe, Owen, and Macnaghten (2013), and von Schomberg (2011).

As Table 1 illustrates responsible innovations, in comparison to social or sustainable innovations, aim to achieve ethical acceptability, sustainability and societal desirability by focusing on ethics, values and rights. However, in social entrepreneurship research use of social and sustainable innovation concepts are more prominent (see examples such as Chalmers, 2012; Chell, Nicolopoulou, & Karataş-Özkan, 2010; Desa & Koch, 2014; Ko, Liu, Wan Yusoff, & Che Mat, 2019; Rinkinen, Oikarinen, & Melkas, 2016). In contrast to this general trend, this paper uses theoretical foundation of responsible innovation as it provides a systematic way to explore innovations from an ethics or values and rights-based angle.

Responsible innovation

Responsible innovation, originally used in science and technology, is defined as:

a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society) (von Schomberg, 2011, p. 9).

The need for responsible governance of innovations arises due to several reasons. First, innovations (e.g., nuclear power) create 'dual uses' or 'double effects' (Voegtlin & Scherer, 2017). The effects of innovations are usually identified through legal compliance and by engaging with end users (Stahl, Chatfield, Ten Holter, & Brem, 2019). These types of activities are also considered 'morally minimum' and considered to be insufficient to identify the double effects of innovations to avoid harm (Stahl et al., 2019). Second, there can be uncertainties regarding the future uses of innovation. That is, the information asymmetry between the current uses and possible unintended consequences of innovation in the future create uncertainties of the net benefits in the long run (Voegtlin & Scherer, 2017). This gets further complicated as some of the ethical issues which need attention are far removed from the direct purview of an organisation or can not be easily incorporated into organisational objectives (Stahl et al., 2019). Hence, governance of positive and negative effects of innovations requires early societal interventions through consultations, proactive actions for self-regulations and shared political responsibilities through private and public partnerships (Voegtlin & Scherer, 2017; von Schomberg, 2011).

The responsible governance of innovation includes four dimensions: anticipation, reflexivity, inclusion and deliberation, and responsiveness (Stilgoe, Owen, & Macnaghten, 2013). Although the terms inclusion and deliberation are used interchangeably (see Owen, Stilgoe, Macnaghten, Gorman, Fisher, & Guston, 2013; Stilgoe, Owen, & Macnaghten, 2013), Lubberink et al. (2019) point out that deliberation and inclusion are two separate dimensions. This is because of the different activities and processes that encompass these two dimensions. However, the original conceptualisation of Stilgoe, Owen, and Macnaghten (2013) where deliberation and inclusion are considered one dimension, provides conceptual grounding to consider who, when, how and in what ways stakeholders are involved in the decision-making process under one conceptual area. Therefore, this paper uses deliberation and inclusion as one dimension in the responsible innovation process.

An additional dimension relevant to business context is knowledge management; creating and mainstreaming the knowledge within an organisation (Lubberink et al., 2017). This is derived from knowledge-based dynamic capabilities and explains actions which social entrepreneurs use to overcome practical knowledge gaps that arise with innovation. Knowledge management includes the creation of knowledge within an organisation, creating or obtaining knowledge from external actors or sources and integrating knowledge into the innovation process. See Table 2 for further explanations on the responsible innovation dimensions and for some examples.

As Table 2 illustrates, organisations conduct multiple activities under each of the responsible innovation dimensions. All these activities are self-regulatory as responsible innovation is about organisations themselves taking the initiative and considering positive and negative effects of innovations (Voegtlin & Scherer, 2017).

Social enterprises and responsible innovation

In the business domain, there is a strong reliance on market mechanisms to deal with the ethical challenges of innovation (Stahl et al., 2019). That is, businesses perceive that socially undesirable consequences of their activities will be dealt with market forces which will be reflected from lack of commercial success (Stahl et al., 2019). However, this is recognised as insufficient to ensure responsible actions in the long term. Responsible innovation, in particular within small and medium enterprises, requires ‘additional motivations apart from desire and feasibility of the change, empathy with social needs and a sense of morality’ (Bahena-Álvarez, Córdón-Pozo, & Delgado-Cruz, 2019, p. 14). These can be enthusiasm in developing a business in a responsible manner, technological and academic abilities, or the support from entrepreneurial or social networks to inspire creativity and development of innovations (Bahena-Álvarez, Córdón-Pozo, & Delgado-Cruz, 2019). At the same time, novel resource combinations which comprise factors such as equity, research and development cooperation, networks, industry knowledge and reputation can facilitate the responsible innovation process within enterprises (Halme & Korpela, 2014).

