



Evolution of the Indian LPG industry: Exploring conditions for public sector business model innovation

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ABSTRACT

Business model innovation in the public sector is important in creating value for citizens, industry, and government. The differing priorities of these stakeholders, which often require intervention or unification to address a societal need, are at the heart of both supply-side and demand-side strategy research. Moreover, it represents a core element of the business model innovation delivering a key commodity, liquid petroleum gas (LPG), to large populations in the developing world. In this paper, we examine varying conditions in the public sector that require both supply-side and demand-side business model innovation for value creation, capture, and appropriation through deployment of digital government initiatives and policy interventions. By analysing the Indian LPG industry over a 70-year period, we argue that the supply-side and demand-side perspective, along with the business model concept, promote a better understanding of government industry interventions in the interest of all stakeholders. Specifically, the contribution of this paper to the public sector is unique, because (i) research on demand-side strategy can help business model scholars gain a more robust, granular understanding of effective value propositions for citizens, (ii) supply-side strategy business models create a seamless delivery mechanism, and (iii) both supply-side and demand-side strategy with their unique propositions serve as a “bridging concept” in coming up with the *Framework for the Customer-Integrated Public Sector Business Model* that connects the shared ideas of both areas of study to resource-based streams of strategy research.

1. Introduction and background

Public sector innovation, which is of critical importance for the broader community, is mainly problem-driven (Windrum and Koch, 2008) and experiences specific challenges (De Vries et al., 2016), including limited resources, gaps in innovative capacity, and failure to deliver public value (Hartley, 2005, 2006). Governments struggle to manage innovation (Green et al., 2014) due to bureaucratic structures (Hood and Peters, 2004) and risk aversion (Bommert, 2010). In the public sector, attempts to solve “wicked” societal challenges (Rittel and Webber, 1973) are frequently unsuccessful and “innovation often gets derailed” (Eggers and Singh, 2009, pp. 6–7). It is therefore crucial to understand how governments can support successful innovation in industry to benefit citizens.

As underscored in the OSLO manual (2018), a key subarea of business-process innovation in firms and industries is business model

innovation (BMI), which emphasizes a holistic approach to deriving value from unique business model configurations (Zott et al., 2011). Business models offer a system-level view of how organizations create value (Amit and Zott, 2012) and have helped us understand the emergence of some of the largest organizations in history (Brynjolfsson et al., 2011), especially as reliance on digital capabilities grows (Weill and Woerner, 2013). A key challenge to BMI is that there are varied, inconsistent perspectives to be incorporated (Massa et al., 2017). For instance, Foss and Saebi (2017) observe that the BMI literature lacks theoretical underpinning and cumulative empirical inquiry. Conversely, Teece (2010) appropriately highlights that one of the greatest challenges in this field is that “business models are frequently mentioned but rarely analysed” (p.192).

The existing literature draws increasing attention to how digital business models have allowed new products and services that redefine how industries operate (Baden-Fuller and Haefliger, 2013; Dushnitsky

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and Klueter, 2017). This has prompted organizations to adjust their ways of thinking about business models across multi-stakeholder environments (Baden-Fuller and Haefliger 2013; Khanagha et al., 2013, 2014; Van Knippenberg et al., 2015), and to shift emphasis from supply-led, demand-led, and mixed approaches to BMI (Priem and Swink, 2012; Priem, Wenzel, & Koch, 2018). Organizations that have failed to adjust have often struggled to remain successful (Brynjolfsson and McAfee, 2014; Goldfarb and Tucker, 2012). One of the most important areas of change is the adoption of business models by governments (Bason 2010), with their innovative ways of interacting with industry. However, the understanding of BMI in the public sector is still limited (De Vries et al., 2016). Governments are under increasing pressure to navigate multiple, disparate organizations to orchestrate innovation (Crosby et al. 2017) and enable transformations through BMI (Martins et al., 2019). In recent years, there has been greater recognition that the public sector can introduce specific interventions to create government, industry, and public value through BMI (Cabral et al., 2019; Klein et al., 2013).

We recognize the transformative impact of modern digital technologies on business models (Massa et al., 2017), yet governments have struggled to adopt digitally enabled business models (Castelnovo and Sorrentino, 2017; Scott-Kemmis, 2018). Our research tries to bridge the gap between emerging theory and analytical frameworks in business models, and their adoption in public sector. Specifically, how can governments improve industry and citizen outcomes by implementing BMI, pivoting across supply-side value capture, demand-side value creation, and value appropriation? We contribute here to the understanding and integration of the supply-side and demand-side of business models (Priem and Swink, 2012; Priem et al., 2018) in a public organization setting.

To examine this research question, we adopt the interpretive research approach to explore the historical transformation of a public sector case study; our goal is to understand sequence of phases and patterns in the evolution of public sector business models. We focus on continuous innovation in the liquefied petroleum gas (LPG) industry in India through business model transformations. The current Indian LPG market has grown to over 280 million active consumers. It comprises a complex network of producer LPG plants, over 18,000 distributors, government policy, and financial support. In growing to this scale over seven decades, the market has experienced distinct evolutionary periods involving various actors, interactions, and business models.

Importantly, in response to the specific consumer needs and challenges of each period, the government has varied its policy interventions to support the business model and introduce a cash-transfer program, the Direct Benefit Transfer Program (DBTL). The roll-out of the world's largest cash-transfer scheme is an exciting case to explore public sector business models (Khanagha et al., 2014), managing digital BMI (Foss and Saebi, 2018), and to look at government's role in fostering innovations (Wang, 2018) through strategic formulations and adoption of digital technologies (Castelnovo and Sorrentino, 2017; Khanagha et al., 2014; Skålén et al., 2018).

Our research identifies the sequence of phases for the Indian oil industry and the government as they seek profitability and sustainability from the perspective of supply-side value capture (Priem, 2007; Teece, 2010). Moreover, it focuses on value creation for the citizens of India (e.g., Chesbrough and Rosenbloom, 2002; Demil et al., 2015; Priem, 2007; Priem et al., 2012, 2013; Zott et al., 2011). The cross-fertilization between the demand-side and the supply-side facilitates a greater understanding of the joint integration of supply-side and demand-side business models (Priem and Swink, 2012; Priem et al., 2018) with a view toward public organization. Our work contributes to the strategy literature by extending the business model concept into the public sector, by proposing a *Framework for Customer-Integrated Public-Sector Business Model (CIPSBM)*, and by applying existing business-model assessment tools to a large, multiyear government case study in a way that has not been seen before. The synthesis of the case study demonstrates the

applicability of the business model theory to the public sector as it integrates the demand-side and supply-side perspectives and the business model concepts. Specifically, we provide business model scholars with more robust, detailed insights of effective value propositions and business models in the public sector, where the shared ideas of each area of study to resource-based streams of strategy research can be bridged. More importantly, we provide guidance to government and policy advisors on how to support firms and industries by increasing collaborative business models.

The rest of this paper is organised as follows. First, we review the literature of BMI and public sector innovation. Next, we outline the research method used to examine and synthesise the evolving patterns and conditions required for public sector BMI. We then explore the nature of business model transformation and adjustments that underpinned the LPG industry changes over the 1955–2013 period. We conclude by discussing a research framework, based on empirical analysis, that embodies both the supply-side and the demand-side of the business model to enable public sector BMI. Finally, we explore implications and avenues for future research.

2. Literature review

This section provides an overview of the current literature and emerging research trends in the areas of business models, value creation, capture and appropriation, public sector BMI, public sector innovations, and technology as an enabler of BMI.

2.1. BMI and value creation/capture/appropriation

Business models are system-level views of how organizations operate and create value (Amit and Zott, 2012). Chesbrough and Rosenbloom (2002) position business models as the logic that relates an organization's technical composition and the economic value it creates. Foss and Saebi (2018) argue that business models are the architecture of the firm's value creation, delivery, and capture mechanisms. Mizik and Jacobson (2003) distinguish the business model literature between value creation and value capture. The value-creation side relates to the production and supply of resources and outputs. The value-capture side is more closely related to customers demanding and absorbing the outputs from the business models. While traditional mindsets in the resource-based view of firms have focused on the supply-side (Barney et al., 2001), a more contemporary focus is the demand-side of business models, through greater customer engagement and building of business models around the customer. This strand of the literature sees organizations derive value from creating strong networks beyond their boundaries with partners and customers (Berglund and Sandström, 2013) and focuses on appropriating or capitalizing value-creation activities (Foss and Saebi 2018). Ple et al. (2010) highlight the shifting role of customers, from being the beneficiaries of a business model to being value co-creators (Chesbrough and Rosenbloom, 2002).

The study of new business models goes hand in hand with the field of BMI (Chesbrough, 2010). BMI emphasizes a holistic approach to derive value from unique business model configurations (Zott et al., 2011). BMIs have helped us understand the emergence of the some of the largest organizations in history (Brynjolfsson et al., 2011). Foss and Saebi (2017) encapsulate BMI as either a concept or an outcome, and they assert that the current literature lacks theoretical underpinning and cumulative empirical inquiry. Moving beyond observation, Gerdoçi et al. (2018) highlight the importance of understanding how to manage business models. Teece (2018a) draws a close linkage between dynamic capabilities, which determine an organization's ability to create long-term sustainable value, and the management of an organization's business model. This presents opportunities to observe BMI as a repeatable process, with corresponding antecedents in the forms of capabilities, mechanisms, and leadership requirements. Organizational routines, which articulate the repeatable actions that underpin

organizational procedures and systems (Feldman and Pentland, 2003), are a further mechanism for observing BMI. Meanwhile, the evolution of routines can be used to understand the impact of different business model interventions (Cohen, 2007). Given the nature of these interventions, one needs to address the tension in the business model around balancing value creation, capture, or appropriation (Foss and Saebi, 2018), as well as the need to deploy targeted mechanisms to achieve all three elements (Mizik and Jacobson, 2003).

