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Product Service Systems: A Sustainable Design Strategy for SMEs in the Textiles and Leather Sectors

Abstract Sustainability is no longer an optional facet of production. Concrete actions are needed from every actor in society to achieve more efficient, responsible, and innovative ways of producing, consuming, and living. Businesses, including small and medium enterprises (SMEs), are key actors in the drive toward sustainability. Product Service Systems (PSS) are an alternative for SMEs willing to make the transition towards more sustainable operations, but they remain an unknown quantity for many companies. In this article we present findings from two recent studies on the design of sustainable PSS for SMEs. Our main objectives are to inform designers, design managers, and policymakers about the advantages a sustainable PSS offers to SMEs seeking more sustainable operations, and discuss SMEs' operational needs should they wish to innovate using PSS.

Keywords

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1 Editorial note: while the body text conforms to U.S. English, all project titles and institution names adopt British English where appropriate.

2 Jonathan Lash and Fred Wellington, "Competitive Advantage on a Warming Planet," *Harvard Business Review* 85, no.3 (2007): 95–102, available at <https://hbr.org/2007/03/competitive-advantage-on-a-warming-planet>.

3 C. Van Hemel and Jacqueline Cramer, "Barriers and Stimuli for Ecodesign in SMEs," *Journal of Cleaner Production* 10, no. 5 (2002): 439–53, DOI: [https://doi.org/10.1016/S0959-6526\(02\)00013-6](https://doi.org/10.1016/S0959-6526(02)00013-6).

4 Francesco Ciliberti, Pierpaolo Pontrandolfo, and Barbara Scozzi, "Investigating Corporate Social Responsibility in Supply Chains: An SME Perspective," *Journal of Cleaner Production* 16, no. 15 (2008): 1579–88, DOI: <https://doi.org/10.1016/j.jclepro.2008.04.016>.

5 Ram Nidumolu, C. K. Prahalad, and M. R. Rangaswami, "Why Sustainability Is Now the Key Driver of Innovation," *Harvard Business Review* 87, no. 9 (2009): 3–10, available at <https://hbr.org/2009/09/why-sustainability-is-now-the-key-driver-of-innovation>.

6 John Elkington, *Cannibals with Forks: The Triple Bottom Line of 21st Century Business* (Oxford: Capstone Publishing Limited, 1997).

7 Al Gore, *An Inconvenient Truth: The Planetary Emergency of Global Warming and What We Can Do about It* (Emmaus: Rodale, 2006).

8 Laurie Michaelis, "The Role of Business in Sustainable Consumption," *Journal of Cleaner Production* 11, no. 8 (2003): 915–21, DOI: [https://doi.org/10.1016/S0959-6526\(02\)00160-9](https://doi.org/10.1016/S0959-6526(02)00160-9).

9 Lash and Wellington, "Competitive Advantage on a Warming Planet."

10 David L. Rainey, *Sustainable Business Development: Inventing the Future through Strategy, Innovation, and Leadership* (Cambridge, UK: Cambridge University Press, 2010).

11 World Commission on Environment and Development, *Our Common Future* (Oxford, UK: Oxford University Press, 1987).

Introduction

Ensuring economic, social, and environmental sustainability is of vital interest to governments, businesses, and the public alike.¹ For businesses, being sustainable means adopting more responsible practices and holding themselves accountable for the environmental impact their activity creates. Moving toward sustainability and innovative operational change is particularly critical not only in industries where resources have become scarce. Businesses small and large are under increasing pressure from local authorities and communities to change the ways they operate.² For multinationals and small and medium enterprises (SMEs) alike, that pressure is now constant and considerable.

To meet these challenges effectively, companies must understand what sustainability means and what that implies for their operations. Yet they lack awareness about environmental legislation and social impact, and lack access to knowledge and skills transfer networks, both of which become barriers preventing organizations moving towards sustainable business models, especially SMEs.³ In developing economies, the situation is compounded by communication gaps in supply chains, low savings rates, and poor infrastructure,⁴ which also act as major obstacles for companies willing to move towards a sustainable way of doing business.

Despite these challenges, businesses must continue to identify and implement sustainable operating models, make themselves responsible for the impact they have. At the same time, they must innovate and remain competitive.⁵ For all these reasons, it is crucial that businesses grasp the sustainable parameters within which they must operate and are able to evaluate their customers' and supporters' perceptions of their efforts.

In this article, we present two studies recently carried out on the implementation of Sustainable Product Service Systems (PSS) in Botswana and Colombia. These studies evaluate different aspects of using *servitization* – service-oriented selling – a means of boosting business competitiveness and preparing for uncertainty. Sustainable PSS are part of a group of emerging models conceived to support an alternative approach that focuses less on producing physical products and more on enhancing functionality to fulfill needs.

Design plays a major role in sustainable PSS development. For this reason, the main purpose of this paper is to inform designers, design managers, and policy-makers about the potential offered by sustainable PSS development as a strategic component of innovation. We highlight local experts' and SMEs' perceptions about the feasibility and promise of sustainable PSS, and examine factors that can impact the PSS design and development process. We begin by presenting the theoretical background to our research, including an introduction to the PSS concept and a brief statement supporting the work within the context of SMEs. We then go on to explain our methodology and the results from our two studies. After analyzing and discussing these findings, we conclude with some final thoughts and suggest avenues for further research.

Research Background

Integrating social, environmental, and economic considerations is known as "the triple bottom line."⁶ That line means companies must seek positive environmental and social impact as much as they do economic return. Given the important role that businesses play in our complex social and economic systems, and the challenges associated with limited resources and fragile ecosystems,⁷ the onus is on them to adjust their operations accordingly.⁸ Businesses are not the only actors that must reckon with the environmental consequences of producing goods and

services – governments, consumers, and civil society are also responsible. Despite the value that businesses provide – such as jobs and an enhanced quality of life – if they wish to survive in a constrained future, influence changes in consumption behaviors, and ensure that their positive contributions to society are not obscured by negative rebound effects, it is becoming imperative that companies incorporate sustainable practices into their strategies and operations.⁹

In the late 1970s, businesses (strongly influenced by the enforcement of new laws)¹⁰ began to take the necessary steps toward more responsible production practices. As a result, they were able to achieve significant improvements in their use of resources.¹¹ Even though legislation has, over the years, continued to be a very important driver of environmental and social measures inside companies, enhancing their brand image, reducing costs, and satisfying customer and shareholder demands have become the main motivations behind sustainable strategies.¹² Since the 1970s, companies confronting the sustainability challenge have moved away from compliance-driven approaches and have taken a more proactive stance.¹³ Despite the risks involved, innovating in the quest for sustainability and successfully implementing environmentally and socially viable development practices can earn businesses significant rewards.¹⁴

Among the variety of approaches to innovation and sustainable operations businesses have used, service-oriented solutions have shown promising results.¹⁵ Service-oriented models uphold the idea that many of our needs can be satisfied using services instead of products – a shift that can reduce our consumption of resources and energy, and the amount of waste we produce.¹⁶ One promising exemplar of the service-oriented model is the Sustainable Product-Service System (PSS).¹⁷ Some scholars maintain that we need radical innovation – large scale change to consumption and production systems – to achieve sustainable development targets.¹⁸

Product Service Systems

A number of definitions for PSS have emerged over the last forty years. They similarly describe PSS as a system of products, services, and supporting infrastructure designed and developed to satisfy customer needs in innovative ways.¹⁹ Central to all these definitions is the transition from product-centered solutions to “servitization,” or service-centered solutions.²⁰ Transitioning from a product to a service focus implies change. Consumers will change what and how they consume, and even perhaps how they perceive a brand. To enable that shift requires cultural and operational change at the heart of the service-providing organization as well. For this reason, some recognize PSS as a sustainable alternative capable of satisfying many of our current and potential future needs. According to Robin Roy, “The key to sustainable product-service systems is that they are designed and marketed to provide customers with a particular result or function – clean clothes, mobility, warmth, and so on – without them necessarily having to own or buy physical products, such a washing machine, a car, or fuel, in order to get that result.”²¹ Sustainable PSS are part of a radical transformation of our economic system from a consumption model and a linear approach to production to one less dependent on physical resources. Services play a central role, and reuse, recycling, and remanufacturing are desirable ways to ensure closed-loop production cycles and eventually zero waste.

