Socially and Environmentally Responsible Value Chain Innovations: New Operations Management Research Opportunities

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Abstract. By examining the state of operations management (OM) research from 1980 to 2015 and by considering three new industry trends, we propose new OM research directions in socially and environmentally responsible value chains that fundamentally expand existing OM research in three dimensions: (a) contexts (emerging and developing economies); (b) objectives (economic, environmental, and social responsibility); and (c) stakeholders (producers, consumers, shareholders, for-profit/nonprofit/social enterprises, governments, and nongovernmental organizations). In this paper, we describe some examples of this new research direction that are intended to stimulate more exciting OM research, to contribute to the economic and social well-being of both developing and developed economies.

1. Introduction

Our first exposure to operations management (OM) research articles began in the early 1980s as doctoral students. Over the last 35 years, it has been gratifying to see how OM practice and research have played an important role in the development and refinement of many big business ideas ranging from the Toyota Production System to global supply chain management. We also witnessed many manufacturing firms change from being “vertically integrated” to being “globally decentralized” in the 1980s, while many developed countries shifted from being “manufacturing-based economies” to “service-based economies” in the 1990s, and then shifted further to being “knowledge- and information-based economies” in the early 2000s. Industry trends and emerging needs have motivated OM researchers to go beyond traditional OM areas like quality, inventory, production planning, queueing, and scheduling to examine healthcare management, service management, revenue management, design and product innovations, interfaces with marketing and finance (see Van Mieghem 2013), global supply chain issues ranging from supply contracts to supply chain coordination, and, more recently, operational issues arising from the sharing economy (Cachon et al. 2017).

While supply chain management was grounded in fundamental multiechelon inventory theory developed by Clark and Scarf (1960), Lee et al. (1997) was among the first to examine a decentralized supply chain that mimics actual practices when different parts of the supply chain do not belong to the same company. Since 1997, we have observed an exponential growth in the number of published research articles on supply chain coordination dealing with incentive alignment of multiple members of the supply chain, while traditional OM research areas have experienced steady growth. However, Lariviere (2016) suggested that the research in supply chain management (and supply chain contracts) is getting saturated. To examine this issue, we searched through the Scopus citation database for social science and the humanities using the keywords “supply chain,” “inventory,” “scheduling,” and “queueing” appearing in the title, abstract, or keywords of academic articles published between 1980 and 2015. We also searched through Google Ngram using the same keywords to measure the percentage of books (in English) published between 1980 and 2008.1 Our findings are summarized in Figures 1 and 2.

From Figures 1 and 2, it appears that OM research in “inventory,” “scheduling,” and “queueing” is getting saturated, while “supply chain” research is experiencing limited growth. If the entire OM research community continues to work on traditional areas without regard to emerging trends and forces in the global economy, our community will become stagnant, and the value and relevance of our research marginalized (Tang 2016). To thrive, we need new research areas that can attract more young scholars to join our
community so that the community can become more vibrant, more relevant to the business community and society at large, and more impactful by improving profits, changing lives, and creating a better world. With this goal in mind, we strive to answer three questions:

- What are the new OM research areas that we should explore?
- Why are these topics different from traditional OM research areas?
- How can the OM research community explore these new OM research areas?

As we pondered these three questions, we discovered there are many exciting OM research topics that the OM research community can explore, especially those involving innovative business models (e.g., sharing economy, network economy; Girotra and Netessine 2014), new technologies (e.g., 3D printing, mobile financial services, and drone delivery services, etc.) or humanitarian operations (Starr and van Wassenhove 2014) that deserve attention. However, because of our domain knowledge and our research interests, we shall focus our attention on one emerging topic that involves global supply chains that goes beyond production planning and inventory control, information sharing, and supply chain coordination and collaboration. Specifically, we should expand the scope of supply chains to include the value created by service chains (that involve service operations) and financial chains (that involve financial flows along supply chains). By broadening the scope of supply chains to include value chains (that involve materials, service, information, and financial flows), we identify two emerging OM research areas that deal with the operational issues arising from the development and the execution of socially and environmentally responsible value chains in developing economies. These two areas pertain to the provision of services and values to these economies and the creation of value for these economies.

In the rest of this paper, we first describe industry and research trends in this area. We classify different types of socially and environmentally responsible value chains according their strategic intents, and we illustrate different types of value chains using case examples in Section 3. Section 4 presents recent OM research that examines different issues arising from social and environmental responsibility along with some open research questions. This paper is concluded in Section 5. (As a disclaimer, this paper is not meant to be a comprehensive review of the OM research literature. Therefore, any omission is our own responsibility.)

2. Industry Trends in Social and Environmental Responsibility
Since the early 2000s, two major forces have been pressuring firms to pay attention to the triple bottom...
line of profit, people, and planet (Elkington 2002). First, rapid global economic development has led to increasing demand for natural resources (clean water, crude oil, forests, metals, etc.), especially in countries such as India and China, where the supply of these natural resources continues to diminish. As greenhouse gas emissions have been considered a major cause of climate change, the general public is increasingly concerned over environmental sustainability. Second, to reduce cost, global companies have extensively offshored their production to emerging and developing economies, which have become major supply nodes of many product and service value chains. The treatment of the labor force, the setup of a production environment, and the well-being of the communities where production occurs constitute increasing concern to global companies and their end consumers. With stagnant growth in developed countries since the recession in 2008, global companies producing fast-moving consumer goods such as Unilever and Procter & Gamble, and food and beverage companies such as Coca-Cola, Nestlé and Starbucks, are expanding their markets to these economies (Prahalad 2004). To develop emerging markets so that poor producers can become consumers, these companies need to help the poor to break out of the poverty cycle (Karnani 2007). Strengthening developed economies as supply bases and as new demand sources is the motivation for companies to engage in social responsibility.

