Digital Policy, Regulation and Governance
The impact of digitalization on business models

Harry Bouwman, Shahrokh Nikou, Francisco J. Molina-Castillo and Mark de Reuver

Abstract

Purpose – This paper aims to explore how digital technologies have forced small- to medium-sized enterprises (SMEs) to reconsider and experiment with their business models (BMs) and how this contributes to their innovativeness and performance.

Design/methodology/approach – An empirical study has been conducted on 338 European SMEs actively using social media and big data to innovate their BMs. Four in-depth case studies of companies involved in BM innovation have also been carried out.

Findings – Findings show that the use of social media and big data in BMI is mainly driven by strategic and innovation-related internal motives. External technology turbulence plays a role too. BMI driven by social media and big data has a positive impact on business performance. Analysis of the case studies shows that BM is driven by big data rather than by social media.

Research limitations/implications – Research into big data- and social media-driven BMs needs more insight into how components are affected and how SMEs are experimenting with adjusting their BMs, specifically in terms of human and organizational factors.

Practical implications – Findings of this study can be used by managers and top-level executives to better understand how firms experiment with BMI, what affects business model components and how implementation might affect BMI performance.

Originality/value – This paper is one of the first research contributions to analyse the impact of digitalization, specifically the impact of social media and big data on a large number of European SMEs.

Keywords Business model, Business model innovation, Social media, Big data, Digitalization

Paper type Research paper

1. Introduction

Attention to business model innovation (BMI) is increasing in both entrepreneurial practice and research (Zott and Amit, 2010). In this paper, the concept of BM is defined as the business logic to create and capture value for both consumers and businesses. In other words, it refers to the way a single organization or a network of firms collaborates at strategic and operational levels to bring products and/or services (bundles) to the market. A single organization or a network of firms makes use of technical platforms and architectures to create and capture value for both (networked) organization and the customer (Bouwman et al., 2008). BMI is defined as a change in a company’s BM that is new to the firm and results in observable changes in its practices toward customers and partners. The focus of our research, however, is how companies and specifically small- to medium-sized enterprises (SME) experiment with BMs as a result of digital transformation, specifically with regard to social media and big data. BM experimentation is defined as activities related to discussing and trying out changes in BMs carried out by a manager or a team with a budget specifically allocated for BM experimentation. In this paper, we focus on BM practices, defined as the way the team in charge of the experimenting process makes...
the transition from strategy to BMs in practice through digital transformation. It is about how strategy is actually implemented while experimenting with social media- and big data-driven BMs.

Much research attention has been devoted to SMEs, which are considered to be the driving force in most economies. Research has had very diverse foci, such as industry, size, phase of maturity and ownership. It is often emphasized that SMEs are responsible for much of the employment, innovation and growth in national economies, as indicated by the Organization of Economic Cooperation and Development (OECD), European Union and national governments. Therefore, study of SMEs and changes in their BMs is important. From the perspective of telecommunications, information technology (IT) and information systems (IS), innovations such as social media and big data are important topics of study. Social media can offer an extra channel to communicate with customers, but it can also be developed as a service in itself. Similarly, big data can affect SMEs’ BMs, with regard to not only marketing but also business processes. For instance, in the industry 4.0 domain, monitoring production and production quality affect many SMEs' BMs. BMI is not about optimizing internal processes or incorporating and implementing new technologies in an organization; innovation has to affect the core business logic of SMEs and be observable to others.

Advanced technologies such as social media and big data are considered to play a core role in BMI in most firms and therefore also in SMEs. However, what drives BM innovations based on digital technology and how experiments with BMI affect performance is, to our knowledge, not yet researched. Therefore, in this paper, the main questions are as follows:

Q1. How digital technologies, specifically social media and big data, have forced SMEs to reconsider their BM? How BMI mediates the impact of digital technologies on innovativeness and performance?

In the context of the H2020 Envision Project, quantitative data were collected and case studies of BMI as executed by SMEs were carried out. Based on a mixed-method approach, a data set of 338 European SMEs engaged in BMI related to social media and big data were analysed, and a number of in-depth case studies were performed. The quantitative data set is a subset of a larger sample of companies engaged in BMI ($N = 586$). Data were collected in 2016. The conceptual model under investigation relates to BM incentives and experimentation with (subjective) performance indicators. Several sample cases in which social media and big data (analytics) affect BMs were conducted to deepen the insights obtained from the quantitative data.