Despite their potential to *be* sustainable, not all PSS *are* sustainable. There are three types of PSS: product-oriented, user-oriented, and result-oriented.²² Among these three, those oriented towards results have a higher chance of leading to more sustainable solutions. Ezio Manzini and Carlo Vezzoli²³ state that being

12 Rainey, *Sustainable Business Development*.

13 Nidumolu et al., “Why Sustainability Is Now the Key Driver of Innovation.”

14 Ibid.; Adam Werbach, *Strategy for Sustainability: A Business Manifesto* (Boston: Harvard Business Press, 2009).

15 Robin Roy, “Sustainable Product-Service Systems,” *Futures* 32, no. 3-4 (2000): 289–99, DOI: [https://doi.org/10.1016/S0016-3287\(99\)00098-1](https://doi.org/10.1016/S0016-3287(99)00098-1).

16 Arnold Tukker and Ursula Tischner, eds., *New Business for Old Europe: Product-Service Development, Competitiveness and Sustainability* (London: Routledge, 2017).

17 Tracy Bhamra, Ricardo Hernandez, and Richard Mawle, “Sustainability: Methods and Practices,” in *The Handbook of Design for Sustainability*, ed. Stuart Walker and Jaques Giard (London: Bloomsbury Academic, 2013), 106–20; Marcel Crul and Jan C. Diehl, “Design for Sustainability (D4S): Manual and Tools for Developing Countries,” in *Proceedings of the 7th Annual ASEE Global Colloquium on Engineering Education* (Cape Town: ASEE, 2008), 1–10, available at https://www.researchgate.net/profile/Marcel_Crul/publication/237235968_Design_for_Sustainability_D4S_Manual_and_Tools_for_Developing_Countries/links/53df2fd00cf2a76fb6680b46.pdf.

18 Arnold Tukker, “Eight Types of Product-Service System: Eight Ways to Sustainability? Experiences from SusProNet,” *Business Strategy and the Environment* 13, no. 4 (2004): 246–60, DOI: <https://doi.org/10.1002/bse.414>.

19 Mark J. Goedkoop, Cee J. G. van Halen, Harry R. M. te Riele, and Peter J. M. Rommens, *Products Service Systems: Ecological and Economic Basics* (The Hague: Dutch Ministries of Environment (VROM) and Economic Affairs (EZ), 1999); Oksana K. Mont, *Product-Service Systems* (Stockholm: Swedish Environmental Protection Agency, 2000), available at <https://naturvardsverket.se/Documents/publikationer/afr-r-288-se.pdf>.

20 Ezio Manzini and Carlo Vezzoli, “A Strategic Design Approach to Develop Sustainable Product Service Systems: Examples Taken from the ‘Environmentally Friendly Innovation’ Italian Prize,” *Journal of Cleaner Production* 11, no. 8 (2003): 851–57, DOI: [https://doi.org/10.1016/S0959-6526\(02\)00153-1](https://doi.org/10.1016/S0959-6526(02)00153-1).

21 Roy, "Sustainable Product-Service Systems," 293.

22 Tukker, "Eight Types of Product-Service System?"

23 Manzini and Vezzoli, "A Strategic Design Approach."

24 Alain Findeli, "Rethinking Design Education for the 21st Century: Theoretical, Methodological, and Ethical Discussion," *Design Issues* 17, no. 1 (2001): 5–17, DOI: <https://doi.org/10.1162/07479360152103796>.

25 Matthew B. Cook, Tracy A. Bhamra, and Mark Lemon, "The Transfer and Application of Product Service Systems: From Academia to UK Manufacturing Firms," *Journal of Cleaner Production* 14, no. 17 (2006): 1455–65, DOI: <https://doi.org/10.1016/j.jclepro.2006.01.018>; Oksana K. Mont, "Clarifying the Concept of Product-Service System," *Journal of Cleaner Production* 10, no. 3 (2002): 237–45, DOI: [https://doi.org/10.1016/S0959-6526\(01\)00039-7](https://doi.org/10.1016/S0959-6526(01)00039-7); David Ness, "Sustainable Product Service Systems: Potential to Deliver Business and Social Benefits with Less Resource Use," in *Web-Based Green Products Life Cycle Management Systems: Reverse Supply Chain Utilization*, ed. Hsiao-Fan Wang (Hershey: Information Science Reference/IGI Global, 2009), 232–49; Agus Sutanto, Berry Yulindra, Benny Tjahjono, and Rika A. Hadiguna, "Product-Service System Design Concept Development Based on Product and Service Integration," *Journal of Design Research* 13, no. 1 (2015): 1–19, DOI: <https://doi.org/10.1504/JDR.2015.067224>.

26 Oksana K. Mont, "Drivers and Barriers for Shifting towards More Service-Oriented Businesses: Analysis of the PSS Field and Contributions from Sweden," *The Journal of Sustainable Product Design* 2, no. 3-4 (2002): 89–103, DOI: <https://doi.org/10.1023/B:JSPD.0000031027.49545.2b>.

27 Carlo Vezzoli, Fabrizio Ceschin, Jan C. Diehl, and Cindy Kohtala, "Why Have 'Sustainable Product-Service Systems' Not Been Widely Implemented? Meeting New Design Challenges to Achieve Societal Sustainability," *Journal of Cleaner Production* 35, no. 28 (2012): 288–90. DOI: <https://doi.org/10.1016/j.jclepro.2012.05.050>.

results-oriented means developers have more freedom to create systems that produce environmental and social benefits.

Design plays a major role in sustainable PSS systems development. On the one hand, the services themselves must be sustainable. This means using sustainable materials and sources of energy, avoiding hazardous substances, aiming for low energy consumption during use, incorporating materials recovery into the production cycle, and not generating waste. The latter two are crucial. On the other hand, design is also a valuable tool to ensure sustainable PSS are effectively a means to support a broad, radical, long-term transformation of the economic system. In this sense, designers must make the systems reproducible and scalable, encourage sustainable behaviors, and ensure they are easy to understand and customizable. Not only this – sustainable PSS systems should also have environmental, social, and economic impact in ways that ensure sustainable living for all. Designing systems like the ones we describe here entails a great number of challenges for designers trained to identify gaps and generate product-based, standalone solutions that do not function as part of a larger system. For designers to be effective in this context, they must be educated differently. They must learn to see beyond the "product design" mentality, become proficient in multidisciplinary approaches, and be capable of incorporating sustainable principles into their designs.²⁴

Some of the environmental and social benefits that sustainable PSS generate include reduced consumption of raw materials and energy during system creation and use, fewer physical products produced, and the provision of services to people experiencing financial or physical limitations. Overall, relationships in the value chain become stronger, producers take more responsibility for the products they generate, and collaboration between actors involved in the production and delivery of the systems is the norm.²⁵

Despite the potential rewards that product-service systems offer, there are also a number of limitations barring their adoption. These include low user acceptance,²⁶ resistance from stakeholders to changing the status quo in the value chain,²⁷ a generalized lack of knowledge about PSS and other related concepts,²⁸ unfavorable public policies,²⁹ and the fact that many companies do not have the financial resources to embrace their design and development.³⁰ And yet, a system in place that favors sustainable operations helps companies differentiate their offerings from their rivals, increases customer loyalty, favors innovation, and produces important savings in materials and energy³¹ – all of which are very attractive possibilities. One very real challenge is that there are relatively few sustainable PSS to choose from, whereas the market abounds with solutions centered on physical products that embody the traditional, transactional, buy-and-sell model.³²

Buy-and-sell is the model that sustainable PSS can innovatively transform, and its prevalence is (arguably) the primary obstacle preventing more widespread PSS implementation. Creating and implementing sustainable PSS requires support and dedication from actors working in a variety of domains, all aligned to fulfil a common purpose. This cohort of actors and collaborators includes consumers willing to trade some of the privileges that products afford them for services that are more efficient and, in the long run, serve the interests of the common good. This kind of cooperation and collaboration – this commitment – is rare, and where such combined efforts do exist, their scope is usually limited. What is more, very few of the systems already on the market have been developed by SMEs. Sustainable PSS is still a novel and somewhat alien concept – especially for small companies – but it represents an attractive opportunity for SMEs who are ready and willing to make the move toward more sustainable practices and outputs.