As companies venture into developing markets as sellers of their products or as buyers of raw materials and production services, they face three fundamentally different challenges that are not prevalent in developed economies:

1. **Contexts/constraints.** Developing or emerging markets have various inherent constraints including lower education/literacy levels, lower skilled workforces, inadequate physical infrastructure, inconsistent law enforcement, and inadequate/nonexistent financial services, etc.

2. **Objectives.** Global companies are more likely to be held environmentally and socially responsible when operating in developing countries. Therefore, these companies need to achieve the triple bottom line (profit, people, and planet).

3. **Stakeholders.** When they operate in developing countries, besides shareholders, these companies need to comply with regulations set by local governments as well as, in many cases, international standards such as trade agreements or labor standards. Their conduct is monitored by local workforces, governments, non-governmental organizations (NGOs), and consumer activists. To be successful, the alignment of interests of these organizations, local governments, and financial institutions is crucial.

Therefore, as companies embark on these new ventures, they face many challenging operational issues, and these challenges create great opportunities for OM researchers to explore. Because these new research opportunities in socially and environmentally responsible value chains involve different constraints, multiple objectives, and multiple stakeholders, one cannot simply extend or modify existing OM research to examine these issues. As such, these changes in the corporate world and the needs of the global economy can stimulate innovative OM research in the near future.

While companies are facing issues surrounding “social responsibility,” “corporate social responsibility,” “sustainability,” and “social innovations,” we asked if this industry trend has motivated researchers to explore these issues. We searched through the Scopus citation database for social science and humanities and through Google Ngram using these keywords, and we summarize our findings in Figures 3 and 4. Both figures reveal the exponential growth in research on sustainability since 1995 or so. At the same time, we observe an increasing trend in other related areas.

In the context of sustainability, most OM research tends to focus on the area of remanufacturing, partly because it is directly related to manufacturing with the flow reversed (Ferguson and Souza 2010). However, in the context of the triple bottom line/environmental sustainability/social responsibility, Agrawal and Takay (2010) commented that this remains a nascent research area in the OM literature because there is no consistent measure for environmental and social responsibility, and there are self-interests among different partners along supply chains. Finally, through a comprehensive review, Tang and Zhou (2012) found that extensive research has been done in remanufacturing, while other areas (e.g., social responsibility) need more investigation. These observations reveal that the OM research community has a great opportunity to
explore these new research areas that deal with environmental and social responsibility in the context of developing economies.

Since environmental and social responsibility are nascent research areas in OM, we will present our ideas using the following steps. In the next section, we will classify socially and environmentally responsible value chain practices according to the primary intent of a company (or a social enterprise). Then, we use case examples to illustrate the three aforementioned challenges (contexts/constraints, objectives, and stakeholders) and to discuss some exciting research opportunities for further examination. Ultimately, we hope this paper can stimulate more OM researchers to embark on scope-expanding research in OM.

### 3. Socially and Environmentally Responsible Practices

By and large, most firms engage in developing economies intending to create value for communities and firms, but different firms put different weights on these two goals. Some may put more weight on “doing good” by serving the needs and improving the standard of living of the poor as well as improving environmental sustainability in the communities where they operate. At the same time, others put more weight on “doing well” by creating shared value through productivity improvement and economic development in communities. With this classification of “doing good” and “doing well” as two extreme cases, global firms as well as local entrepreneurs can create value by considering different innovative mechanisms as depicted in Table 1.3

Using the framework of Table 1, we use case examples to illustrate different innovative mechanisms that are intended to do good (or do well) by incorporating the underlying challenges (contexts/constraints, objectives, and stakeholders).

#### 3.1. Creating Do-Good Value Chains Though Value Provision

**3.1.1. Case 1: Institute of Public and Environmental Affairs (IPE).**

**Contexts/constraints.** China is facing severe environmental pollution: 20% of rivers are poisonous (Miao et al. 2015), and polluted air shortens the lifespan of people in northern China by 5.5 years (Chen et al. 2013b). Alibaba’s founder Jack Ma (commented that “Our water has become undrinkable, our food inedible, and our milk poisonous. Meanwhile, cancer is now an everyday topic. China must seek to change all of this, but the challenge is huge” (Ma 2013). However, due to exponential economic growth, short-term focus on profit, loose government regulations, and inconsistent law enforcement, progress to improve the environment in China has been slow.

**Objectives.** The objective is to provide free public access of environmental information in China to enable public and value chain partners’ participation to facilitate change.