Social enterprises, due to the combination of philanthropic and economic outcomes, are considered one of the institutional types which focus on responsible innovation (Bahena-Álvarez, Córdón-Pozo, & Delgado-Cruz, 2019). In addition, social entrepreneurs’ inclination for responsible innovation, according to the dimensions explained in Table 2, is anecdotally and empirically evident. However, there is limited theorisation and examination, with the exception of Lubberink et al. (2017, 2019) on how social entrepreneurs generate and implement innovations responsibly. Lubberink et al. (2017, 2019), using an exploratory study conducted among 42 Ashoka fellows, identified that added socio-ethical value (e.g., providing system-shaping solutions by enhancing availability, accessibility and acceptability), bottom-up innovation (e.g., working with targeted beneficiaries by empowering them), radical incrementalism (e.g., conducting multiple iterations, sharing ideas and experimentation) and engaging in institutional support (e.g., combining top-

Table 2. Dimensions of responsible governance of innovation

Dimension	Explanation	Selected activities
Anticipation	Taking into account those intended and potentially unintended impacts – economic, social, environmental and other – that might arise from the innovations, and asking ‘what if?’ and ‘what else might it do?’ questions.	<ul style="list-style-type: none"> • Determining desired impacts and outcomes of innovation • Preventing or mitigating negative impacts • Development of roadmaps for impact
Reflexivity	Considering underlying purposes, motivation, and potential impacts and asking ‘what is known?’ and ‘what is not known?’.	<ul style="list-style-type: none"> • Taking into account actions and responsibilities • Considering values and motivations • Being aware of different perceived realities
Inclusion and deliberation	Opening up visions, purposes, questions and dilemmas to broad, collective deliberation through processes of dialogue, engagement and debate, and inviting and listening to wider perspectives from public and diverse stakeholders. This includes thinking who to involve, during which stage of the innovation process, how to involve them and whether the stakeholder networks are representative.	<ul style="list-style-type: none"> • Involvement of stakeholders at different stages (who and when) • Provision of resources and capital (how) • Raised commitment and contribution (how) • Obtaining feedback from stakeholders
Responsiveness	The collective process of reflexivity, through effective mechanisms of participatory and anticipatory governance, to set the direction and influence the subsequent trajectory and pace of innovation.	<ul style="list-style-type: none"> • Making sure that one can respond to changes in the environment • Actual response to changing environments • Preparedness to address grand challenges
Knowledge management	Creating knowledge within the firm through experimenting and ensuring it is available throughout the organisation.	<ul style="list-style-type: none"> • Knowledge creation and integration

Adapted from Lubberink et al. (2017), Owen et al. (2013), and Stilgoe, Owen, and Macnaghten (2013).

down approaches such as policymaking with bottom-up to enhance legitimacy) are ways which social enterprises engage in responsible innovation. Based on these findings, Lubberink, Blok, van Ophem, van der Velde, and Omta (2018) also developed a typology by combining different dimensions of responsible innovation, to explain different types of responsible social entrepreneurs.

Although Lubberink et al. (2017, 2018, 2019) provide valuable insights into the responsible innovation process, the factors identified in their studies do not clearly illustrate various dynamic actions of social enterprises. For example, the complexity in the environment affects innovation process (Pichlak, 2016); hence, to ensure acceptance of an innovation, social enterprises could be focusing on inclusion using bottom-up development at the initiation stage and not after. Inclusion strategies, especially forming partnerships, have been found to be prominent during the innovation development (Chalmers, 2012) and even the innovation scale-up stage (Corner & Kearins, 2018).

All these dynamic entrepreneurial actions have implications for achieving SDGs. For example, bottom-up development could facilitate the development of innovative systems (goal 9) while community engagement could facilitate partnerships (goal 17). These arguments align with

Horne, Recker, Michelfelder, Jay, and Kratzer (2020) and Littlewood and Holt (2018), where these authors demonstrate that social enterprises directly or indirectly address multiple SDGs through numerous innovative ways. Therefore, further development of the existing work of Lubberink et al. (2017, 2018, 2019) and others, by considering the dynamic nature of innovation development and implementation process, could provide new insights on how responsible innovations contribute to SDGs.

Method

This qualitative study is a part of a project on scaling-up social impact which examines scalable innovative business models in social enterprises. The first phase of the project includes collecting secondary data to develop organisational profiles while the second and subsequent phases include collecting and analysing primary data. This paper uses data from the first phase of this project and answers the research question how and in what ways do social enterprises use responsible innovation practices to achieve SDGs?

Study design and data collection

This study used case study methodology and collected data from three social enterprises purposively selected from the Skoll Foundation Social Enterprise Award winners in 2018 and 2019:¹ Angaza, myAgro and mPedigree. The case study methodology was considered suitable as it provided detailed descriptions of the activities of the social enterprises (Yin, 2014). These organisations address one or more ‘wicked’ problems in the areas of environmental sustainability, education, economic opportunity, health, peace and human rights, and sustainable markets, and use innovative technology platforms, combined with mobile apps or messaging services, to provide accessibility to products/services. See Table 3 for a description of the three case organisations.