2.2. Public sector BMI

BMI literature to date has largely concentrated on the private sector; studies of the public sector are underrepresented (De Vries et al., 2016). Public sector innovation (PSI) focuses on the creation and culmination of new ideas that lead to outcomes for society that create public value (Hartley, 2005; Mohr, 1969; Mulgan and Albury, 2003, 2007). Innovation in the public domain is important for populations across the globe (Castelnuovo and Sorrentino 2017). Meeting the needs of an ever-changing society includes offering demand-led services, where the customer is the focal point (Van der Boor et al., 2014). These types of services are increasingly delivered in collaboration with the constituents in the community and other businesses (Bowden, 2005; Carter and Belanger, 2005; Rosenberg and Feldman, 2008). PSI is largely supply-led and characterized as “top-down” (through sound policy making, strategy, and execution) or “lateral” (by sharing good practices through external sources) (Hartley, 2006, p. 61). Such a multidimensional understanding of innovation is intertwined with varied and concurrent innovations (Agarwal and Selen, 2009, 2011). Therefore, government and policy makers must coordinate what is ultimately a complex business model, with the different stakeholders and dimensions, in order to deliver immediate and longer-term *organizational value* (Birkinshaw et al., 2008, Mol and Birkinshaw, 2009; Schoemaker et al. 2018). At the core of this dilemma is the need for governments to facilitate demand-led interventions that lead to new business models, in order to conceptualize and adopt new ways of doing things (Chandra and Leenders, 2012), especially through networked organizations (Keast et al., 2004) and partnerships with industry and other nongovernment entities (Hodge et al., 2017). Klein et al. (2013) pose a specific challenge to governments across balancing the creating and bundling of capabilities, and interacting across public and private actors.

2.3. Public sector interventions to facilitate BMI

In response to these challenges, governments are increasingly achieving their policy ambitions: improving society through BMI (Bolton and Hannon, 2016). This helps governments take a system-level approach to derive value from unique business model configurations (Sharpe and Agarwal, 2014). Crosby et al. (2017) highlight the importance of understanding government’s role in managing multiple disparate organizations in order to create value and innovation. Moore (2005) highlights the importance of public sector organizations in delivering public value, as governments need to take different approaches to innovation when fewer resources are available (Demircioglu and Audretsch, 2017).

Over the past decade, there has been an increasing effort to conceptualize the public sector business model. Eggers and Singh (2009) broke down the sources of innovation in government across employees, internal partners, external partners, and citizens. These authors consider the PSI mindset to be distributed across a continuum, from internal orientation to external orientation. Between an internal versus external orientation, public sector organizations can cultivate or replicate innovation internally, partner with others, form networks, and invite open-source innovation. Martins et al. (2019) demonstrate more recent efforts to break down public sector business models by using a business model canvas to separate organizations into internal parts, partnerships, relationships, and customers. These studies exemplify efforts to

introduce the business model concept into the public sector; overall, however, the literature still lacks a strong body of long-term case studies into the nature of innovation in the sector (Djellal et al., 2013). Carbel et al. (2019) capture the evolving role of government as one needing to design government interventions that are tailored to the specific stakeholder dimensions.

2.4. Technology as an enabler of BMI

An area of great interest is the relationship between business models and digital technology (Massa et al., 2017). Digital BMI has accompanied the rise of some of the most exciting organizations in history, ones that have disrupted the retail, hospitality, and transportation industries to create the largest shopping, short-term rental, and car-sharing networks in the world (Castellacci and Tveito, 2018), through their global distribution networks and highly evolved digital operations (Brynjolfsson and Simester, 2011). Digital technologies are a key element of modern BMI (Brynjolfsson and McAfee., 2015; Svahn et al., 2017; Teece, 2018b). Organizations have been able to create unprecedented value through digital capabilities (Weill and Woerner, 2013). Two themes common to these organizations are digital platforms supporting innovation and the utility of complementary assets to support value creation (Teece, 2010). Other papers describe complementary assets as a core requirement for modern technologies to function (Teece, 2018b). There is still a gap in understanding about the targeted positioning of digital platforms in BMI (Helfat and Raubitschek, 2018). In the public sector, digital business models have helped governments connect with unprecedented numbers of citizens through greatly improved services at a fraction of the cost (Fishenden and Thompson, 2012). They have made public services more accessible and reliable (Castelnuovo and Sorrentino, 2017) and enhanced citizen outcomes (Gil-Garcia et al., 2018).

3. Research question and theoretical framework

Overall, significant gaps exist in our understanding of public sector BMI and how governments can facilitate the right mix of value creation, capture, and appropriation in the interconnected digital world while attempting to meet the expectations of their stakeholders. This research study is underpinned by the opportunity to extend our understanding of both the supply-side and the demand-side in conjunction with BMI. This research enables authors to manage PSI across the varied contexts of policy, public management, and e-government (De Vries et al., 2018). We will use the evolution of the Indian LPG industry as a case study to understand public BMI.

Fig. 1 represents a theoretical model that shows the intertwining relationships between different dimensions, namely policy intervention, stakeholders, and the outcomes of BMI.

To address this research gap, we explore the following research question:

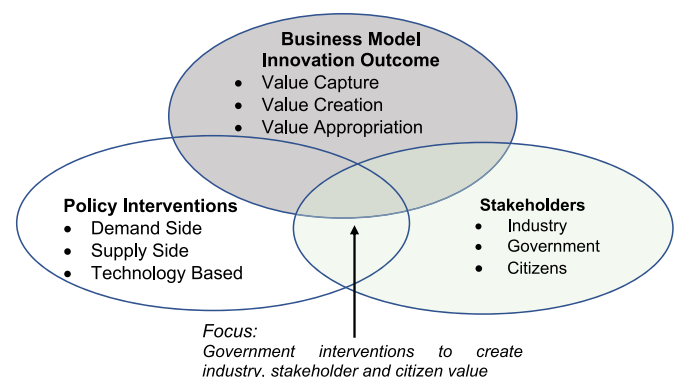


Fig. 1. Relationship Between BMI, policy intervention, and stakeholders.

How can governments enable improved industry and citizen outcomes by implementing business model innovation by pivoting across supply-side value capture, demand-side value creation, and value appropriation over time in the digitally enabled world?

3.1. Research context, design and method

This research uses a longitudinal case study (Van de Ven, 2007; Yin, 2009) to explore public sector supply-side and demand-side interventions in the Indian LPG industry that enabled various business models over seven decades. Several rounds of in-depth discussions with decision-making executives at the Ministry of Petroleum and Natural Gas (MOP&NG), the Petroleum Planning and Analysis Cell (PPAC), and the oil marketing companies (OMCs)—made this a good “strategic research site” (Merton, 1987) by “bounding our phenomenon of interest in a tractable manner” (Chiles et al., 2004; p. 503). In the following sections, we illustrate the research context, the framework analytical strategy, and the data collection.

3.2. Research context

According to Roome and Louche (2016), studying a context-dependent phenomenon whose boundaries and context are fuzzy (Yin, 2009) is best achieved through case-study research. Case-study research allows one to develop “contextually sensitive knowledge of actual management practices” (Keating, 1995, p. 66) and also helps to empirically evaluate a contemporary event in a real-life context using information from different sources (Yin, 2009). Our research uses an interpretative case-study approach (Yin, 2003) through the use of the illustrative case (Eisenhardt, 1989; Yin, 1994; Yunus et al., 2010) of the Indian public sector LPG supply chain. Note that successful implementation of innovation in the public sector is extremely rare (Shiffma et al., 2004). The qualitative investigation is inductive; it is based on a longitudinal (1955–2013) analysis that helps qualify the evolutionary path of the Indian LPG market over time (Denzin and Lincoln, 2011), through changing business models, innovations, and government policy interventions (Patton, 1980). By nature, this approach is descriptive and explanatory; it explores business model routines over time to observe antecedents to BMI in the public sector. This case study elucidates how government policy interventions operate across the supply-side and demand-side of the multi-stakeholder environment; this is an appropriate methodological fit for investigating such a contemporary phenomenon within a longer term, dynamic, real-life scenario (Carson et al., 2001; Yin, 2009).

In addition, the case is not archetypal, because of the underlying innovations in the Indian public sector-run LPG supply chain; rather, it challenges existing ideas, or the theory guiding the study (Murray and Elston, 2005). Lastly, in gathering data for LPG supply chains, we have been hampered by political, legal, and commercial exploitation risks (especially for the period when the data was captured only in hard copy, primarily before the 1990s).

3.3. Framework analytical strategy

We analyze the set of contextual elements to understand events over time, making the historical perspective an integral part of the research included in the iterative process. The overarching lens of analysis is the *business model*, which represents the underlying framework by which value is captured and created in a network (Shafer et al., 2005) to take care of both the supply-side and the demand-side of the business model, respectively.

The analysis uses two business model frameworks: Demil and Lecocq’s (2010) Resources, Competences, Organization, and Value (RCOV); and Zott and Amit’s (2010) design patterns (Content, Structure, and Governance) and design themes (Novelty, Lock-In,

Complementarity, and Efficiencies). The RCOV framework deconstructs a business model into independent components. Resources and Competencies (RC) describe the underpinning structures, resources, and abilities of a business model. Organization (O) captures the core processes and operational dimensions of the business model. Value (V) covers the key areas by which the organization generates revenue and positive impact. In Zott and Amit’s (2010) business model framework, design patterns define content (the activities performed), structure (the mechanisms for delivery and their interdependencies), and governance (who performs activities). Their design themes, or NICE, capture value-creation attributes within a system across Novelty (newness of the system), Lock-In (attraction/affinity for continued participation in the business model), Complementarity (where there is opportunity in bringing together different activities) and Efficiencies (areas where cost can be reduced).

To supplement the business model analysis, we use the concept of organizational routines (Ostenwalder et al., 2005). We use these routines as the frame of reference because they help articulate the repeatable actions that underpin organizational procedures and systems (Feldman and Pentland, 2003). These routines capture the human changes (Leonardi, 2011), tools, templates, written procedures, and information and communication technologies (ICTs) that permit a change over time (Pentland et al., 2012). Feldman and Pentland (2003) define routines as both a source of reinforcing organizational behavior and a driver of organizational change. Therefore, the analysis of routines and changes to routines is useful in assessing BMI. As evident from Schoemaker et al. (2018), these organizational routines help us understand generalizable drivers for public sector BMI and the conditions required to support it. In this case, we observe the distinct actors and relationships between these actors (Scott 1995). These actors include OMCs and distributors, consumers, and the government. Note that the government plays varying roles in the industry throughout time in relation to supporting refining and distribution, creating price controls, and advocating for customers.

In looking at evolving business model routines, we categorize historical BMIs using the typology suggested by Foss and Saebi (2017), as shown in Table 1. In Table 3, we analyze the historical business model interventions in relation to this typology and as they relate to forms of value creation, capture, and appropriation over time (Cabral et al., 2019).

By using the above business model typology and categorization of value generation, we can observe the discrete BMIs over time and link them back to specific government interventions.

