POMS PRODUCTION AND OPERATIONS MANAGEMENT

PRODUCTION AND OPERATIONS MANAGEMENT POMS

Vol. 28, No. 12, December 2019, pp. 2960–2982
ISSN 1059-1478 | EISSN 1937-5956 | 19 | 2812 | 2960
DOI 10.1111/poms.13112

The Role of Inclusive Innovation in Promoting Social Sustainability

Başak Kalkanci*, Morvarid Rahmani, L. Beril Toktay
Scheller College of Business, Georgia Institute of Technology, 800 West Peachtree Street NW, Atlanta, Georgia 30308, USA,
Basak.Kalkanci@scheller.gatech.edu, morvarid.rahmani@scheller.gatech.edu, beril.toktay@scheller.gatech.edu

This special issue implores us to address sustainability from the lens of emerging economies and the role that innovation can play in this context. We posit that, for sustainable operations research to be relevant in the context of emerging economies, it needs to incorporate social concerns and conditions of underserved populations, with an emphasis on inclusion and equity. Especially important for addressing social concerns of these populations will be product/service innovation, process/business model innovation, and supply chain innovation. We further posit that successful innovation in these areas will require collaboration of for-profit firms with the public sector, civil society organizations, and communities. In thisstudy, we put forward "inclusive innovation" as a unifying approach that enables the collaborative integration of social issues of relevance to underserved populations in operations management decisions. We then focus on contemporary sectoral challenges in services, manufacturing, and agriculture, highlight the relevant social sustainability issues with an emphasis on those relevant to underserved populations, and point to new opportunities for research.

Key words: social sustainability; inclusive innovation; emerging economy; sustainable operations; sustainable development goals
History: Received: May 2018; Accepted: November 2019 by Hau Lee and Hongtao Zhang, after 1 revision.

1. Introduction

In Operations, we have a large extant literature on sustainable operations from an environmental point of view, as illustrated by recent edited books (Atasu 2016, Bouchery et al. 2017). In recent years, however, the concept of sustainable operations—at least on the ground—has shifted from focusing on environmental sustainability to including social responsibility (Lee and Tang 2018, Tang 2018) and larger social issues such as freedom from hunger or poverty, equity, equality, and inclusion (*Transforming Our World* 2015). Issues of equity and inclusion have been addressed in the environmental justice literature (Agyeman and Evans 2004, Agyeman et al. 2003), but less so in the operations management (OM) literature. We springboard from these foundations to take on the issue of social-sustainability-focused innovation with an emphasis on inclusion.

According to Steurer et al. (2005), social sustainability refers to "how the company contributes to the social well-being of the society and neighbourhood in which it operates, and the individuals who work for it." As such, progress in social sustainability by for-profit firms, which are the focal point of this study, will need to include a multitude of stakeholders, such as the public sector, civil society, and community-based organizations, in order to succeed (Balaisyte et al. 2017). In this study, we focus on the concept of "inclusive innovation" (Heeks et al. 2014)—a unifying approach that enables the collaborative integration of social issues in operations management decisions, particularly as regards to underserved populations. Specifically, we address such questions as follows: What are the major social issues that relate to underserved populations in different economic sectors, and what is the role of inclusive innovation and partnerships in addressing these issues? Which operational decisions and actions can firms take to be more inclusive in their innovation processes and outcomes?

To answer these questions, we start out by tracing the evolution of sustainability, including the emergence of an equity and inclusion focus, and discuss the role of innovation in addressing social issues relevant to underserved populations. In the following sections, we develop an operations-focused framework for inclusive innovation and discuss how OM research can bring this lens to selected social sustainability issues in different sectors.

1.1. The Evolution of the Sustainability Concept

Thirty years ago, the United Nations charged the Brundtland Commission with developing "a global agenda for change" in the face of growing concerns regarding the degradation of earth's ecosystems and the "divide" between developed and developing economies. One of the key charges was to "to propose long-term *environmental strategies* for achieving

sustainable development by the year 2000 and beyond" (United Nations World Commission on Environment and Development 1987). The Brundtland Commission is credited with emphasizing the inseparability of environment and development. It catalyzed action by governments and industry alike to make environmental impact considerations more core to decision making and gave shape to beyond-compliance industry approaches in environmental sustainability.

This initial global agenda for change has been criticized, however, for framing sustainability primarily as an environmental concern at the expense of social concerns, and one in which "justice and equity are at best implicit" (Agyeman and Evans 2004, p. 157). The "environmental justice" movement, highlighting social injustices and inequities in exposure to environmental "bads" (toxic waste, air pollution) and benefits from environmental "goods" (clean air, access to parks), gave voice to a number of social concerns affecting underserved populations. Its main point was that low-income groups in general, and underrepresented minorities in particular, got more than their "fair share" of environmental burdens such as toxic waste exposure, air pollution, lead contamination, etc. Two early landmark studies (Commission for Racial Justice 1987, U.S. General Accounting Office 1983) and academic research (Bryant and Mohai 1992, Bullard 1983, Bullard and Wright 1986, 1987a,b, Mohai and Bryant 1991) paved the way for The First National People of Color Environmental Leadership Summit (Lee 1992). In that summit, delegates adopted 17 Principles of Environmental Justice (presented in Appendix A.1), which were circulated internationally during the 1992 Rio Earth Summit (Bullard 2015). In 1994, Executive Order 12898 was issued in the United States to address environmental injustice within existing federal laws and regulations, and later adopted by some states.

While the environmental sustainability and environmental justice movements developed separately, the two have increasingly converged. Agyeman and Evans (2004, p. 160) coined the term "just sustainability" to refer to "an equal concern with equity, justice, and ultimately governance on the one hand, and environment on the other." Just sustainability refers to the full integration of social justice and sustainability, which Agyeman and colleagues define, in a variation of the Brundtland definition, as "*the need to ensure a better quality of life for all, now and into the future, in a just and equitable manner, whilst living within the limits of supporting ecosystems*" (Agyeman et al. 2003, p. 5).

The convergence of the environmental and social spheres, with an explicit focus on justice, equity and inclusion in line with the 'just sustainability' concept, now underpin the UN Sustainable Development Goals (presented in Appendix A.2), prefaced by the following declaration:

> We are committed to achieving sustainable development in its three dimensions—economic, social and environmental—in a balanced and integrated manner. [. . .] We resolve, between now and 2030, to end poverty and hunger everywhere; to combat inequalities within and among countries; to build peaceful, just and inclusive societies; to protect human rights and promote gender equality and the empowerment of women and girls; and to ensure the lasting protection of the planet and its natural resources. We resolve also to create conditions for sustainable, inclusive and sustained economic growth, shared prosperity and decent work for all, taking into account different levels of national development and capacities. (*Transforming Our World* 2015)

Paralleling the evolution of the UN framework, the business world has also shifted from an initial focus on environmental issues (Anderson 1998, Esty and Winston 2006, Hart 2005, Hawken 1993, International Chamber of Commerce 1991) toward the more recent emphasis (within the last 10–15 years) on social sustainability (Porter and Kramer 2011, Prahalad and Hammond 2002, Prahalad and Hart 2002, Pralahad 2004, 2012). Over the same period, producers in developing countries were integrated into global supply chains as a result of globalization, which holds significant sustainable development potential (Thorlakson et al. 2018). However, negative social and environmental consequences of this trend (e.g., child labor, excessive overtime, pollution) have also been significant (Barboza 2010, 2011, Doorey 2011, Hobson 2013). Consequently, civil society organizations have called on global brands to take action to create "just" supply chains (Locke 2013). Incorporating the just sustainability perspective, the Business and Sustainable Development Commission (2017) states "Business will need to demonstrate that it [. . .] engages as a partner with others to build an economy that is more just." These issues are particularly important in emerging economies.

1.2. A Focus on Emerging Economies

In this study, we interpret "emerging economies" to not only refer to developing nations but also to underserved populations in developed nations. Developing nations have levels of income inequality significantly higher than the OECD average. Some, such as China and India, have observed increases in inequality despite sustained economic growth, while others continue to have very high levels of absolute poverty, defined as living on less than USD 1.25 a day (e.g.,

India at 42%). Population growth is expected to remain concentrated in the 47 least developed countries (LDCs), making it difficult to combat absolute poverty (UNPD 2017). Even within developed economies, economic and other inequities exist, and in some cases, continue to grow (Piketty 2015), creating a substantive underserved population. In the United States, for example, the wealth share of the bottom 90% of families fell from 33.2% in 1989 to 22.8% in 2016 (Bricker et al. 2017). Finally, economic and educational exclusion of certain groups (e.g., ethnic minorities, women) remain challenges for both developing and developed nations.

In addition, emerging economies are also disproportionately affected by the two global trends defining the 21st century—climate change and urbanization. According to the IPCC,[1] climate change is increasing the frequency, intensity, and impact of extreme weather and climate events, in turn increasing the level of climate hazards with adverse social implications such as food insecurity, health problems, the displacement or involuntary migration of populations, and an exacerbation of poverty rates and inequities. In particular, "initial socioeconomic inequalities determine the disproportionate adverse effects arising from climate hazards, which in turn results in greater inequality" (WESS 2016, p. 22), as demonstrated in diverse examples, including Hurricane Katrina, flooding in Bangladesh, and desertification in the Sahel region in Africa. Similarly, urbanization is expected to disproportionally affect emerging economies because when done with limited urban planning or resources, urbanization can translate to "stuffing hundreds of millions of poor people into half-built metropolitan areas that often lack basic sanitation, waste management or water services."[2] Many cities, including in developed nations, already have patterns of settlement that exhibit structural inequities.[3,4]

1.3. The Role of Innovation in Addressing Social Issues in Emerging Economies

In the face of problems that affect the world's most vulnerable populations, we can turn to innovation. Innovation is the engine of economic growth, and in emerging economies, innovation is seen as the key to addressing pressing societal problems (Goedhuys et al. 2015). There is an important role for business, which "can apply its innovative genius in three ways to create shared prosperity: by supplying quality products at ultra-affordable prices, which will allow the masses to stretch their purchasing power and improve living standards; by creating new opportunities for gainful employment, which will increase their incomes; and by providing access to services that will increase their future earning potential" (Govindarajan and Ramamurti 2015, p. 3).

Researchers have offered various perspectives on innovation in such economies. For example, Pralahad (2012) views bottom-of-the pyramid business models as a source of product innovation, while Lee and Tang (2018) argue that supply chain innovation is an effective means of achieving social sustainability. We argue that innovation in all its forms (in product/service, process/business model, and supply chain) has a key role to play in achieving social sustainability in emerging economies.

Yet innovation is a double-edged sword that can have unintended consequences unless there is a deliberate attempt to incorporate justice, equity, and inclusion considerations (e.g., expensive micro-irrigation technologies can push small local producers out of business; grid interconnection can focus only on urban areas at the exclusion of rural populations; affordable housing can omit to account for long-term energy efficiency, etc.). To ensure these considerations are integrated, we need closer alignment and collaboration between the for-profit sector, civil society organizations, and government. As a community, our research and teaching need to support this transformation. Thus, motivated, we propose "inclusive innovation" as a lens through which OM can approach these compelling issues.

In section 2, we define inclusive innovation, develop an operations-focused framework for this concept in the areas of product/service innovation, process/business model innovation, and supply chain innovation. In section 3, with "inclusive innovation" as our new lens, we present selected sectoral issues of high social impact (specifically low-wage jobs and digitalization in services, labor/human rights and automation in manufacturing, food scarcity/safety, and livelihood of smallholders in agriculture) where the OM field has the potential to make significant contributions. Section 4 concludes.

2. Inclusive Innovation: An Operations Lens

Innovation is referred to as the introduction of something new (product, service, or process) that is business focused (e.g., revenue generating) and is the economy's engine of growth. However, as history shows, the dual goals of inclusive economic growth and industrialization (UN SDGs 8 and 9) do not happen without thoughtful consideration of how innovation is fostered. In this section, we adopt the lens of "inclusive innovation" as a way to attain inclusive economic growth. The Global Research Alliance defines inclusive innovation as "any innovation that leads to affordable access of quality goods and services creating livelihood opportunities for the excluded population, primarily at the base of the

pyramid, and on a long-term sustainable basis with a significant outreach."[5] Similarly, Foster and Heeks (2013, p. 335) define it as "the inclusion within some aspect of innovation of groups who are currently marginalized." In this study, inspired by the "ladder of inclusive innovation" introduced in Heeks et al. (2014), we conceptualize inclusive innovation in the operations management context along three domains: (i) inclusive product and service innovation (section 2.1), (ii) inclusive process and business model innovation (section 2.2), and (iii) inclusive supply chain innovation (section 2.3). We present several practical examples of inclusive innovation in each context with an emphasis on collaboration and partnerships, as well as operational challenges it presents. The key ideas of this section are summarized in Table 1.

2.1. Inclusive Product and Service Innovation

Krishnan and Ulrich (2001) define the operations of product/service innovation as a sequence of steps and phases with the performance metric of efficiency (Thomke and Bell 2001). They identify decision variables as being related to sequencing process stages (Bhattacharya et al. 1998), point of differentiation (Moorthy and Png 1992), project management (Mihm 2010, Rahmani et al. 2018), and supplier selection (Ulrich and Ellison 1999).

Similarly, Lee and Schmidt (2017) view successful product/service innovation as a process that involves the following phases: (i) ideation, (ii) concept evaluation, (iii) design and development, (iv) testing and validation, (v) launch and ramp-up, (vi) maintenance, and (vii) end of life.