Table 3 also outlines the secondary data sources used to develop case summaries of the three organisations. Secondary sources were used to collect data related to organisational history, development, products/services, partnerships, investments, awards and recognitions, and other significant entrepreneurial events. This study used websites, periodic reports, social media, YouTube videos, published interviews of the founders and media articles produced by independent organisations. These data sources were used to develop the innovation journey including the innovation development and implementation process for each of the case organisations. These multiple data sources were also used to avoid potential biases of using self-reported data and to triangulate the evidence (Yin, 2014).

Data analysis and findings

NVivo software was used for preparing, managing and analysing the data. The data preparation for analysis included developing case summaries for each of the organisations covering history, founders’ details, organisational products and services, funding, partnerships, and impact. During this stage, multiple sources were used for verifications. Sometimes the same article or newsfeed appeared on the organisation’s website and associated sources such as social media. Similarly, external news articles were posted on the organisation’s websites. In these situations, only one ‘feed’ was used for data analysis.

¹The Skoll Foundation drives social change by investing in, connecting and celebrating social entrepreneurs (Skoll Foundation, 2019a). The foundation selects winners based on six criteria: social entrepreneur, impact potential, collaboration, innovation, issue area and Skoll leverage (i.e., organisational benefits associated with engaging with the foundation) (Skoll Foundation, 2019a).

Table 3. Case descriptions

Case organisation	Founder/s	Mission of the organisation	Core business	Operational model	Data sources
<i>Angaza</i>	Lesley Marincola and Bryan Duggan	Create technology that allows businesses to offer life-changing products to anyone, anywhere.	A metering and monitoring technology service that allows manufacturers to make their products pay-as-you-go (PAYG) enabled.	Angaza operates using a partnership model. The organisation partners with manufacturers and distributors of off-grid energy products (e.g., solar). The distributors/manufacturers sell the products at village level, for a small down payment, while Angaza provides technology to enable PAYG services. This technology service allows the products to stay on for an amount of time proportional to the size of the payment that was made. After that amount of time has elapsed, the device deactivates and cannot be turned on again until another payment is made.	<ul style="list-style-type: none"> • Company website: 1 • Reports: N/A • Blog posts (both in company website and other sources): 2 sources (54 posts) • Social media – i.e., Twitter, Facebook, Instagram and LinkedIn: 3 accounts • YouTube videos: 1 video (1 source) • Other websites (e.g., online news): 3 articles • Other sources- i.e., government publications: 1 website
<i>myAgro</i>	Anushka Ratnayake	Move smallholder farmers out of poverty.	Micro-savings for farmers facilitated through a mobile layaway system.	myAgro operates using a field-based agent system. Agents of myAgro at the field level enrol smallholder farmers for different savings plans according to which crops they want to cultivate. The farmers can purchase scratch cards ranging from 50 cents to \$50 (USD) – similar to mobile phone credit – from vendors in their local villages and text the number using a mobile phone. The money gets saved in a layaway account with myAgro. At the end of the savings plan myAgro delivers quality seeds or fertilizer to farmers.	<ul style="list-style-type: none"> • Company website: 1 • Reports: 15 annual/quarterly reports 1 financial statement • Blog posts (both in company website and other sources): 2 sources (256 posts) • Social media – i.e., Twitter, Facebook, Instagram & LinkedIn: 4 accounts • YouTube videos: 3 videos (3 sources) • Other websites (e.g., online news): 6 articles • Other sources – government publications: N/A

(Continued)

Table 3. (Continued.)

Case organisation	Founder/s	Mission of the organisation	Core business	Operational model	Data sources
<i>mPedigree</i>	Bright Simons	Building innovative technology tools for brand protection from faking, counterfeiting and diversion in global supply chains.	A product authentication service using a Goldkeys platform.	The organisation operates using a partnership model where they partner with brand owners, regulators and telecom companies. At the product manufacturing stage, a unique product identification marker that consumers can use to determine authenticity is incorporated into the product package. When consumers buy a product they scratch off a panel on the product packaging revealing a pin. Consumers then text the code to a toll free number where they get a reply back either verifying the product or denying it.	<ul style="list-style-type: none"> • Company website: 1 (and 1 associated website) • Reports: 1 case study 1 journal article • Blog posts (both in company website and other sources): N/A • Social media – i.e., Twitter, Facebook, Instagram and LinkedIn: 3 accounts • YouTube videos: 3 videos (3 sources) • Other websites (e.g., online news): 8 articles • Other sources- government publications: 2 articles

Sources used to develop case descriptions: Angaza (2019a), Butcher (2015), myAgro (2019a), mPedigree (2018, 2019), and Skoll Foundation (2019b).

A structured concept-driven coding process, highlighted by Gibbs (2007), was used to analyse the data. First, using key literature on responsible innovation and SDGs, key thematic areas were identified. Then, by going through each case, codes (e.g., texts, report or website extracts, etc.) that reflect the key concepts were identified and assigned to each thematic area. Any new themes emerging from the data were also identified and incorporated into the coding tree. This coding tree was used to conduct a within-case and cross-case analysis by comparing key themes, identifying key patterns and trends, and overlaps of practices related to responsible innovation dimensions. (See online supplementary file for the coding tree for responsible innovation dimensions.)