Interest in SMEs

As authors Nidumolu, Prahalad, and Rangaswami state unequivocally, “There’s no alternative to sustainable development.”³³ Not only is this statement true, it applies to every actor in society. For businesses and organizations of all shapes and sizes, the implications are huge, and pressure is mounting on SMEs to follow in the sustainable footsteps of their corporate cousins. An increasing number of academics, policymakers, and government and non-government agencies are turning their attention to SMEs, because SMEs – as major contributors to societies and economies – may play an important role in achieving sustainable development goals. SMEs produce and supply goods, create jobs, and shape global supply chains. Around 80% of the world’s companies fall into the SME category.³⁴ In the UK, they account for 99% of the total number of companies;³⁵ in Botswana they constitute 95% of that total;³⁶ and in Colombia they represent 99.8% of the total number of businesses.³⁷ In terms of their contribution to the economy, in Botswana SMEs generate 30 to 45% of GDP,³⁸ and in Colombia they generate 37%.³⁹ In terms of job creation, SMEs in Botswana provide approximately 75% of the nation’s formal employment opportunities,⁴⁰ while in Colombia this figure sits at around 80%.⁴¹

SMEs’ combined social and economic contributions, environmental impact, and the influence they exert on social systems are, without question, very relevant to the sustainability challenge. Ensuring that SMEs have the resources and support they need to operate under the new paradigm of sustainable development is therefore crucial. Given the urgency driving sustainable innovation, and the complexity of the systemic challenges we face on our planet, if new and existing SMEs wish to survive, it is crucial that they incorporate sustainable innovation into their operations. In this article, we present the case for sustainable PSS as a model SMEs can implement to initiate and support their transition to sustainability.

Despite the valuable insights provided by existing research,⁴² SMEs need more targeted information about how to implement the PSS concept. They need to better understand the feasibility of the PSS model for their structures. They need an ability to discern the drivers and barriers to PSS design and development. And they need to understand the perceptions of their supporters as regards PSS. The present research is our attempt to meet these needs.

Research Focus

In order to accomplish our research objective, we analyzed perspectives from selected experts and SME representatives from two very different developing countries: Botswana and Colombia. These experts were academics, consultants and government employees working in the domains of SME competitiveness, new business strategies, and sustainable industry initiatives. The SMEs from both countries were either from the textiles or the leather manufacturing industry. The majority of the SMEs were small rather than medium companies (an assessment we based on the number of employees). We carried out each of these studies to explore PSS as a potential strategy for SMEs to become more sustainable operationally and in terms of their offerings. Our intention was not to look for statistical representations or to make inferences about the path all SMEs in these countries should take. Our aim was to gain a broader understanding of an unexplored strategy that – in the literature and in the few examples already on the market – had produced significant social, economic, and environmental benefits despite the barriers and challenges inherent to it.

28 Cook et al., “The Transfer and Application of Product Service Systems,” 1455–65; Andrew Williams, “Product Service Systems in the Automobile Industry: Contribution to System Innovation?,” *Journal of Cleaner Production* 15, no. 11–12 (2007): 1093–103, DOI: <https://doi.org/10.1016/j.jclepro.2006.05.034>.

29 Fabrizio Ceschin and Carlo Vezzoli, “The Role of Public Policy in Stimulating Radical Environmental Impact Reduction in the Automotive Sector: The Need to Focus on Product-Service System Innovation,” *International Journal of Automotive Technology and Management* 10, no. 2–3 (2010): 321–41, DOI: <https://doi.org/10.1504/IJATM.2010.032631>.

30 Katrin Besch, “Product-Service Systems for Office Furniture: Barriers and Opportunities on the European Market,” *Journal of Cleaner Production* 13, no. 10–11 (2005): 1083–94, DOI: <https://doi.org/10.1016/j.jclepro.2004.12.003>.

31 Goedkoop et al., *Products Service Systems*; Mont, “Drivers and Barriers for Shifting towards More Service-Oriented Businesses”; Tukker and Tischner, *New Business for Old Europe*.

32 Ricardo J. Hernandez-Pardo, “Designing Sustainable Product Service Systems: A Business Framework for SME Implementation” (PhD dissertation, Loughborough University, 2012), available at <http://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.561168>.

33 Nidumolu et al., “Why Sustainability Is Now the Key Driver of Innovation,” 57.

34 Samuel B. Moore and Susan L. Manning, “Strategy Development in Small and Medium Sized Enterprises for Sustainability and Increased Value Creation,” *Journal of Cleaner Production* 17, no. 2 (2009): 276–82, DOI: <https://doi.org/10.1016/j.jclepro.2008.06.004>.

35 National Federation of Self Employed & Small Businesses, “UK Small Business Statistics: Business Population Estimates for the UK and Regions in 2017,” *fsb.org*, accessed July 24, 2018, <https://www.fsb.org.uk/media-centre/small-business-statistics>.

36 Joel Sentsho, Johnson T. Maitetso, and Margaret Sengwa-ketse, *Performance and Competitiveness of Small and Medium*

Sized Manufacturing Enterprises in Botswana (Gaborone: Bay Publishing, 2007), available at <https://www.africaportal.org/publications/performance-and-competitiveness-of-small-and-medium-sized-manufacturing-enterprises-in-botswana-2/>.

37 DANE, *Censo General 2005: Nivel Nacional* [General Census 2005: National Level] (Bogotá: Departamento Administrativo Nacional de Estadística, 2005), available at <https://www.dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/censo-general-2005-1>.

38 Sentsho et al., *Performance and Competitiveness*.

39 DANE, *Censo General 2005*.

40 Kaiser Associates/Maphanyane and Associates, *Botswana Local Enterprise Authority Needs Assessment for the SMME Sector and Business Development Service Providers* (Cape Town: Kaiser Associates, 2009), available at <http://www.lea.co.bw/needs-assessment-study-smmes-complete-vesion>.

41 DANE, *Censo General 2005*.

42 Ricardo J. Hernandez-Pardo, Tracy Bhamra, and Ran Bhamra, "Exploring SME Perceptions of Sustainable Product Service Systems," in *IEEE Transactions on Engineering Management* 60, no. 3 (2013): 483–95, DOI: <https://doi.org/10.1109/TEM.2012.2215961>.

43 Botswana Ministry of Finance and Development Planning, *Mid-term Review of National Development Plan 10* (Botswana Government, Gaborone, 2013).

44 Botswana Ministry of Trade and Industry, *Economic Diversification Drive: Medium to Long Term Strategy 2011–2016* (Botswana Government, Gaborone, 2011).

45 Botswana Ministry of Trade and Industry, *Economic Diversification Drive*.

46 DNP (Departamento Nacional de Planeación Colombia), *Documento sectorial cadena cuero, calzado y manufacturas* (Bogotá, 2007), 48.

47 "La crisis del cuero. Diario el Espectador," *El Espectador*, February 2, 2011, <http://www.elespectador.com/impreso/negocios/articulo-248624-cri-sis-del-cuero>.

Botswana

The recent economic crisis had a considerable impact on the Botswanan economy. As a result, the nation has begun to explore other avenues for economic growth and diversification.⁴³ Its heavily diamond-dependent economy was hard hit by a reduction in diamond revenue. A number of government policies highlight the importance of the leather industry for economic diversification.⁴⁴ Since the government depends on diamond revenue to fund most of its projects, the ultimate intention behind economic diversification is to establish private sector activity that can thrive without government support.

According to a report published by the Botswanan government in 2011,⁴⁵ the decision to focus on the growth and development of the leather industry has two goals:

- Reduce the import of leather products by supporting and growing the local industry, and
- Exploit the export potential of leather products from Botswana.

The concept of sustainable PSS offers Botswana leather SMEs a holistic path toward the kind of growth that its government hopes to achieve, especially given the abundance of raw materials available locally. Exploiting potential and reducing unnecessary importation are goals that the sustainable PSS model serves well. Sustainable PSS are localized. They seek to maximize the use, reuse, and recycling of materials; create jobs; and generate business opportunities across the entire lifecycle of the product/service. Because sustainable PSS models are completely absent from the Botswanan leather sector, and have not been widely adopted in other sectors of the Botswanan economy, we deemed the locality an ideal place to introduce the concept.

Colombia

Our decision to work with the leather industry in Colombia was motivated by two key insights. The first was that the entire industry has been under heavy scrutiny over the last few decades due to its poor practices, especially its environmental impact.⁴⁶ Up to now, the majority of this pressure was focused on the treatment of raw leather *before* it reaches the manufacturing stage. Little attention had been paid to improving the environmental and social performance of the industry *at* the manufacturing stage – the phase in the production process that employs the greatest number of people in the industry. These employers are largely SMEs. The second was that SMEs in this industry have been suffering from a loss of competitiveness in recent years. Cheaper products from Asia and other countries in South America have entered the market, and the local companies cannot compete. Due to these new entrants, many local firms have disappeared or are at risk of doing so.⁴⁷

In order to address these difficulties – especially considering how important these companies are to the economies of several regions – we decided to propose the PSS concept as a means of helping them transition to more efficient and sustainable operations. Because the majority of these small companies had no previous experience with sustainable PSS, our first step was to explore the concept's feasibility.