**Stakeholders.** In addition to Chinese citizens with serious concerns about pollution, the Chinese government has concerns about Chinese activism and social chaos. Factories that violate environmental regulations also worry about being exposed, and global original equipment manufacturer buyers worry about negative publicity if their suppliers in China are caught linked to environmental violations. Finally, NGOs such as Greenpeace need information to monitor the behavior of different factories.
Innovative mechanisms for value chain efficiencies. In 2008, the Chinese Environment Ministry required environmental agencies to disclose information on regional environmental quality and reveal the list of enterprises violating discharge standards within 20 days on the agency’s website or through the press. However, the information posted on individual agencies’ Chinese websites was not easily accessible. To ensure information can be easily accessible by Chinese and English readers, the IPE collected information from different agencies and developed a single online platform by providing information (in Chinese and English) about water and air pollution for the entirety of China. The IPE worked with various NGOs to create a blacklist of polluters operating in China, both domestically owned and foreign owned. By exposing to the public the identities of polluters in China as well as their national and multinational manufacturers, it created pressure for multinationals such as Nike, Adidas, and Levi Strauss to step up their auditing and monitoring efforts to ensure their suppliers would comply with environmental regulations. By naming the polluters and their customers on the IPE’s website, it enabled activists and consumers to participate in the battle against pollution in China. Specifically, consumers can take action (e.g., boycotting) against those who fail to take corrective actions for improving their environmental performance (Lee and Plambeck 2011).

The IPE has been successful in exerting implicit public pressure on some multinationals to work with their suppliers to comply with environmental regulations. At the same time, the IPE developed the Green Choice Alliance with various NGO organizations that promote global green value chains by pushing global corporations to concentrate on the environmental performance of their suppliers. The IPE provides information about the performance of brands such as Apple, Walmart, Adidas, etc., and their responses and actions in improving the environmental performance of their value chains. As a result of the IPE’s efforts and impact, the founder of the IPE, Mr. Ma Jun, was the 2012 recipient of the Goldman Environmental Prize.

3.1.2. Case 2: Men on the Side of the Road in South Africa. Contexts/constraints. In South Africa, the unemployment rate was 40% in 2003 (and approximately 25% in 2015). On any given day, over 100,000 people (mostly men) with basic skills stand on the side of the road hoping to get some odd jobs to survive. At the same time, many potential customers are fearful to hire these day laborers for odd jobs (painting, landscaping, etc.) at their homes even though using them would be more economical than the alternatives. Consequently, supply does not meet demand.

Objectives. The objectives are to create job opportunities for day laborers and to provide a safe environment for customers and workers.

Stakeholders. The stakeholders are day laborers, home owners, and social enterprise.

Innovative mechanisms for improving value chain efficiencies. Recognizing this imbalance of supply and demand, Charles Maisel founded a nonprofit organization in South Africa in 2003 called the Men on the Side of the Road (MSR) project. The MSR project provides education and skill development for day laborers. MSR conducts background and reference checks on each applicant wishing to register as a day laborer and checks on each registered customer to ensure safety for customers and workers. Then, by using an online

### Table 1. Classifications of Socially Responsible Operations in Developing Economies

<table>
<thead>
<tr>
<th>Strategic intent</th>
<th>Innovative mechanism</th>
<th>Case examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doing good (by serving the needs of the poor, and improving sustainability)</td>
<td>Value provision: providing easily accessible information to drive change, designing extremely affordable products and services, and building efficient value chains for their distribution</td>
<td>• Institute of Public Environmental Affairs provides transparency as a means to improve sustainability • Men on the Side of the Road alleviates poverty through matching the demand and supply of day laborers • Riders for Health provides basic healthcare needs in rural areas with no access to paved roads</td>
</tr>
<tr>
<td>Doing well (by improving productivity and creating new business opportunities)</td>
<td>Value creation: value chain transformations and social reengineering, and developing new business models</td>
<td>• ITC e-Choupal uses information to increase distribution efficiency • Li &amp; Fung uses “capability building” to improve the sustainability of supply bases • Mountain Hazelnuts uses innovations and financial flow design to successfully introduce high-value crops</td>
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*Li & Fung actually used the term “capacity building” in their annual reports. The idea is that, through enhancing suppliers’ capabilities, they have more factories that stay sustainable and can serve Li & Fung with greater capacity. Capacity building also enables the supplier not to subcontract to second tier suppliers—a potential sustainability hazard.*
Recognizing that four-wheel vehicles are not efficient to provide the necessary maintenance, created a sound and daily care, setup a hub-and-spoke service network for the last mile delivery of healthcare services. In many settings, Riders for Health is a nonprofit organization that promotes the use of motorcycles as the means for the last mile of healthcare services in rural areas by providing a reliable means of transportation for health workers, doctors and nurses, and medical supplies, is that the “last mile delivery” of healthcare services is often not feasible. The continent’s physical infrastructure is severely underdeveloped: 62% of the rural population live within 2 kilometers of a road. Most people are connected to health clinics or centers through single-lane sand or dirt roads. As a result, many do not get services provided by health workers, and it would be very difficult for patients to travel on foot or bicycles to the nearest clinic.

Objectives. The objective is to solve the last mile delivery of healthcare services in rural areas by providing a reliable means of transportation for health workers.

Stakeholders. The stakeholders are health workers, nonprofit organizations, government (ministries of health), medical suppliers such as pharmaceutical manufacturers, and hospitals/clinics.