Following Lincoln and Guba (1985), this study used several techniques to ensure the trustworthiness of the data. First, multiple sources were used to triangulate and validate key claims. Second, multiple researchers (i.e., the author of this paper and a research assistant) were involved in the process. The research assistant collected, compiled and developed the case summaries for each of the organisations. Then the author of this paper reviewed the original sources and compared them with the case summary. This helped to identify valid information. Finally, a self-audit was conducted to ensure all the key themes were coded. In order to conduct the audit, the author of this paper manually coded all the text and assigned the codes into key themes. Then as there were a number of articles, open codes were created using the auto-coded function in NVivo. Once the auto codes were generated, auto codes were compared with manual codes to ensure the comprehensiveness of the coding process. The next section expands and explains these literature-driven key themes and categories using examples from case organisations.

Findings

The findings are presented according to two main sections. The first section explains the SDGs focused on by the organisations and activities conducted to achieve social goals. The second section describes responsible innovation strategies used by the case organisations in order to achieve the desired change.

SDG focus

The three case organisations worked towards achieving different SDGs: no poverty (goal 1), good health and well-being (goal 3), and affordable and clean energy (goal 7). The focus was on accessibility, affordability and availability of services. The primary target groups were poor and low-income people. Reaching these groups required innovative infrastructure and system changes. For example, Angaza developed a pay-as-you-go (PAYG) system for the sale of solar-powered electrical products, myAgro developed a mobile layaway system to enable farmers to save, and mPedigree established a mobile verification system to validate the authenticity of products. Hence, all these innovations aligned with SDG 9 (industry, innovation and infrastructure).

Although each organisation started with addressing only a few SDGs, with growth they increased the type of activities conducted and services provided. For example, myAgro started with a savings solution for farmers, and then ventured into the provision of quality seeds and fertilizer. myAgro also conducted farmer training programs, provided health and nutrition information, invested in research and development, employed women and youth, and conducted professional development tasks. Therefore, myAgros' increased service delivery broadens the impact and contributed to the achievement of multiple SDGs. These include decent work for economic growth (e.g., myAgro providing women and youth decent work) and adapting to climate change (e.g., myAgro developing climate-resistant seed varieties). Similarly, mPedigree's platform was initially used for detecting counterfeit drugs. The organisation later expanded the platform to detect uncertified seeds, and other counterfeit products. To do so, mPedigree relied on partnerships with public, private and not-for-profit organisations (goal 17). These examples demonstrate

that although the case organisations, at the initiation stage, were focused mostly on one or two SDGs, with growth they inevitably addressed several social goals.

The broadened focus on SDGs seemed to be also indirectly linked to the geographical expansion of services. All three organisations started with a single country and then expanded their operations into multiple countries. As an example, myAgro started in Mali and expanded to Senegal and Tanzania. Similarly, Angaza expanded across Africa, East Asia and South Asia while mPedigree expanded into multiple countries in Africa, South Asia and the Middle East. Venturing into these different locations required partnerships (e.g., investors, regulators, mobile operators and others) and piloting models again in new contexts. For example, a myAgro team piloted a village entrepreneur model in several locations. Although there were certain modifications for services (e.g., picture-based application developed for the mobile app in myAgro) due to requirements in each new location, expansions allowed organisations to create widespread social impact.

Responsible innovation strategies

Case organisations used various strategies to ‘minimise harm’ and be responsible in the innovation process (see [Table 4](#) for a summary of findings).

As [Table 4](#) highlights social enterprises used a number of strategies to be responsible in their innovation process. The following sections explain these strategies using examples from the case organisations.

Anticipation

Determining desired impacts and outcomes of innovation: Driven by the social issues identified in communities, all three organisations developed accessible, affordable and reliable solutions that would create impact. To do so, these organisations identified social needs, developed desired solutions, used customer-centric approaches and tested and experimented the products and services. This process helped the organisations to anticipate any positive and negative effects. For example, Angaza used design thinking, in particular human-centred design and empathy principles, to develop a desirable, feasible and viable energy solution. The team used an ‘observe, define, create, iterate and test’ approach in the service design. This included researching customers’ processes, tools and pain points by conducting individual interviews, group interviews and in-person observations, and then determining customers’ biggest pain point and developing a key needs statement. It also included sketching designs of solutions to develop quick and cheap prototypes and testing them with potential customers across various locations and country contexts. The feedback was used to revise the final design (see [Angaza \(2018\)](#) for details). This elaborative design process assisted the Angaza team to identify user-friendly solutions that can create the desired impacts in the communities.

Avoiding negative impacts and consequences: As outlined in [Table 4](#), Angaza had recognised that proactive actions were required to avoid harm:

We have a social obligation to explore unintended consequences of our data products and commit to taking proactive steps to avoid harm ([Angaza, 2019b](#)).