Methodology

We used different methods to collect data in each country, as there were different levels of access and engagement available to us. We also adopted a qualitative approach, because this study was exploratory in nature.⁴⁸ Qualitative research does not begin by forming a theory, as that theory might not sufficiently explain what is

happening in the natural environment. So we also applied an inductive approach, which allowed the theory to emerge as we collected and analyzed the data.⁴⁹ Our data collection methods involved close human participation with the intention of developing rather than testing any theory.⁵⁰

In Botswana, we used a two-round Delphi study to gain insight from the experts, while in Colombia the consultations took place during personal interviews. Collecting the data from the SMEs in Botswana involved an online survey, whereas in Colombia data was collected through semi-structured personal interviews with managers and owners of the SMEs. Despite these methodological differences, the main purpose of this article, and our research, is to explore the concept of sustainable PSS in countries whose economies have similar characteristics. Even though our intention here is not to establish a direct comparison, we used the same set of categories to collect and analyze the information from each group of interest in both countries.

We used three major categories of analysis to parse the data given by the experts:

- Needs in terms of SME business development
- Perceived suitability of the Sustainable PSS concept, and
- Drivers and barriers to developing sustainable PSS.

To present the main findings of our research in each country, we describe

- The SMEs' operational and strategic strengths, weaknesses, opportunities, and threats, and
- SMEs' perceptions about developing a Sustainable PSS.

Consulting with the Experts

Despite being in different countries and working in a variety of domains, the experts' profiles were very similar – all were business development professionals. Some of them worked in the public sector, others in academia, and, in a few cases, in private organizations. In the following sections, we describe in detail the methods we used to consult with the experts.

Botswana

We carried out a two-round Delphi study to consolidate the opinions offered by a group of nine experts into a consensus. Table 1 presents an overview of the Botswanan experts' domains of expertise.

Table 1. Experts for the Delphi study in Botswana.

Number of Experts	Professional Discipline
1	Business development consultancy
1	Research institutions (SME research)
1	Policy and related issues
1	National branch support network (SMEs)
1	SME practitioner
1	Manufacturing (Industry-academia collaboration)
3	Academia and research

The sample was purposively selected⁵¹ for their expertise in sustainability and sustainable design, sustainable PSS, SME research, practice, and policy issues. The

48 Colin Robson and Kieran McCartan, *Real World Research*, 3rd ed. (Chichester: John Wiley & Sons Ltd., 2011).

49 David Silverman, *Doing Qualitative Research*, 3rd ed. (London: Sage Publications, 2010).

50 Nicholas Walliman, *Social Research Methods* (London: Routledge, 2006).

51 Tarah S.A. Wright, "Developing Research Priorities with a Cohort of Higher Education for Sustainability Experts," *International Journal of Sustainability in Higher Education* 8, no. 1 (2007): 34–43, DOI: <https://doi.org/10.1108/14676370710717571>; Tarah S.A. Wright, "Giving 'Teeth' to an Environmental Policy: A Delphi Study at Dalhousie University," *Journal of Cleaner Production* 14, no. 9 (2006): 761–68, DOI: <https://doi.org/10.1016/j.jclepro.2005.12.007>.

52 Wright, "Developing Research Priorities with a Cohort of Higher Education for Sustainability Experts."

53 Sinéad Hanafin, *Review of Literature on the Delphi Technique* (Dublin: National Children's Office, 2004), available at <https://pdfs.semanticscholar.org/38d8/baf4f555fe5ff230dd75eb8483eb-9298cfaa.pdf>.

54 Ashley Behrens et al., "Dysfunctional tear syndrome: a Delphi approach to treatment recommendations," *Cornea* 25, no. 8 (2006): 900–907, available at https://journals.lww.com/corneajrnl/Fulltext/2006/09000/Dysfunctional_Tear_Syndrome_A_Delphi_Approach_to.8.aspx.

55 K. Armon et al., "An Evidence and Consensus based Guideline for the Management of a Child after a Seizure," *Emergency Medicine Journal* 20, no. 1 (2003): 13–20, DOI: <https://doi.org/10.1136/emj.20.1.13>.

panel comprised a non-stratified sample to ensure views representative of various professionals and organizations dealing with SMEs in Botswana.⁵²

Among the nine experts, four – three of which were academics – were already familiar with sustainable PSS. The academics had all done some research on sustainable design and service innovation. Even though they had never worked directly with sustainable PSS, all of them consistently maintained that the ultimate for achieving sustainability was to reduce product focus intensity by addition of services and new value creation. All the academics called this approach the equivalent of creating a "sustainable PSS." During the consultation discussions before the Delphi study, although the remainder of the experts did express a certain awareness about sustainable PSS, none used the actual term. However, all were able to characterize a sustainable PSS using examples of existing models in their domains.

Round one began with eliciting qualitative responses to two main questions intended to establish the competitiveness of the SMEs and whether it would be possible to achieve greater competitiveness with a sustainable PSS. The responses were analyzed between the two rounds, with round one responses analyzed using thematic analysis and round two mainly with descriptive statistics.

The Delphi study sought answers to two key questions:

1. What operational components do Botswana SMEs need to be competitive?
2. What needs to happen for SMEs in Botswana to become competitive using Product Service Systems?

We analyzed the Delphi questionnaire responses individually, once each of the deadlines had elapsed. As previously stated, since Delphi round one elicited qualitative data from open-ended questions, we analyzed the results using thematic analysis. This analysis led to our categorizing the responses under three headings: goals, strategies, and barriers. We analyzed round two results by listing descriptive item statistics in a Microsoft Excel spreadsheet. We based the list headings on the Likert scale items proposed in the round two questionnaire. Round two participants were asked to rate the importance of items on a scale of 1–5, where 1 = not at all important, and 5 = very important. We then ranked their responses according to the cumulative percentage of participants who rated an item as important or very important. We chose this range because the experts had rated most items from 3 = somewhat important to 5 = very important.⁵³

Our review of a number of published Delphi studies revealed that the notion of consensus ranged from a two thirds (66%) majority⁵⁴ to anything greater than 75% and even up to 83% majority.⁵⁵ With high consensus on a number of issues, if we had chosen to use a two-thirds majority indicator, that would make it difficult to distinguish the value placed on different goals, and so we considered anything greater than a 75% majority to be reasonable.

Colombia

We carried out the consultation process through personal interviews with a group of three experts. The group consisted of one university professor of industrial ecology, the director of MiPYME Digital (a National Public Program from the Ministry of Information and Communications Technologies), and the director of a university center for strategy and competitiveness research.

The three experts were familiar with several of the elements that constitute a sustainable PSS. Despite the novelty of the concept, after an introduction and discussion around several examples as part of the consultation process, all three acknowledged familiarity with previous initiatives involving servitization, virtualization, and transitioning of small business practices towards sustainable operations. Drawing from their individual experiences, each was able to tie the

sustainable PSS concept to specific projects they have done in the past in which some sustainable PSS characteristics were present. For example, the professor recognized some similarities between sustainable PSS and some of the strategies he had used in the past with small manufacturing businesses to reduce resource consumption, improve energy use, and achieve more efficient final disposal of waste using a systemic approach. The director of MiPYME Digital believed some of the means used in sustainable PSS to achieve operational transformation – such as process virtualization – are strongly connected with some the instruments his government ICT program uses for the same purpose. Similarly, the director of the university center for strategy and competitiveness research found several similarities between the sustainable PSS concept and some initiatives developed by the center, especially around servitization. This common understanding of and empathy for the sustainable PSS concept from the experts was of profound importance to our research, as one of the major objectives of the consultation process was to gain an understanding of their perspectives regarding PSS suitability for small and medium businesses.

We describe the professions of these experts in greater detail in [Table 2](#).

Table 2. Expert profiles in Colombia.

Experts	Profiles
Expert 1	Associate Professor in a Colombian business school. His main areas of interest and expertise are industrial ecology, cleaner production, and environmental management. He works in these areas with small, medium, and large companies in Colombia and other countries in the region.
Expert 2	Director of a national program supported by the Ministry of ICT in Colombia. This program aims to increase the use of the Internet and complementary information technologies among SMEs. His areas of interest cover uses of ICT, competitiveness among SMEs, and business strategy.
Expert 3	Director of a university center for strategy and competitiveness research. The center works to improve business strategy and competitiveness among Colombian companies grouped into industrial clusters and different sectors. Her main interests include business strategy, supportive networks, business clusters, and innovation.