Building on Lee and Schmidt's framework, we next discuss operational decisions and actions that firms can take toward inclusiveness at different phases of the innovation cycle. We further simplify Lee and Schmidt's framework by combining phases (iii)–(vii), resulting in three broad phases: ideation, concept evaluation, and development and launch. In addition, for each phase, we discuss how firms can push inclusive innovation beyond their boundaries via partnerships and collaboration.

2.1.1. Inclusive Ideation. The innovation cycle starts with idea generation. Kornish and Hutchison-Krupat (2017) categorize ideation into two groups, namely market driven and technology driven. We first focus on market-driven ideation (i.e., when the market signals a need) given our emphasis on inclusiveness, and then discuss examples of inclusive technology-driven ideation (i.e., finding problems that the emerging technology can solve).

In order to generate ideas for needs of the excluded population, one natural way is to include that population in the ideation process (Kornish and Ulrich 2014, Von Hippel 1986). For instance, Digital Green produces and disseminates community videos that spread best practices (in farming and health) among low-income communities. This innovative service was initiated by farmers in India who expressed that they "are much more likely to listen to peers who look and sound like them."[6] Since 2008, Digital Green produced more than 5000 locally relevant videos in more than 50 languages.

In order to reach out to excluded communities, firms can leverage technology or partner with crowd-based ideation firms (e.g., Innocentive) to collect community-driven ideas. Open innovation breaks down "traditional corporate boundaries," and "allows intellectual property, ideas, and people to flow freely both into and out of an organization" (Chesbrough and Garman 2009, p. 2). For instance, in 2010, the Dell Social

Table 1 Inclusive Innovation from an Operations Lens, Possible Approaches, and Examples

Inclusive innovation	Approaches	Examples
Product or service	Include the excluded population in the ideation and/or evaluation stages (i.e., market-driven innovation)	Dell Social Innovation Contest Clean Team Digital Green
	Look for needs of excluded population that emerging technology can solve (i.e., technology-driven innovation)	Mobile money (M-Pesa) Solar box (M-Kepa)
	Offer employment and business opportunities for the excluded population at the development and/or launch stages of the innovation	Coca Cola 5by20 program Clean Team
Process or business model	Develop processes that offer employees more control and agency	Gap Shift Messenger
	Offer platforms for sharing economy that serve excluded population and also create job opportunities for them	Airbnb, Uber Kickstarter
Supply chain	Source from underserved demographics/communities (e.g., smallholders, micro-enterprises)	Unilever Diavik Diamond Mine
	Adopt inclusive financing models	INOVE program
	Build distribution network to serve excluded areas and population	Whole Foods JD.com

Innovation Competition collected 1000 ideas from students in 55 countries (350 colleges) on addressing social issues (e.g., poverty, women's rights).[7]

In situations where the needs of the excluded community are common knowledge or ideation is technology driven, firms can achieve inclusive ideation even without involving the excluded population in the process. For instance, to serve low-income populations, firms can design affordable products and services, which requires them to alter their ideation objective from seeking the best quality to seeking the least cost (under the constraint of sufficient quality). For instance, Clorox has introduced new affordable products, called low-out-of-pocket (LOOP), to serve budget-conscious consumers.[8] In engineering terms, this form of innovation is also referred to as "frugal innovation," where firms reduce the complexity and cost of production (e.g., via removing non-essential features) to offer more affordable products and services. Specifically, frugal innovation is about offering products and services by integrating four core attributes: affordability, simplicity, quality, and sustainability (Radjou and Prabhu 2014). For example, M-Kopa home solar box is a result of frugal innovation, which as of January 2018, has connected over 600,000 homes to affordable solar power (i.e., light, radio, and cell phone charger).[9]

As another example, consider a technology-driven ideation of mobile money (e.g., in Kenya, there are over 24 million registered mobile money users). Mobile money applications are results of "technology push," that is, the solution came prior to the identification of the problem. These applications (e.g., M Pesa) have created financial inclusion for large (excluded) communities all over the world (Balasubramanian et al. 2017) without them being directly involved in the ideation phase.

Inclusive ideation comes with its own operational challenges. For instance, in open innovation, the contest organizer has to make key operational decisions, such as duration of the tournament (Bimpikis et al. 2019, Körpeoğlu et al. 2017), transparency level of the identity of participants and submissions (Bockstedt et al. 2016), feedback mechanism (Mihm and Schlapp 2019, Wooten and Ulrich 2017), and incentive and award structure (Ales et al. 2017, 2018a, Erat and Krishnan 2012, Körpeoğlu and Cho 2018); see Ales et al. (2018b) for a more comprehensive review for this literature. In the case of technology-driven ideation, the main challenge is that such innovations are often more radical and therefore high risk (given that there is no pre-expressed need for them). As a result, firms should make strategic and operational decisions on allocating budget (Chao et al. 2009) and authority (Hutchison-Krupat and Kavadias 2015) to search for such radical ideas.

2.1.2. Inclusive Concept Evaluation. The second phase of the ideation process is to evaluate and select among collected ideas. Kornish and Hutchison-Krupat (2017) introduce two idea-selection processes, namely, idea selection based on experts' prediction and idea selection based on market feedback. Here, we focus on selection based on market feedback as a way to achieve inclusive evaluation.

When ideation is market driven, firms can combine the inclusive ideation and evaluation phases. That is, they can involve the excluded population from the ideation phase in the evaluation and selection phase. This is the approach Digital Green has followed by involving the farmers in the ideation and selection of good practices to disseminate.

However, in situations where ideation is technology driven (i.e., it requires certain technical expertise, which may not be available to the excluded population), it would be more viable for firms to involve the excluded population primarily in the evaluation phase (i.e., running prototypes with them). In fact, this is the basis of the human-centered-design (HCD) approach introduced by IDEO, a global design company. The process starts with observing users' needs, followed by rapid prototyping, and getting user feedback. This flexible and iterative ideation process facilitates inclusive concept evaluation and selection. While it does not require the excluded population to be involved in the ideation process itself, it forces the evaluation phase to be completely based on the end-user feedback. Indeed, the "user feedback" is referred to as the "most critical phase of the human-centered-design process."[10]

Firms can also move toward inclusive evaluation via partnering and collaborating with NGOs that provide HCD services, such as IDEO.org (a non-profit design organization with a mission to improve the lives of poor and vulnerable communities through design). For instance, UNICEF has partnered with IDEO.org on multiple inclusive HCD projects. Examples include Clean Team, which provides safe, affordable in-home toilets for low-income families in Ghana. They piloted the project with about 100 families in the city of Kumasi. One of their biggest learnings from the rapid prototyping was that "no matter how compelling or aspirational the toilet itself, no one wanted to slosh a bucket of waste through their homes." Accordingly, Clean Team developed and offered a full-on delivery, removal, and maintenance system.[11]

Involving the excluded population in the evaluation process has its own operational challenges. For instance, the targeted population may not be easily accessible. It also requires the innovation process to be more flexible in terms of prototyping (Rahmani and Ramachandran 2017, Terwiesch and Loch 2004,

Yoo et al. 2018) and work dynamics (Rahmani et al. 2017). Despite the importance and criticality of user feedback in inclusive innovation (Buchanan 2001), this phase has received less attention in the operations management literature as compared to other phases, which implies opportunities for future research.

2.1.3. Inclusive Development and Launch. The remaining phases of the innovation cycle include development, testing, launching, and maintenance. We discuss the first three together, and consider maintenance more broadly, as either ongoing service provision or product maintenance.

Involving the excluded population in the development phase not only brings their input into the process, but also leads to employment and business opportunities for those communities. Employing individuals from underserved populations can be facilitated by a number of practices (Bastien 2017):

- Removing the barriers that prevent economically insecure workers from accessing good jobs: removing criminal background and credit checks,[12] providing childcare benefits and mobility support for low-wage workers;
- Scaling up workforce development efforts that connect struggling workers to quality jobs and career pathways: expanding apprenticeship and paid training programs, especially in growing sectors, increasing youth employment and undertake targeted hiring;
- Growing the base of employers committed to hiring disadvantaged workers and providing quality jobs: supporting the growth of minority- and women-owned businesses, leveraging the power of large "anchor" institutions, developing a cooperative ecosystem.

There is an increasing number of companies developing inclusive hiring practices: Companies ranging from Walmart to Bloomberg and Starbucks offer employment opportunities to U.S. veterans.[13] Some companies have committed to hiring people with physical disabilities (Gaudiano and Hunt 2017, Narayanan et al. 2018). Other examples include Johns Hopkins Hospital, which has partnered with an NGO helping ex-offenders integrate back into society to fill healthcare positions,[14] and EY and SAP, which work with an NGO that identifies, trains, and supports individuals with autism.[15]

Business opportunities for underserved communities in development and launch phases of innovation can emerge when firms push beyond their boundaries and partner with their supply chain network. This opportunity can extend to the provision of the service (or maintenance of the product). For example, the Coca Cola 5by20 program[16] for community-driven innovation and entrepreneurship has largely involved the unserved population not only in all phases from ideation to launch, but also in the delivery of the service. Splash Bar is one example of Coca Cola's inclusive development approach in India under the 5by20 program. This new service has enhanced the incomes of women by training them to become entrepreneurs and selling products to their communities, and has also created a hotspot for community gatherings and activities in rural areas.[17] Yet it also has the potential to create a host of countervailing health problems such as obesity and diabetes if a soft-drink culture takes hold.[18]

Another example of inclusive launch and maintenance is the Clean Team example discussed earlier, where the delivery and maintenance of in-home toilets services is run by local franchises. That is, Clean Team not only involved the excluded population in evaluating ideas, but also in launching and maintaining the product and service delivery.

Involving a diverse group of people in the development and launch phases of innovation can create operational challenges, such as misalignment of incentives, and conflicting opinions and preferences (Aksin et al. 2015, Huckman and Staats 2011). In order to address these issues, firms should design incentives to induce help and knowledge sharing (Crama et al. 2018, Ozkan-Seely et al. 2015, Siemsen et al. 2007), manage free-riding and cost salience (Bonatti and Horner 2011, Wu et al. 2014), and create a participatory work environment (Rahmani et al. 2018, Rotemberg and Saloner 1993). Operations management research on "people-centric operations" is growing, as evidenced by recent calls for special issues,[19] and has the opportunity to focus on how to involve underserved populations in all stages of innovation.

2.2. Inclusive Process and Business Model Innovation

In addition to new product and service innovation, firms can also pursue innovation toward improving the inclusiveness of their processes or business models. We discuss such approaches through the lens of a number of recent examples.

2.2.1. Inclusive process innovation. Process innovation can involve changes in equipment/technology, using new tools and software solutions, or changing operating methods and techniques. Firms often seek process innovation to improve efficiency. However, recent practical evidence has shown that the dual goals of higher efficiency and higher social performance/employee satisfaction can be complementary.[20]

For instance, Gap has recently launched a self-scheduling app, Shift Messenger, which allows its workers

to manage their schedules (without supervisor approval). Unstable schedules are known to be a challenge for workers in retail and other low-wage service industries[21] and hamper social mobility.[22] The Gap study, which used a randomized encouragement design approach, shows that the self-scheduling app not only led to higher employee satisfaction, but also achieved higher store performance due to productivity gains (Kesavan et al. 2017). The same study showed that a significant portion of the instability in scheduling derived from operational challenges such as inaccurate information about the size and timing of shipments, which underlines the negative social impact of poor operational performance.

Another example of inclusive process design comes from the field of medical surplus allocation. There is evidence that much of the medical surplus donated to developing nations under the "push" model is wasted due to a mismatch with needs; the WHO estimates that 70% of donated medical equipment was inappropriate (World Health Organization 2010). In contrast, Medshare developed an inclusive "pull" process that opens up its inventory information to potential recipients and lets them pick the items that they need the most from the available inventory (Atasu et al. 2017).

Firms can also push inclusive process innovation beyond their boundaries by collaborating within their supply chain network. For instance, Taylor Guitar partnered with an ebony mill in Cameroon (Orsdemir et al. 2019). Through that partnership, they improved harvesting practices, transformed the milling operation, and planted ebony trees for the future. In particular, they initiated the use of new technology and harvesting practices, which significantly improved the livelihood of the forestry community in Cameroon.[23]

The main operational challenges with inclusive process innovation are twofold: to use a social objective as the lens through which processes are reviewed, and to identify changes that simultaneously help achieve that objective while improving the firm's financial performance. This may be counterintuitive at first—for example, why should one expect that store performance would improve if schedules become more stable? In this case, a moderating variable—the retention of experienced workers—is improved as a result of the focus on the social objective, translating into better financial performance. Recent evidence on the complementarity of community-level social innovations and firm-level economic performance (Vakili and Zhang 2018) also suggests opportunities for future research in this area. In fact, we observe a trend in OM research on process improvement with social objectives. Some examples include service design for maximizing social impact of non-profit organizations serving distressed individuals (Arora et al. 2017), and mechanism design for maximizing value provision of medical surplus recovery organizations (Zhang et al. 2018).

2.2.2. Inclusive Business Model Innovation. Business model innovation involves changes in ways that products and services are delivered to market, and they are often technology driven and business focused (Chen et al. 2018, 2019). Similar to process innovation, in business model innovation, sustainability and economic objectives can be complementary (Girotra and Netessine 2013, Loch et al. 2012). In fact, Kiron et al. (2013, p. 69) reported that "63% of [survey respondents who profited from sustainability] also say their organization has changed its business model in response to sustainability."