One such proactive action was related to detecting energy theft where some customers tampered with devices to bypass the metered monitoring mechanism to avoid a PAYG option. If energy theft was not detected or incorrectly predicted, it would have created negative consequences to the agents who sold solar products and their customers. Hence, Angaza developed a Unit Health Alerts feature which automatically detected and diagnosed issues, malfunctions and energy theft. This feature enabled swift action from the agents who sold the products. At the same time to avoid any errors in data models and avoid falsely indicating that energy theft was occurring, Angaza used data models with little margin of error for false positives.

Table 4. Summary of findings

Dimension	Activities	Evidence identified from case organisations	
Anticipation	Determining desired impacts and outcomes of innovation	Identification of social needs	
		Developing desired solutions	
		Customer-centric approach	
		Product and service testing at the customer level	
	Avoiding negative impacts and consequence	Proactive action	
		Having systems and protocols	
	Roadmaps for impact	Having strategic plans	
Periodic monitoring and evaluation			
Obtaining frequent user feedback			
Reflexivity	Actions and responsibilities	Being self-aware	
		Evaluating one's own performance	
		Reflecting on lessons learnt	
		External validation through recognitions and awards	
	Considering values of an organisation	Adhering to organisational values and principles	
		Managing ethical and value-based organisational culture	
		Considering emerging challenges and values	
	Knowledge and perceived realities	Realising different perspectives of stakeholders and building consensus	
	Inclusion and deliberation	Involvement of stakeholders at different stages (who, when and how)	Having multiple stakeholders at micro, meso and macro levels
			Supporting and collaborating with stakeholders
Involving customers for product development			
Provision and creative use of resources and capital to enhance involvement		Investing in product and service development and technology	
		Developing/training staff, interns and field agents	
Responsiveness	Preparedness to respond to changes in the environment	Identifying challenges	
	Actual responses to changing environments	Reactive responses for existing challenges	
		Identifying and responding to hidden social issues	
	Preparing for future grand challenges	Preparing for external macro environmental challenges that affect organisations	
Knowledge management	Creating knowledge within the organisation	Identification of knowledge gaps	
		Creating new ideas and operating models	
		Use of data to create new knowledge	
	Integrating knowledge throughout the firm	Integrating and disseminating knowledge throughout the business	

Roadmaps for impact: All three case organisations had clear missions and strategies. For example, myAgro's mission is to 'serve 1 million smallholder farmers, supporting 10 million family members by 2025 to increase their income by \$1.50 per farmer per day to move out of poverty' (myAgro, 2019a). In achieving this mission, the organisation formed strategic plans, used feedback and data to track the progress and assessed additional needs of their customers. The progress was tracked using scale (e.g., number of farmers, number of staff members and number of vendors), impact (% harvest increase) and sustainability indicators. Action plans and priorities were listed using the GBITE framework (Grow, Build, Impact, Trial and Evaluate) (myAgro, 2017a). These helped the organisation to be focused and achieve the preset targets.

However, during the process of achieving organisational goals, social entrepreneurs had to make strategic choices due to changes in the business context. In the case of mPedigree, the founder converted the not-for-profit organisation into a for-profit entity due to the easiness of attracting investments and enhanced credibility among stakeholders. To address competition, the organisation developed a complementary product enabling consumer rewards solution. Furthermore, mPedigree expanded into other sectors such as agriculture. Therefore, although the roadmaps for impact were essential, feedback was needed to be on the right track while strategic choices were needed to be made along the journey to achieve impact.

Reflexivity

Actions and responsibilities: Organisations were self-aware of their actions and responsibilities. myAgro, during its journey, reflected on two key areas: 'Are smallholder farmers too poor to save their way out of poverty? Can a simple mobile savings program be the answer?' (myAgro, 2017b). In addition, myAgro evaluate their own performance by having a dedicated monitoring and evaluation team who gathered harvest data from farmers. They also used rigorous and transparent measures and made continuous improvements to services to enhance impact.

Being self-aware also helped the case organisations to identify changing needs of the customers, reflect, modify practices and learn from the process. For Angaza, realising that the problems needed to be approached from the user's perspective was part of the reflective process:

When we first started, we approached the problem like typical engineers, focused on engineering optimizations, as engineers are wont to do ... and we learned that this mindset resulted in a poor user experience (Thorne, 2018).

Awards received by each of these organisations were external validations of the activities they undertook. In 2018, myAgro was the recipient of the Drucker Prize, Lipman Family Prize: Philadelphia, and Skoll Award for Social Entrepreneurship. Angaza was the recipient of the Ashden Award for International Financial and Business Model Innovation (2018), the Skoll Award for Social Entrepreneurship (2018), Tech Awards (2012 and 2016) and the Echoing Green Fellowship (2013). mPedigree was listed as a Leading Global Innovator in 2017 in Disrupt 100 and one of the winners of the Skoll Award for Social Entrepreneurship (2019). These awards provided recognition of the organisational work among external stakeholders.