We addressed different questions to each expert according to their field of expertise. The university professor’s interview was oriented towards identifying sustainable practices in SMEs and the barriers and drivers to implementing them. With the national ICT program director, we focused primarily on his experience working with SMEs and integrating technologies to improve SME operations. Finally, our consultation with the research center director focused on SME competitiveness factors and possible avenues of approach as regards sustainability.

Consulting with the SMEs

The SMEs from both countries were part of the leather and textile industries.

Botswana

We contacted a group of SMEs from the leather and textile industry through an online survey. While this may have limited the number of companies we could gain access to, because over 39% of Botswana’s population has access to the Internet,⁵⁶ there was still the potential for us to reach a broad audience. The purpose

57 Graham R. Gibbs, *Analyzing Qualitative Data* (London: Sage Publications, 2007).

58 Robson and McCartan, *Real World Research*.

59 Nigel King, *Template Analysis: Qualitative Methods and Analysis in Organizational Research* (Thousand Oaks, CA: SAGE Publications, 1998).

of the survey was to seek understanding of existing SME business practices, and their awareness of sustainability and PSS. The survey mainly targeted SMEs with access to the Internet, and so we gave little consideration to their geographical distribution. A link to the questionnaire was sent directly to the owner/manager's email address – we retrieved their contact details online and from others' sources through a snowball effect. In total, 10 SMEs responded, 75% of whom were from the leather industry, with the remaining 25% from the textile industry. We used descriptive statistics to analyze the data they provided, including tabulation of data across specific items. We expected that this method would enable us to make better sense of the relationships between strategic and operational issues related to innovation and sustainability, and help us grasp their awareness of PSS more clearly. We supported this analysis via qualitative narratives intended to elicit more meaning from the quantitative data.

As a way to access participants willing to self-administer the questionnaires, snowball sampling enabled us to contact potential participants via existing social, support, and personal networks. The sampling frame consisted of leather and leather products manufacturing SMEs in Botswana belonging to an online support network. Due to our geographical distance from the participants, we relied on contact details uploaded to the support network database (email addresses), which also gave rise to our use of an online questionnaire. We sent a link to the questionnaire to the potential participants' via email, and as this is not typical for the audience, we had a low response rate. You will remember that our research objective was not to gain statistical representation, but rather to obtain insights directly from companies about the topics. Therefore, we have analyzed the results rather broadly.

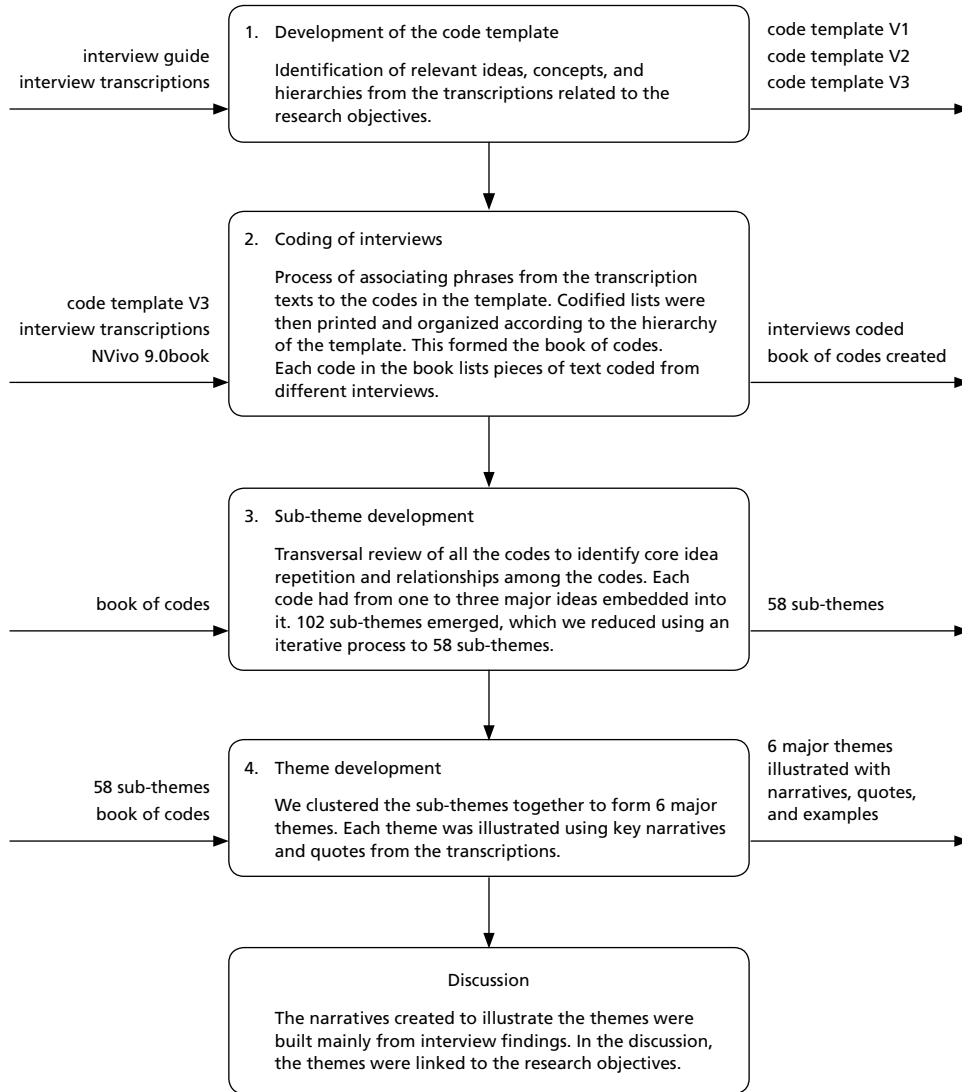
Colombia

We studied 16 Colombian SMEs from the leather manufacturing industry distributed across two large Colombian cities. We worked with the companies directly through semi-structured interviews carried out mostly with the owners, and, in a few cases, with the general managers. Additionally, we undertook direct observation in the factories to characterize and understand their design processes.

After the interviews were completed, we used the transcriptions to develop our analysis of the information. For this we followed a coding and clustering methodology, which produced a variety of data. The thematic coding analysis follows the recommendations of Graham Gibbs⁵⁷ and Colin Robson.⁵⁸ We carried out the coding process partially in NVivo 9.0 and partially by hand using the final version of a template. According to Nigel King,⁵⁹ the reasons for using template analysis as a method to analyze qualitative data are directly related to the position of thematic coding analysis between content and grounded theory approaches. Due to the exploratory nature of this research and the instruments we used to collect the data, we decided that this method was appropriate.

Each transcription was codified breaking the text into small pieces that we attached to at least one of the codes included in the template. After this, we grouped similar concepts and ideas into roughly one hundred sub-themes which, during our analysis, we reduced to a total of fifty-eight. This was the clustering stage. Finally, we grouped the sub-themes into six major themes and narratives that characterized the results. [Figure 1](#) summarizes the coding and clustering process.

Figure 1 Coding and clustering process of Colombian SME interview content. Copyright © 2018 Tracy Bhamra, Ricardo J. Hernandez, Yaone Rapitsenyane, and Rhoda Trimmingham.



Results and Analysis: Botswana

In the following sections we present the main findings from the research we carried out with experts and SMEs in Botswana. These results are shown according to the categories of analysis defined for each interest group mentioned previously in [Table 1](#).

Findings from the Expert Respondents

Business Development Needs

The Botswanan experts ranked goals and strategies across three main categories: business strategy, sustainable industry, and PSS. The business strategies they favored reveal some important issues that the SMEs would need to address to reduce the possibility of failure and generally boost their business practice. An example is the desire to adopt a multidisciplinary approach, which would enable them to collaborate with other actors more readily. Examples of sustainable industry priorities were things like adopting closed loop systems of production and implementing resource efficiency measures. In terms of PSS, the experts saw this and other forms of innovation as a means of growing their business and succeeding in the market. In [Figures 2 and 3](#), we present the set of goals and strategies ranked by the experts.

Figure 2 Goals discussed by the Botswana experts. Copyright © 2018 Tracy Bhamra, Ricardo J. Hernandez, Yaone Rapitsenyane, and Rhoda Trimmingham.