The most recent large-scale examples of business model innovations are sharing economy models such as Airbnb and Uber, which disrupted stable and long-running business models in the hotel and taxi industries.[24] Although these business model innovations did not necessarily start with the goal of being inclusive, they provided new opportunities for excluded communities. For instance, Uber and Airbnb significantly improved the affordability of transportation and lodging services. In addition, these businesses have created flexible income sources for low-income communities by employing them as drivers and hosts. Similarly, Amazon's retail delivery model has given rural communities access to a wide range of products, which they would not have been able to access otherwise. As another example, consider Kickstarter, which helps members of all communities (e.g., including low-income and minorities) find resources and support for their needs to make their ideas a reality across thousands of projects.[25]

Firms can innovate successful business models via partnership with their supply chain networks and end consumers. For instance, Uber and Airbnb have partnered with, or in other words leveraged, their network of consumers to deliver their services. Similarly, Amazon Prime and Uber Eats delivery are results of partnership and collaborative initiatives between them and mail services (e.g., UPS) and restaurant chains, respectively.

An unwelcome aspect of the sharing economy is the possibility for systematic racial bias.[26] Recent OM research has identified operational improvements that can partially mitigate this challenge, in particular, the deployment of a credible, easy-to-use online reputation and communication system (Cui et al. 2017, Li et al. 2017).

Operational challenges of business model innovations vary depending on the context. For instance, decisions on surge pricing of Uber (Cachon et al. 2017), designing crowdfunding rules for Kickstarter (Babich

et al. 2018, Marinesi et al. 2018, Swinney and Chakraborty 2018), setting rules for Airbnb reviews (Proserpio and Zervas 2017), and addressing liquidity constraints (Uppari et al. 2019) are a few examples of operational decisions in this context. Given rapid technological advancements, new business models continue to arise and create future research opportunities.

2.3. Inclusive Supply Chain Innovation

Inclusion can be practiced in both the upstream and downstream supply chain; for example, developing the capacity of smallholders (i.e., small local producers) to become suppliers to agribusiness, or designing services areas so as to include socio-economically underprivileged areas in a city or country. We organize the discussion along the following two aspects: inclusive sourcing practices and inclusive retailing and distribution practices. These dimensions include the "pro-poor" supply chain dimensions highlighted in Sodhi and Tang (2011, 2014, 2017) and Tang (2018): the poor as suppliers, the poor as distributors, and inclusive financial models to support them in both roles.

2.3.1. Inclusive Sourcing. Inclusive sourcing refers to a range of practices that intentionally incorporate a variety of target demographics/communities, with a particular emphasis on poor and marginalized groups, in sourcing strategies. These practices can involve investing in the capability of smallholders, small family businesses, and other micro-enterprises (e.g., minority- and women-owned businesses) to become a reliable source of quality supply. In the extractives sector, inclusive sourcing typically refers to "local content strategies" that stimulate local economic development by procuring locally for operations and support services.[27] A closely related inclusive supply chain practice is "impact sourcing," where companies "prioritize suppliers that intentionally hire and provide career development opportunities to people who otherwise have limited prospects for formal employment."[28]

A representative yet ambitious example of inclusive sourcing is the Unilever "Enhancing Livelihoods" initiative, two of whose components are "opportunities for women" and "inclusive business," with the main goals of empowering 5 million women (by advancing opportunities for women in operations, providing upskilling, and expanding opportunities in the value chain), improving the livelihoods of 500,000 smallholder farmers, and increasing the participation of young entrepreneurs in the Unilever value chain.[29] In the extractives sector, Diavik Diamond Mine in Canada achieved a 34% Aboriginal employment rate; a copper mine in Zambia run by Barrick developed a supplier development program aiming to engage up to 1000 local SMEs and micro-businesses as suppliers in the mine's value chain; and Anglo-American took up to 49% equity stakes in local businesses (with a planned 3–5 year exit strategy) as part of South Africa's Black Empowerment Policy, funding 1885 companies through 2016 (Östensson 2017). In developed economies, inclusive supply chain practices are typically focused on the inclusion of minority- and women-owned enterprises (Carter et al. 2006). Globally, it is said that "women are the next emerging economy," representing a credit gap of $USD 1.5 trillion.

Partnership plays an important role in inclusive sourcing. Firms can leverage intermediary providers and platforms to identify and get connected to suppliers in geographically delimited areas and small local producers. For instance, SAP Ariba is a platform that connects firms to a global procurement network with specific emphasis on deep "supply chain transparency" and "creating opportunities for livelihood." They promote the principle of procurement with social purpose: "When you know the working conditions of the people who work for your suppliers, you can change those people's lives."[30]

In addition, firms can partner with commercial banks and financing companies to promote inclusive financing models.[31] In fact, limited access to capital, cash flow constraints, and lack of resilience to revenue fluctuations often plague small businesses. IFC (2011) identifies access to capital as a bigger challenge for women-owned enterprises relative to others (due to weaker property rights, lower asset ownership, lower credit history, cultural norms, etc.). An example of a successful partnership towards inclusive sourcing is the INOVE supplier development program in Brazil that, via partnership with commercial banks, has provided invoice factoring and working capital loans to local suppliers (Östensson 2017).

There are a number of operational and strategic challenges in achieving inclusive sourcing practices. For instance, firms need to put in place policies that require their suppliers to pay subcontractors without delay (Östensson 2017), undertake a gender-differentiated approach to their supply chain analysis (IIED 2011, table 2, Barraja and Pontes 2017), be more cognizant of the detrimental impacts of time pressure on suppliers (Caro et al. 2018), design incentive mechanisms for their suppliers that promote inclusiveness, find effective ways to source from a larger network of smaller suppliers, or experiment with new financing and information/knowledge sharing strategies to empower smallholders (Chen and Tang 2015, Chen et al. 2013, 2015, IFC 2011, Xiao et al. 2018).

2.3.2. Inclusive Retailing and Distribution. The same principles discussed in the inclusive sourcing section above also apply downstream in the supply

chain. For example, Unilever's "Enhancing Livelihoods" initiative provided around 1.5 million small-scale retailers in their distribution network access to initiatives aiming to increase their incomes,[32] and Coca-Cola uses a manual distribution center model in sub-Saharan Africa and Southeast Asia, creating new opportunities for entrepreneurship and employment in the formal sector.[33]

Another aspect of inclusion that is salient in downstream supply chains is which markets/customers to serve. For instance, food retailers can target food deserts (i.e., areas with low-income residents that have limited access to affordable and nutritious food) for the distribution of their products. In fact, we observe that in response to the increasing visibility of food deserts (thanks to tools such as the USDA Food Access Atlas),[34] some retailers have started making deliberate attempts to serve those areas in need. For example, Whole Foods opened a store in a Chicago food desert, with sustained attention on including community members in decision making.[35] Similarly, Walmart's founding purpose was to bring an assortment of low-cost products to rural America.[36]

Last-mile delivery innovations are expected to facilitate the inclusion of new sets of "customers" and "service providers" in global distribution networks. Innovations such as delivery drones or driverless vehicles enable the delivery of goods to remote locations or rural areas with poor infrastructure (Stanford Value Chain Innovation Initiative 2016). For example, Chinese retailer JD.com started testing deliveries to China's remote countryside in an attempt to reach consumers in the country's rural interior (Chao 2016), which is supported by the Chinese government as a way to help alleviate poverty in rural areas and narrow the wealth gap[37] . Furthermore, crowdsourced delivery options in the last-mile (such as Roadie or Amazon Flex) enable ordinary people to enter the delivery business as drivers. Most recently, Amazon is partnering with and providing resources (i.e., technology, leased vehicles, and training) to entrepreneurs establishing their last-mile delivery business[38] .

The main operational challenge for inclusive retailing and distribution is that firms need to balance an (apparent) trade-off between developing an inclusive distribution model and making a robust profit. When Amazon rolled out same-day delivery service in Boston, it included virtually all neighborhoods in Boston, except for three low-income zip codes with a predominantly minority population.[39] The reason was that Amazon's algorithm for determining where to roll out same-day service factored in the number of Amazon Prime customers (a demand-side factor) and the location of warehouses (supply-side factor), resulting in unintentional exclusion. In grocery retailing, margins are very thin, so the same demand-side assumptions and supply-side considerations can result in store siting decisions that bypass low-income communities, resulting in food deserts. The same dynamic can be seen in food delivery services.[40]

Two approaches can be productive to be more accurate about the above trade-off: First, examining assumptions on cost and demand: in some cases, operating in low-income neighborhoods could be cheaper than anticipated and demand could become more robust with some attention to product assortment. Second, developing and delivering every-day low price products through operational excellence. Operations management research has the ability to shed deeper light on trade-offs in inclusive supply chain management practices and support firms in their decision making. Recent examples include Calmon et al. (2018) who focus on the distribution of durable life-improving technologies to low-income consumers, and Uppari et al. (2019) who analyze strategies for selling off-grid light to liquidity-constrained consumers.

3. Contemporary Sectoral Challenges

In section 2, we developed a framework to operationalize inclusive innovation in practice. In this section, we focus on challenges where inclusive innovation seems particularly salient, limiting the scope of our discussion to two topics by sector: the service sector (low-wage jobs and digitalization), the manufacturing sector (labor rights and automation), and the agriculture sector (food scarcity/safety and livelihood of smallholders). We discuss the main social issues associated with these topics, possible inclusive innovations for resolving them, and potential research directions. Note that even though we focus primarily on inclusive innovations that can help improve social sustainability, innovations reviewed in this section (particularly in manufacturing and agriculture sectors) often simultaneously contribute to environmental sustainability.

3.1. Services

The service sector dominates most economies in the world. In developed economies, the service sector constitutes over 70% of GDP; it also plays a major role in developing economies, constituting over 55% of their GDP (see Appendix A.3). Apte et al. (2012, p. 1) report that the service industry is evolving toward an information economy globally, but it continues to be labor-intensive nevertheless. To capture this dichotomy, we discuss social issues associated with labor and digitalization.

3.1.1. Low-Wage Jobs. The two fastest-growing jobs in the United States are retail salesperson and

cashier (United States Bureau of Labor Statistics 2017). While job growth is generally seen as a positive, these positions are poorly paid, with the median hourly wages of both occupations below the poverty threshold for a family of four (Peterson 2017). As a result, such low-wage retail jobs have put a large portion of the US population in poverty and food insecurity. In addition to social challenges associated with low-wage jobs, such working conditions can also impact retailers' profitability and survival rates. For instance, one of the most serious causes of Sears' closure is reported as mismanaging workforce (in terms of low wages, high expectations, and not including employees in decision-making).[41]

To address these issues, some large-scale retailers, including Costco and Nordstrom, offer higher wages to their sales staff and cashiers (Peterson 2017). In order to compensate for paying higher wages, retailers need to develop innovative solutions to increase their sales and/or reduce their processing costs. For instance, Costco's high wages are made possible because of its innovative business model (i.e., annual customer membership fees).[42] Similarly, Target has recently announced an increase in hourly wages of its sales representatives. To compensate for that, the company has pursued several service and process innovation initiatives, including same-day delivery service in major cities, and emphasis on quality.[43] As stated by the Target's VP of information and digital technology, "We're not trying to be the catalog of everything," and "aren't going to add products to our website and stores just because they exist" (Safdar 2017). By focusing on quality rather than variety, Target aims to make shopping easier in its stores to enhance sales/revenue and potentially compensate for higher hourly wages.

A second concern with retail jobs is that employees often have unstable and inflexible schedules. The work schedules of retail jobs are often released 1 or 2 weeks in advance and may even change last minute. This lack of stability not only makes it difficult for these workers to manage their time with their family or on a second job, it also makes their source of income unpredictable (Kamalahmadi et al. 2018, Ton 2015). Women are largely affected by the lack of stability and flexibility in retail jobs. Accordingly to the 2017 Bureau of Labor Statistics, women constitute 47% of retail trade jobs in the United States (United States Bureau of Labor Statistics 2017). The percentage rises to 74% when only considering jobs at clothing stores (United States Bureau of Labor Statistics 2017), which are canonical examples of unstable and inflexible jobs (Ton 2015). In the meantime, a recent study shows that job flexibility is one of the most critical components for women at work and that can largely determine their retention and job satisfaction.[44] Another trend in services is the growth in the "gig economy" where organizations contract with independent workers for short-term engagements. A recent paper shows under what conditions this practice is welfare increasing/decreasing for workers (Benjaafar et al. 2018).

Inclusive process innovation can help address some of these issues. For example, self-scheduling/shift swapping apps (e.g., Shift Messenger) can give workers more control over their schedules, in turn increasing job satisfaction and schedule stability (Williams et al. 2017). Retailers can also pursue inclusive process innovation to smooth out the workload at stores and offer more stable and predictable schedules to their employees. For example, Mercadona headquarters incorporates store input into the process and timing of deliveries to ensure that they have enough capacity to handle them; Costco introduces new products to stores at staggered times to even out workload; and some retailers scatter promotions over time (instead of offering them only during weekends and holidays) to balance out store traffic (Ton 2017). Future operations management research can study how technology-driven inclusive innovation can improve service operations from the firm's as well as employees' perspective. Such technology-driven innovations can impact scheduling, resource planning, and other operational levers. Since they may not always achieve dual goals of higher efficiency and higher job satisfaction, a closer examination of their impact would be valuable.

3.1.2. Digitalization. In recent years, technology advancement has made service processes information-rich, which is often referred to as digitalization. This transformation has enabled businesses to leverage digitized data in their operations by turning information into business-focused action. For instance, banks have revolutionized their service delivery by embracing digitalization to help customers save and reduce human errors in processes. In spite of the benefits that digitalization has offered to society, it has also led to some serious social concerns, including the digital divide and algorithmic bias.