3.4. Data collection

The research methodology we deploy in this case-study research is iterative and exploratory in nature, consisting of both extant literature evidence and field experiential content, as well as in-depth discussions/interviews with senior management and distributors (Edmondson and McManus, 2007) and use of consumer data (Mittal et al., 2018). See Table 2 for in-depth discussions with decision-making executives within the Indian MOP&NG, the PPAC, and the OMCs. On average, the participants had 12 years of industry experience (with a minimum of four years in a leadership role), and they were part of the team responsible for implementing long-term LPG projects.

We also use quantitative data on sales and subsidy, number of LPG customers, and number of LPG distributors. The structured process

Table 1
Business model typology.

		Scope	
Novelty	New to Firm	Modular	Architectural
	New to Industry	Evolutionary	Adaptive
		Focused	Complex

Table 2
Research interview list.

ID	Year	Organization	Role(s)
1	2014	Indian Oil Corporation	Executive Director LPG, General Manager LPG, Deputy General Manager LPG
2	2014	Hindustan Petroleum Corporation	Executive Director LPG, General Manager LPG Sales, Deputy General Manager LPG Technology and Development
3	2014	Bharat Petroleum Corporation	Director Marketing, Executive Director LPG, Deputy General Manager LPG Marketing Services
4	2014	MOP&NG	Joint Secretary LPG Marketing MOP&NG, Director LPG MOP&NG

defined by Okoli and Pawlowski (2004) comprises analysis of the consumer data, the knowledge base of the senior executives in the sector, and discussions with professionals and senior identified executives. Additional data comes from written sources such as government and industry reports, document compilations, and gazetteer documents that offered anecdotal information, as well as from the literature and government published reports (see Appendix A: List of Government Reports and Publications, and Appendix B: List of Government Publications and Press Releases Via Websites).

Given this backdrop, we recognize that expert knowledge is tacit not explicit, and is the only source of information (Linstone and Turoff, 1975). Sharing this tacit knowledge for scientific progress, and economic and social change, is considered legitimate for scenario building (Shiftan et al., 2003). The structured use of the Delphi method, which seeks confirmation from experts in the case of LPG domain, has been deployed (Von der Gracht and Darkow, 2016). Relying on the role of experts due to their knowledge, and their ability to facilitate discussions, and developing new knowledge through differing opinions is a recognized method (Rikkonen and Tapio, 2009). Appendix C: Organizational Stakeholders Over Time summarizes the organizational stakeholders involved and the different policy controls applied over the course of the seven decades, while Appendix D: Quotes Informing Business Model Analysis summarizes the key quotes informing business model analysis discussed in the next section. This methodology is widely used in public administration, policy making, and strategic decision making, and in multidimensional and complex situations (Mittal et al., 2018; Venkatesh et al., 2015; Von der Gracht and Darkow, 2016). After confirmation from the experts in the LPG sector, the business model mapping was confirmed.

3.5. Case-study overview

The Indian LPG industry has over 280 million active LPG consumers across India, a complex network of producer LPG plants, over 18,000 distributors, and significant government involvement. Over its lifespan, the industry has experienced four distinct phases:

- Period 1 (1955–1970): Introduction of the LPG supply
- Period 2 (1970–2002): Introduction of the Subsidy for LPG supply
- Period 3 (2003–2011): Dismantling of the Subsidy for LPG supply
- Period 4 (2012–2013): Introduction of Capping and the Direct Benefit Transfer of LPG (DBTL) Subsidy

With each new phase, there was a fundamental shift in the way in which LPG was provisioned and managed (see the quotes from government publications, stakeholder listings, and others in Appendices A through D).

Phase 1, 1955–1970: In 1955, the LPG market in India commenced when two enterprises, the Burmah-Shell and Stanvac companies, started

producing LPG at their refineries in Mumbai, Maharashtra (see Appendix C). LPG was a clean, convenient, domestic fuel packed in cylinders with door-to-door delivery in the towns around the refineries. LPG delivery, distribution, and consumption involved a transactional relationship between consumers and the monopolistic, public sector oil companies. One interviewee described the period as “Suppliers determined their selling price based on market pricing based on production and logistics costs with no government subsidies” (Appendix D).

Phase 2, 1970–2002: This period saw increased public sector involvement and control. This included the introduction of nationalized oil marketing companies (OMCs), increased acceptance and demand for LPG (sales tripled by 1980–1981), and expansion of LPG across the country (Nautiyal, 2013). An interviewee observed that in this period “Burmah-Shell was nationalized to become Bharat Petroleum Corporation Ltd., and ESSO and Caltex were merged and nationalized as Hindustan Petroleum Corporation Ltd.” (Appendix D). The government also introduced price control through an administered pricing mechanism (APM) using a “cost plus basis” mechanism. The government accompanied the APM by transferring funds to OMCs via a payment account. The role of digital technologies was limited; early interventions targeted oil production and distribution systems (Moro, 2003).

Phase 3, 2002–2012: During this period, the government committed to deregulating the industry, dismantling the APM, and moving to a subsidy regime. These conditions resulted in unique challenges. First, LPG consumption increased from 64 million LPG customers in 2001 to 126 million by 2011. Second, the LPG subsidy burden ballooned to approximately USD \$900 million by 2012, which saw the subsidy impact increase by nearly 900% on oil companies (Fig. 2).

Second, the subsidy applied to domestic LPG prices; commercial LPG did not receive the subsidy, hence the price tripled. This led to a widening price difference between subsidized and commercial LPG, from 29% in 2002 to 151% in 2011 (Fig. 3).

The increasing gap in prices of subsidized and commercialized LPG created an incentive for an illegal market of domestic LPG for commercial use, such as auto LPG, cooking fuel in hotels, and other industrial uses. An interviewee identified the shortcomings in government efforts as plan “to do away with subsidies, did not succeed despite some efforts. The price differential between subsidized and non-subsidized LPG was growing, this saw a quantum of subsidized cylinders being misused in the non-domestic sector” (Appendix D). During this period, there was pressure to improve the supply chain, as the industry came under increasing financial and organizational strain, and LPG customers experienced deterioration in quality of service. The OMCs and distributors also encountered strained conditions: increasing global fuel prices, demands to invest in infrastructure, and challenges in expanding services across urban and rural India.

Phase 4, 2012–2013: In response to these problems, Project Lakhsya was launched in June 2012, and PaHal in June 2013. As outlined in the descriptions of policy interventions over the period (Appendix C), multiple initiatives were undertaken to alleviate the problems, including:

- A web portal based on a unique ID that enabled customer interactions with LPG distributors and the OMCs for connection requests, ordering cylinders, reviewing performance, submitting complaints, and portability of connections across distributors;
- Establishing a Know Your Customer (KYC) program to support an industrywide unified consumer database and duplicate connection analytics;
- Capping of the number of subsidized cylinders per consumer household connection;
- PaHaL platform to deliver the subsidy directly to consumer bank accounts;
- The GiveItUp program, which used social pressure as a “nudge” to encourage well-to-do LPG consumers to give up their subsidy and buy it at market price (Appendix 2).

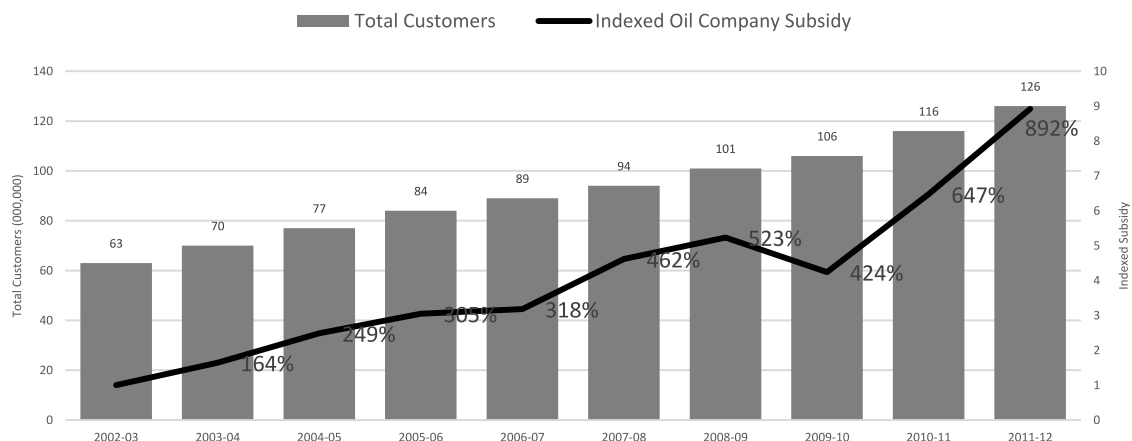


Fig. 2. Registered LPG customers and indexed government/industry subsidy (2002–2011)

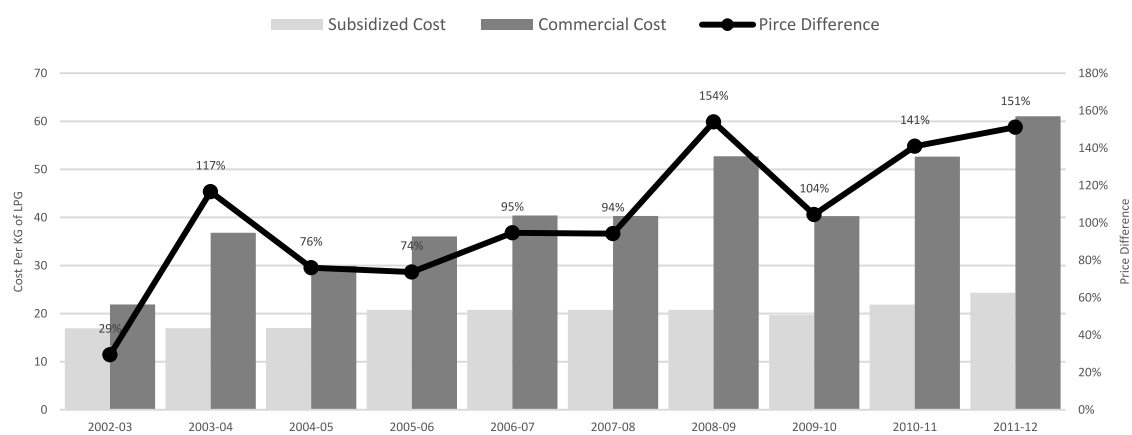


Fig. 3. Comparison of subsidized and commercial cost of LPG (2002–2011)

These initiatives saw the government adopt a new digital business model to address some of the emerging challenges of subsidy burden, illegal diversion, customer dissatisfaction, and strain on distributors/governance/OMCs. One interviewee characterized the time, saying that “the period was indeed the era of progress with the help of technology” (Appendix D). In the Results section, we examine these evolving business models over the years.