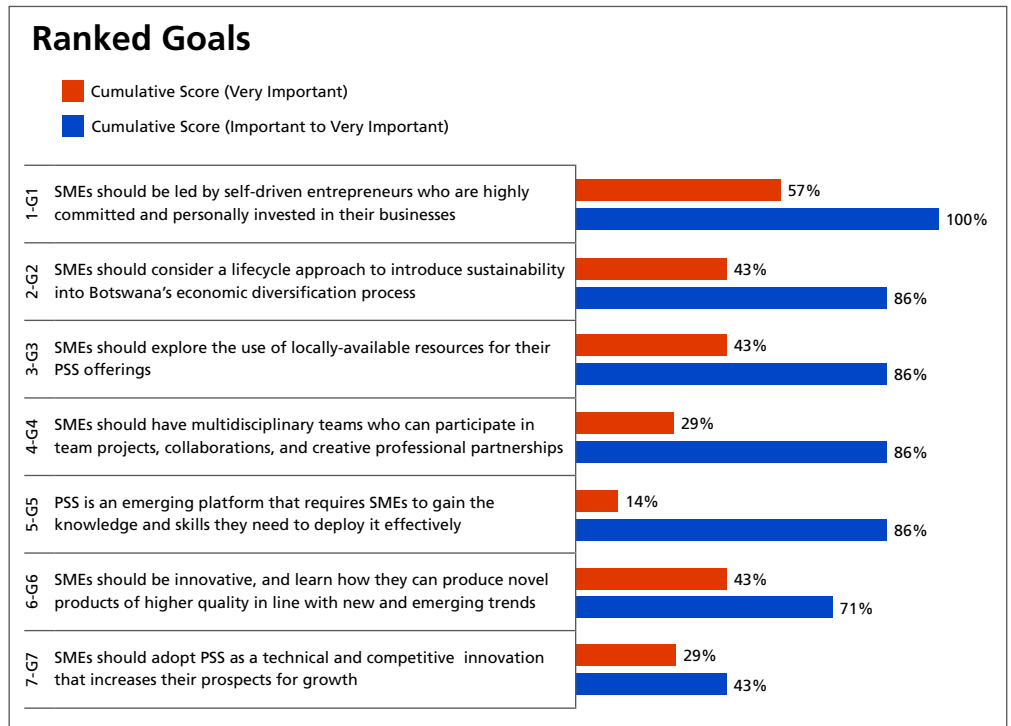
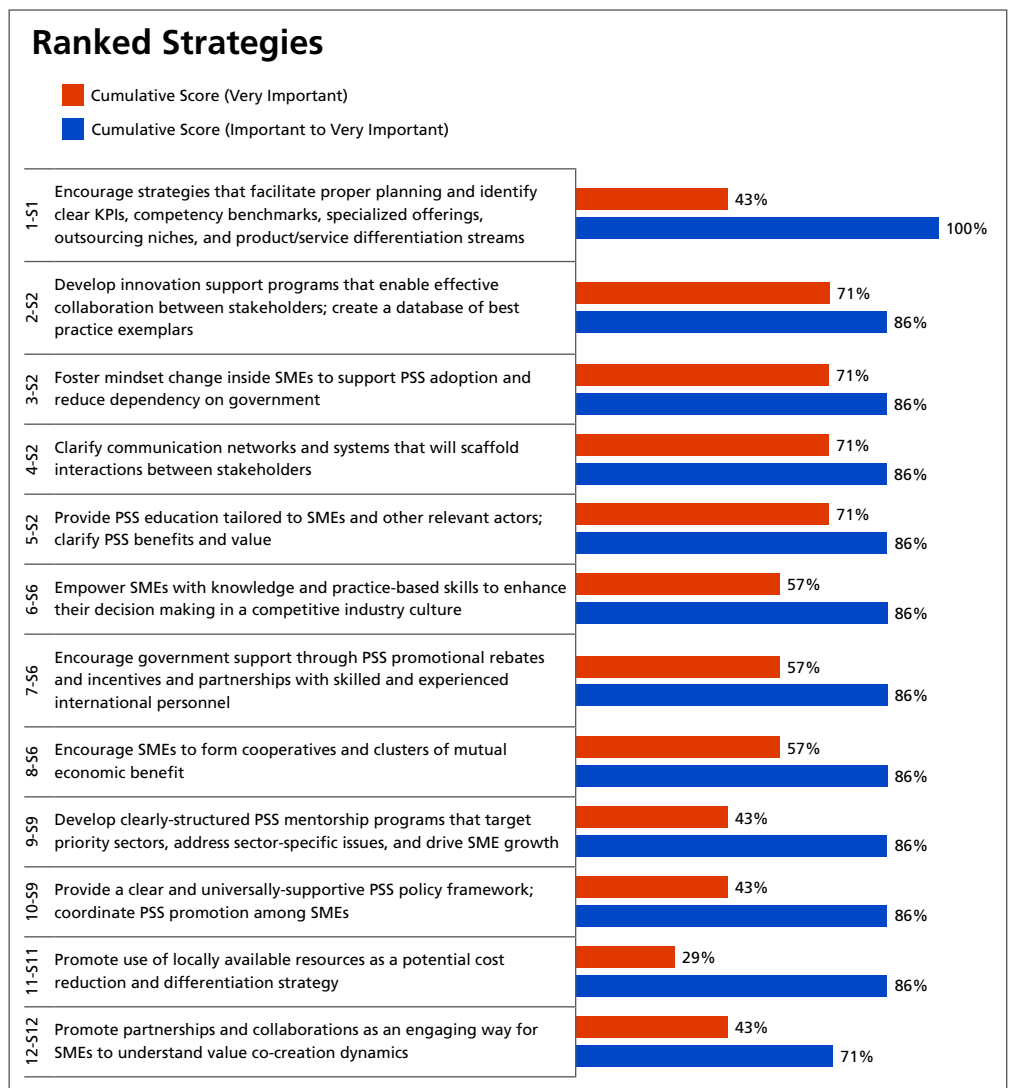


Figure 3 Strategies considered by the Botswana experts. Copyright © 2018 Tracy Bhamra, Ricardo J. Hernandez, Yaone Rapitsenyane, and Rhoda Trimmingham.



Are Sustainable PSS appropriate for Botswanan SMEs?

The group of experts in Botswana favored PSS as a means of countering what they perceived as a lack of originality among SMEs. To them, innovation support programs that would enable SMEs to improve the quality of their offering and differentiate themselves through unique, service-oriented selling points would foster the necessary change in mindset implied by PSS adoption. Implementing PSS would also allow SMEs to keep up to date with new and emerging trends promoting sustainability-oriented innovation in manufacturing. Service orientation in manufacturing SMEs would need more commitment and discipline so that SMEs are not derailed by the observed short-term goals.

Any plan to adopt the PSS model by SMEs in Botswana would mean prioritizing knowledge based business competencies, especially as regards harnessing locally-available resources. Gathering a more solid knowledge base would enable SMEs to cope in a PSS business environment with a positive mindset as they interact with users and other stakeholders. A stronger knowledge base would also empower SMEs' strategic decision making.

Finally, at a macro level, the experts felt that for sustainable PSS to gain traction among SMEs in Botswana, government coordination, support, and promotion – in the form of policy frameworks aimed at buttressing PSS and sustainability initiatives – would be crucial.

Drivers and Barriers for SMEs Wishing to Develop Sustainable PSS

In terms of barriers, experts recognized some related to the current national vision embodied by the government's economic diversification agenda. Common stereotype issues of business as usual – meaning that SMEs often believe that the current status quo is the only way of making money – emerged as a major barrier. This was further supported by what they saw as a follower mentality – the notion that something is feasible only if proven to be successful elsewhere. The experts link this concern to the socio-economic situations of SMEs – operating in a low-income society, and the strain on SME owners' social position. The experts emphasized a need to overcome their inability to exploit potential sustainability benefits, especially in terms of material availability and a variety of cost-related concerns. Harnessing locally available resources and skills was seen as a way of increasing the chances of market success.

Findings from the SME Respondents

We carried out an online survey with a group of Botswanan SMEs to gain a better understanding of their current business practices and deeper insight into their awareness about sustainability and PSS. The questionnaire emphasized innovation-related issues to establish whether they felt they had the capacity and flexibility to adopt more sophisticated innovative strategies like sustainable PSS. Our analysis of the questionnaire was therefore intended to address operational and strategic weaknesses, threats, strengths, and opportunities associated with the development of sustainable PSS.