The digital divide, which refers to the growing gap in access to computer and the internet between excluded communities (e.g., low-income, rural) and wealthy, middle-class, and young communities living in urban areas,[45] creates social inequality and puts the excluded community at a disadvantage. For instance, Nethope reports that "nearly 72% of Kenyans are without Internet and some even lack basic electricity, affecting the quality of education, politics, healthcare and everything in between. Living without Internet access is usually a factor of expense."[46] The digital divide is not limited to developing countries; it is also

a problem in developed countries. Consider the digitalization of educational services in the United States. According to a Pew survey, only 18% of teachers said that their "students have access to the digital tools they need at *home*."[47] These survey results clearly show a gap in educational development of youth between low-income and high-income communities.

In order to resolve and prevent the digital divide, one viable solution would be for local NGOs to partner with global tech companies (e.g., Google, Microsoft) to provide digital access and training to the excluded community (e.g., low-income households). For instance, in Kenya, NetHope, in collaboration with Microsoft (as part of Microsoft's 4Afrika initiative) and the USAID Global Broadband and Innovations (GBI), has been able to provide affordable Internet and electricity (15 mbps at $3/month) to Kenyans who are living off-grid in rural areas.[46] Future research can study the effect of such inclusive service innovations by technology and telecommunication firms on their operational and financial performance. In particular, such initiatives are not only inclusive (prevent the digital divide), but can also potentially lead to new market demand for the firm's current and future services. Another interesting area of research is whether mobile Internet and innovative access models can bridge the digital divide.

Another issue with digitalization is algorithmic bias, which is an artifact of the growing use of artificial intelligence (AI) (i.e., machine learning) in information services. Algorithmic bias denotes errors in AI algorithms that use sample data to estimate or represent a population, and the impact of those errors on decision making. An example of algorithmic bias that has recently received attention is gender bias in the data sets used to teach language skills to AI programs.[48] Even though the extent of the impact of this gender bias is yet to be explored, experts believe that it has the potential to exacerbate unfairness in society and particularly in industries such as medicine and law.[49] Resolving the issue of algorithmic bias requires collaborative innovation initiatives by global tech companies who are largely using AI in their decision making. For instance, researchers at Microsoft in collaboration with LendingClub and Northpointe are using risk assessment modeling to mitigate algorithmic bias in their programs.

Given the widespread applications of analytics and algorithms in business decision making, firms need to adopt inclusive design and development practices to avoid inadvertent exclusion of communities or hard-coding of (discriminatory) social attitudes into processes. Future research in operations management can study how firms' algorithmic decisions on distribution, pricing, or quality could be affected by algorithmic bias, and develop methods to avoid these issues.

3.2. Manufacturing

In developed economies, the manufacturing sector is 25.67% of GDP composition, while it constitutes 28.36% of GDP in developing economies (see Appendix A.3). Many global companies have moved their production to emerging economies over the past few decades in order to benefit from the low cost and increasingly skilled workforce, expanding the "producer" role of these economies globally. As a result of increasing population and prosperity, emerging economies have also grown in their "consumer" role, providing booming consumer markets and growth opportunities for global corporations (Cui and Lu 2017, Dobbs et al. 2013). Despite the emergence of local-for-local sourcing and production trends since at least 2012, manufacturing is projected to grow in the developing economies in the near term due to the fast growth in the domestic markets (O'Marah 2016). We focus on two salient social issues in this sector: labor and human rights, and automation.

3.2.1 Labor and Human Rights. A global survey of the sustainable sourcing practices of 449 publicly listed companies around the world has identified major gaps in firms' social sustainability practices today (Thorlakson et al. 2018): First, companies' sustainable sourcing practices in global supply chains are focused on workers' rights and compliance with national laws. In emerging economies, however, national laws do not necessarily cover other important social issues like health, education, gender, and inequality, and only 15% of companies addressed such issues in their supply chain directly. Second, sustainable sourcing practices are most commonly adopted by firms to address issues at their first-tier suppliers, even though the risk of social responsibility violations tends to increase in the higher tiers of a supply chain in terms of both frequency and severity (Sedex 2013, Villena and Gioia 2018). For instance, African children are forced to work in cocoa farms, Indian families are forced to work in the Bangladesh tea industry, and government-organized forced labor occurs during the annual cotton harvest (United States of America Department of State 2013).

To address the issue of labor and human rights and increase social responsibility, one avenue firms can pursue is inclusive supply chain innovation in the form of transparency commitments. For instance, firms can commit to disclosing their responsibility policies (Cho et al. 2019, Liu et al. 2018), learned information about responsibility levels of suppliers (Kalkanci and Plambeck 2018a), audit reports (Plambeck and Taylor 2016), identities of current and/or terminated suppliers (Chen et al. 2018, 2019, Kalkanci and Plambeck 2018b), or the source of their products (Guo et al. 2016). Future research can evaluate the

relative efficacy of such transparency practices by context and content.

Other and more advanced ways of inclusive supply chain innovation include (i) expanding the supplier pool by offering suppliers deferred or contingency payments and multi-period supply agreements (Babich and Tang 2012, Chen and Lee 2017, Lewis et al. 2017), or (ii) helping suppliers build manufacturing capabilities (Distelhorst et al. 2017). In addition, business model innovation can give voice to employees and other stakeholders via creative uses of social media (O'Marah 2016). For example, Labor Voices, a new company in this domain, provides factory workers direct access to information about their rights and collects information about factory conditions through anonymous surveys (Lapowsky 2013). Future research can investigate process design questions (e.g., content and frequency of communication to workers) and the value of information collected through social media or other channels in predicting future supply chain disruptions and financial performance.

Finally, an awareness of intercultural differences has been shown to be particularly valuable in determining the effectiveness of different operational choices such as shift scheduling, quality management, facility location, etc. (Metters 2008, 2017, Metters et al. 2010). Prior literature points out that the corporate social responsibility outlook is driven by the concerns and priorities of Western countries and calls for a more inclusive perspective centered on developing countries (Barkemeyer and Figge 2014, Idemudia 2011, Jamali 2010). While human subject experiments demonstrate value for a firm in providing consumers transparency across a variety of dimensions (Buell and Kalkanci 2019, Kalkanci et al. 2016, Kraft et al. 2018), recent research shows that consumer responses to transparency and responsibility can differ significantly in the developing and developed economies (Buell and Kalkanci 2017), underlining the importance of understanding local cultural norms as a key element of inclusive supply chain innovation. Future research can build on the initial work by Buell and Kalkanci (2017) to identify further cultural differences related to inclusion and equity, as well as the operational implications of such differences.

3.2.2. Automation. Advances in artificial intelligence and robotics are paving the way for the widespread use of automation in the next several decades. Physical activities in highly structured and predictable environments, as in manufacturing, are the most susceptible to automation (Manyika et al. 2017). The trend toward automation is expected to lead to greater productivity, better utilization of resources, and lower environmental impact from manufacturing (World Economic Forum 2018a). Automation has the potential to reduce lead times and localize sourcing and production, and therefore, has important operational implications. Chen et al. (2017a,b) examine the effect of 3-D printing on a firm's production technology choice (i.e., build-to-stock vs. build-to-order), pricing and inventory decisions, and consumer utility. 3-D printing is also found to have important implications in spare part logistics (Song and Zhang 2016) and on product assortment (Dong et al. 2017).

The social implications of the automation trend, however, warrant further research and discussion. Some studies have pointed out potential negative consequences of automation. For example, emerging economies may not rely on low-cost labor for development any more since automation will drive down the cost of manufacturing globally (Manyika et al. 2017). In fact, China and India have the highest automatable employment potential (with more than 700 million full-time jobs). Even more importantly, automation is expected to reduce demand for low-skill labor in lower-paying routine tasks, while increasing demand for high-skill, high-earning labor (Manyika et al. 2017, Tyson 2017). Therefore, automation is expected to polarize wages and contribute to the rising inequality in the distribution of labor income. Furthermore, women are more likely to lose jobs than men as automation increases (World Economic Forum 2018b).

In order to mitigate the social welfare losses associated with automation and provide higher value to customers, firms can pursue process innovation that combines the automation of blue-collar tasks with new white-collar roles for employees (Hopp et al. 2009). For instance, although Ford motors has integrated Artificial Intelligence (AI) into the final inspection line to boost quality, the company still needs skilled workers to interact with the AI tools.[50] For that, they require new process designs and reskilling of the workforce. Companies (in collaboration with governments) can establish new education and training possibilities for the workforce (Manyika et al. 2017, Norton 2017). Given that there is still a big debate on the productivity benefits of automation, especially since it involves "hard to reverse" investments, future research can study how companies can optimize and balance their use of people and investments in new machines. Related open research questions include the effective combined design of (human) high-touch and (automated) routine jobs, and the value of business process designs that emphasize the agency of employees.

3.3. Agriculture

In developed economies, the agriculture sector is 2.36% of the GDP, while it is seven times higher in developing economies (i.e., 15.53% of GDP) (see Appendix A.3). This sector currently employs more

than 2 billion people around the world (World Bank 2018), including the poorest. We focus on two issues: alleviating food scarcity and livelihoods of smallholders and women.

3.3.1. Food Scarcity and Safety. One key challenge for the agriculture industry is to feed the world population in the future (Searchinger et al. 2013). It is estimated that feeding the world in 2050 will require a 70% increase in overall food production because of population growth (predominantly in developing countries) and changes in consumption due to the expansion of the middle class (Food and Agriculture Organization of United Nations 2009). Moreover, the consumption of meat and dairy products (which are more resource intensive to produce than plant-based diets) is projected to grow by 74% by 2050 (Searchinger et al. 2013), likely due to shifts in diets (Ranganathan 2013).

One way to address food scarcity is through process innovation to increase the efficiency of farming processes; for example, adopting technologies that increase yield and value (de Zegher et al. 2019, Stanford Value Chain Innovation Initiative 2017), mechanisms to achieve the efficient distribution of natural resources required for farming (such as water) (Dawande et al. 2013), crop rotation mechanisms to increase yields (Boyabatli et al. 2019, Zhang and Swaminathan 2017), and the use of technologies for agriculture planning (Soto-Silva et al. 2016). In addition, gene editing can be used to accelerate selective breeding and cultivation practices to increase yields, drought tolerance, and resource efficiency (and hence resiliency of plants to climate change), and reduce the occurrence of diseases (World Economic Forum 2018a). However, genetically modified seeds are protected under patent protection laws.[51] This precludes farmers from saving seeds year to year, a practice that is ubiquitous in many farming communities in emerging economies, and raises concerns about the economic exclusion of such communities.[52]

Another solution for the issue of food scarcity is reducing food waste and ensuring more effective distribution. Food waste remains an important source of inefficiency in food supply chains; 24% of all food calories are lost or wasted from "farm to fork" per year (da Silva 2016). In order to reduce food waste, grocery retailers can pursue process innovation to (i) manage their store density and revenue models (Belavina 2017, Belavina et al. 2017), and (ii) improve their ordering and inventory management practices and salesforce incentives (Akkas and Honhon 2018, Akkas et al. 2019). In addition, food suppliers can use the waste stream of unsold products as an input ingredient for another product (Lee and Tongarlak 2017), and farmers can develop solutions to improve the operational efficiency of gleaning programs to supply food-insecure individuals through food banks (Ata et al. 2017). Both the production and distribution phases in the agriculture industry offer opportunities to study inclusive process and business model innovations beyond the literature discussed here.

A second key challenge facing the agriculture industry is food safety. It is estimated that 10% of all food that consumers buy in the developed world is adulterated (Castle and Carjaval 2013), meaning it is impure, unsafe, or unwholesome. In 2008, six infants died and nearly 300,000 people in China were sickened after consuming milk powder contaminated with melamine (Jacobs 2008). In 2017, two of the largest food processing companies in Brazil were accused of exporting salmonella-contaminated meat to Europe (Romero 2017). In 2018, Lactalis pulled more than 7000 tons of potentially contaminated baby formula and other powdered milk products across more than 80 countries due to salmonella contamination (Alderman 2018). Roth et al. (2008) argue that the heightened adulteration risk can be attributed to globalization, consolidation, and commoditization trends in food supply chains.

To address the issue of food safety, suppliers can pursue inclusive process innovation. For instance, suppliers can set inspection and incentive approaches to deter farmers from strategic adulteration (Levi et al. 2018), or vertically integrate with their agricultural suppliers (Lin et al. 2018, Orsdemir et al. 2019). In addition, technology-driven innovations, such as blockchain, offer the potential to address food safety issues by providing a reliable and accessible record of the entire trajectory of products from farming to consumption (Babich and Hilary 2019). Blockchain technology is already finding applications in fish, coffee, and cotton supply chains (Hackett 2017, Peters 2016, Schiller 2018). One example of the successful use of such technology is collaboration between Unilever, British supermarket chain Sainsbury, packaging company Sappi, and three global financial services companies (Barclays, BNP Paribas, and Standard Chartered) to develop a system for tracking and verifying contracts for farmers supplying tea in Malawi (Clancy 2017). The technology will be used to track the origins of tea supplies of Unilever and Sainsbury, and help banks access more reliable information about the farming methods of individual farmers and fund those focused on sustainable farming. These emerging technology-driven product and supply chain innovations that aim to improve food safety offer several opportunities for future research.

3.3.2. Livelihood of Smallholders and Women. Many agricultural commodity supply chains are characterized by the prevalence of smallholders at the

origination point. Many of these smallholders are very poor and engage in practices such as deforestation that help their livelihoods in the short run, but cause long-term negative ecological impact, and in particular, climate change impact. For example, Indonesia has millions of smallholder palm oil farmers living in poverty, and has contributed approximately 10% of global greenhouse gas emissions in the past decade, due to deforestation for palm oil (de Zegher et al. 2017, Orsato et al. 2014).