In the next section, mainstream BM factors from extant literature are drawn to build our research model. In Section 3, based on the discussion laid out in Section 2, the research hypotheses are developed. Section 4 discusses the research methodology, data collection process and the measurement development, followed by research results in Section 5. Section 6 presents the discussion of findings. Section 7 outlines the research’s theoretical contributions, conclusions, limitations and considerations for future work.

2. Theoretical background

Here, we briefly discuss some main concepts from the BM innovation literature. Conventionally, research on BMs can be categorized into three main areas:

1. the use of internet, mobile and IT on an infrastructure and its application level (Bouwman et al., 2008);

2. strategic issues concerned with firm performance and value creation (Casadesus-Masanell and Ricart, 2010; Hedman and Kalling, 2003; Methlie and Pedersen, 2007; Teece, 2010; Zott and Amit, 2008, 2010); and
3. innovation and technology management (Chesbrough, 2010, 2006; Waldner et al., 2015; Zott et al., 2011).

With the aim of not replicating the existing BM literature reviews (Lambert and Davidson, 2013; Zott et al., 2011), our focus is limited to empirical studies on BMI. BMI is defined as the changes made in the business logic for creating and capturing value. BM changes need to be evident for stakeholders, including customers and/or end users and are often explicit due to change in BM components. BM components are the building blocks of a BM, such as value proposition, activities of actors supporting the ecosystem, pricing or revenue model and risk attribution. Studies of BMs are mostly based on cases, specifically in the domain of internet, mobile and IT (Ballon, 2007; Bouwman et al., 2008). Extant quantitative studies are within the strategic and innovation management domain. From these studies, conceptual papers on entrepreneurship (Doganova and Eyquem-Renault, 2009), strategic management (Zott et al., 2011) or IS literature (Schneider and Spieth, 2013), as well as empirical papers on BMI and performance (Aspara et al., 2010; Aziz and Mahmood, 2011; Clausen and Rasmussen, 2013; Huang et al., 2012) have often unclearly defined BMs and BMI (Foss and Saebi, 2017). Although we agree with Wirtz et al. (2016) that BMI requires a crucial transformation of the existing value proposition and/or value constellation, the problem is that core characteristics, components or concepts of the value constellation are often ambiguously defined, depending on the specific ontology used (Hartmann et al., 2016; Souto, 2015). Some authors, for instance, offer a rather arbitrary list of components (Hartmann et al., 2016). These components are unrelated to other concepts such as value proposition, customer segment and key partners as used in the BM CANVAS (Osterwalder et al., 2005). Other components such as service, technology platform/architecture, ecosystem and finance and risk-related uncertainties are used in the STOF (service, technology, organization and finance) model (Bouwman et al., 2008), while components such as interface or service platform have been proposed by the VISOR (value proposition, interface, service platform, organizing model and revenue) model (El Sawy and Pereira, 2013). The disagreement about what a BM is reflects also on the definitions of what BMI entails; thus, definitions in empirical papers are unclear or not provided. Some authors use revenue models as synonymous with BMs (Aspara et al., 2010; Aziz and Mahmood, 2011; Brettel et al., 2012).

Our approach is in line with Osterwalder et al. (2005) and Wirtz et al. (2016) that define BMI as the result of the rearrangement of a BM’s components. Some authors such as Bucherer et al. (2012), Bonakdar (2015), Hartmann et al. (2016) and Frankenberger et al. (2013) also follow this view and define BMI as the deliberate modification of one or more firm’s core components, or the introduction of new components. Björkdahl and Magnus (2013) stress that BMI can be the result of new combinations of new and old products or services, as well as changes in the firm’s market position and process management. Lindgardt et al. (2009) focus on value delivery and define BMI as the reinvention of two or more BM components that can lead to novel ways of value delivery. The definition of Amit and Zott (2010) suggests that BMI can be the adoption of novel activities that define the BM of a firm, the adoption of new linkages between the existing activities or the replacement of business actors in the firm’s value network.