Innovative mechanisms for improving value chain efficiencies. Recognizing that four-wheel vehicles are not suitable for transportation because of road condition in many settings, Riders for Health is a nonprofit organization that promotes the use of motorcycles as the means for the last mile delivery of healthcare services. To do so, they trained nurses and health workers to ride on motorcycles and to perform basic maintenance and daily care, set up a hub-and-spoke service network to provide the necessary maintenance, created a sound inventory system for spare parts control, and developed a comprehensive performance measurement system to monitor and improve performance. Since the program’s implementation in Gambia and Zambia, the motorcycles were found to last longer, the up times were significantly higher, the health workers’ productivity went up, more outreach visits to distant villages were conducted, more vaccinations and vitamin supplements were delivered, and the cost per kilometer, a key cost measure, was found to be lower. A basic operations management model of preventive maintenance and inventory control resulted in this great success. The positive experience in Gambia has resulted in that country’s Ministry of Health asking Riders to take over management of their four-wheel fleet, including ambulances, etc. (Lee and Tayan 2007).

3.2. Developing Do-Well Value Chains via Value Creation

3.2.1. Case 1: ITC e-Choupal in India. Contexts/constraints. To ensure that farmers are not exploited by intermediaries who compel farmers to sell their produce at the farm gate at low prices, the Agricultural Production Marketing Act of India requires farmers to sell their produce via auctions at a mandi (a state-sanctioned wholesale marketplace). At the mandi, potential buyers such as ITC engage their commission agents to bid on their behalf for certain prespecified quantities at certain prespecified maximum bids. While the open auction mechanism appears to be fair especially when the market is fragmented, the farmers are disadvantaged for the following reasons: (1) farmers lack information about fair market prices; (2) farmers are under pressure to sell at a lower price, especially since they have incurred the sunk cost for transporting the produce to the mandi and they do not have adequate storage space to hold unsold produce; (3) farmers are underpaid because of unscientific assessments of quality and quantity of the produce; and (4) farmers may not get full payment immediately from commission agents due to delayed or installment payments (Anupindi and Sivakumar 2006).

Objectives. The objectives are to provide market price information to empower Indian farmers to obtain fair selling prices and also to improve the selling operations’ efficiency so that farmers can have more time to tend to their farms to improve productivity. At the same time, ITC would like to obtain high-quality produce at fair prices and cross-sell its products to farmers.

Stakeholders. Besides farmers, the mandis, and ITC, ITC’s commission agents can be affected as ITC works with farmers to change their selling operations.

Innovative mechanisms for value chain transformation and social reengineering. To help these farmers to overcome the aforementioned constraints, ITC embarked on an initiative called ITC e-Choupal that uses information and communications technology to change selling
operations for the farmers in India. Specifically, ITC lets the villagers select a representative for training to help them access ITC’s web portal to learn of the commodity prices traded at each mandi on the previous day. On the same portal, ITC announces the minimum price it will offer the following day. With this market price information, the farmers can either sell to ITC according to the announced price or go through auctions at the mandi. In the former case, the representative will grade the quality and quantity, and the farmers can sell the produce directly to ITC and receive full payment the following day. Alternatively, the farmers can bring their produce to the mandi the following day, but they know the minimum bid offered by ITC when considering the bids offered by other potential bidders. Therefore, the e-Choupal initiative enables farmers to obtain fair market prices and reduce the time to haul the produce to the mandi and receive payment quickly. Also, ITC keeps all of its commission agents by assigning them to set up the e-Choupals, facilitate ITC’s purchasing transactions, and help cross-sell ITC’s products (seeds, fertilizers, etc.) to the farmers.

As of 2010, ITC has launched over 6,500 e-Choupals in 40,000 villages, offering web access to four million farmers. To recognize the value that ITC e-Choupal has created for rural communities, ITC received the Stockholm Challenge Award in 2006 and the United Nation Industrial Development Organization Award in 2008.

3.2.2. Case 2: Li & Fung’s Drive for Sustainability. Contexts/constraints. To reduce product costs and to gain market access in developing countries such as China and India, many multinational retailers and brand owners of consumer goods and garments sourced their products from Asia. However, because of inconsistent inspection processes, lax law enforcement in many developing countries, and short-term focus on profit, there is a strong incentive for suppliers not to comply with environmental, health, and safety (EH&S) regulations (e.g., release of toxic waste, unsafe buildings with fire hazards, etc.). For example, a garment factory in Bangladesh caught fire in 2012, killing over 100 workers when the factory door was locked and the building had no fire escapes. In 2013, Rana Plaza in Bangladesh collapsed, killing over 1,000 workers, as a result of the factory building being illegally expanded and the building being constructed with poor materials on swampy land (Lee and Melvin 2015). In addition to those in Bangladesh, noncompliant suppliers with unsafe factories exist in many countries such as China, Cambodia, and Vietnam, where multinational firms are under pressure to improve their suppliers’ EH&S compliance.

Objectives. The objective is to entice suppliers to comply with EH&S regulations in a sustainable and financially viable manner for the suppliers and the buyers.

Stakeholders. The issue of EH&S has received great attention among factory workers, factory owners, multinational firms (i.e., buyers), consumers, NGOs, and local governments.