To improve the livelihood of farming smallholders, companies can consider innovative supply chain models (i.e., incentive mechanisms and purchasing contracts) to assure the triple goals of reliable supply, no environmental degradation, and poverty alleviation (de Zegher et al. 2017). In addition, companies can adopt bio-based materials in their products to create additional income opportunities for farmers (in addition to reducing GHG emissions and creating more environmentally sustainable alternatives to traditional materials). Innovations in this domain are rapidly growing: Audi, BASF, and Covestro have developed a 70% biomass auto body coating (Covestro 2017); Ford uses rice hulls for reinforcement and soy-beans to make seat covers in its F-150 trucks (BusinessGreen Staff 2013); Reebok has recently begun manufacturing shoes made from corn stalks (Grady 2017). While these innovations are promising for improving livelihoods and reducing environmental impacts, the social implications are ambiguous. A potential challenge is that these materials can create competition for food crops at the farm level, thereby exacerbating food scarcity (World Economic Forum 2018a). This is an issue that has recently received attention from the operations community (Wang et al. 2017) and provides opportunities for further research.

Women represent a larger proportion of the workforce than men in the agricultural sectors of the developing regions in the world such as Asia, sub-Saharan Africa, the Middle East, and North Africa (World Bank, FAO and IFAD 2009). There is overwhelming evidence that income generated by women is more likely to be spent on food and children's needs (World Bank, FAO and IFAD 2009). Therefore, expanding opportunities for women in agriculture is expected to yield significant societal benefits; the mechanisms by which such benefits are realized and their relative efficacy are open research questions.

4. Conclusions

In an early sustainable operations review article, Corbett and Klassen (2006) argue that taking an environmental perspective has far-reaching consequences in that it "forces OM scholars to adopt a broader, more holistic view of the operations being studied" (p. 7). They also conjecture that "environmental management in operations will have become an established and accepted part of mainstream OM by 2015" (p. 19). They conclude with the following commentary: "Expanding the boundaries also implies integrating the concerns of more stakeholders [. . .] we now have to account for governments, local communities, public interest groups, and future generations. How can their interests be integrated into such areas as product and process design and operational decision making? This is a key concern of the environmental justice movement [. . .]" (p. 18), and they conjecture that social issues will also become part of mainstream Operations Management (OM), too.

While Corbett and Klassen's first conjecture about environmental management has been borne out, it is fair to say that the environmental justice and social sustainability themes have not been widely addressed in the OM community yet. Broadening our horizons to encompass these themes has the potential to further shape our research in new and exciting ways. To prompt a deeper examination of these themes and their implications for operations management, in this study, we focused on a context where they are particularly salient: the role of innovation in addressing social issues in emerging economies and underserved populations therein. Motivated by the environmental justice literature and the concept of "just sustainability," we focused our discussion primarily on the concept of "inclusive innovation" from an operations management lens. We developed some propositions about how inclusive innovation can be practiced in product/service innovation, process/business model innovation and supply chain innovation to improve social sustainability. A number of innovations discussed in this study are expected to increase productivity, create job opportunities, and improve some dimensions of social sustainability (e.g., blockchain technology, self-scheduling of work, automation). However, each of these innovations could pose important trade-offs and potentially unintended social consequences, where OM research can be influential in informing business practice and policy solutions. The inclusive innovation framework we outline in this study can be used to explain why some innovations for social impact succeed while others may fail.

4.1. Opportunities for Future Research

Although the operations management literature has recently put more attention on social sustainability (particularly in supply chain management), research on operational challenges of "inclusive innovation" is still in its infancy. What makes inclusive innovation distinct is two-fold: First, it requires adopting social objectives more explicitly in problem definition and scoping; second, it is people-centric and built on

interactions with underserved populations of diverse cultural, geographical, and economical characteristics. These distinctions offer tremendous opportunities for future research in operations management:

1. *Process Innovation with a Social Sustainability Lens*: At a high level, operations management research on innovation has focused more on "product" innovation (design and development) and less on "process" innovation. However, throughout this study, we discussed many social issues in emerging economies that can be solved or prevented by changing operating methods and techniques. We believe that research on process innovation toward the dual goals of promoting efficiency and inclusion will become more established and mainstream in operations management.
2. *Management of Underserved Populations*: For the most part, operations management research on social sustainability has focused more on "supply chain" management and less on "people" management. As we highlight in this study, many examples of successful inclusive innovation require effective interactions with underserved populations (as customers, employees, stakeholders, etc.). We conjecture that research on people-centric operations, along with incorporating multi-disciplinary methods from social work, public management, and sociology, will receive more attention from the operations management community.
3. *Energy Transition*: Avoiding the worst impacts of climate change will require a massive global energy transition. In addition to new operations challenges in "cleantech" (Plambeck 2013), this dramatic transformation creates the opportunity for businesses to emphasize inclusion and equity in the delivery of energy services, transportation infrastructure investments, and mobility solutions. Taking an inclusive innovation lens will allow the operations management field to make unique contributions in this area.
4. *Smart and Sustainable Communities*: To support effective urbanization, "smart city" technologies are being phased in to help cities collect data from a wide range of sensors so they can utilize their assets and resources efficiently. The smart city concept provides the opportunity to emphasize participatory action and engagement, to use open data to improve communities, and to ultimately create not only smart, but also livable, connected, and sustainable communities for urban areas across the globe. This area holds great promise for future operations management research.

In this study, we focused on for-profit firms. Inclusive innovation is also relevant for non-profit operating practices (Berenguer and Shen 2018, Berenguer et al. 2017) and humanitarian logistics (Tomasini and Van Wassenhove 2009). We limited our discussion to two focus areas within each sector. These can be expanded further. For example, within the service sector, issues of inclusion and access are quite important in healthcare operations (Kohnke et al. 2017, Ramdas et al. 2012) and deserve further research attention. Finally, we focused on how inclusive innovation can help firms achieve their social sustainability goals. However, the relationship between firms' social sustainability and innovation objectives can be bidirectional. In fact, recent evidence shows that improving social sustainability can also positively impact firms' innovativeness (Liu and Chao 2018). Identifying and quantifying such effects is another valuable research direction.

Given ongoing societal and technological transformations, and the richness, complexity and importance of social sustainability, we have an opportunity as the operations management community to make research on social sustainability and inclusive innovation "mainstream" as we have done with environmental sustainability in the last two decades. We hope that this article provides a useful roadmap to that end.

Acknowledgments

We deeply appreciate the constructive and valuable feedback by special issue co-editors Hau Lee and Hongtau Zhang. This article benefited from the insightful input of many colleagues, including Arzum Akkas, Vishal Agrawal, Priyank Arora, Atalay Atasu, Vlad Babich, Gemma Berenguer, Raul Chao, Soo-Haeng Cho, Kaitlin Daniels, Milind Dawande, Nagesh Gavirneni, Luyi Gui, Jennifer Hirsch, Vish Krishnan, Deishin Lee, Michael Lim, Samantha Kepler Meyer, Serguei Netessine, Kamalini Ramdas, Fabian Sting, Konstantinos Stouras, Gerry Tsoukalas, Anita Tucker, Veronica Villena, Shouqiang Wang, and Safak Yucel.

Appendix A: Framing Principles and Data.

A.1. Principles of Environmental Justice[53]

1. Environmental Justice affirms the sacredness of Mother Earth, ecological unity and the interdependence of all species, and the right to be free from ecological destruction.
2. Environmental Justice demands that public policy be based on mutual respect and justice for all peoples, free from any form of discrimination or bias.

3. Environmental Justice mandates the right to ethical, balanced and responsible uses of land and renewable resources in the interest of a sustainable planet for humans and other living things.
4. Environmental Justice calls for universal protection from nuclear testing, extraction, production and disposal of toxic/hazardous wastes and poisons and nuclear testing that threaten the fundamental right to clean air, land, water, and food.
5. Environmental Justice affirms the fundamental right to political, economic, cultural and environmental self determination of all peoples.
6. Environmental Justice demands the cessation of the production of all toxins, hazardous wastes, and radioactive materials, and that all past and current producers be held strictly accountable to the people for detoxification and the containment at the point of production.
7. Environmental Justice demands the right to participate as equal partners at every level of decision making, including needs assessment, planning, implementation, enforcement and evaluation.
8. Environmental Justice affirms the right of all workers to a safe and healthy work environment without being forced to choose between an unsafe livelihood and unemployment. It also affirms the right of those who work at home to be free from environmental hazards.
9. Environmental Justice protects the right of victims of environmental injustice to receive full compensation and reparations for damages as well as quality health care.
10. Environmental Justice considers governmental acts of environmental injustice a violation of international law, the Universal Declaration On Human Rights, and the United Nations Convention on Genocide.
11. Environmental Justice must recognize a special legal and natural relationship of Native Peoples to the US government through treaties, agreements, compacts, and covenants affirming sovereignty and self-determination.
12. Environmental Justice affirms the need for urban and rural ecological policies to clean up and rebuild our cities and rural areas in balance with nature, honoring the cultural integrity of all our communities, and provided fair access for all to the full range of resources.
13. Environmental Justice calls for the strict enforcement of principles of informed consent, and a halt to the testing of experimental reproductive and medical procedures and vaccinations on people of color.
14. Environmental Justice opposes the destructive operations of multinational corporations.
15. Environmental Justice opposes military occupation, repression and exploitation of lands, peoples and cultures, and other life forms.
16. Environmental Justice calls for the education of present and future generations which emphasizes social and environmental issues, based on our experience and an appreciation of our diverse cultural perspectives.
17. Environmental Justice requires that we, as individuals, make personal and consumer choices to consume as little of Mother Earth's resources and to produce as little waste as possible; and make the conscious decision to challenge and re-prioritize our lifestyles to ensure the health of the natural world for present and future generations.

Table A1 Average Nominal GDP Composition based on Economy Sector and Development

Economy\sector	Agriculture	Industrial	Service
Developed	2.36%	25.67%	71.97%
Developing/emerging	15.53%	28.36%	56.12%

A.2. UN Sustainable Development Goals

Goal 1. End poverty in all its forms everywhere.

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

Goal 3. Ensure healthy lives and promote well-being for all at all ages.

Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Goal 5. Achieve gender equality and empower all women and girls.

Goal 6. Ensure availability and sustainable management of water and sanitation for all.

Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all.

Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Goal 10. Reduce inequality within and among countries.

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable.

Goal 12. Ensure sustainable consumption and production patterns.

Goal 13. Take urgent action to combat climate change and its impacts.

Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development.

A.3. GDP Compositions

According to UN World Economic Situation and Prospects (2017),[54] economic development of countries are categorized in three groups: (i) Developed economies (e.g., US, UK, EU-15), (ii) In-transition economies (e.g., Ukraine, Armenia, Russian), and (iii) Developing economies (e.g., China, India). Since the second group is relatively small (less than 10%), we simplify the categorization to two: Developed and Developing/Emerging economy.

Using the country-based GDP data from CIA The World Factbook (2017),[55] we have calculated the average percentage of GDP compositions in developed and developing economies, which is summarized in the Table A1.

Notes

[1]http://www.ipcc.ch/
[2]http://science.time.com/2012/09/18/urban-planet-how-growing-cities-will-wreck-the-environment-unless-we-build-them-right/
[3]https://www.nytimes.com/2018/04/07/opinion/Sunday/americas-federally-financed-ghettos.html?action=click&pgtype=Homepage&clickSource=story-heading&module=opinion-c-col-left-region&region=opinion-c-col-left-region&WT.nav=opinion-c-col-left-region
[4]https://www.citylab.com/life/2015/11/economic-segregation-and-inequality-in-europes-cities/415920/
[5]http://www.theglobalresearchalliance.org/index.php/inclusive-innovation
[6]https://www.gatesnotes.com/Development/Innovation
[7]http://www.dellsocialinnovationcompetition.com/
[8]https://www.thecloroxcompany.com/blog/making-affordable-products-for-low-income-shoppers/
[9]http://solar.m-kopa.com/about/our-impact/
[10]https://www.usertesting.com/blog/2015/07/09/how-ideo-uses-customer-insights-to-design-innovative-products-users-love/
[11]https://www.ideo.org/project/clean-team
[12]http://www.nelp.org/publication/ban-the-box-fair-chance-hiring-state-and-local-guide/
[13]https://corporate.walmart.com/global-responsibility/opportunity/veterans-and-military-families; https://www.monster.com/career-advice/article/retail-companies-committed-to-hiring-veterans; https://www.bsr.org/our-insights/blog-view/impact-sourcing-inclusive-supply-chains-bloomberg-digital-divide-data
[14]http://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2017/04/19/matching-ex-offenders-with-hard-to-fill-health-care-jobs
[15]https://phillyautismjobs.com/
[16]https://www.coca-colacompany.com/stories/the-road-to-5-million–coca-cola-empowers-1-2-million-women-entr
[17]http://www.coca-colacompany.com/stories/women-entrepreneurs-in-india-make-a-splash-in-their-neighborhood
[18]https://africa-health.com/news/world-health-organization-wants-sugar-taxes/
[19]http://connect.informs.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=43988882-8057-46b8-8b05-2842829335a0
[20]https://www.nytimes.com/2018/03/28/business/economy/gap-schedule-study.html
[21]ibid.
[22]https://www.nytimes.com/interactive/2014/08/13/us/starbucks-workers-scheduling-hours.html
[23]https://www.taylorguitars.com/ebonyproject
[24]https://differential.com/insights/the3typesofinnovation/
[25]https://www.kickstarter.com/about?ref=global-footer
[26]https://www.washingtonpost.com/news/wonk/wp/2016/09/08/how-airbnb-plans-to-fix-its-racial-bias-problem/?noredirect=on&utm_term=.53b6c4488a8d
[27]http://www.worldbank.org/en/news/feature/2013/11/20/local-content-in-extractive-industries-enables-inclusive-growth
[28]https://gisc.bsr.org/
[29]https://www.unilever.com/sustainable-living/enhancing-livelihoods/
[30]https://www.ariba.com/about/procure-with-purpose
[31]https://www.iml.fraunhofer.de/en/fields_of_activity/einkauf_finanzen_supply_chain_management/services/financial-supply-chain-management/inclusive-supply-chain-finance.html
[32]https://www.unilever.com/sustainable-living/enhancing-livelihoods/inclusive-business/
[33]https://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/agribusiness/resources/agri_sustainable+and+inclusive+supply+chains
[34]https://www.ers.usda.gov/data-products/food-access-research-atlas/go-to-the-atlas/
[35]https://www.marketplace.org/2016/09/27/business/whole-foods-opens-store-chicago-food-desert
[36]https://www.pbs.org/newshour/economy/business-July-dec04-sam-walton_08-20
[37]https://www.bloomberg.com/news/features/2018-07-03/china-s-on-the-fast-track-to-making-uav-drone-deliveries