4. Results

In this section, we explore the emergence of business models through the four phases in the Indian LPG industry, and we examine the differing nature of the government and industry business models, as well as policy and technological interventions. Our analysis reveals the evolving, additive, and complementary nature of business model interventions on the single industry over time.

4.1. Emergence of business models through the four phases

The dynamic nature of India’s LPG industry is evidenced through the varied business models, value-creation arrangements, and organization routines over 70 years. At a macro level, the business model describes the relationship between participants in the LPG industry. At a more granular level, the organizational routines embody the patterns of actions that help the business model to generate value (Feldman and Pentland, 2003; Pentland et al., 2012). After the initial rollout of LPG in the 1950s, the four phases saw distinctive evolutions of business models, with OMCs, distributors, consumers, and government working in different collaborative configurations to produce, deliver, and control

LPG supply.

Phase 1 saw a direct relationship between oil suppliers and consumers. LPG delivery involved a limited number of public sector oil companies delivering cheap, reliable fuel to a small customer base. The OMCs and distributors received a financial benefit from servicing their customers. An interviewee characterized this period as “the Government brought in Indian Oil Corporation Ltd. (IOCL) ... for LPG delivery, distribution and consumption” (Appendix D).

In Phase 2, OMCs served more consumers, while the government introduced pricing controls and nationalized OMCs. More customers benefited from the continued availability of cheap, reliable fuel. Underpinning this was the changing consumer demographics as “demand moved from being urban-centric to outwards reaching the semi-urban or peripheral rural areas” (Appendix D). The OMCs and distributors grew their overall volumes and revenues from the industry by nearly 400% (Appendix C). At this time, government sought assurance by controlling supply via the nationalized OMCs, as outlined in the 1970 Report of the Oil Prices Committee (Appendix A).

In Phase 3, more customers benefited from the cheap, reliable fuel. The OMCs and distributors continued to grow their volumes and revenues from the industry, and government sought to control supply through subsidies. However, the size of the LPG industry led to costs on OMCs that they were unable to offset, reduced quality of services to customers, and a ballooning subsidy burden on government. These environmental factors spurred transformations that were embodied in Project Lakshya, followed by PaHaL and GiveItUp, which were released in over 10 government publications on the topic (Appendix B).

Finally, in Phase 4, government interventions saw BMIs and new digital platforms, which helped LPG regain its status as an affordable,

reliable fuel source. The *2014 Report of the Direct Benefit Transfer for LPG Scheme* (Appendix A) noted that this change was enabled by improved service and cost savings that went directly into a personal bank account. The OMCs and distributors were provided a more stable cost base for their operations through the introduction of market pricing. The government regained confidence in oversight of industry supply and quality. These changes came about thanks to adjustments to organizational routines, tasks, and activities that included market-based LPG delivery (1955–1970) and direct government subsidy to consumers (from 2012). Though the four discrete phases differ in length, from two to 32 years, each encapsulated a distinct way of working from the previous phase.

Across the four time periods identified, different RCOV and Design Patterns emerge, along with their respective but distinct business models, as synthesised using the RCOV Perspective (Demil and Lecocq, 2010; Ple et al., 2010) and the (Zott and Amit, 2010) business models, as detailed in Table 3.

As evident from Table 3, each period saw new routines forming (Pentland et al., 2012) between stakeholders, leading to distinctive creation, capture, and appropriation of value (Bason, 2010; Sørensen and Torfing, 2011). The introduction of LPG to India in 1955 (Phase 1) established an initial value-creation organizational routine characterized by a direct relationship between oil suppliers and consumers, and LPG delivered at market-driven prices. LPG delivery, distribution, and consumption involved a transactional relationship between consumers and the monopolistic public sector oil companies. Suppliers determined their selling price based on market pricing with no subsidies. This created value for the monopolistic OMC, which acquired new LPG consumers as part of a market-based transactional relationship between the buyer and seller, which is commonly understood as a *traditional business model* (Chesbrough, 2010). The driver for this change in this period can be observed in the supply-side efforts of public sector oil companies to establish the LPG supply chain.

Phase 2 saw growth in the overall LPG supply chain industry through a tripling in the uptake of LPG (Nautiyal, 2013). The role of digital technologies was very limited; early policy interventions targeted oil-company production and distribution systems (Moro, 2003). This period extended the value created by the OMCs with an increasing number of customers, government nationalization of the OMCs, and adoption of pricing controls. This caused an adjustment of the routines underpinning the business model by introducing new players and changing roles. The key routine was clean, sustainable, convenient fuel for citizens, based on a government-controlled delivery model. These routines represented an *open-distributed business model* (Chesbrough, 2007a, 2007b). With greater adoption of LPG and expansion into other regions as “demand moved from being urban-centric to outwards reaching the semi-urban or peripheral rural areas” (Appendix D), the nature of value creation shifted to demand-led, while the nature of government intervention moved from direct supply of the commodity to pricing controls.

Phase 3 experienced further changes to the organizational routine and overall business models in response to unprecedented growth in consumption—per Appendix C, the supply to consumers increased from a few thousand distributors in the 1970s to approximately 14,000 in 2012. During this period, numerous government reports highlighted inefficiencies in the pricing controls resulting from heightened costs, fraudulent use of the subsidy, and lack of transparency in the system (Appendix A). This prompted the government to scale back subsidies and give greater autonomy to industry and consumers. This period also saw a greater role for digital technologies, as oil companies expanded operations and competed to win customers, manage delivery, and control costs. Technology became more intertwined with the routines across the LPG supply chain, as OMCs digitized their own supply chains and improved customer relationship management (Subramani, 2004). The overall routine changed to one of independent organizations focused on their own tactical efficiencies, and winning customers, with some degree of strategic autonomy to target capturing customer demand but within a

context of customers bound by government controls. The result was a shift to a *shared business model* (Casadesus-Masanell and Ricart, 2010).

In Phase 4, which saw the launch of Project Lakshya, later followed by PaHaL, organizational routines further evolved. The deployment of new government policies and technological solutions changed the routines around customer engagement and empowerment. Partnerships with other stakeholders, such as private banks and telecommunications providers, boosted customer engagement through mobile applications. The end customer was incorporated into the business model, and with upstream sharing of information, there was a shift to a *customer-integrated business model* (CIBM) (Ple et al., 2010). This was enabled by BMI built on demand-led interventions and government value appropriation, exemplified through digital platforms (Helfat and Raubitschek, 2018), seamlessly connecting stakeholders and allowing end-to-end integration, alignment, and collaboration of the service value network (Agarwal and Selen, 2009, 2013). These targeted government interventions into industry and with citizens allowed both value capture across all parties and greater prevalence of value appropriation orchestrated by government (Cabral et al. 2019).

Each period saw new routines formed (Pentland et al., 2012) between government and the various industry and public stakeholders to create, capture, and appropriate value (Sørensen and Torfing, 2011). Government had to moderate the interventions to address the different stakeholder compositions and requirements of the time. In 1955, the initial value proposition of LPG was as an innovative product that was efficient, easy to use, and delivered to the customer’s doorstep, whereby government could ultimately deliver the service between what was described in interviews as the “monopolistic public sector oil company and consumers” (Appendix D). As the scale, complexity, and industry/customer demands increased through shifting to OMCs, price regulation, and finally installing digital controls and customer support, government had to shift its role and focus on the industry, from enabling value creation to enabling customer value capture to value appropriation. Underpinning these changes were discrete innovations. The next section looks at the passage of BMI interventions in each period.

4.2. Evolving nature of BMI

This section looks at the numerous and varied innovations through the history of the Indian LPG industry. It captures the innovation types based on the business model analysis above and categorizes these into BMI typology (Foss and Saebi, 2018).

Table 4 highlights the numerous innovations throughout the years. Complex BMIs relating to the introduction of LPG into India in the 1950s transitioned to evolutionary BMIs, as firms drove industry growth from the 1970s to the 2000s. At this point, government intervened into the industry through both complex and focused BMIs, through industry support and nationalizing OMCs. The most notable feature of this period was a focus on value creation and supply-side interventions. At the turn of the century, government intervention was scaled up through the introduction of a domestic-use subsidy. This represented the first attempt to operate in the value capture and demand-side of the business model through direct efforts to assist consumption. While the demand-led intervention had the intended result of increasing consumption, there were multiple negative outcomes on the demand-side: reduced quality of services and illegal diversion of subsidized LPG for commercial use.

Importantly, the last period saw the greatest prevalence of government interventions in the business model that directly connected with customers to appropriate value through digital interventions. This included direct interventions with customers, and industrywide focus on improving customer interactions and complex BMIs through new mechanisms of payments and leveraging digital identification. As one interviewee stated, there were “many changes in the policies governing LPG marketing” (Appendix D) and direct interactions between customers and suppliers in the industry. The historical listing, progression,

Table 3
Phases in India LPG business model evolution.