Innovative mechanisms for value chain transformations and social reengineering. By managing a global supply network of over 15,000 suppliers, Li & Fung is one of the largest trading companies providing design, development, sourcing, and distribution services to retailers, brand owners, and wholesalers around the world (Fung et al. 2008). Without owning any factories, Li & Fung leverages its agile global supply network to meet the changing needs of its customers (Tang 2006). Since its supply network has grown rapidly in East and Southeast Asia, it has become challenging to ensure that all 15,000 suppliers in its entire network comply with EH&S regulations. For instance, the noncompliant factories in Bangladesh that caught on fire and the one that collapsed were Li & Fung’s suppliers. Faced with pressure from its customers and the public, Li & Fung recognized the need to create innovative solutions and build value for its customers in sustainable value chain management (Lee and Melvin 2015).

Instead of focusing mainly on auditing and compliance that can lead to an endless cat-and-mouse game, Li & Fung created a new business unit called Vendor Support Services (VSS) in 2014 to work closely with its suppliers to improve their operations and become socially and environmentally compliant. For example, VSS works with suppliers to measure greenhouse gas emissions and water usage and then develops ways to help them to use energy and natural resources more efficiently. By demonstrating that certain sustainable manufacturing processes can enable suppliers to become more productive and more cost efficient, the suppliers have economic incentives to adopt sustainable practices in the long run. This approach is win–win because it can help suppliers to become more cost efficient and more environmentally friendly. At the same time, it enables Li & Fung to develop track-and-trace capabilities that are demanded by its customers. By creating value for its suppliers and its customers, Li & Fung can help improve the EH&S compliance of its suppliers, improve its reputation, and generate more business in the long run.

3.2.3. Case 3: Mountain Hazelnuts in Bhutan. Contexts/constraints. Located in the eastern Himalayas, Bhutan is a country where 69% of the population live in rural areas. Out of this, 40% live at a subsistence level, with income less than $1 a day. With high poverty, many of the young people in rural areas migrate to urban cities to look for jobs, which are also hard to find. Such migration has resulted in many broken families, with young children not having their fathers at home and young women not having their husbands living with them. To increase their income, farmers have also
engaged in deforestation to make room to grow crops, resulting in severe soil erosion.

Objectives. The objectives are to create jobs and value and to improve environmental sustainability in rural Bhutan through the identification and nurturing of higher-value agriculture.

Stakeholders. The stakeholders are social entrepreneurs, local government, farmers and their communities, agronomists, buyers such as Nestlé, and financiers such as the International Finance Corporation and the Asian Development Bank.

Innovative mechanisms for value chain transformations and social reengineering. The steps are to identify a higher-value crop that could be grown in Bhutan, convince farmers and local government to support this crop, teach farmers to successfully grow the crop with high productivity, and to find ways to distribute and sell the crop to outside markets. Hazelnut is a high-value nut for which Bhutan’s climate and environmental conditions are suitable. It is also a crop with growing demand but limited supply since there are only a small number of countries that can grow the crop. Mountain Hazelnuts (MH) was founded with three missions (see Hoyt and Lee 2011): (a) to create a commercially profitable and sustainable venture, (b) to provide economic opportunities to rural farmers and communities, and (c) to provide environmental benefits by growing in degraded areas.

To achieve these goals, one needs to develop innovative operations and a new business model. First, it is not efficient (or even possible) to grow the nut directly in Bhutan. Instead, tissue culture has to be grown in a place with know-how and a controlled environment. MH found that it is more effective to cultivate hazelnut tissues in its laboratories in Yunnan, China. Second, the tissues are then transported to nurseries in the eastern part of Bhutan, where they are grown to become baby trees. Third, because poor farmers cannot afford to take risks in investing in baby trees, MH offers the baby trees to farmers free of charge. Fourth, MH has to use technologies such as mobile phones to monitor the growth of the trees, to give instructions to farmers, and to provide the right information to help farmers to irrigate and take care of the trees. Fifth, when nuts are collected, MH will purchase the nuts from the farmers according to prearranged prices. Then MH has to overcome the logistical challenges of transporting the nuts from Bhutan, a land-locked country, to ports in India for distribution to global buyers. In addition, the new business model calls for MH giving 20% of revenue back to local communities to create incentives for the country to accept MH’s introduction of hazelnuts. The trees are also planted on degraded slopes, so MH is also making a positive contribution to the environment. MH’s target is to eventually have 15% of Bhutan’s population engaged in hazelnut farming, lifting many out of poverty along the way.

4. New Operations Management Research Opportunities

We now describe some recent OM research that is either based on or motivated by these case examples to illustrate how this stream of recent research incorporates the underlying challenges (contexts/constraints, objectives, and stakeholders). Toward the end of this section, we discuss various exciting opportunities for future OM research.

4.1. OM Research Motivated by the Institute of Public and Environmental Affairs and Li & Fung’s Sustainability Practice

The IPE case highlights the importance of monitoring and screening to ensure sustainable value chains, while the Li & Fung case shows how global companies need to use the right incentives as well as investing in capacity building to reduce the risks of having responsibility violations by suppliers. Global companies as buyers often use supplier certification schemes, periodic audits, negative incentives such as penalties or discontinuance or reduction of business, or positive incentives such as better terms and conditions and increased business. Chen and Lee (2016) examined the effectiveness of these multiple mechanisms when the riskiness of the suppliers engaging in such activities is unknown to buyers. The key feature is to model the behavior of the supplier, who, in face of uncertainties in production, has to make the decision of whether to violate responsibility requirements to save costs. Plambeck and Taylor (2016) presented a game-theoretic model to examine the interactions between the buyer’s actions (audit level) and the supplier’s actions (compliance level and deception level). By examining equilibrium outcomes, they characterize “backfiring conditions” under which the buyer’s actions (increasing audit level, paying a higher price, etc.) would motivate a supplier to cause more harm.