[38]https://techcrunch.com/2018/06/28/amazon-launches-a-last-mile-delivery-program-powered-by-entrepreneurs/
[39]https://www.bostonglobe.com/business/2016/04/21/why-doesn-amazon-offer-same-day-delivery-roxbury/09m1fLx69trWXWAk3UNgcK/story.html
[40]https://www.washingtonpost.com/news/food/wp/2018/04/02/dc-has-never-had-more-food-delivery-options-unless-you-live-across-the-anacostia-river/?noredirect=on&utm_term=.d212948b6f57
[41]https://www.forbes.com/sites/panosmourdoukoutas/2015/06/10/four-strategic-mistakes-that-haunt-sears/#3470a45862a4
[42]http://www.businessinsider.com/why-costco-pays-more-than-other-chains-2014-4
[43]http://www.latimes.com/business/la-fi-target-minimum-wage-20180306-story.html
[44]https://www.huffingtonpost.com/entry/down-with-face-time-a-flexibility-manifesto_us_5732d022e4b046ff51c0f70e
[45]https://cs.stanford.edu/people/eroberts/cs201/projects/digital-divide/start.html
[46]https://nethope.org/project/mawingu-tv-white-space/
[47]http://www.pewinternet.org/2013/02/28/how-teachers-are-using-technology-at-home-and-in-their-classrooms/
[48]https://www.technologyreview.com/s/602950/how-to-fix-silicon-valleys-sexist-algorithms/
[49]https://www.technologyreview.com/s/608986/forget-killer-robotsbias-is-the-real-ai-danger/
[50]https://www.wsj.com/articles/in-the-race-between-humans-and-robots-humans-are-often-winning-1541092652
[51]https://monsanto.com/company/media/statements/saving-seeds/
[52]https://www.theguardian.com/global-development/poverty-matters/2013/jun/24/gm-crops-african-farmers
[53]https://www.ejnet.org/ej/principles.html
[54]https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/2017wesp_full_en.pdf, see pages 153–155.
[55]https://www.cia.gov/library/publications/the-world-factbook/fields/2012.html

References

Agyeman, J., B. Evans. 2004. 'Just sustainability': The emerging discourse of environmental justice in Britain? *Geog. J.* **170**(2): 155–164.

Agyeman, J., R. Bullard, B. Evans. 2003. *Just Sustainabilities: Development in an Unequal World*, 1st edn. Earthscan/MIT Press, London, UK.

Akkas, A., D. Honhon. 2018. Shipment policies for products with fixed shelf lives: Impact on profits and waste. Working paper, Boston University, Boston, MA.

Akkas, A., V. Gaur, D. Simchi-Levi. 2019. Drivers of product expiration in consumer packaged goods retailing. *Management Sci.* **65**(5): 2179–2195.

Aksin, O. Z., S. Deo, J. O. Jonasson, K. Ramdas. 2015. Learning from many: The impact of partner diversity on operational performance in fluid teams. Working paper, London Business School, London, UK.

Alderman, L. 2018. "My baby almost died": Formula scandal sends shudders through France, vol 1, *New York Times*, February.

Ales, L., S. Cho, E. Körpeoğlu. 2017. Optimal award scheme in innovation tournaments. *Oper. Res.* **65**(3): 693–702.

Ales, L., S. Cho, E. Körpeoğlu. 2018a. Innovation tournaments with multiple contributors. Working paper, Carnegie Mellon University, Pittsburgh, PA.

Ales, L., S. Cho, E. Körpeoğlu. 2018b. Innovation and crowdsourcing contests. M. Hu, ed. *Sharing Economy: Making Supply Meet Demand*. Springer Series in Supply Chain Management. Springer, Cham, Switzerland, 379–406.

Anderson, R. 1998. *Midcourse Correction: Towards a Sustainable Enterprise*. Chelsea Green Publishing, Hartford, VT.

Apte, U., U. Karmarkar, H. Nath. 2012. The US information economy: Value, employment, industry structure and trade. *Found. Trends TIOM* **6**(1): 1–87.

Arora, P., M. Rahmani, K. Ramachandran. 2017. Balancing advisory and service delivery efforts in nonprofits: A service design perspective. Working paper, Georgia Institute of Technology, Atlanta, GA.

Ata, B., D. Lee, E. Sönmez. 2017. Dynamic volunteer staffing in multicrop gleaning operations. Working paper, University of Chicago, Chicago, IL.

Atasu, A. (Ed.). 2016. *Environmentally Responsible Supply Chains*. Springer Series in Supply Chain Management. Springer, Switzerland.

Atasu, A., L. B. Toktay, W. M. Yeo, C. Zhang. 2017. Effective Medical Surplus Recovery. *Prod. Oper. Manag.* **26**(6): 1142–1162.

Babich, V., G. Hilary. 2019. Distributed ledgers and operations: What OM researchers should know about blockchain technology. *Manuf. Serv. Oper. Manag.* Forthcoming. https://doi.org/10.1287/msom.2018.0752

Babich, V., C. S. Tang. 2012. Managing opportunistic supplier product adulteration: Deferred payments, inspection, and combined mechanisms. *Manuf. Serv. Oper. Manag.* **14**(2): 301–314.

Babich, V., S. Marinesi, G. Tsoukalas. 2018. Does crowdfunding benefit entrepreneurs and venture capital investors? Working paper, The Wharton School of the University of Pennsylvania, Philadelphia, PA.

Balaisyte, J., M. Besiou, L. N. Van Wassenhove. 2017. Cross-sector partnerships for sustainable supply chains. Y. Bouchery, C. J. Corbett, J. C. Fransoo, T. Tan, eds. *Sustainable Supply Chains: A Research-Based Textbook on Operations and Strategy*. Springer Series in Supply Chain Management, Springer, Cham, Switzerland, 485–505.

Balasubramanian, K., D. Drake, D. Fearing. 2017. Inventory management for mobile money agents in the developing world. Working paper, Harvard Business School, Boston, MA.

Barboza, D. 2010. After suicides, scrutiny of China's grim factories. *The New York Times*, June 6.

Barboza, D. 2011. Apple cited as adding to pollution in China. *The New York Times*, September 1.

Barkemeyer, R., F. Figge. 2014. CSR in multiple environments: the impact of headquartering. *Crit. Perspect. Int. Bus.* **10**(3): 124–151.

Barraja, M., M. Pontes. 2017. New BSR guidance integrates gender equality into supply chain codes of conduct. *Business for Social Responsibility Blog*, April 26.

Bastien, A. 2017. Employment equity: putting Georgia on the path to inclusive prosperity. Report, Partnership for Southern Equity, Policy Link and USC Program for Environmental and Regional Equity, Atlanta, GA.

Belavina, E. 2017. Grocery store density and food waste. Working paper, University of Chicago, Chicago, IL.

Belavina, E., K. Girotra, A. Kabra. 2017. Online grocery retail: Revenue models and environmental impact. *Management Sci.* **63**(6): 1781–1799.

Benjaafar, S., J.-Y. Ding, G. Kong, T. Taylor. 2018. Labor welfare in on-demand service platforms. Working paper, University of Minnesota, Minneapolis, MN.

Berenguer, G., Z. J. M. Shen. 2018. Challenges and strategies in managing nonprofit operations: An operations management perspective. *Manuf. Serv. Oper. Manag.* Forthcoming. https://doi.org/10.1287/msom.2018.0758

Berenguer, G., P. Keskinocak, J. G. Shanthikumar, J. Swaminathan, L. N. Van Wassenhove. 2017. Special issue on not-for-profit operations. *Prod. Oper. Manag.* **26**(6).

Bhattacharya, S., V. Krishnan, V. Mahajan. 1998. Managing new product definition in highly dynamic environments. *Management Sci.* **44**(11): 550–564.

Bimpikis, K., S. Ehsani, M. Mostagir. 2019. Designing dynamic contests. *Oper. Res.* **67**(2): 399–356.

Bockstedt, J., C. Druehl, A. Mishra. 2016. Heterogeneous submission behavior and its implications for success in innovation contests with public submissions. *Prod. Oper. Manag.* **25**(7): 1157–1176.

Bonatti, A., J. Horner. 2011. Collaborating. *Am. Econ. Rev.* **101**(2): 632–663.

Bouchery, Y., C. J. Corbett, J. C. Fransoo, T. Tan, eds. 2017. *Sustainable Supply Chains: A Research-Based Textbook on Operations and Strategy*. Springer Series in Supply Chain Management. Springer, Switzerland.

Boyabatli, O., J. Nasiry, Y. Zhou. 2019. Crop planning in sustainable agriculture: Dynamic farmland allocation in the presence of crop rotation benefits. *Management Sci.* **65**(5): 2060–2076.

Bricker, J., L. J. Dettling, A. Henriques, J. W. Hsu, L. Jacobs, K. B. Moore, S. Pack, J. Sabelhaus, J. Thompson, R. A. Windle. 2017. Changes in U.S. family finances from 2013 to 2016: Evidence from the survey of consumer finances. *Fed. Reserve Bullet.* **103**(3): 1–42.

Bryant, B. I., P. Mohai, eds. 1992. *Race and the Incidence of Environmental Hazards*. Westview Press, Boulder, CO.

Buchanan, R. 2001. Human dignity and human rights: Thoughts on the principles of human-centered design. *Design Issues* **17** (3): 35–39.

Buell, R., B. Kalkanci. 2017. Sustainable operations versus corporate social responsibility: A cross-country analysis of value chain transparency. Working paper, Harvard Business School, Boston, MA.

Buell, R., B. Kalkanci. 2019. How transparency into internal and external responsibility initiatives influences consumer choice: Evidence from the field and lab. Working paper, Harvard Business School, Boston, MA.

Bullard, R. D. 1983. Solid waste sites and the black Houston community. *Sociological Inquiry* **53**(2–3): 273–288.

Bullard, R. C. 2015. Environmental justice in the 21st century: Race still matters. *Phylon (1960-)* **52**(1): 72–94.

Bullard, R. C., B. H. Wright. 1986. The politics of pollution: Implications for the black community. *Phylon (1960-)* **47**(1): 71–78.

Bullard, R. C., B. H. Wright. 1987a. Blacks and the environment. *Humboldt J. Soc. Relat.* **14**(1/2): 165–184.

Bullard, R. C., B. H. Wright. 1987b. Environmentalism and the politics of equity: Emergent trends in the black community. *Mid-Am. Rev. Sociol.* **12**(2): 21–37.

Business and Sustainable Development Commission. 2017. Better business better world report. Report, Business and Sustainable Development Commission, London, UK.

BusinessGreen Staff. 2013. Ford expands bio-based part list with rice hulls. *GreenBiz*, August 12.

Cachon, G. P., K. M. Daniels, R. Lobel. 2017. The role of surge pricing on a service platform with self-scheduling capacity. *Manuf. Serv. Oper. Manag.* **19**(3): 368–384.

Calmon, A., D. Jue-Rajasingh, G. Romero, J. Stenson. 2018. Operations strategy at the base of the pyramid: Consumer education and reverse logistics in a durable goods supply chain. Working paper, INSEAD, Fontainebleau, France.

Caro, F., L., L., A. Saez de Tejada Cuenca. 2018. Can brands claim ignorance? Unauthorized subcontracting in apparel supply chains. Working paper, UCLA, Los Angeles, CA.

Carter, C., R. J. Auskalnis, C. L. Ketchum. 2006. Purchasing from minority business enterprises. *J. Supply Chain Manag.* **35**(4): 28–32.

Castle, S., D. Carjaval. 2013. Counterfeit food more widespread than suspected. *New York Times*, June 26.

Chao, L. 2016. JD.com tests drones for rural China package delivery. *Wall Street Journal*, January 28.

Chao, R., S. Kavadias, C. Gaimon. 2009. Revenue driven resource allocation: Funding authority, incentives, and NPD portfolio management. *Management Sci.* **55**(9): 1556–1569.

Chen, L., H. L. Lee. 2017. Sourcing under supplier responsibility risk: The effects of certification, audit, and contingency payment. *Management Sci.* **63**(9): 2795–2812.

Chen, Y.-J., C. S. Tang. 2015. The economic value of market information for farmers in developing economies. *Prod. Oper. Manag.* **24**(9): 1441–1452.