Period and Business Model Type	Phase 1, 1955–1970: Traditional Business Model (TBM)	Phase 2, 1970–2002: Open-Distributed Business Model (ODBM)	Phase 3, 2002–2012: Shared Business Model (SBM)	Phase 4, 2012–2013: Customer-Integrated Business Model (CIBM)
Organizational Routine	Monopolistic provision using market pricing under Material Management arrangements.	LPG delivery underpinned by Government Oil Pool Account (OPA) and material management via APM.	Vertically Integrated supply chain across the oil industry suppliers, distributors and consumers. LPG delivery underpinned by losses on account of subsidy between upstream & downstream oil companies.	Project Lakshya and PaHaL enabled supply chain improvements and reduction in subsidy leakage, routinely embedded in new digital technologies, with banks as horizontal partners and oil companies as vertical partners.
RCOV Perspectives (Demil and Lecocq, 2010; Ple, Lecocq and Angot, 2010)				
Value Proposition	An innovative product introduced by the oil companies to replace other traditional methods of fuel – clean, efficient, convenient fuel delivered at doorsteps on demand.	Availability of eco-friendly product at an affordable price (subsidized) in a large geographical area.	Availability of eco-friendly product at an affordable price (subsidized) at a larger geographical area.	Transparency in distribution & delivery of benefit (subsidy) directly to the customer’s bank account.
Resources and Competencies - Technology - Pricing and revenue model - Benefit-transfer method	Monopoly of public sector oil companies. Availability of LPG from the refinery at Bombay, with local dealer-operated door-to-door delivery. Pricing based on production and logistics cost at no government subsidy.	Increase in production sources & consequent product availability, deployment of new technologies. Need felt to cover market in larger geographies. Stable pricing key to make product widely acceptable. Government offers protection to maintain stable prices through an OPA. Marketing introduced to encourage adoption of LPG.	Transition of LPG from elite to a mass product. Growing environment concerns led the government to continue subsidies to support mass consumption by the poorer sections of society. Pricing shifted to subsidy burden-sharing mechanism.	Dual pricing mechanism led to leakages of subsidized LPG for commercial use, which led to an inflated subsidy burden. Government e-technology to identify multiple connection holders and caps the usage as a blunt instrument. These measures saw a drop in the consumption of subsidized LPG. Pricing continued to be subsidized.
Organization: the value chain of activities and the network of created relationships	Marketing by oil companies through dealer appointment and handholding dealers to market the product to target customers. Organization reached out with one-to-one propagation to create awareness about product through word of mouth. Customers unknowingly became the resource conveying the value proposition.	Growth in coverage of large geographies with network expansion. Value creation through technology deployment for ease of customers. Constant networking by organizations/surveys to understand customer needs/network aspirations to create value-driven relationships.	Exponential growth in reach of LPG to cover larger geographies & network expansion. Value creation through higher degree of technology deployment for optimizing costs in supply and distribution as well as creation of centralized consumer database.	Transparency lends huge credibility to an organization. This led to the creation of the Transparency Portal by OMCs and hosting it in public domain, where customers could view their complete details from booking to delivery and the notional amount of their subsidy. Benefits delivered directly to the customer’s bank account.
Inclusion of customer as a resource	Customer is a mandatory resource who adds value by spreading awareness as well as the key revenue contributor.	Customer continued to be the focus. Inputs from customers received through formal/informal processes were the key inputs to deliver value.	Customer inputs to improve convenience remained a core delivery area.	Technology facilitates cash transfer. Customer facilitates this process by linking Aadhaar no. and bank to the LPG database. Customers volunteered to market price mechanism and contributed to fiscal savings. Transition to customer integrated business model (CIBM) complete.
Design Parameters (Zott and Amit, 2010)				
Design Elements				
Content	Introduction of LPG as a new fuel for cooking, packed in cylinders with door-to-door delivery.	Increase in product availability, coverage in larger geographies and introduction of a subsidized product.	Increase in distribution chain as LPG product changed from an elite to a mass product. Leakages in LPG delivery prevailed due to dual pricing of product.	Standardization of new connection process through online applications with unique LPG ID across oil companies, de-duplication of accounts, benchmarking and rating of distributors, and portability.
Structure	Marketing of LPG cylinders through dealer network – handholding customer involved network.	Growth in coverage of large geographies with network expansion. Growth in customer base was an incentive to the network as the business model was commission payouts on sales achieved.	Exponential growth in LPG & network expansion. Value creation through higher degree of technology deployment for optimizing costs in supply and distribution and creation of centralized consumer database.	Mechanism to deliver benefit directly to the customer’s bank account by using Aadhaar number as the key. Transparency portal provides access to supply chain data to consumer online and real-time.
Governance	Organization, dealer, and customer.	Organization, dealer, and customer.	Organization, dealer, and customer, monitoring of consumption pattern to reduce diversion.	Transparency Portal - data in public domain - social audit becomes possible.
Design Themes				
Novelty	New product, convenient and clean energy.	Coverage of larger geographies, value creation ease of customers. Parallel marketing introduced to allow market priced industry.	Exponential growth in LPG coverage, everybody “wants it.”	Delivery of subsidy benefit directly to the customer’s bank account by using Aadhaar number as the unique key.
Lock-in	Marketing activity through customer in the true sense.	Subsidy introduced.	Constant communication with customer to get feedback.	Customer confidence in transparent system and portability allow retention of customers with greater satisfaction.
Complimentary		No change.		

(continued on next page)

Table 3 (continued)

Efficiency	Single product, distribution stores, door-to-door delivery and monopoly. Extensive use of word of mouth, with customer as the resource to convey the value proposition.	Surveys through professional agencies to understand customer needs/ demand projections. Computerization of dealer operations to capture data.	Maturing of overall technology literacy and usage of technology.	Consolidation of technology literacy.
Value creation/benefits to stakeholders for customers, for govt, OMCs, etc.	To organization – to dispose available product. To dealer – a new product to market. To customer – an innovative, clean and convenient product.	To organization – larger market. To dealer – growing business. To customer, particularly in rural India – innovative convenient product, prestigious to own.	To organization – larger market. To dealer – growing business. To customer, particularly in rural India – innovative convenient product, prestigious to own and consume.	To organization – curbing leakages and revenue loss. To dealer – cleaner business, tighten control. To customer – transparent business practices, and self-accountability to use LPG efficiently.

Table 4
Breakdown of government interventions and BMIs by period.

Period	Innovation	Business Model Innovation	Nature of Value Creation of Capture	Government Value Leakage / Appropriation	Resource Source	Technology	Nature of Relationships and Value Created for Each Actor
Phase 1, 1955–1970	1. First supply of LPG in India	Complex	Value creation / supply-side	NA	Firm level investments by monopolistic public sector companies	Initial Production Technology	
Phase 2, 1970–2002	2. Improved provisioning on LPG	Evolutionary	Value creation / supply-side	NA	Firm based reinvestments	Improved production technologies	
	3. Nationalized oil marketing companies	Focused	Value creation / supply-side	Appropriated: Industry Growth	Government support for Nationalized oil marketing companies	Firm operations technologies	
	4. Company cost support mechanism	Complex	Value creation / supply-side	Appropriated: Industry Growth	Government payment to firms	Cost offset payment account to firms	
Phase 3, 2002–2012	5. Domestic use subsidy	Evolutionary	Value capture / demand-side	Appropriated: Continued industry development and customer adoption. Loss: Increasing subsidy burden and leakages / inefficiencies. Customer dissatisfaction with industry and government, and reduced uptake of potential LPG customers.	Government payment to firms	Subsidy payment account to firms	
Phase 4, 2012–2013	6. Capping household cylinder consumption	Focused	Value capture / demand-side	Appropriated: Reduced subsidy leakage.	Government investments in Project Lakshya and PaHal	Digital capture of transactions	
	7. Transparency portal	Focused	Value capture / demand-side	Appropriated: Consumer visibility across suppliers and trust in government.		Digital Transparency portal for customers	
	8. Direct Transfer and payment platform	Complex	Value capture / demand-side	Appropriated: Reliable immediate consumer support and improved perception in government. Limited as supply-led.		Direct bank cash transfer for customers	
	9. KYC in enrollment	Focused	Value creation / suppl- side	Limited as supply-led.		Unique customer database and support algorithms	
	10. National Unique Identify System	Complex	Value capture / demand side	Appropriated: Common digital record to support interactions.		Centralized government program	

and categorization of these interventions and the nature of value generation is elaborated in Table 4.

4.3. Technological innovations supporting BMI

In relation to the last period, Project Lakshya and PaHaL generated substantial positive impact on customers and overall LPG operations, in line with innovations in management practices, consumer rights, and customer engagement (Yoo et al., 2012), strong benefits from digital innovation (Koellinger, 2008) and productivity gains (Brynjolfsson, 2011). Specifically, during this period the three main technological innovations were the digital transparency portal www.mylpg.in, a KYC process, and the direct-benefit transfer of LPG PaHaL.

The first technological innovation, the digital transparency portal, has a full range of e-enabled services enabling online LPG services, thereby improving service quality and customer satisfaction. This portal was supported by a unique LPG ID across the OMCs and a user-friendly interface connecting to distributors and the OMCs through the web. The rollout of the portal was further supported by access on mobile devices and information campaigns, education, and training. These services included:

- Ordering and tracking of booking/deliveries of LPG cylinders;
- Comparisons of LPG OMCs service levels and distributors supported by a 5-star distributor rating system;
- Portability across the OMCs;
- Online grievance management capability.

The second component of the digital innovation initiative was the KYC process, which enabled testing of genuineness and uniqueness of the customers. This prevented illegal diversion of subsidized LPG cylinders to commercial markets. With a single linked database using a unique identifier that provided a unified view of all customers across OMCs, the government was able to remove over 36 million duplicate, inactive, or ghost accounts and save Rs. 210 trillion (MoP&NG 2017a, 2017b).

The digitization program culminated in the introduction of the third digital innovation, PaHaL, which allowed market pricing of LPG cylinders, but neutralized this pricing's impact on consumers by allowing for subsidy transfers directly to a customer's bank account. This subsidy-transfer program is now the largest cash-transfer program in the world—over Rs. 400 trillion had been transferred by 2017 (MoP&NG, 2017a, 2017b). This is made possible through a robust, seamless digital process, where LPG sales are reported across the distributor network to the OMCs based on a biometric unique identification number for every LPG consumer (the Aadhaar number is the biometric ID issued to all residents of India) and is linked to the bank account of the consumer.

These interventions—in response to significant challenges across consumers, distributors, the OMCs, and the government—are important, because they show a new form of industrywide (Gawer and Cusumano, 2014), demand-led interventions coupled with the application of digital technologies to address emerging problems. This helped change interactions between parties, generating value through partnerships and policy adjustments, and allowed government to appropriate value through BMIs.

4.4. Learnings around innovating the government business model

The changes during the 2012–2013 reforms highlight three necessary conditions for public sector BMI: (1) establishing a demand-led and digital-enabled business model, (2) use of complementary assets, and (3) finding the right balance across value creation, capture and appropriated alongside value co-creation (Kogut, 2000; Bowden, 2005; Green et al., 2014) are detailed next.

First, the adoption of the customer integrated business model in 2013 allowed smooth industry and customer interaction for the largest cash

transfer in the world, with digitally supported processes allowing daily passage of tens of thousands of units of LPG. This was made possible through a discrete sequence of supply-side and demand-side government interventions (Table 3) that culminated in the availability of customer and industry data, which enabled new insights (Van Knippenberg et al., 2015) to underpin the LPG industry. A digital business was at the core of the improved LPG supply and government intervention. The digital business models excelled beyond normal capabilities and delivered dynamic capabilities that helped create new organizational and customer value (Teece 2017; 2018b).