Most studies are vague about how core concepts are measured (Aziz and Mahmood, 2011). Velu (2016) considers diversification/product launch and external funding as two indicators of BMI. Others use dummy variables for consulting BM, technology BM, software BM, etc. (Clausen and Rasmussen, 2013). Kim and Min (2015) define BMI simply as adding online retail activities. Souto (2015) uses unspecified two-item scales. Huang et al. (2012) use a random list of components as indicators. Clauss’s (2017) valuable paper focuses on developing a validated scale for BMI.
Moreover, the data used in empirical studies show some limitations. Some studies make use of the European Common Innovation Survey data as a proxy (Barjak et al., 2014; European Union, 2017) or data from the existing databases (Cucculelli and Bettinelli, 2015; Hartmann et al., 2016; Kim and Min, 2015). Original data are seldom collected. Therefore, there is great diversity conceptually, both at the definition and operational levels, as well as in the use of data collected for other reasons.

In general, empirical studies are drivers in their research focus, based on strategic management perspectives and linear econometric data analysis (Cucculelli and Bettinelli, 2015; Guo et al., 2015, 2013; Hartmann et al., 2016; Kim and Min, 2015; Zott and Amit, 2007). Performance is the key dependent variable and, most of the time, linear regression analyses are used; some studies apply structural equation modelling.

It can be concluded that research on digital transformation and BMI is still rather scattered and sometimes lacks an in-depth understanding of what BMI implies, what its antecedents are and how it affects firms’ performance and innovativeness. Moreover, to our knowledge, research by Barjak et al. (2014) alone specifically addresses SMEs. Therefore, a generic BMI model taking into account the antecedents of BMI as well as outcomes is developed and tested. Literature on BM and BMI in relation to the role of social media (Hanna et al., 2011) and big data (Hartmann et al., 2016) is limited and often industry specific (Friedrichsen, 2013; Sigala et al., 2012). The focus of this paper, therefore, is on the relation between these technologies and BMs. Publications on the relation between social media and BMs are industry-specific and relate to smart tourism, media or health care. Social media are often associated with new digital channels. The wide use of digital media, and especially of social media, led to the generation of big data that, according to several studies (Fosso-Wamba et al., 2015; Jin et al., 2015), can be analysed and used to create relevant information for businesses.

3. Hypothesis development

The overall leading theoretical model (Figure 1) posits that both internal (innovation activity and strategy) and external (competitiveness intensity and technology turbulence) factors directly influence BM experimentation. This paper proposes that BM experimentation – discussing and trying out changes in BMs – positively influences BM practices, that is, the transition from strategy to BM in practice. In addition, this paper proposes that BM practices positively influence both innovativeness and the overall business performance of a firm. Finally, this paper proposes that innovativeness
influences the overall business performance. These concepts are introduced in the following subsections.

**Innovation activity** in an organization is defined as all the activities undertaken by a company to add value to its products and services. Therefore, the use of technologies such as social media and big data – which are perceived as innovative in themselves by most SMEs – can affect BM experimentation. An internal driver like innovative activity, when explicitly pursued by the firm (Hurley and Hult, 1998; Utterback and Abernathy, 1975), is expected to lead to experimentation and therefore, budget allocation and team activities in relation to BM will be supported. Companies that score high on innovation – whether it is product, marketing or organizational innovation – are generally expected to be prepared to experiment with their BM. This will also be the case when technologies such as social media and big data are considered.

\textbf{H1}. Innovation activity has a direct effect on business model experimentation.

Strategy is a concept that is often associated with BMs or business planning. BMs involve the implementation of a strategy in the business logic on a more operational level. Therefore, an orientation toward strategic decisions in a firm will enable their implementation in the BM, and therefore, BM experimentation will be relevant (Casadesus-Masanell and Ricart, 2010; Chesbrough, 2010; Chesbrough and Rosenbloom, 2002). Openness to discussion on strategy will translate into SME’s experimentation with its BM.

\textbf{H2}. Strategy has a direct effect on business model experimentation.

Competitiveness intensity of a company defines its position in the business ecosystem and shows how it manages to compete with its rival companies. The more competitive the external environment is, the more discussions on what to do on a strategic as well as a BM level will be initiated (Carayannis and Provance, 2008; Casadesus-Masanell and Ricart, 2010; Pauwels and Weiss, 2008).