Operational SWOT Analysis

The weaknesses and threats reported by SMEs were, interestingly, different to those found in the literature. In Botswana, strategic issues are characterized by fundamental challenges affecting the companies' mandates as manufacturing establishments selling innovative products. Most SMEs who took part in the survey had received training focused around business planning and management, as those topics have been identified by government programs as crucial to increasing SMEs' performance and competitiveness. Other areas related to sustainability

and legislation – which could act as levers for innovation – appear to be heavily undersubscribed. The previous training SMEs have received might be considered a strength, because this formal training prepared them to be open to new programs. But as they came to realize the importance of external support for developing sustainable PSS, their lack of knowledge about sustainability becomes a major obstacle. Added to this, there are no regulation standards or certification schemes to ensure their products conform to international standards, which could potentially increase their credibility in the market. The majority of the companies not adhering to any standards or certification frameworks expressed that a lack of skills was the main barrier to incorporating sustainability-oriented innovation in their businesses. All the companies working towards meeting standards or achieving certification recognized that the lack of a coherent business strategy – one that envisions and articulates the innovative intentions of the firm – was as much of a barrier as any challenge associated with entering a new market.

Developing a Sustainable PSS

The concept of PSS was introduced in the survey alongside the argument that it has the potential to drive innovation among SMEs. We furnished the SMEs with a definition supported by examples to enhance their understanding. One of the examples was taken from the service sector in their country, to bring the concept closer to them. The examples emphasized innovative ways that companies have adopted the approach to enhance their products with new services.

Only 22% of the Botswanan SMEs involved in the second online survey claimed to have any understanding of the PSS concept. Although the SMEs showed a lack of understanding of what a PSS is, they still thought their companies could implement the PSS concept. They linked this confidence to the perception that a sustainable PSS could generate cost savings and enhance value through better user experiences. In terms of resources needed to engage in sustainable PSS development, the SMEs mentioned that they were concerned about the financial commitments required.

In terms of operational issues in Botswana, there is a general lack of skills essential to pursuing innovation, especially those associated with sustainable PSS, including actor coordination, stakeholder engagement, sustainable design, lifecycle thinking, and multidisciplinary skills. Many companies did not see sustainability as a way of increasing their innovation potential but welcomed it for its cost saving potential, the competitive advantage it promises, and the energy and material savings it could provide.

Results and Analysis: Colombia

Findings from the Expert Interviews

It is important to mention that all these interviews were carried out in person, and because they were semi-structured, a variety of feedback was generated.

Business Development Needs

In Colombia, SME heterogeneity was seen as a problem, especially the marked difference among companies in terms of knowledge and skills when implementing public programs. One such program facilitated the adoption and use of ICT (MiPYME Digital) where these differences made the program's objective – transforming SME operations – difficult to achieve. To accommodate these differences, ICT use was restricted to accessing an email account, using word processing software, storing information correctly, and – in more promising instances – transitioning physical processes to digital ones. The program expert and others pointed

to companies' lack of technical knowledge and skill as the main obstacle to increasing competitiveness and productivity levels.

The experts interviewed in Colombia argued in favor of increasing the level of support from external bodies to help SMEs develop their own business strategies. They recognized that not all SMEs were aware of the importance of having formally-defined objectives, mission statements, and future vision statements, and the need to communicate these competently and appropriately. They said that public and private programs supporting SMEs should not only focus on operational necessities, but also address opportunities to help these companies improve their strategic aims. This insight is very relevant for the development of sustainable PSS – before initiating operational changes that recalibrate company operations to meet the requirements of these types of systems, SMEs should first adjust their strategies to include support for them.

Are Sustainable PSS Appropriate for Colombian SMEs?

The experts thought that targeting the newest generation of Colombian entrepreneurs for support with sustainable PSS initiatives – they cited young entrepreneurs' openness as a factor – would be a better approach than working with traditional owners. Older business owners they saw as more conservative and reluctant to pursue radical change, especially in terms of environmental management. To them, traditional owners are very conscious of complying with existing legislation to avoid fines and ensure their right to operate, while the younger generation of entrepreneurs are more willing to go one step further and try novel alternatives – not only to fulfil legal requirements, but also to create environmental value through their operations. According to the experts, this attitude is not necessarily shared by every SME in the country, but they considered it common enough to support PSS initiatives. As one of the experts had experience researching this phenomenon – the differences in attitude between first and second generations of entrepreneurs – across various economic sectors in Colombia and Mexico, he was able to speak in general about it, especially its impact on the manufacturing sector.

Another argument put forward by experts in Colombia emphasized the need for SMEs to develop their businesses with services embedded into their offers. An ideal proportion of products to services in an offer was suggested to be 10% products and 90% services. Manufacturing SMEs such as the ones considered in this paper are in general reluctant to include services as part of their offers, but according to the Director of the Centre of Strategy and Competitiveness it is fundamental that they change this point of view if they want to be competitive. Even in traditional sectors like leather manufacturing trends are changing and customers expect not only better products but better and more complete offerings that go beyond the selling and assure good performance of products in long term. According to the experts in Colombia, this has been the case especially in high-end markets but recently also something expected in less luxury products. In terms of geographical location this change of trends is also happening across high-income and emergent markets.

Experiences of working with SMEs in Colombia like the MiPYME Digital program have demonstrated new possibilities of approaching SMEs. These ways to approach the companies have changed from agreements with medium sized technology operators with knowledge and expertise developing solutions for SMEs, to work with the most powerful actor in the supply chain of those SMEs to push the use of technologies by transactional requirements. Each of these approaches has shown advantages and disadvantages to motivate the use of technologies among SMEs. In the case of developing sustainable PSS the research carried out with the Colombian SMEs revealed that working with intermediaries such as consultancies,

universities, and research centers in a co-design process to develop these types of systems is a promising alternative.

Drivers and Barriers for SMEs Wishing to Develop Sustainable PSS

The experts in Colombia said that for PSS to be a viable alternative, there was a need to collaboratively develop their knowledge base. Having a fixed mindset was also seen as a stumbling block to strategy development at Colombian SMEs. To the experts, Colombian SMEs' general lack of strategy development affects their efficiency and productivity, and is ultimately a massive barrier hindering their progress towards better and more sustainable business models. According to the experts, SMEs have little awareness about the importance of productivity and what it means for them. They also mentioned how SMEs are so immersed in their day-to-day routines that they have neither the time nor the resources to think about improving their practices, using their resources more efficiently, and decreasing costs. In many cases, SMEs depend on external help from government programs or expensive consultancies to carry out these important tasks. The experts also noted that because SMEs dedicate little or no time to defining a business strategy, they are unable to develop innovative products and services. Other hurdles to innovation in Colombia include a lack of incentives to boost innovative projects, public program disarticulation, and a lack of consistency among public initiatives meant to support SMEs. However, on a more positive note, these public programs have improved over the last decade, and today there is more consistency among them and more opportunities for them to access capital for innovative projects have arisen. The challenge now for the Colombian Government is to communicate these programs effectively and to widen their scope.

Findings from the SME Interviews

The semi-structured interviews carried out in Colombia with the 16 SMEs were mainly focused on understanding the product design and development process in the companies and their perception of the possible development of a sustainable PSS. During the interviews, we addressed topics such as sustainability, general management, uses of information and communications technologies and PSS.

Operational SWOT Analysis

Our SME interviewees corroborated the lack of financial resources and knowledge, and weak networks among SMEs and third parties cited in the literature. They added that that issues associated with unbalanced relationships in the value chain and unfair working conditions – unreasonably long payment terms, for example – were major obstacles to their development. These threats are relevant because one of the main factors impacting PSS system development is the collaboration needed between supply, production, and consumption stakeholders. Without trust between SMEs, large companies, suppliers, and industrial associations, the development and provision of a sustainable PSS is very unlikely. Added to these threats, the majority of the SMEs reported being very concerned with the influx of cheap products from overseas. This phenomenon intensifies price competition but not necessarily SMEs' will to innovate. To bolster the effort they would expend to increase their competitiveness, the SME representatives asked for stronger government policy frameworks. We present the complete list of these weaknesses, threats, strengths, and opportunities in [Table 3](#).