Values of an organisation: The values set the boundary for organisational practices when developing new products or services, establishing new partnerships, or developing human resources. For example, Angaza had a strong ethical and value-driven engineering culture. The values 'never compromise quality', 'focus on our end goal', 'pick team first' and 'empathy' were embedded in the culture (Finn, 2018). Similarly in myAgro (2018, 2019b, 2019c), values such as 'act with integrity', 'respect and empathy', 'collaboration and team work' and 'self-reflection and learning' set the performance standards. These values also helped myAgro to develop a value-based culture and build relationships with farmers in a transparent and respectful manner:

I think this value is essential for us to gain the trust of the farmers with whom we interact, says Ami [An Agricultural Assistant in Senegal]. If we put the emphasis on integrity, respect and empathy to communicate with farmers that helps us to convince them to accept and practice the new agricultural techniques that we propose to them (myAgro, 2018).

However, with the enterprise development, new challenges such as protecting client data or privacy concerns emerged. For example, in Angaza, data was both an asset and a liability; this created new value-based challenges:

This data represents both a strategic asset and a strategic liability: while it allows us to offer valuable business insights to our customers and take an evidence-based approach to improving our own product, accidental release of sensitive information could negatively impact our customers' businesses and low quality insights and predictive analytics could lead to poor business decisions and degraded trust (Angaza, 2019b).

Nevertheless, adhering to values ensured that there was internal integrity within the organisation.

Knowledge and perceived realities: Early on mPedigree's founder realised that organisational success depended on building consensus and trust among a very diverse group of stakeholders. These stakeholders include manufacturers, telecom networks, government regulators and even foreign donors, whose interests and motivations varied substantially. For example, pharmaceutical companies were interested in ensuring the legitimacy of their products, maintaining brand integrity, avoiding costly lawsuits, retaining market share and profitability potentially lost to counterfeiters. The mobile phone operators benefited from technology due to the increased short message traffic and phone calls. They also gained the ability to promote value-added services to customers. While law enforcement was one of the main objectives of governments and regulatory agencies. The data from the platform was of interest to regulators to identify counterfeit 'hotspots' in real time, and then conduct targeted inspections of stores and markets by better utilising the resources. As some of the largest purchasers of pharmaceuticals were made through foreign donations, these donors were interested to monitor the uptake of drugs purchased through their donations. Hence, becoming aware of these multiple realities helped to be responsible for all the stakeholders.

Inclusion and deliberation

Involvement of stakeholders at different stages (who, when and how): All three organisations focused on customers and involved them during the service/product design and implementation stages. In Angaza, design thinking practices facilitated inclusion:

Essentially, we're in the field with last-mile distributors trying to understand the challenges that they're facing. We're talking to their clients, their agents, we're even putting prototypes, whether that be a pen and paper drawing, in front of the agents, or we mock up something quick through PowerPoint to help them interact with a piece of software or with a new screen on the mobile app. This is all to ensure that we're designing something that's useful for the distribution business, and that's easily understood and used by the client base and rural sales agents (Angaza, 2019c).

All organisations developed partnerships at micro, meso and macro levels to enhance the effectiveness of service delivery. For example, Angaza's ability to provide a wide range of products was highly dependent on the number of partnerships they were able to form. Similarly, myAgro relied on field-level boutique networks where their clients bought the 'scratch' cards. Partnerships were also core to mPedigree due to the nature of the services they provided. For example, mPedigree required the support and collaboration of partners from the supply chain (e.g., drug

manufacturers and seed companies) to deliver their services. It also needed the collaboration of regulatory agencies due to these being highly regulated sectors.

Provision and creative use of resources and capital to enhance involvement: Stakeholder involvement was ensured through creative utilisation of financial, human and physical resources. For example, Angaza used sales data as a resource to determine types and amounts of products which need to be ordered for distribution by sales agents. These data were useful to determine different locations and even track how sales agents were performing against their targets. In myAgro, savings figures were used to identify which crops had the highest demand and provide customers with targeted information. Mapping the Fall Army Worm attacks visually using GIS assisted the organisation to plan next steps and better assist farmers. myAgro also provided resources such as a coaching toolkit to train commissioned-based village entrepreneurs (who work part-time enrolling farmers), sales tools and motivational videos; these resources facilitated the deliberate inclusion of customers and staff into the organisational practices.

Responsiveness

Preparedness to respond to changes in the environment: The case organisations recognised emerging challenges in the environment and prepared to address them. However, the activities conducted were reactive in nature. Angaza, for example, focused on accommodating the growing number of clients and the data they generate. This required identifying emerging trends and changing systems and processes:

A technical challenge is the growing size of these data sets. Angaza customers have grown incredibly over the last couple of years. As that trend of growth continues, we'll be moving from more traditional data science techniques, executed on a single machine, towards more distributed architectures (Angaza, 2019d).

Similarly, mPedigree experienced a hacking attack at the initial stage and that made them realise that they needed to be prepared for future potential cyber-attacks.