Chen, Y.-J., J. G. Shanthikumar, Z. M. Shen. 2013. Training, production, and channel separation in ITC's e-Choupal network. *Prod. Oper. Manag.* **22**(2): 348–364.

Chen, Y.-J., J. G. Shanthikumar, Z. M. Shen. 2015. Incentive for peer-to-peer knowledge sharing among farmers in developing economies. *Prod. Oper. Manag.* **24**(9): 1430–1440.

Chen, J., A. Qi, M. Dawande. 2017a. Supplier centrality and auditing priority in socially-responsible supply chains. Working paper, UT Dallas, Dallas, TX.

Chen, L., Y. Cui, H. L. Lee. 2017b. Retailing with 3-D printing. Working paper, Cornell University, Ithaca, NY.

Chen, Y., T. Dai, G. Körpeoglu, E. Körpeoğlu, O. Sahin, C. Tang, S. Xiao. 2018. Innovative online platforms: Research opportunities. *Manuf. Serv. Oper. Manag.* Forthcoming. https://doi.org/10.1287/msom.2018.0757

Chen, S., Q. Zhang, Y.-P. Zhou. 2019. Impact of supply chain transparency on sustainability under NGO scrutiny. *Prod. Oper. Manag.* **28**(12): 3002–3022.

Chesbrough, H. W., A. R. Garman. 2009. How open innovation can help you cope in lean times. *Harv. Bus. Rev.* **87**(12): 68–76.

Cho, S.-H., X. Fang, S. R. Tayur, Y. Xu. 2019. Combating child labor: Incentives and information disclosure in global supply chains. *Manuf. Serv. Oper. Manag.* **21**(3): 692–711. https://doi.org/10.1287/msom.2018.0733

Clancy, H. 2017. Unilever teams with big banks on blockchain for supply chain. *GreenBiz*, December 13.

Commission for Racial Justice. 1987. Toxic wastes and race in the United States. Report, United Church of Christ Commission for Racial Justice, New York, NY.

Corbett, C. J., R. D. Klassen. 2006. Extending the horizons: Environmental excellence as key to improving operations. *Manuf. Serv. Oper. Manag.* **8**(1): 5–22.

Covestro. 2017. On the road to sustainability. Available at https://www.covestro.com/en/ecs-2017/automotive/bio-based-hardener (accessed date March 28, 2018).

Crama, P., F. J. Sting, Y. Wu. 2018. Encouraging help across projects. *Management Sci.* **65**(3): 1408–1429.

Cui, S., L. X. Lu. 2017. Optimizing content requirements under technology gaps. *Manuf. Serv. Oper. Manag.* **21**(1): 213–230.

Cui, R., J. Li, D. Zhang. 2017. Discrimination with incomplete information in the sharing economy: Evidence from field experiments on Airbnb. Working paper, Emory University, Atlanta, GA.

Dawande, M., S. Gavirneni, M. Mehrotra, V. Mookerjee. 2013. Efficient distribution of water between head-reach and tail-end

farms in developing countries. *Manuf. Serv. Oper. Manag.* **15** (2): 221–238.

de Zegher, J., D. A. Iancu, H. L. Lee. 2019. Designing contracts and sourcing channels to create shared value. *Manuf. Serv. Oper. Manag.* **21**(2): 271–289.

de Zegher, J., D. A. Iancu, E. L. Plambeck. 2017. Pay it forward: Sustainability in smallholder commodity supply chains. Working paper, Stanford University, Stanford, CA.

Distelhorst, G., J. Hainmueller, R. M. Locke. 2017. Does lean improve labor standards? Management and social performance in the Nike supply chain. *Management Sci.* **63**(3): 707–728.

Dobbs, R., J. Remes, S. Smit, J. Manyika, J. Woetzel, Y. Agyenim-Boateng. 2013. Urban world: The shifting global business landscape. Report, McKinsey Global Institute.

Dong, L., D. Shi, F. Zhang. 2017. 3D printing vs. traditional flexible technology: Implications for manufacturing strategy. Working paper, Washington University, St. Louis, MO.

Doorey, D. J. 2011. The transparent supply chain: From resistance to implementation at Nike and Levi-Strauss. *J. Bus. Ethics* **103** (4): 587–603.

Erat, S., V. Krishnan. 2012. Managing delegated search over design spaces. *Management Sci.* **58**(3): 606–623.

Esty, D. C., A. S. Winston. 2006. *Green to Gold: How Smart Companies use Environmental Strategy to Innovate, Create Value and Build Competition Advantage*. Yale University Press, New Haven and London.

Food and Agriculture Organization of United Nations. 2009. Global agriculture towards 2050. Available at http://www.fao.org/fileadmin/templates/wsfs/docs/Issues_papers/HLEF2050_Global_Agriculture.pdf (accessed date September 11, 2019)

Foster, C., R. Heeks. 2013. Conceptualizing inclusive innovation: Modifying systems of innovation frameworks to understand diffusion of new technology to low-income consumers. *Eur. J. Develop. Res.* **25**(3): 333–355.

Gaudiano, P., E. Hunt. 2017. How Capital One supports diversity from top to bottom. *Forbes,* July 20.

Girotra, K., S. Netessine. 2013. Business model innovation for sustainability. *Manuf. Serv. Oper. Manag.* **15**(4): 537–544.

Goedhuys, M., H. Hollanders, P. Mohnen. 2015. Innovation policies for development. S. Dutta, B. Lanvin, S. Wunsch-Vincent, eds. *The Global Innovation Index 2015: Effective Innovation Policies for Development*. World Intellectual Property Organization, Geneva, Switzerland, 81–85.

Govindarajan, V., R. Ramamurti. 2015. 3 ways businesses are addressing inequality in emerging markets. *Harvard Business Review Online*, January 23.

Grady, B. 2017. Got plants? Bio-based shoes, lingerie, auto parts and more. *GreenBiz*, May 11.

Guo, R., H. L. Lee, R. Swinney. 2016. Responsible sourcing in supply chains. *Management Sci.* **62**(9): 2722–2744.

Hackett, R. 2017. How this startup plans to use blockchain to revolutionize the coffee supply chain. *Fortune*, October 24.

Hart, S. 2005. *Capitalism at the Crossroads: The Unlimited Business Opportunities in Solving the World's Most Difficult Problems*. Pearson Education Inc., Upper Saddle River, NJ.

Hawken, P. 1993. *The Ecology of Commerce: A Declaration of Sustainability*. HarperCollins Publishing, New York.

Heeks, R., C. Foster, Y. Nugroho. 2014. New models of inclusive innovation for development. *Innov. Dev.* **4**(2): 175–185.

Hobson, J. 2013. To die for? The health and safety of fast fashion. *Occup. Med.* **63**(5): 317–319.

Hopp, W. J., S. M. Iravani, F. Liu. 2009. Managing white-collar work: An operations-oriented survey. *Prod. Oper. Manag.* **18** (1): 1–32.

Huckman, R. S., B. R. Staats. 2011. Fluid tasks and fluid teams: The impact of diversity in experience and team familiarity on team performance. *Manuf. Serv. Oper. Manag.* **13**(3): 310–328.

Hutchison-Krupat, J., S. Kavadias. 2015. Strategic resource allocation: Top-down, bottom-up, and the value of strategic buckets. *Management Sci.* **61**(2): 391–412.

Idemudia, U. 2011. Corporate social responsibility and developing countries: Moving the critical CSR research agenda in Africa forward. *Prog. Dev. Stud.* **11**(1): 1–18.

International Chamber of Commerce. 1991. The business charter for sustainable development: Principles of environmental management. *Environ. Policy Governance* **1**(4): 10–11.

International Finance Corporation (IFC). 2011. Strengthening access to finance for women-owned SMEs in developing countries. Report, International Finance Corporation, Washington, DC.

International Institute for Environment and Development (IIED)/Sustainable Food Lab. 2011. Sourcing gender: Gender productivity and sustainable sourcing strategies. Available at pubs.iied.org/pdfs/16027IIED.pdf (accessed September 11, 2019).

Jacobs, A. 2008. Chinese release increased numbers in tainted milk scandal. *New York Times*, December 2.

Jamali, D. 2010. The CSR of MNC subsidiaries in developing countries: Global, local, substantive or diluted? *J. Bus. Ethics* **93**(Suppl 2): 181–200.

Kalkanci, B., E. Plambeck. 2018a. Managing supplier social & environmental impacts with voluntary vs. mandatory disclosure to investors. *Management Sci.* Forthcoming. https://ssrn.com/abstract=2709649

Kalkanci, B., E. L. Plambeck. 2018b. Reveal the supplier list? A trade-off in capacity vs. responsibility. *Manuf. Serv. Oper. Manag.* Forthcoming. https://ssrn.com/abstract=3113797

Kalkanci, B., E. Ang, E. L. Plambeck. 2016. Strategic disclosure of social and environmental impacts in a supply chain. A. Atasu, ed. *Environmentally Responsible Supply Chains*. Springer, Cham, Switzerland, 223–239.

Kamalahmadi, M., Q. Yu, Y.-P. Zhou. 2018. Call on duty: Staffing flexibility at a restaurant chain. Working paper, Indiana University, Bloomington, IN.

Kesavan, S., S. Lambert, J. Williams. 2017. Stable schedules study: Field experiment at the Gap Inc. Working paper, University of North Carolina at Chapel Hill, Chapel Hill, NC.

Kiron, D., N. Kruschwitz, M. Reeves, E. Goh. 2013. The benefits of sustainability-driven innovation. *MIT Sloan Manage. Rev.* **54** (2): 69–73.

Kohnke, E. J., U. K. Mukherjee, K. K. Sinha. 2017. Delivering long-term surgical care in underserved communities: The enabling role of international NPOs as partners. *Prod. Oper. Manag.* **26**(6): 1092–1119.

Kornish, L., J. Hutchison-Krupat. 2017. Research on idea generation and selection: Implications for management of technology. *Prod. Oper. Manag.* **26**(4): 633–651.

Kornish, L., K. Ulrich. 2014. The importance of the raw idea in innovation: Testing the Sow's Ear hypothesis. *J. Mark. Res.* **51** (1): 14–26.

Körpeoğlu, E., S. H. Cho. 2018. Incentives in contests with heterogeneous solvers. *Management Sci.* **64**(6): 2709–2715.

Körpeoğlu, G., E. Körpeoğlu, S. Tunç. 2017. Optimal duration of innovation contests. Working paper, University College London, London, UK.

Kraft, T., L. Valdes, Y. Zheng. 2018. Supply chain visibility and social responsibility: Investigating consumers' behaviors and motives. *Manuf. Serv. Oper. Manag.* **20**(4): 617–636.

Krishnan, V., K. T. Ulrich. 2001. Product development decisions: A review of the literature. *Management Sci.* **47**(1): 1–21.

Lapowsky, I. 2013. The start-up giving factory workers a voice. *Inc.com*, August 7.

Lee, C., ed. 1992. *Proceedings: The First National People of Color Environmental Leadership Summit*. United Church of Christ Commission for Racial Justice, New York, NY.

Lee, H., G. Schmidt. 2017. Using value chains to enhance innovation. *Prod. Oper. Manag.* **26**(4): 617–632.

Lee, H., C. S. Tang. 2018. Socially and environmentally responsible value chain innovations: New operations management research opportunities. *Management Sci.* **64**(3): 983–996.

Lee, D., M. H. Tongarlak. 2017. Converting retail food waste into by-product. *Eur. J. Oper. Res.* **257**(3): 944–956.

Levi, R., S. Singhvi, Y. Zheng. 2018. Economically motivated adulteration in farming supply chains. *Management Sci.* Articles in Advance.

Lewis, T., F. Liu, J.-S. Song. 2017. Developing long-term voluntary partnerships with suppliers to achieve sustainable quality. Working paper, Duke University, Durham, NC.

Li, J., D. Zhang, R. Cui. 2017. A better way to fight discrimination in the sharing economy. *Harvard Business Review Online*, February 27.

Lin, Y.-T., H. Sun, S. Wang. 2018. Designing sustainable products under co-production technology. Working paper, University of San Diego, San Diego, CA.

Liu, X., R. Chao. 2018. How does social orientation influence firm innovation. Working paper, University of Virginia, Charlottesville, VA.

Liu, X., A. Mishra, S. Goldstein, K. Sinha. 2018. Toward improving factory working conditions in developing countries: An empirical analysis of Bangladesh ready-made garment factories. *Manuf. Serv. Oper. Manag.* **21**(2): 379–397.

Loch, C., F. Sting, A. Huchzermeier, C. Decker. 2012. Finding profits in fairness. *Harv. Bus. Rev.* **90**(9): 111–116.

Locke, R. M. 2013. *The Promise and Limits of Private Power: Promoting Labor Standards in a Global Economy*. Cambridge University Press, New York.

Manyika, J., M. Chui, M. Miremadi, J. Bughin, K. George, P. Willmott, M. Dewhurst. 2017. Harnessing automation for a future that works. Report, McKinsey Global Institute.

Marinesi, S., E. Belavina, G. Tsoukalas. 2018. Designing crowdfunding platform rules to deter misconduct. Working paper, The Wharton School of the University of Pennsylvania, Philadelphia, PA.

Metters, R. 2008. A case study of national culture and offshoring services. *Int. J. Oper. Prod. Manag.* **28**(8): 727–747.

Metters, R. 2017. Gender and operations management. *Cross Cultural Strategic Manag.* **24**(2): 350–364.

Metters, R., X. Zhao, E. Bendoly, B. Jiang, S. Young. 2010. "The way that can be told of is not an unvarying way": Cultural impacts on operations management in Asia. *J. Oper. Manag.* **28**(3): 177–185.