Second, the business model was built on unique supporting conditions and complementary assets. These included changes in the population and industrywide technology platforms. At the societal level, India's e-participation had tripled, from 25% in 2003 to 76% by 2016 (United Nations, 2003, 2016). Alongside the tripling of the country's internet users was the dramatic shift from cash to electronic transactions through demonetization, and the rollout of the National Unique Identify System for India's citizens (Gupta and Auerswald, 2017). Across the industry, OMCs had their own electronic customer databases, for which they issued a unique LPG ID (based on demographic details, non-biometric) across the OMCs. Over a period of time, three-quarters of customers linked their LPG ID to their Aadhaar number (unique biometric ID across the country was introduced after introduction of LPG ID) and to their bank accounts, which had been the focus for the Indian government (Gupta and Auerswald, 2017). The other quarter received their subsidy directly into their bank accounts without linkage to Aadhaar. The latter method was second best to Aadhaar linkage, as it could not ensure uniqueness of LPG customers across three databases, but it did ensure existence of a customer. Most importantly, it allowed the direct transfer of subsidy to be rolled out independently of the Aadhaar rollout. All of these things were adjacent changes in the LPG industry built on digital capabilities, which highlights the need to leverage such complimentary assets to drive digital innovation (Teece, 2018b).

Third, government, through policy adjustments and strategic decision making, realized a need to work in service value networks with its partners in the LPG industry. These partners included customers, banks, producers, and distributors. Service value networks realized through a customer integrated business model (Ple et al. 2010). This represented participative strategy-making (Birkinshaw 2016, Schoemaker et al., 2018) from senior government officials and encouraged collaboration with both satisfied and dissatisfied customers, high- and low-performing distributors, and other government organizations providing complementary digital platforms. This reaffirms the need for co-creation in digital business models, where there is an increasing role for government in facilitating interactions through setting policy, ensuring partner participation in the LPG industry, building higher-order capabilities, and providing targeted demand-side interventions and selected complimentary assets.

Government leaders learned even more about stimulating innovation, encouraging user adoption, and justifying investments through their experience in running the system over time and by participating in exploratory exercises. The LPG supply chain experienced increasing subsidy burden due to rising fuel prices and expansion of the LPG customer base, and low customer satisfaction. During this time, the government explored and learned about the problem through numerous reviews, including the Pricing and Taxation of the Rangarajan Committee (Feb 2006), the Kirit Parikh Committee (Feb 2010), and the Special Government Taskforce (Jul 2011)—the full list of publications is in Appendix A. A balanced BMI occurred in response to a major societal need (Potts and Kastle, 2010) to reduce subsidy leakage, and to improve accountability and quality of service (Mittal et al., 2017; Mittal et al., 2018). In the longer term, there was a balance, as the Indian government made purposeful interventions after analysis to recognize opportunities offered by investing in digital, leveraging the complementary assets, and employing more refined policy interventions.

The digital innovation was only successful once the appropriately

designed effective business model was in place and organizational routines were enacted with policy interventions and adjustments, delivery of digital platforms, and leveraging of complementary assets. These were supported with both policy and technological interventions that systemized knowledge and enabled unique customer IDs, electronic cash transfers into bank accounts, and utilization of the complementary assets of distributors, the OMCs, and distribution networks/IT systems. In this case, government, industry, and consumers used digital technologies to create a collaborative business model, which improved the operations of the market (Grimpe and Sofka, 2016) and helped deliver a significantly improved LPG supply chain across India. In tackling wicked problems through digital innovations, government must therefore strive to orchestrate the right business model configurations, respond to customer feedback (Demircioglu and Audretsch, 2017), and leverage both digital and complementary assets across society and industry.

These BMIs helped change the fundamental structure of the Indian government subsidy and allowed the LPG industry to create sustainable value. Without these disruptive changes to the LPG industry, it may have been impossible to meet rising demand by the public oil companies in the 1970s or to maintain viable commercial outfits during the global price increase during the early 2000s.

This study has observed, over multiple generations, necessary government business model interventions and routines to effect positive value creation, capture, and appropriation across industry and citizens. In setting the largest cash-transfer program in the world, the Indian government had to evolve its role in the business model. Once established, it could move to an open-distributed business model, with government financially supporting suppliers. Beyond this, a shared business model saw government assistance shift to providing industry subsidies. Finally, the final maturation of the business model saw government provision of services directly to both suppliers and consumers and open collaboration between all parties in a customer integrated business model. This had the notable benefits for affordable and reliable fuel for consumers, with greater trust in service providers and government.

Industry has benefited with high volume of demand, greater margin on services, and comfort in government controls for irregular use. The resultant relationship between government, suppliers, and citizens is summarized in the below *Framework for Customer-Integrated Public Sector Business Model*, which links the parties, the value each derives, and nature of government interventions.

This study has identified through nearly 70 years of observations a framework (see Fig. 4) for public sector BMI. This highlights government’s unique role in supporting both industry and citizens through supply-side and demand-side interventions to generate value for all industry participants. The case study highlights the need for government to establish supply through efforts such as acting as a supplier, marketing, or providing subsidies. Only once the industry matures might the nature of interventions shift to demand-side interventions (with industry, citizens, or both citizens and industry) through provision of information services, enabling collaboration, and providing direct cash transfers. In this case, the final stage of demand-side interventions was enabled only by more recent advances in digital citizen IDs and cash-transfer arrangements with banks.

The resultant model demonstrates the practicalities of evolving these external relationships over time and awareness from government in taking a mixture of internal-led, network, and collaborative approaches (Eggers and Singh 2009). It is also the only known study that applies the business model analytical frameworks of Demil and Lecocq (2010) and Zott and Amit (2010) in a multiyear analysis of the evolution of a large, complex, public sector business model that shows not only their applicability but also their unique application when navigating government, industry, and citizens.

This framework can be applied to the historical observation of existing government services and business models to understand development and determine future policy interventions. This framework would also be valuable in observing these conditions and patterns in other large-scale government services and contexts to understand the generalizability of the framework and specific impacts of the conditions

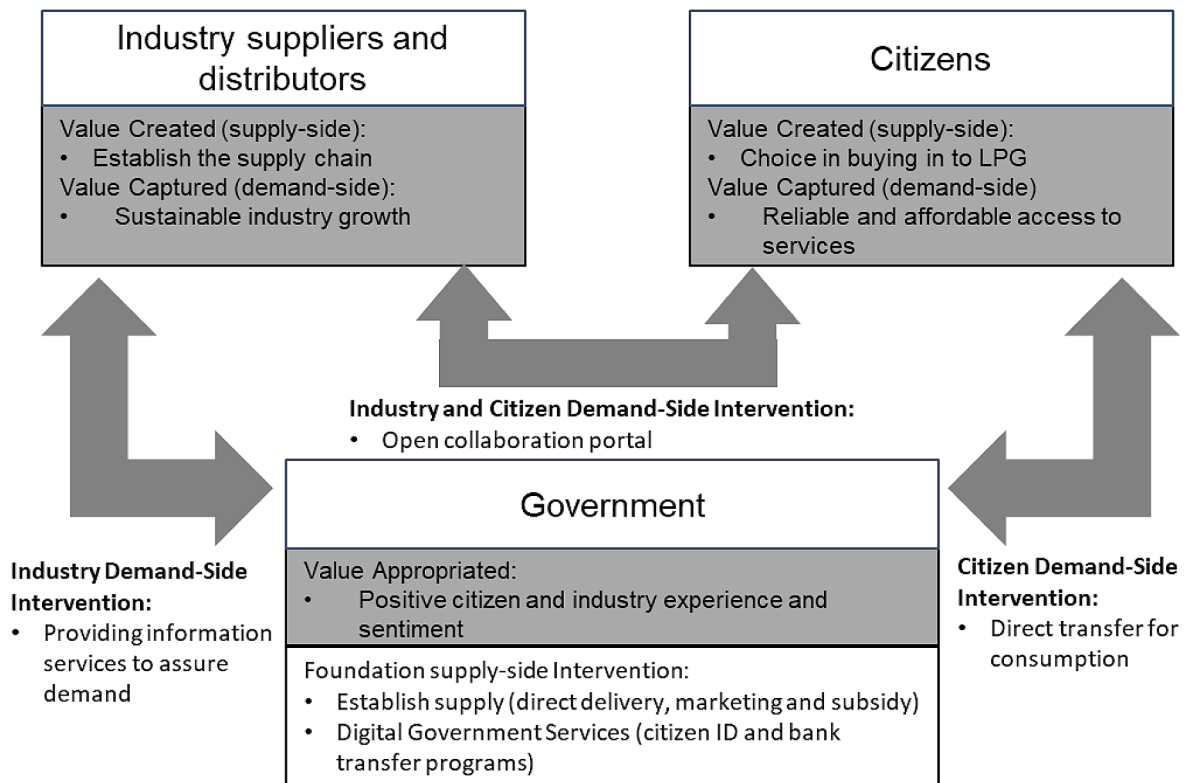


Fig. 4. Framework for Customer-Integrated Public Sector Business Model.

and patterns.

5. Discussion: implications and further research

By exploring the evolving change over time of the Indian LPG industry, and a large market of over 280 million consumers, we observed various iterations in the underlying industry business model and its evolution over time, as applicable to the public sector.

The business model interventions across the period of seven decades saw massive expansion of the LPG network, pricing controls/subsidies, e-enabling of the LPG supply chain, and finally, DBTL. Each of these impacted the LPG industry differently because of varying routines, roles, relationships, and benefits to industry, the government, and the public. While the year-on-year improvements to LPG blending helped the oil companies to gradually respond to increased LPG demand through incremental innovations in their production processes, digital BMI was disruptive, as it seamlessly integrated customers into the LPG business model by enabling collaboration across government, industry, and customers.

This industry transformation would not have occurred into a win-win proposition for all stakeholders without targeted policy interventions, the commitment of top political leadership, and close partnerships of MoP&NG with the OMCs, their distributors, banks, customers. The BMI initiatives were underpinned by digital innovations based on an understanding of customer needs and customer diversity (Mittal et al., 2017; Mittal et al., 2018), which built new capabilities (Vargo and Lusch, 2008; Vargo et al., 2008; Yong et al., 2015).

These changes in the LPG industry saw adjustments to organizational routines that ranged from market-based LPG delivery (1955–1970), increasing scale and a controlled pricing mechanism (1970–2002), and subsidized LPG to consumers (2002–2012). The final evolution of routines occurred with the full integration of customers into the business model with DBTL, enabled by digital technology innovations introduced as part of Project Lakshya and Project PaHal. This reveals the importance of feedback loops (Demircioglu and Audretsch, 2017) and tailoring government intervention to the market dynamics (Blind et al., 2017). Importantly, the historical analysis demonstrated the need to build core digital capabilities across the business model, followed by increased customer value co-creation, in order to improve customer satisfaction and the impact of government interventions.