Actual responses to changing environments: As explained above, the changing environment required organisations to take action to react to external changes. Due to declining farm productivity, myAgro invested in research and development to improve the productivity of smallholder farms. The organisation invested in developing and identifying agriculture equipment and testing new crop varieties such as sorghum, maize and millet. The organisation also made available planting equipment to farmers through their savings scheme.

Similar actions were taken by myAgro to empower women and youth, as they were highly disadvantaged in rural communities, by providing decent work (myAgro, 2019b). The employees, in particular youth and women, received training on field leadership and coaching. In addition, the organisation hired and trained seasonal interns – young people who were interested in agriculture to re-train farmers and conduct follow-up visits. These seasonal interns became a pool of potential candidates for future recruitment for the organisation.

Preparing for future grand challenges: The grand challenges each of the case organisations faced varied due to the industry they were engaged in. As myAgro's key target group was farmers in West Africa, they were highly susceptible to effects of climate change: Adama Faye, a myAgro farmer in Senegal noted,

This season rain was scarce, and only the plot with fertilizer produced enough to keep the family from pulling kids from school and skipping meals (myAgro, 2019c).

Hence, myAgro was helping the farmers to adjust to climate change by providing access to climate-smart seed varieties and quality fertilizer.

In contrast, Angaza's focus was on artificial intelligence and how it could be used in an ethical manner:

The other challenge and trend in the whole data science field is a focus on 'ethical artificial intelligence.' There is genuine concern about what power we're putting into the hands of our algorithms (Angaza, 2019d).

As Angaza highly rely on customer data, addressing how data could be managed in a responsible way is a grand challenge which the organisation needs to reflect on.

Knowledge management

Creating knowledge within the organisation: The knowledge creation practices in each of these organisations started with the identification of knowledge gaps. The organisations identified a social problem, recognised the lack of solutions, realised that one particular individual or organisation did not have the solution, engaged with the communities and created sustainable solutions. Examples for such knowledge creation processes include the design thinking process of Angaza, field testing of seeds by myAgro and pilot testing conducted by mPedigree. In addition, customer data (e.g., savings patterns in myAgro and customers' buying behaviour in Angaza) were used to create new knowledge. This information was useful to further strengthen the operational models. For example, myAgro identified that working with the existing family structure, where female farmers could discuss savings with their husbands and families, facilitated the growth of the organisation in the long term.

Integrating knowledge throughout the firm: Replication of responsible practices occurred through the dissemination of efficient and effective practices throughout the organisation at a particular country or multi-country levels. For example, when myAgro found an effective operational model, they replicated that in all the countries. Similarly, myAgro Senegal identified a village entrepreneurship model as effective and replicated that throughout Senegal.

The knowledge dissemination also happened across stakeholders to increase the overall effectiveness of systems. For example, mPedigree data helped regulators to identify markets with higher numbers of counterfeit products. This information was useful to have targeted approaches by prioritising those geographical areas in policing.

Discussion and conclusion

This study focused on the research question of how and in what ways do social enterprises use responsible innovation practices to achieve SDGs? The findings illustrate that social enterprises use innovative solutions to address 'wicked' social problems. Aligning with Garcia and Calantone (2002), innovative solutions explained in this study can be categorised as radical or transformative. For example, all three enterprises use cutting-edge technologies and create value using new ways. Hence, these social enterprises radically redesigned products and services to address social problems.

The findings in this study highlight that although social enterprises start their innovative ventures aligned with few SDGs, due to the nature of issues faced by their target groups, these enterprises broaden their social focus. These findings align with the arguments made by Horne et al. (2020). The authors found, in a German context, social enterprises address SDGs indirectly; the reason being the progress in one SDG is tied to the progress in another SDG. This study also noted these interdependencies such as climate action with no poverty, and decent work with no poverty and innovative system changing solutions with partnerships.

The findings also demonstrate that social enterprises use a number of responsible innovation practices. These align with the work of Lubberink et al. (2019), Owen et al. (2013) and Stilgoe, Owen, and Macnaghten (2013). Table 4 demonstrates the different strategies used by each of