Mihm, J. 2010. Incentives in new product development projects and the role of target costing. *Management Sci.* **56**(8): 1324–1344.

Mihm, J., J. Schlapp. 2018. Sourcing innovation: On feedback in contests. *Management Sci.* **65**(2): 559–576.

Mohai, P., B. I. Bryant. 1991. Race, poverty & the distribution of environmental hazards: Reviewing the evidence. *Race Poverty Environ.* **2**(3/4): 24–27.

Moorthy, K. S., I. P. L. Png. 1992. Market segmentation, cannibalization, and the timing of product introductions. *Management Sci.* **38**(3): 345–359.

Narayanan, S., T. Soun, K. Deb. 2018. Inclusive manufacturing: Maximizing disability diversity, cultural diversity and productivity. Working paper, Michigan State University, East Lansing, MI.

Norton, A. 2017. Automation and inequality: The changing world of work in the global South. Report, International Institute for Environment and Development, London, UK.

O'Marah, K. 2016. Future of supply chain report. SCM World. Available at http://www.scmworld.com/wp-content/uploads/2017/07/Future_of_Supply_Chain_2016_pdf (accessed date September 11, 2019).

Orsato, R., H. Falcao, L. N. Van Wassenhove, R. L. Weiss, M. P. McNicholas, G. Sanches. 2014. The palm-oil dilemma. INSEAD Case Study.

Orsdemir, A., B. Hu, V. Deshpande. 2019. Ensuring corporate social and environmental responsibility through vertical integration and horizontal sourcing. *Manuf. Serv. Oper. Manag.* **21**(2): 417–434.

Östensson, O. 2017. Local content, supply chains, and shared infrastructure. Working paper, United Nations University WIDER (World Institute for Development Economics Research), Helsinki, Finland.

Ozkan-Seely, G., C. Gaimon, S. Kavadias. 2015. Dynamic knowledge transfer and knowledge development for product and process design teams. *Manuf. Serv. Oper. Manag.* **22**(2): 177–190.

Peters, A. 2016. Tracking tuna on the blockchain to prevent slavery and overfishing. *Fast Company*, September 8.

Peterson, H. 2017. Here are the best and worst paying retailers in America. *Business Insider*, May 18.

Piketty, T. 2015. *The Economics of Inequality*. Harvard University Press, Harvard, MA.

Plambeck, E. L. 2013. OM Forum—Operations management challenges for some "cleantech" firms. *Manuf. Serv. Oper. Manag.* **15**(4): 527–536.

Plambeck, E. L., T. Taylor. 2016. Supplier evasion of a buyer's audit: Implications for motivating supplier social and environmental responsibility. *Manuf. Serv. Oper. Manag.* **18**(2): 184–197.

Porter, M. E., M. R. Kramer. 2011. Creating shared value. *Harv. Bus. Rev.* **January–February**: 2–17.

Prahalad, C. K., A. Hammond. 2002. Serving the world's poor, profitably. *Harv. Bus. Rev.* **September**: 4–11.

Prahalad, C. D., S. Hart. 2002. The fortune at the bottom of the pyramid. *Strateg. Bus.* **26**: 54–67.

Pralahad, C. K. 2004. *The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits*. Pearson Education Inc., Upper Saddle River, NJ.

Pralahad, C. K. 2012. Bottom of the pyramid as a source of breakthrough innovations. *J. Prod. Innov. Manag.* **29**(1): 6–12.

Proserpio, D., G. Zervas. 2017. Online reputation management: Estimating the impact of management responses on consumer reviews. *Market. Sci.* **36**(5): 645–665.

Radjou, N., J. Prabhu. 2014. 4 CEOs who are making frugal innovation work. *Harvard Business Review Online*, November 28.

Rahmani, M., K. Ramachandran. 2017. Delegating search for innovative solutions: The effects of flexibility and transparency. Working paper, Georgia Institute of Technology, Atlanta, GA.

Rahmani, M., G. Roels, U. S. Karmarkar. 2017. Collaborative work dynamics in projects with co-production. *Prod. Oper. Manag.* **4**(26): 686–703.

Rahmani, M., G. Roels, U. S. Karmarkar. 2018. Team leadership and performance: Combining the roles of direction and contribution. *Management Sci.* **64**(11): 5234–5249.

Ramdas, K., E. Teisberg, A. L. Tucker. 2012. Four ways to reinvent service delivery: How to create more value for your customers and you. *Harv. Bus. Rev.* **90**(12): 98–106.

Ranganathan, J. 2013. The global food challenge explained in 18 graphics. Available at https://www.wri.org/blog/2013/12/global-food-challenge-explained-18-graphics (accessed date September 11, 2019).

Romero, S. 2017. Brazil's largest food companies raided in tainted meat scandal. *New York Times*, March 17.

Rotemberg, J. J., G. Saloner. 1993. Leadership style and incentives. *Management Sci.* **39**(11): 1299–1318.

Roth, A. V., A. A. Tsay, M. E. Pullman, J. V. Gray. 2008. Unraveling the food supply chain: Strategic insights from China and the 2007 recalls. *J. Supply Chain Manag.* **44**(1): 22–39.

Safdar, K. 2017. Target's new online strategy: Less is more. *Wall Street Journal*, March 15.

Schiller, B. 2018. Timberland is helping rebuild Haiti's cotton industry. *Fast Company*, February 9.

Searchinger, T., C. Hanson, J. Ranganathan, B. Lipinski, R. Waite, R. Winterbottom, A. Dinshaw, R. Heimlich. 2013. The great balancing act. Working paper, World Resources Institute, Washington, DC.

Sedex. 2013. Going deep: The case for multi-tier transparency. Available at https://cdn.sedexglobal.com/wp-content/uploads/2016/09/Sedex-Transparency-Briefing.pdf (accessed date September 11, 2019).

Siemsen, E., S. Balasubramanian, A. Roth. 2007. Incentives that induce task-related effort, helping and knowledge sharing in workgroups. *Management Sci.* **53**(10): 1533–1550.

da Silva, J. G. 2016. Food losses and waste: A challenge to sustainable development. Available at http://www.fao.org/save-food/news-%20and-multimedia/news/news-details/en/c/429182/(accessed date September 11, 2019).

Sodhi, M. S., C. S. Tang. 2011. Social enterprises as supply-chain enablers for the poor. *Socio-Econ. Plann. Sci.* **45**(4): 146–153.

Sodhi, M. S., C. S. Tang. 2014. Supply-chain research opportunities with the poor as suppliers or distributors in developing countries. *Prod. Oper. Manag.* **23**(9): 1483–1494.

Sodhi, M. S., C. S. Tang. 2017. Socially responsible supply chains. Y. Bouchery, C. J. Corbett, J. C. Fransoo, T. Tan, eds. *Sustainable Supply Chains: A Research-Based Textbook on Operations and Strategy*. Springer Series in Supply Chain Management. Springer, Cham, Switzerland, 465–483.

Song, J. S., Y. Zhang. 2016. Stock or print? Impact of 3D printing on spare parts logistics. Working paper, Duke University, Durham, NC.

Soto-Silva, W. E., E. Nadal-Roig, M. C. Gonzalez-Araya, L. M. Pla-Aragones. 2016. Operational research models applied to the fresh fruit supply chain. *Eur. J. Oper. Res.* **251**(2): 345–355.

Stanford Value Chain Innovation Initiative. 2016. Technological disruption and innovation in last-mile delivery. Report, Stanford Value Chain Innovation Initiative, Stanford, CA.

Stanford Value Chain Innovation Initiative. 2017. Technological in agribusiness: Opportunities to drive value. Report, Stanford Value Chain Innovation Initiative, Stanford, CA.

Steurer, R., M. E. Langer, A. Konrad, A. Martinuzzi. 2005. Corporations, stakeholders and sustainable development I: A theoretical exploration of business-society relations. *J. Bus. Ethics* **61**(3): 263–281.

Swinney, R., S. Chakraborty. 2018. Signaling to the crowd: Private quality information and rewards-based crowdfunding. Working paper, Duke University, Durham, NC.

Tang, C. S. 2018. Socially responsible supply chains in emerging markets: Some research opportunities. *J. Oper. Manag.* **57**: 1–10.

Terwiesch, C., C. Loch. 2004. Collaborative prototyping and pricing of custom-designed products. *Management Sci.* **50**(2): 145–158.

Thomke, S., D. Bell. 2001. Sequential testing in product development. *Management Sci.* **47**(2): 308–323.

Thorlakson, T., J. F. de Zegher, E. F. Lambin. 2018. Companies' contributions to sustainability through global supply chains. *Proc. Natl Acad. Sci.* **115**(9): 2072–2077.

Tomasini, R., L. N. Van Wassenhove. 2009. *Humanitarian Logistics*, 1st edn. Palgrave McMillan, Basingstoke, UK.

Ton, Z. 2015. 4 reasons retail jobs are about to get better. *Harvard Business Review Online*, September 4.

Ton, Z. 2017. The good jobs solution. *Harvard Business Review Digital Article #BG1706-PDF-ENG*

Transforming Our World. 2015. The 2030 agenda for sustainable development. United Nations, p. 6.

Tyson, L. 2017. The future is automated, but what does that really mean for jobs? *World Economic Forum*, June 13.

Ulrich, K. T., D. J. Ellison. 1999. Holistic customer requirements and the design-select decision. *Management Sci.* **45**(5): 641–658.

United Nations Population Division (UNPD). 2017. World Population Prospects: The 2017 Revision, Key Findings and Advance Tables. Department of Economic and Social Affairs, ESA/P/WP/248.

United Nations World Commission on Environment and Development (Ed.). 1987. *Report of the World Commission on Environment and Development: Our Common Future*. Oxford University Press, Oxford, UK.

United States Bureau of Labor Statistics. 2017. Labor force statistics from the current population survey. Available at https://www.bls.gov/cps/cpsaat18.htm (accessed date September 11, 2019).

United States General Accounting Office. 1983. Sitting of hazardous waste landfills and their correlation with racial and economic status of surrounding communities. Report, Government Accounting Office, Washington, DC.

United States of America Department of State. 2013. Trafficking in persons report. Available at https://2009-2017.state.gov/j/tip/rls/tiprpt/2013/index.htm (accessed September 11, 2019).

Uppari, B. S., I. Popescu, S. Netessine. 2019. Selling Off-Grid Light to Liquidity Constrained Consumers. *Manuf. Serv. Oper. Manag.* **21**(2): 308–326.

Vakili, K., L. Zhang. 2018. High on creativity: The impact of social liberalization policies on innovation. *Strateg. Manag. J.* **39**: 1860–1886.

Villena, V. H., D. A. Gioia. 2018. On the riskiness of lower-tier suppliers: Managing sustainability in supply networks. *J. Oper. Manag.* **64**: 65–87.

Von Hippel, E. 1986. Lead users: A source of novel product concepts. *Management Sci.* **32**(7): 791–805.

Wang, X., M. K. Lim, Y. Ouyang. 2017. Food-energy-environment trilemma: Policy impacts on farmland use and biofuel industry development. *Energy Econ.* **67**: 35–48.

Williams, J., S. Lambert, S. Kesavan. 2017. How the Gap used an app to give workers more control over their schedules. *Harvard Business Review Online*, December 27.

Wooten, J. O., K. T. Ulrich. 2017. Idea generation and the role of feedback: Evidence from field experiments with innovation tournaments. *Prod. Oper. Manag.* **26**(1): 80–99.

World Bank. 2018. World development indicators. Available at http://datatopics.worldbank.org/world-development-indicators/(accessed date September 11, 2019).

World Bank, FAO and IFAD. 2009. Gender in agriculture sourcebook. Available at http://siteresources.worldbank.org/INTGENAGRLIVSOUBOOK/Resources/CompleteBook.pdf (accessed date September 11, 2019).

World Economic Forum. 2018a. Driving the sustainability of production systems with fourth industrial revolution innovation. Report, World Economic Forum, Geneva, Switzerland.

World Economic Forum. 2018b. Towards a reskilling revolution: A future of jobs for all. Report, World Economic Forum, Geneva, Switzerland.

World Economic and Social Survey (WESS). 2016. Climate change resilience—An opportunity for reducing inequalities. Available at https://wess.un.org/wp-content/uploads/2016/06/WESS_2016_Report.pdf (accessed date September 11, 2019).

World Health Organization. 2010. *Medical Devices: Managing the Mismatch: An Outcome of the Priority Medical Devices Project*. WHO Press, Geneva, Switzerland.

Wu, Y., K. Ramachandran, V. Krishnan. 2014. Managing cost salience and procrastination in projects: Compensation and team composition. *Prod. Oper. Manag.* **23**(8): 1299–1311.

Xiao, S., Y.-J. Chen, C. S. Tang. 2018. Knowledge sharing and learning among smallholders in developing economies: Implications, incentives, and reward mechanisms. Working paper, The Hong Kong University of Science and Technology, Hong Kong.

Yoo, O. S., T. Huang, K. Arifoglu. 2018. A theoretical analysis of the lean startup's product development process. Working paper, University College London, London, UK.

Zhang, Y., J. M. Swaminathan. 2017. Optimal seeding policy under rainfall uncertainty. Working paper, University of North Carolina at Chapel Hill, Chapel Hill, NC.

Zhang, C., A. Atasu, T. Ayer, L. B. Toktay. 2018. Truthful mechanisms for medical surplus product allocation. *Manuf. Serv. Oper. Manag.* Forthcoming. https://doi.org/10.1287/msom.2018.0770