In summary, organizations must (1) balance supply-driven and demand-led interventions across evolving industry and consumer actors to position value generation across creation, capture, and appropriation; (2) recognize and appropriate complementary assets; and (3) build core digital and execution capabilities in order to create, capture, and appropriate value. This ability to target interventions over time based on specific industry conditions is aligned to Teece's dynamic capability of sensing, seizing, and transforming in organizations (2007). In our case, however it is unique, as it is shown to be cumulative over time and highly dependent on industry and customer conditions triggered by earlier government interventions. As we show, it sets out a sequence for evolving government interventions from supply-side to demand-led interventions.

Specifically, while exploring the rapid expansion of LPG in India, this paper has advanced our theoretical and practical understanding of a generalizable sequence of BMI in the public sector that shift from supply-side to demand-side in order to best evolve the industry, service customers, and allow the government to generate value, while contributing to the systematic knowledge on how business models evolved over a 70-year period (Zott and Amit, 2010; Demil and Lecoq, 2010). This can be generalized to other governments that are navigating demand-driven and supply-led innovations and deciding on the nature of technology support for policy interventions.

Examination of policy and technological interventions validates the positive impact of government-effected industry-level change (Dushnitsky and Klueter, 2017) in response to the needs of stakeholders and

consumers (Dunleavy et al., 2006). It also reinforces the importance of targeted demand-led interventions and opportunity for digital technologies on innovation (Kleis et al., 2012), and it demonstrates the process of how organizational routines evolve to generate value (Feldman and Pentland, 2003). In addition, it shows the positive effect of the deployment and use of complementary assets (Teece, 2010) in building disruptive digital innovation. Underpinning this is the theme that governments should pursue BMI (Bolton and Hannon, 2016), something they have struggled to implement (De Vries et al., 2016), as a dynamic advisory and execution capability (Teece 2007) in order to design, deliver, and appropriate value (Zott et al., 2011). Practically, the findings guide governments on how to implement change through technology and policy interventions that systematize knowledge production in PSI (Green et al., 2014) and deliver customer-centric digital services (Van der Boor et al., 2014). The research makes a clear case for customer engagement to create value while addressing wicked problems in public services (Bason, 2010; Sørensen and Torfing, 2011) through construction of service value networks (Agarwal and Selen, 2009) and creating meaningful public value (Mulgan, 2007).

This research provides a great platform for understanding strategy settings in the digital age. We understand the customer integrated business model that was established in this context, and we can see its application to other public organizations and to private sector industries. The learning is in how to set strategy and form partnerships with customers (Hautz et al., 2017). We can also understand how to set strategy that utilizes digital platforms (McIntyre and Srinivasan, 2017) and how to build higher-order capabilities and routines in the broader external environment to supplement internally delivered digital platforms and capabilities. These will help organizations deliver dynamic capabilities (Teece 2017; 2018a).

Our study has limitations. The research focused on the LPG supply chain. We would have benefited from looking at the concurrent development of other energy-source mechanisms across India (e.g., kerosene, electricity, fertilizer, food) to understand whether the government interventions, digital innovations, rollout the new business model, and overall improvement in customer experience was generalizable to other energy sources in the same large population. We acknowledge that each of the four phases in this case varied in length, from two to 32 years. While each phase saw distinctive evolutions of business models, further studies may consider consistent time periods or explore why the periods of change may differ. We also acknowledge that data collection was performed prior to 2013, and that collection and exploration of more recent data would be of value.

While this research has explored the impact of disruptive business model interventions across the Indian LPG industry, further research should explore how the industry was able to support incremental innovations throughout its history. While routines were used as a way to understand BMIs, there would be value in understanding how these routines needed to evolve over time, especially during periods of stability or rapid change (Davies et al., 2018) and how they are linked to strategy, leadership, and dynamic capabilities (Schoemaker et al., 2018). Subsequent studies should explore the extent industry and government could and should be able to balance both incremental and disruptive digital innovations at the firm and industry levels. With the rapid introduction of further digital technologies in other industries, research may explore how these are effectively identified and diffused into the India LPG supply chain to support continued growth. We believe that our work offers insights that are applicable beyond the specific context, as many developing countries face similar challenges to those faced by India. Complementary studies to ours could explore how government can support the creation of digitally enabled BMIs in other regions, especially the developing world.

6. Conclusion

At the core of the case, we see a sequence of evolving, additive, and

complementary government BMI across individuals, industry, and the Indian economy, enabling value creation, capture, and appropriation for the public and the LPG industry. What lessons can we learn from this case study? Our research sheds new light on the need for targeting demand-side and supply-side business model interventions. The four-stage evolution of the LPG industry over seven decades shows how the Indian government needed to reconfigure their resources and capabilities to cope with the business model requirements of each era, most notably the modern digital era. In addition, the empirical proof of the effects of recent policy interventions, adjustments, and simultaneous business model changes offers an exemplary case for other governments trying to deliver citizen services in the new digital economy. Given the scope of this research, we think that our findings can be generalizable to all industries responding to digital innovation, as illustrated by the resultant *Framework for Customer-Integrated Public Sector Business Model*. The evolution of the LPG industry across the four stages of business models also demonstrates how sequential BMIs were necessary (Foss and Saebi, 2018) to drive the final subsidy savings and improvements in customer satisfaction through improved service offerings. Overall, the evidence presented in this work should be used by policy makers who seek to shape BMI across governments, industries, and organizations.

CRedit authorship contribution statement

Renu Agarwal: Writing - original draft, Writing - review & editing.

Neeraj Mittal: Investigation, Writing - review & editing. **Eric Patterson:** Writing - original draft, Writing - review & editing. **Michela Giorcelli:** Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. List of government reports and publications^a

ID	Year	Authoring Organization	Report Name and Description	Summary of Policy Reforms
1	1970	Oil Prices Committee Book	Report of the Oil Prices Committee, 1969, Shantilal H Shah, Indian Government Publication Delhi India	This report examined the oil import parity basis applied to oil pricing and found that this approach did not constitute the proper basis for fixation of the prices of petroleum products as indigenous crude oil production and refining capacity had become a considerable factor. Recommended rationalising price of domestic LPG. While the Below Poverty Level (BPL) families are only 10% subsidy is extended to all, even to the non-poor families. Recommended an immediate one-time upward adjustment in the price of domestic LPG by Rs.75/cylinder. Beyond this one-time increase, further gradual increase so that the retail price adjusts completely to the market level eliminating the subsidy altogether. No extra taxation recommended on domestic LPG.
2	2006	MOP&NG	Report of the Committee on Pricing and Taxation of Petroleum Products (Rangarajan Report) February 2006 http://petroleum.nic.in/sites/default/files/Report1.pdf	Subsidies should be minimal, targeted to BPL families and restrained to a monetary ceiling, and borne transparently in the Union Budget. The price of domestic LPG should be raised by Rs 75 per (14.2 kg) cylinder in one go and gradual increases should be made thereafter so that the retail price adjusts completely to the market level and the subsidy is eliminated altogether.
3	2008	MOP&NG	Report of the High Powered Committee On Financial Position of Oil Companies (Chaturvedi Report) http://www.indiaenvironmentportal.org.in/files/B%20K%20Chaturvedi%20Report.pdf	A transparent and effective distribution system for Public Distribution System (PDS) kerosene and domestic LPG can be ensured through UID/Smartcards framework. Until it becomes operational, prices of domestic LPG to be increased by at least Rs. 100 per cylinder. Thereafter, the price of domestic LPG should be periodically revised based on increase in paying capacity as reflected in the rising per capita income. The subsidy on domestic LPG should be discontinued for all others except the BPL households once an effective targeting system is in place. The methodology based on import parity pricing may be continued so long as the country remains a net importer of kerosene and LPG.
4	2010	MOP&NG	Report of The Expert Group on A Viable and Sustainable System of Pricing of Petroleum Products (Kirit Parekh Report) February 2010 http://petroleum.nic.in/sites/default/files/reportprice.pdf	In order to have better accessibility of LPG to rural and remote area households, small format LPG distributorships model was created and rolled out.
5	2009	MOP&NG	Small Format LPG Distributorship (2009)	A PDS IT strategy for LPG gas that recommended a number of reforms which include:
6	2011	MOP&NG	Report of the Task Force on an IT Strategy for PDS, and an implementable solution for the direct transfer of subsidy for Food and Kerosene (October 2011)	1. Grassroots level transparency that include increased social audits, painting of PDS offtake on walls of the shops, painting of trucks; 2. Beneficiary empowerment through the use of coupons, or technology such as smartcards, or even direct cash transfers; 3. Monitoring the movement of goods through the use of technology,

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ID	Year	Authoring Organization	Report Name and Description	Summary of Policy Reforms
				such as GPS tracking of trucks; and 4. Increased monitoring, supervision, accountability, and transparency. Various features were also accounted for in order to attempt a comprehensive solution for deficiencies in PDS.
7	2011	MOP&NG	Task force on Direct subsidy transfer in Fertiliser, LPG and Kerosene (July 2011)	Recommended phasewise implementation starting with quota for subsidized LPG in the first phase . Followed by Aadhaar based direct subsidy transfer.
8	2012	MOP&NG	Report of the Task Force on an Aadhaar-Enabled Unified Payment Infrastructure (February 2012)	A platform approach to payments is recommended using Aadhar (a unique citizen ID) to address the delivery of last mile payments to every part of the country.
9	2014	MOP&NG	Review of the Direct Benefit Transfer for LPG Scheme Committee Report (Dhande Report) May 2014 http://petroleum.nic.in/sites/default/files/dhande.pdf	The Committee after a detailed study of the LPG scheme design, architecture and implementation structure, audit reports, consumer feedback and interactions with the stakeholders, strongly recommended the DBTL scheme as it was found to be a very efficient way to disburse subsidies. The Committee recognized that although the scheme design is indeed very robust and scalable which prevents leakages, it did suggest several systemic changes and enhancements to mitigate the hardships reported by the LPG consumers.

^a For press releases see <http://petroleum.nic.in>

Appendix B

List of Government publications and press releases Via websites.