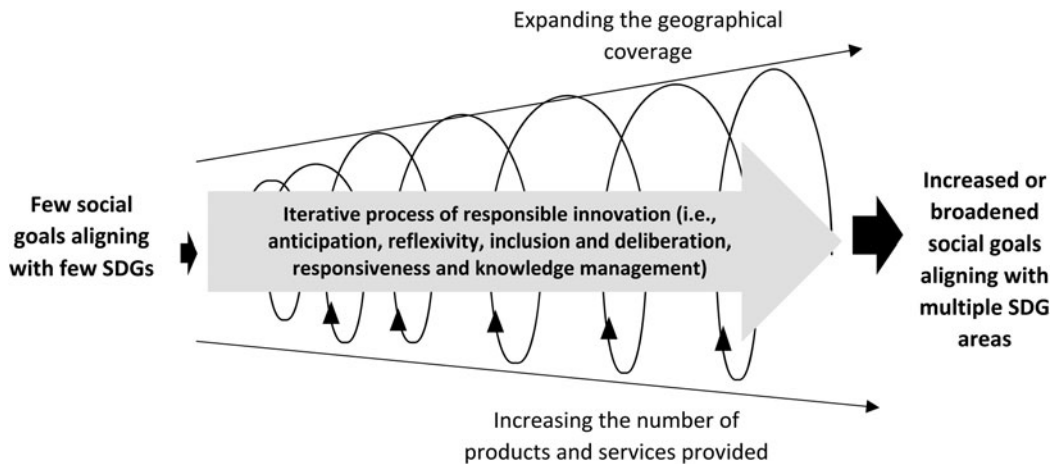


Figure 1. Responsible innovation development and implementation journey in social enterprises

these organisations. These actions seem to be part of social enterprises as these organisations are grounded on social and ethical values (Lubberink et al., 2019).

This study, by combing findings with responsible innovation and SDG literature, proposes the following model (Figure 1) to demonstrate the responsible innovation development and implementation process of social enterprises.

As illustrated in Figure 1 during the innovation process, the enterprises consider all the different dimensions of responsible innovation. Aligning with Owen et al. (2013) and Stilgoe, Owen, and Macnaghten (2013), social enterprises anticipate both positive and negative impacts, reflect on actions, responsibilities and values, obtain participation of stakeholders, are responsive to current and future challenges, and share knowledge within and outside the organisation.

Figure 1 illustrates that responsible innovation dimensions are closely linked with each other. Although this paper explains these dimensions separately, the study findings demonstrate many evidence are inter-connected. For example, as explained in the findings section, anticipation actions are closely linked with responsiveness. Inclusion and deliberation help in anticipating future consequences. Furthermore, these occur iteratively during the innovation journey of a social enterprise where organisations consider and reconsider their actions and implications. This is illustrated in Figure 1 using a spiral. The organisations go back and forth with different dimensions in order to make responsible decisions. Findings also demonstrate that increasing the number of products and services and expansion of geographical areas compel organisations to draw on the different dimensions of responsible innovation more often. It makes the iterative responsible innovation more complex as well. This is illustrated in Figure 1 with a gradual increment in the size of the spiral.

Theoretically, one of the main contributions of this study is the proposed model of responsible innovation to achieve SDGs within the social entrepreneurship context (see Figure 1 and Table 4). This model, combining the responsible innovation and SDG literature streams, demonstrates a novel perspective to study the dynamic nature of the innovation and implementation process when developing responsible solutions. The proposed model demonstrates the iterative nature of different responsible innovation dimensions while Table 4 outlines specific activities that reflect these iterative tasks.

Another contribution of this paper is the usefulness of having responsible innovation as a theoretical framework to analyse innovations in social enterprises. As explained by von Schomberg (2011) and Voegtlin and Scherer (2017), responsible innovation uses the ethics, values and rights-based theoretical angle. Hence, compared to social or sustainable innovation perspectives

(see Adams, Jeanrenaud, Bessant, Denyer, & Overy, 2016; Bos-Brouwers, 2010; Cajaiba-Santana, 2014; Pol & Ville, 2009), responsible innovation provides different insights. By using the responsible innovation framing, this paper provides novel insights which cannot be identified from using social or sustainable innovation perspectives.

These findings provide several managerial implications. First, the findings suggest that responsible innovation is a deliberate process that the managers need to consciously engage in. That is, the founders and top managers of social enterprises should consciously and continuously use strategies to be responsible to diverse stakeholders. Second, with the growth (in terms of number and type of activities and geographies), the responsible innovation activities also increase in number. Hence, there need to be adequate human, financial, physical and other resources allocated into the process. As Halme and Korpela (2014) point out, novel combinations of existing resources can be used to manage resource requirements. Third, managers need to be aware of the changing business context and emerging challenges. Similar to any other organisation, managers of social enterprises need to be prepared to make continuous improvements. That includes recognising that managers need to be flexible and adaptive.

However, this study is not without limitations. As this is an on-going project, secondary rather than primary data was used to construct cases. Therefore, comparable information is not available across all the dimensions. Collecting primary data will help to get more insights and comparable data. In addition, this study only has three case studies. Although the limited number of cases were balanced by having detailed descriptions, future studies could apply this framework to multiple cases. Future studies can further modify and test this model by combining these findings with design thinking (Brown, 2008) and innovation journey (Van de Ven, 2017). The typology developed by Littlewood and Holt (2018), combining social enterprises and SDGs, is also important in this regard as different types of social enterprises could have different approaches.

In conclusion, this study provides a promising initial model of integrating responsible innovations with SDGs and outlines how social enterprises practise different dimensions of responsible innovation. The study also highlights the need to be deliberate in the responsible innovation process and the need for managers to be more conscious of the innovation process. Future studies could expand and strengthen these key theoretical and managerial implications further.

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