After the collapse of Rana Plaza in Bangladesh in 2013, over 166 apparel corporations from 20 countries formed the Accord on Fire and Building Safety in Bangladesh to conduct joint audits of supplier factories, to work with noncompliant factories to implement corrective actions, and to impose joint termination when a nonsupplier fails to participate fully in the inspection and remediation. The notion of joint audit and joint termination motivated Caro et al. (2015) to develop a game-theoretic model to examine its effectiveness. They found that joint audit and joint termination can create the incentive for the supplier to increase its compliance level and it can create a win–win solution only when the audit cost is reasonably low.

Besides analytical models, there are a few empirical papers that examine the impact of environmental violations and the effectiveness of certain penalties and incentives for improving supplier compliance. First,
The idea of creating a two-sided platform to facilitate matching has become more prevalent in socially responsible operations. There are many open research questions to explore. Consider Kiva, an online person-to-person microlending platform that enables ordinary people in the development world to lend at least as $25 to individual borrowers (or groups) who need a small amount of money to start or sustain businesses. This online platform has generated remarkable success, with over 350,000 lenders lending over...
37 million to over 67,000 borrowers in rural Africa alone, with a default rate below 2%. An open research question is, in the absence of borrower credit history, what is the mechanism (screening, monitoring, auditing) that can sustain Kiva’s success so that more people will continue to lend and more poor people can continue to receive loans? Besides Kiva.org, there is an emerging online lending platform using an “equity crowd-funding” mechanism that has enabled start-up companies to raise capital from many small investors in exchange for equity. For example, WeFunder.com and Fundable.com are two online platforms that enable small investors to invest in new start-up companies. What are the effective mechanisms for these crowd-funding companies to screen for good start-ups to ensure investors gain good returns on their investments?

4.3. OM Research Motivated by Riders for Health in Gambia and Zambia

The innovation of Riders for providing the last mile delivery of healthcare services provides an excellent setting for empirical field-based research. Mehta et al. (2016) conducted a field-based experiment in Zambia, where districts were divided into the experimental group with Riders managing the fleet, while the control group was under the management of the Ministry of Health. Over a two-year period, the vehicle survival rates, availability levels, trips made by health workers, distances travelled, operating costs, and health interventions such as vaccinations, vitamin supplement distribution, and children’s weight monitoring were recorded. Statistical analysis showed significant improvements in the experimental districts, confirming the effectiveness of the Riders’ solution for healthcare delivery in extreme conditions. As motor cycles become the key means of transport of many health workers, Riders found that many health workers were still initially not willing to travel to distant villages to deliver healthcare. The reason is that their performance measure was based on the number of trips or the number of vaccinations, for example. Naturally, the health workers want to minimize travel times in any given week, so that distant villages were still not visited as often as the ministry would like. McCoy and Lee (2014) developed a model that introduced equity as part of the performance measures, and showed how such a model would improve the servicing of remote villages drastically.

Microentrepreneurs have been developed as distributors to overcome the logistics infrastructure limitations in developing economies. Vision Spring sells affordable reading glasses (at $4 per pair) to low-income individuals through a network of microentrepreneurs in Southeast Asia and beyond. It offers three-day training and microfinance to help these microentrepreneurs to earn a commission of $1 for selling a pair of reading glasses or for referring a customer to Vision Spring’s optical shop for prescription glasses. By examining the underlying commissions, Sodhi and Tang (2014) showed that Vision Spring creates value for poor customers (by getting access to affordable reading glasses) and for microentrepreneurs (by earning a reasonable commission). In the same vein, Coca-Cola bottlers deliver over $500 million worth of products in East Africa using 1,800 microdistribution centers operated by 7,500 microentrepreneurs using a hub-and-spoke system. The microentrepreneurs use bicycles and push carts to distribute products to micromarkets in congested areas (Cummings 2012).

By piggybacking on Coca-Cola’s distribution network in Africa, ColaLife, an independent UK charity, gets Coca-Cola to distribute its “social goods” (e.g., oral dehydration salts, high-dose vitamin A, and water purification tablets) to rural villages using a wedge-shaped container called an AidPod that fits between the Coca-Cola bottles in their crates, thus reducing distribution costs (Yadav et al. 2011). However, efficient distribution strategies to enable microentrepreneurs in developing countries to buy, distribute, and sell products have not been well studied. Blanco and Fransoo (2013) called such micromarkets “nano-stores,” and suggested research questions related to the stores. Moreover, for piggyback distribution, it is not clear how the value created should be shared between the network owner and the enterprise or microentrepreneurs. For example, how much should Coca-Cola charge ColaLife for distributing its AidPods? The same applies to the problem when private enterprises piggyback on a nonprofit logistics service provider to deliver products. Riders for Health has been approached by private enterprises to deliver their products for a fee. This remains an open research question.