ID	Type of Report Source Taken From the MOP&NG Website	Website Source
1	National Government Services Portal - LPG	https://services.india.gov.in/service/listing?cat_id=114&ln=en
2	LPG Important Processes and Activities	http://petroleum.nic.in/marketing/important-processes-activities
3	LPG-Policies and Guidelines since 2009	http://petroleum.nic.in/marketing/policies-and-guidelines/lpg-policies-and-guidelines
4	List of Retail outlets	http://petroleum.nic.in/marketing/policies-and-guidelines/retail-outlets
5	Orders, Notifications & Amendments Related to LPG since 1987	See http://petroleum.nic.in/marketing/orders-notifications-amendment/lpg-orders-notification-amendments
6	LPG Schemes	http://petroleum.nic.in/marketing/schemes/lpg-schemes
7	LPG Distribution Scheme	http://petroleum.nic.in/marketing/orders-notifications-amendment/lpg-distribution
8	Execution of Subsidy Programmes	http://petroleum.nic.in/execution-subsidy-programmes
9	Result Framework Document	http://petroleum.nic.in/documents/result-framework-do.cument
10	MOP&NG Annual reports since 1999	http://petroleum.nic.in/documents/reports/annual-reports?page=1
11	Indian Petroleum and Natural Gas Statistics – Annual report	http://petroleum.nic.in/more/indian-png-statistics
12	Gazette Notification - Dismantling of Administered Pricing Mechanism (APM) order	http://petroleum.nic.in/sites/default/files/gazette_apm.pdf
12	Gazette Notification – LPG Marketing and Distribution	See http://petroleum.nic.in/more/pan

Appendix C

Organizational stakeholders and policy controls over time.

Period	Government, Oil Marketing Company /Distributors	Number of LPG Markers	Number of Customers (in NOS)	Federal Government Party	Policy Controls Over These Four Phases/Benefits
Phase 1 - 1955-1970 ^a	See Note ^b			National Congress Party (Period 1957-1970)	Introduced LPG with a policy for pricing of LPG based on Import parity pricing (IPP) resulting in LPG cylinders being sold at market-driven prices; there was no subsidy Social benefit: clean and convenient fuel to citizens; but affordable by only a small population.
Phase 2 – 1970-2002 ^c	See Note ^d ; Ranged from 4038 during financial year ^e 1991-1992 to 7486 during financial year 2001-2002.	Ranged from 1730 during financial year 1991-1992 to 2605 during financial year 2001-2002.	Ranged from 181 during financial year 1991-1992 to 635 during financial year 2001-2002.	National Congress Party (Period 1970-1977) Janata Party (1977-1979) Indian National Congress (1980-89) Janata Dal (1989-1991) Indian National Congress (1991-1998) Bhartiya Janata Party (1998-2002)	Policy changed from IPP to cost-plus pricing in 1976 allowing sale of LPG cylinders via APM. The APM pricing allowed introduction of subsidy for LPG cylinders with subsidy management by the Indian government which was managed via bonds/cash transfer to OMCs from an OPA. Subsidized LPG, social benefit: clean and convenient fuel now affordable by larger population.
Phase 3 – 2002-2012 ^f	Ranged from 7910 during financial year 2001-2002 to	Ranged from 3438 during financial year 2001-2002	Ranged from 700 during financial year 2001-2002	Bhartiya Janata Party (2002 – 2004)	- Dismantling of APM for LPG supply - LPG delivery continued at subsidized prices, and subsidy management via structured sharing

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Appendix C (continued)

Period	Government, Oil Marketing Company /Distributors	Number of LPG Markers	Number of Customers (in NOS)	Federal Government Party	Policy Controls Over These Four Phases/Benefits
	11489 during financial year 2011-2012.	to 4866 during financial year 2011-2012.	to 1269 during financial year 2011-2012.	Indian National Congress (2004-2012)	of losses on account of subsidy between upstream and downstream oil companies. Vertically integrated supply chain partnering upstream and downstream across the oil industry suppliers, distributors and consumers. Subsidized LPG, social benefit: clean and convenient fuel now affordable to larger population, particularly the economically weaker sections of society.
Phase 4 – 2012-2013 ^a	Ranged from 12610 during financial year 2012-2013 to 13896 during financial year 2013-2014.	Ranged from 4990 during financial year 2012-2013 to 5105 during financial year 2013-2014.	Ranged from 1387 during financial year 2012-2013 to 1523 during financial year 2013-2014.	Indian National Congress (2012-2014) Bhartiya Janata Party (2014 – to date)	The DBTL scheme was rolled out in 291 districts in the country from June 1, 2013, in six phases covering nearly 10 crore consumers with over 3770 distributors across the three OMCs. Introduction of capping and direct benefit transfer of LPG subsidy (DBTL) to customer's bank account via Aadhaar. The Committee strongly recommended that the Direct Benefit Transfer Scheme for LPG should be immediately recommenced, as it is one of the most comprehensive systemic reengineering of the LPG subsidy disbursement mechanism, which Ensures that the entitlement on LPG reaches the actual LPG consumer and was capped at 9 LPG cylinders per consumer. Reduces the misuse of subsidized LPG, as the incentive for diversion is eliminated. through deployment of IT portal and use of Aadhaar unique consumer ID Direct benefit transfer of subsidy via LPG account/Aadhaar validation. Improves the availability of LPG for genuine consumers. Reduces subsidy burden on LPG by preventing diversion and makes available precious resources for alternative purpose.

^a Excerpts taken from Kirit Report, p. 48.

^b Data for this period was not available.

^c Excerpts taken from Kirit Report, pp. 48-49.

^d Data available from 1990 onwards only.

^e Financial year refers to April 1 of one year up to March 31 of the next year.

^f Excerpts taken from Kirit Report, pp. 49-53.

^g Excerpts taken from Dhande Report, p. 13 and p. 52.

Appendix D

Quotes informing business model analysis.

Period and Business Model Type			
Phase 1 - 1955-1970: Traditional Business Model (TBM)	Phase 2 - 1970-2002: Open-Distributed Business Model (ODBM)	Phase 3 - 2002-2012: Shared Business Model (SBM)	Phase 4 - 2012-2013: Customer-Integrated Business Model
"The commencement of LPG marketing in India took place in 1955 when the then Burmah-Shell and Stanvac companies started production of LPG at their refineries in Bombay city within the state of Maharashtra. These refineries were run by Burmah-Shell under the brand name 'Burshane'. LPG was introduced as a clean and convenient domestic fuel packed in cylinders with door-to-door delivery in the towns around the refineries." "During this phase, the Government brought in Indian Oil Corporation Ltd. (IOCL) the first Oil Marketing Company under public sector. LPG delivery, distribution and consumption involved a transactional relationship between the monopolistic public sector oil company and consumers". "In this era. Suppliers determined their selling price based on market pricing based on production and logistics costs	"The year 1976 saw a great addition to the LPG distribution model. Burmah-Shell was nationalized to become Bharat Petroleum Corporation Ltd. (BPCL) and ESSO and Caltex were merged and nationalized as Hindustan Petroleum Corporation Ltd. (HPCL). The LPG marketing was now completely under the public sector oil companies, generally referred to as oil marketing companies (OMCs) "This phase can be described as the growth phase of marketing LPG. The product having grown in popularity, the demand moved from being urban-centric to outwards reaching the semi-urban or peripheral rural areas." "In this phase the OMCs drew up plans in alignment with the Government's five-year plans and took the leap in the true sense in marketing LPG. They planned for infrastructure in terms of ports, filling plants as well as distributorship network. Execution of plans was also expedited."	"This phase saw the continued increase in marketing of the product with innovative marketing techniques to penetrate deeper into rural India by the OMCs" "It is interesting to note that though the private sector made forays into LPG marketing, it was not anything major. The only impactful happening was the commissioning of a mega refinery by Reliance. This indicated that the consumer had better comfort with the OMCs." "The growth in demand had to be matched with a better distribution system. There was urgent need to expedite the distributor selection process. A radical change was brought into the new distributor selection process which yielded great rewards". "This was also a phase of regularization of domestic connections. New policies were framed to regularize domestic connections for which the present owners	"This phase saw many changes in the policies governing LPG marketing. Many steps were taken to streamline the distributor operations and provide a better consumer experience which include transparent business operations." "The Transparency Portal was launched to bring complete transparency of data as well as functioning of distributorships. It provided various details including the delivery performance of distributors which enabled customers to view the delivery pattern of their distributor and compare it with other distributors in that area. The Portability scheme of moving to another distributor in the vicinity of the same company or any other company was also introduced. This led to a healthy competition". "The greatest change came in the form of the Direct Benefit Transfer of LPG subsidy (DBTL) which was indeed a giant leap as

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Appendix D (continued)

Period and Business Model Type			
<p>with no government subsidies. This allowed LPG to be sold at market price, benefiting customers with clean & convenient fuel.</p> <p>"The latter part of the phase saw the slow winding up of business by both Burmah-Shell and Stanvac companies and the growth in marketing by the only national oil company IOCL. It was a precursor to what was destined to happen- a complete nationalization of the LPG business.</p>	<p>"During the year 2000, the OMCs added 10 million new consumers to their database. The figure was just 1 to 2 million in the years prior to that"</p> <p>"An interesting feature during this phase was the Govt. in allowed Private Parties, under the liberalization policy, to import and market LPG in the country through their own import and marketing infrastructure, at market determined prices in 1993. The objective was to help in meeting the LPG requirements of large number of customers expeditiously including industrial customers, who were then waiting for their LPG connection/ supplies".</p> <p>"This is a phase in which infrastructure, production and distribution saw an unprecedented growth. It also saw the implementation of technology in business".</p> <p>"The year 2000 to 2002 saw the computerisation of distributorship operations. This was a major step in consolidation of database by OMCs which became the strength based on which many changes and monitoring was possible".</p> <p>"Systems and process alignments took place during this phase to enhance customer experience".</p> <p>"This phase also saw the availability of LPG as an eco-friendly fuel marketed at subsidized price though the subsidy burden was getting bigger on the government".</p>	<p>did not have documents as proper ownership documents were essential to avail subsidized LPG".</p> <p>"The government's plan to do away with subsidies, did not succeeded despite some efforts. The price differential between subsidized and nonsubsidized LPG was growing, this saw a quantum of subsidized cylinders being misused in the non-domestic sector".</p> <p>"In this phase there were many thoughts on controlling this leakage of subsidized cylinders for domestic use."</p> <p>"Various Steps had been taken by OMCs from the year 2009 towards in making LPG distribution transparent & reliable as well as to curb leakages of subsidized LPG".</p> <p>"The plans for direct benefit transfer of subsidy took shape during the closing years of this period".</p>	<p>this program covered a phenomenal number of household being beneficiaries with the help of technology. Under the DBTL scheme, the consumer had to buy the cylinder at the market price and the subsidy amount was directly transferred to the bank account of the beneficiary. This helped in curbing the misuse of subsidized LPG and curtailed leakages of subsidy. The period was indeed the era of progress with the help of technology".</p>

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