In spite of these threats and weaknesses, the SMEs involved in the Colombian study said they were willing to embrace new strategies such as sustainable PSS to improve their performance even with their limited resources. The previous experience some SMEs had working with government agencies in public programs was

also a positive factor influencing their willingness to engage with future initiatives in the field of sustainable PSS. Finally, the SME interviewees mentioned having better and more loyal relationships with their clients, which increases the potential value a PSS might afford them – a very attractive prospect. Being able to engage in higher quality relationships with their customers is one possible antidote to the tense and sometimes difficult tenor of the working relationships in their industry.

Table 3. Weaknesses, threats, strengths, and opportunities reported by the Colombian SMEs.

Weaknesses and Threats	Strengths and Opportunities
<ul style="list-style-type: none"> - Lack of financial resources and knowledge to competently face global markets and new challenges - Difficult working conditions based on unbalanced relationships with large clients and suppliers - Lack of support from industrial bodies and work associations - Unfair working conditions among formal and informal actors in the industry - Extremely competitive business environment 	<ul style="list-style-type: none"> - Loyal relationships with clients - Very dynamic industry that favors continuous change and innovation - A generally positive attitude toward adopting new strategies and technologies - Willingness to participate in projects and activities to improve their operations - Previous experience working with government agencies and external bodies - Flexible operations

Developing a Sustainable PSS

The discussion about developing sustainable PSS in Colombia was introduced to the SMEs as part of a hypothetical business strategy. The strategy included scenarios illustrating how to develop a business into a system of integrated products and services. The SME representatives had very little knowledge or understanding about sustainable PSS operation (as noted in the literature), especially the implications of developing one themselves. Although they did see the benefit of being able to add value to existing products by associating services with them, they were unable to recognize the possible challenges associated with integrating the two.

SMEs in Colombia understood the sustainable dimension of PSS as less of a financial matter and more a question of improving their environmental performance. We mentioned the better use of materials, reduced energy use, and the potential to reuse and recycle their supplies as part of our explanation describing the implications a sustainable PSS would have for them. In general, the Colombian SME representatives saw integrating sustainable PSS as a means of improving and driving innovation inside their organizations. They also recognized the importance of getting help from third parties to improve their business strategies. The majority of SMEs we interviewed said that if they were to receive the appropriate support, they would favor the transformations that PSS requires and leads to.

Discussion

Despite the differences between the studies in Botswana and Colombia, three common issues emerged in our analysis of their results. The first was the need for collaborative support networks; the second was the importance of having a formal, well-structured business strategy; and the third points to the formative role government should play, by offering a public framework and setting up the conditions that would facilitate the deployment of these types of systems. All the groups involved in the study – experts and SME representatives from both countries – mentioned these three points.

Both the experts and the SME representatives acknowledged there was a generalized lack of knowledge and skills around sustainable operations, which they saw

as a major obstacle to embracing the sustainable PSS concept. The SME representatives from both countries showed a very poor understanding of the PSS concept and the potential implications – positive and negative – for their organizations. To respond to this weakness, the experts in both countries recommended working towards the construction of collaborative support networks that can help SMEs build the required knowledge and competencies, but that could also act as mentoring bodies. PSS were recognized by the experts as a potential means of shifting SMEs' thinking towards innovation, original designs, and more competitive offers. In order to achieve such benefits, the SMEs need training and education at different levels. They also need guidance to be able to embrace change, reduce uncertainty, and share the risks of developing a sustainable PSS with other actors – other suppliers, producers, and users – in the supply chain. Collaborative support networks could train, guide, and support this co-design process through public and private schemes.

Clearly, having a formal and well-defined business strategy is also a crucial part of the PSS integration puzzle. In general, the SMEs involved in both studies were unable to articulate their business strategy, objectives, and long-term vision. The experts highlighted that this is common with SMEs in their countries because of the way these small factories work. Running these businesses is very demanding, and major decisions are the responsibility of a single individual – usually the owner or head of the family. The priority is to survive, and there is often little time available to think in longer terms. As some of the experts mentioned, many of these firms were created by self-motivated entrepreneurs who had no formal business education. As a result, they do not necessarily have the knowledge and tools to define a formal strategy and grasp the broader forces shaping their business environment. When this was the case, in the experience of the experts, the company had no clear direction. The dynamics of these companies are aligned with the survival instincts of their owners. The owners have extensive experience and a good sense of business, as any entrepreneur should, but they remain under constant threat from their more well-prepared competitors.

What is the best way to respond to this lack of strategy? The answer is not abundantly clear. Both groups of experts mentioned the importance of third parties positioned to support SME operations. However, how those third parties should approach the companies is a topic they were unable to agree upon. The experts felt that the traditional approach – delivering knowledge through lectures, one day meetings, and conferences – is no longer the best way to teach the skills and ensure the successful adoption of new practices. According to the director of MiPYME Digital (Colombia), more structured approaches to collaborative knowledge building fostered by support groups are needed. Finding the best ways to approach, inspire, and instruct SMEs in these countries about strategy building and visioning is a vast and promising area for future research.

Lastly is the question of governmental support. There are two vectors for their involvement: establishing legal frameworks and regulations, and creating incentive schemes.

Both countries would benefit from a legal framework defining a) the environmental standards that companies should comply with if they want to operate; and b) the parameters of fair commercial agreements that address the interests of all parties involved. These types of definitions and rules are fundamental to the development of complex systems such as PSS, where many different actors work to produce and deliver system value. These frameworks already exist in both Botswana and Colombia. However, it is time for them to be updated so they apply to new types of business models and new modes of thinking around sustainability. These legal frameworks should be updated and discussed in consultation with

industry – not only to verify the applicability of any proposed legislation, but also to support and promote business development more generally, and erase the pervasive notion that laws are put in place to negatively affect business operations.

There is also a need in both countries for government-sponsored incentives that support innovation, potentially via sustainable PSS. Constructing collaborative networks, innovating, developing sustainable operations, and cooperation among regional and national supply and production chains are all areas that require huge investment. SMEs in general do not have the resources they need to confront the challenges and uncertainty that lies on the path toward PSS innovation. Governments have the capacity to influence and provide support in the four areas we mention, either by dedicating public funds or by offering incentives to large actors in exchange for their support. In Colombia, for example, a national policy on innovation exists, but the companies and the experts were very skeptical about its applicability in terms of PSS.

One important insight from this discussion is that, despite the studies being undertaken in different countries, there are elements in common – they have similar needs, and their approach to addressing those needs is also similar.

Conclusions

There are a number of similar challenges confronting SMEs in these two countries as regards servitization, including unfavorably competitive business environments and other technical, financial, and operational barriers. The unique methodology we adopted – despite the disparity in our approaches, we obtained comparable results – only serves to increase the validity of our findings. However, we recognize there are limitations to generalizing those results. The similar viewpoints expressed by actors in this particular industry may not be shared by actors from other industrial sectors in these two countries. Also, some recommendations and opinions offered by the experts – such as the need for more government support for SMEs – may come off as controversial. Therefore, we chose to present our findings as a set of common themes rather than recommendations. SMEs in general – in any country, and from any industry – would benefit from more extensive research into how best to support their innovation ambitions, whether they opt for sustainable PSS or another concept that implies transformation on an operational and collective scale.

Developing a sustainable PSS is a knowledge- and skill-intensive undertaking, demanding ongoing collaboration with other actors in the value chain. This is a new business dynamic for SMEs, and one that needs deliberate policy measures encouraging and supporting PSS as business opportunities. Policy and support mechanisms will need to be carefully designed and developed according to the context and particular conditions of the SMEs involved. Feeling supported by policy frameworks, rebates, and incentives could inspire manufacturing companies to conceptualize their offers as sustainable PSS.

SMEs in Colombia and Botswana must make a conscious effort to develop a business strategy that supports the flexibility and adaptability they need to implement new and radical business models like sustainable PSS. For SMEs, developing a business strategy enables them to articulate and envision a roadmap for business development that makes sense to internal and external actors and stakeholders. When that roadmap is effectively communicated throughout an organization, every employee shares in its fulfillment. Developing a business strategy may also involve external consultants and collaborators, since actors across the value chain are potential co-decision makers.

It is important to make sustainability an integral part of any PSS, even ones

developed by SMEs who are just trying to remain solvent and meet everyday responsibilities. Valuing sustainability will encourage resource efficiency and decoupling – both of which may relieve some of SMEs’ resource challenges. Supportive intermediaries, including governments, should place sustainability among their top priorities to ensure that their support schemes are geared towards economic gain *and* environmental and social benefit for SMEs, customers, and society at large.

It was interesting that similar results emerged from companies with similar economic, social, and political contexts, practices, work environments, and pre-occupations but located in different countries – despite the different methodologies we used.