4.4. OM Research Motivated by ITC e-Choupal

Recall that ITC provided market price information to farmers in villages and preannounced its selling price to farmers so that farmers could decide whether to sell directly to ITC based on the announced price or to sell through the mandis via open auction. While eliminating intermediaries can improve selling efficiencies and eliminate the commissions paid to the agents, it is not clear that more selling options will benefit farmers. In a game-theoretic setting, Sodhi and Tang (2014) showed that, in equilibrium, offering farmers an option to sell directly to ITC at a preannounced price is mutually beneficial.

Chen et al. (2013a) examined the broader research pertaining to information provision: should ITC provide information to farmers who do not belong to the ITC e-Choupal network? If yes, how much information
should ITC disclose to the farmers outside of the network? How does this new business model affect the market price, the farmer’s selling decisions, and ITC’s profit? By analyzing a stylized single-period model, they found that once farmers joined the ITC network, they would always give priority to sell directly to ITC. In a variety of scenarios, they found that it is optimal for ITC to provide the best available information to the farmers outside the network.

While ITC e-Choupal provides value to farmers so that they can make informed selling decisions and obtain fair (and higher) selling prices, ITC faced major challenges to scale up its operations partly due to inadequate infrastructure (road, electricity, Internet access) and bureaucratic and inconsistent regulations in different states. To overcome these challenges, companies such as Reuters Market Light and Nokia Life Tools can distribute personalized market price information to farmers via mobile phones. Besides the fact that virtually all farmers have access to featured mobile phones, these companies can scale up their operations without incurring significant operating costs and without needing to deal with local government regulations. Chen and Tang (2015) examine the economic value of market information to farmers who compete on quantity (i.e., Cournot competition). They showed that when farmers possess private information, offering additional public information may not increase farmer welfare. However, they found that public market information can reduce income inequality among farmers.

The stream of research motivated by ITC e-Choupal has been based on providing information access to producers in the form of price. Price information is a signal of the supply and demand condition. Future research could explore what other information could create value for the producers. As for the government, creating the infrastructure or mechanism to provide information access is one powerful way to improve the livelihood of producers. As for the government, creating the infrastructure or mechanism to provide information access is one powerful way to improve the livelihood of producers. What about other types of information access is one powerful way to improve the livelihood of producers. As for the government, creating the infrastructure or mechanism to provide information access is one powerful way to improve the livelihood of producers.

4.5. OM Research Motivated by Mountain Hazelnuts in Bhutan

The Mountain Hazelnuts case demonstrated the power of having the right incentive design to introduce an innovative agricultural product to a developed country. It was based on a new financial flow model for the relationship between Mountain Hazelnuts and farmers. There has been interesting research work that is also based on having the right financial contracting model as a way to incentivize innovations in a value chain. Here, we describe dealing with wool grazing in Patagonia, Argentina. In the wool value chain, farmers graze the sheep to produce wool that is then sold to top manufacturers. There is a new management technique called management-intensive grazing (MIG) that could increase yields for farmers, at a higher variable cost. In New Zealand, farmers have successfully shifted from conventional grazing to MIG, with positive returns. In Patagonia, Argentina, the apparel company Patagonia championed MIG, but the results have not been encouraging. Farmers shied away from adoption unless subsidies were given. Using an economic model of the wool farming operation, de Zegher et al. (2017) examined this interesting dilemma, and showed how proper contract specification is necessary to induce the right incentives so that both farmers and the manufacturers can be better off with the adoption of MIG.

The Mountain Hazelnut case of using of financial flow design to incentivize farmers is similar to Starbucks’ Coffee and Farmer Equity (C.A.F.E.) practices (see Lee 2008). The C.A.F.E. initiative aims at having the coffee value chain engaged in economically fair, environmentally sound, and socially responsible activities. It uses a set of guidelines, investments by Starbucks, training and microfinancing, and direct financial incentives to encourage adoption. Motivated by this program, Lewis et al. (2015) developed a multiperiod, two-party model with double-sided asymmetric information and a dynamically changing environment to explore mechanisms that could induce efficient supplier-development investments by a buyer. One of the elements of the mechanisms is that the buyer’s payments in each period should reflect market conditions, and that the buyer has to be willing to invest in and commit itself to the agreement.

The multiperiod work by Lewis et al. (2015) showed the importance of modeling long-term effects in agricultural value chains. An intervention, such as a new technology for irrigation or farming method, may not have returns immediately. Modeling the longer-term effects is an important research direction. The Mountain Hazelnut case also highlights the potential values of agricultural innovations for productivity gains as well as environmental contributions. The farmers in Bhutan gain employment and income through the growth of hazelnuts, but at the same time, growing nuts on degraded slopes restore deforested areas. The simultaneous treatment of agricultural productivity and sustainability is a worthwhile research opportunity. There has been severe illegal poaching of elephants by locals in Zambia, endangering the elephant population. The Community Markets for Conservation group found that investing in improving farming productivity so that the incomes of the local people increased resulted in less poaching. Similarly, one way to counter deforestation for palm oil farming is to increase the productivity of farms so that farmers do not have to continuously deforest to increase their yields (Kennedy and Sept 2013). These are examples
that can motivate research that links farming productivity to sustainability improvements.

Upon examining the case study presented in Section 3 along with the recent OM research illustrated in this section, we can identify three major exciting research areas that OM researchers can explore by using different research methods, including field experiments, behavioral experiments, empirical analysis, mathematical analysis, etc. First, while each case study and the corresponding research articles presented above are based on a specific context, it is important to develop a unified (or a general) framework/theory/model to classify/examine/evaluate different initiatives so that we can gain a more structural understanding of the underlying issues. For example, is there a general framework for examining the following research questions motivated by the ITC e-Choupal case?: (1) What kind of information (market price, farming advisory service, etc.) should be disseminated to farmers? (2) How widely should this information be disseminated? (3) How much should the firm charge for this kind of information services? (4) Should the firm offer services that can facilitate peer-to-peer learning among farmers? Of course, the case studies have shown how positive results have come out of the intervention initiatives. More comprehensive research could examine the impacts of unintended consequences, e.g., could information hurt some groups, or could it be misused?

Second, in each of the case studies and the related OM research, the original intent of the firm is to “do good” by improving social and environmental sustainability for the community and “do well” by creating monetary value for the firm and the community. This intent is certainly noble, and it is important to measure the social, environmental, and financial values created by different initiatives and how these values are being shared between the firm and the community. For example, related to the case studies of Mountain Hazelnuts and the Starbucks’ C.A.F.E. initiative, it would be of interest to develop a general framework to examine these kinds of initiatives, and it is important to examine how value is created and shared among different parties. As different stakeholders receive differential impacts, a framework can be developed to examine the trade-offs. For example, how can the costs/benefits to farmers, consumers, and the community at large be combined? Should there be other performance measures like equity used? And in the extreme cases, should we consider the impact of the intervention on stakeholders in developed economies (e.g., consumers in developed economies who import crops from developing economies)? A deeper understanding of these issues can enable us to develop ways to improve the effectiveness of different initiatives.

Third, when operating in emerging markets, there is a natural concern that some firms may use their knowledge and bargaining power to take advantage of the poor. To prevent this kind of unethical practice, the government may need to develop effective policies to regulate certain operations to encourage more firms to “do good” and “do well.” For example, in the context of a person-to-person microlending platform such as Kiva, peer-to-peer lending such as Lending Club, and “equity crowd-funding” firms such WeFunder.com and Fundable.com, the regulations are still fluid. However, as peer-to-peer loan volume hit $77 billion in 2015, a 15-fold increase since 2012, there is a legitimate concern about the default risk, especially when these lending operations are not heavily regulated. To protect individual investors’ interests and to ensure the borrowers’ accessibility to these loans, OM researchers can certainly explore particular policy issues and examine how different policies would affect financial flows between investors and borrowers.

5. Conclusions

In this paper, we showed statistically that traditional OM research areas (inventory, scheduling, queuing, and even supply chain management) are getting saturated. To thrive, the OM research community should embark on new research areas so that our research community will stay relevant and impactful. While there are many exciting new OM research directions, we used industry practices and current research trends to argue that the OM research community is equipped to explore the areas of socially and environmentally responsible value chains.

Because this area of research is nascent, we used different case studies to illustrate two types of socially and environmentally responsible value chains: one focused on doing good and another focused on doing well. To demonstrate how these case studies can lead to innovative OM research, we described some recent research and open research questions that were based on or motivated by these case studies. There are many others that we omitted, particularly because this paper is not a comprehensive review of the literature.

While research in socially and environmentally responsible value chains can create value for society at large and for enterprises, it can even influence public policy. OM research in this area is fundamentally different from traditional OM research because of the inherent constraints in the context of developing countries, multiple objectives, and multiple stakeholders. As such, one cannot simply extend or modify existing OM research work to examine the issues arising from developing countries. Ultimately, these new challenges can stimulate innovative OM research involving different research methods like field-based and behavioral experiments (Croson and Donohue 2006, Bloom et al. 2013, Parker et al. 2016), empirical analysis (Fisher 2007), data-driven research (Simchi-Levi 2014), and
analytical model analysis (Cachon 2012). It is our hope that this paper will stimulate more OM researchers to embark on topics that are important to corporations and society at large.

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Endnotes

1 Google populated the database using over five million books published up to 2008. Accordingly, as of January 2016, no data will match beyond the year 2008.

2 While environmental and social responsibility are nascent research areas in OM, it is interesting to note that they have been explored by researchers in strategy and marketing. Examples include Bierhoff (2002), Svegas and Tamayo (2013), and Du et al. (2011).

3 The notions of doing good and doing well capture the motivations for companies to create shared value between the poor and the firm, which is different from the context examined in the behavioral economics literature (e.g., Ariely et al. 2009, Chernev and Blair 2015). In behavioral economics, doing well is motivated by an individual’s “intrinsic value” of (charitable) giving, and doing good is motivated by an individual’s “extrinsic value” of the benefit associated with (charitable) giving.

4 While ITC uses the online platform, Reuters Market Light disseminates the prevailing selling price at different mandis to farmers who subscribe to the service. By using real data obtained from a natural experiment, Parker et al. (2016) provide empirical evidence about how price information can reduce price variability across different mandis.

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