\textbf{H3}. Competitiveness intensity has a direct effect on business model experimentation.

Technology turbulence has a direct effect on business (Johnson et al., 2008). The evaluation and advancement of technological innovations over the past decades have been the fastest growing trend in business in recent history. SMEs have to adjust to IT applications continuously and therefore will try to find out how new technologies affect their BMs. Moreover, they will experiment with IT applications and what they could mean for their BMs. This is also true, \textit{ceteris paribus}, for new IT applications like social media and big data.

\textbf{H4}. Technology turbulence has a direct effect on business model experimentation.

BM experimentation entails all the activities that a company conducts and supports in terms of changes to its business logic. Although previous studies have discussed on either incremental change in parts of the BM or radical overhaul, this study focuses on enabling experimentation by allocating budget to teams engaged in experimentation and the management of those teams, rather than the kind of experimentation carried out.

\textbf{H5}. Business model experimentation has a direct effect on business model practices.

The concept of BM practices involves the way the strategy of the company is expressed in its BM and the way that strategy is implemented. Innovativeness is seen as a dependent variable that represents the overall innovative output of the firm. Therefore, the more a SME transfers strategy to its BM, the more innovations it will be able to spin out.

\textbf{H6}. Business model practices have a direct effect on innovativeness.
Business performance can be significantly affected by BM practices, as firms that are more focused on BMI outperform firms that do not, in terms of profit (Giesen et al., 2010, 2007). Besides, the IBM CEO study reported that CEOs from top firms acknowledge the impact of BMI on the operating margin growth in their companies (Pohle and Chapman, 2006). BMI has become one of the three main foci of innovation for these CEOs to improve their firms’ business performance. By innovating their BMs, firms can also gain competitive advantage, as BMs might be hard to replicate; thus, this allows firms to continue being profitable (Chesbrough, 2006). Market share of a small–medium firm or start-up can also be positively affected by BM practices as a novel BM can recombine the existing internal resources or use external partners’ resources (Zott and Amit, 2007).

**H7.** Business model practices have a direct effect on the overall performance of a company.

It is clear that innovation output will also affect the overall performance of a firm. Innovation can have a positive effect on business performance as it can enable firms to develop competitive advantage (Hult et al., 2004; Hurley and Hult, 1998). Firms willing to innovate will focus on activities that give them better capacity to do so (Hurley and Hult, 1998). This willingness to innovate is mainly driven by market, learning and entrepreneurial orientation (Hult et al., 2004). This orientation drives firms to improve continuously to adapt to the constantly changing market, which, if their competitors cannot keep up, will give them a competitive advantage and improved business performance. Hence, we propose the next hypothesis:

**H8.** Innovativeness has a direct effect on the overall performance of a company.

Considering the above-defined concepts and their effects on the overall performance of a firm, the following research model is proposed to be tested via an empirical research (Figure 1).

4. Research methodology: quantitative data

In this section, the method used in this study to examine and evaluate the proposed research model is elaborated. Based on the above discussion, an empirical research is performed to examine how digitalization enables firms to change or innovate their current BMs.

4.1 Developing a measurement model

To ensure the reliability of the measurement and have a comprehensive list of measures, an extensive review of the existing literature on several disciplines such as entrepreneurship, strategic management and BMs was executed. All survey items for each latent construct were selected from previously validated measures. Data were collected on internal and external drivers, type of innovations, the changes in BM and their management, familiarity with and use of BM ontologies and tools and performance and background characteristics. The overall performance of the firm was measured subjectively according to the model proposed by Venkatraman and Ramanujan (1986). Due to ethical concerns, merging the firms’ data with data from statistical offices to use objective reported performance information could not be done. McDermott and Prajogo (2012) suggest that the use of subjective measures of performance is a valid proxy for objective performance measures.

Sales volume and revenue growth were used as control variables. Next, Likert-type scales were used (1 = totally disagree, 7 = totally agree) based on well-known studies on innovation, entrepreneurship and strategic management with regard to firms’ BMs (Subramanian, 1996; Zott and Amit, 2008; see also Table I).
To find and identify the relationship among constructs, the data set was analysed using SEM techniques. SEM is especially applicable when dealing with relationships among constructs such as in BM experimentation and subjective assessment of overall business performance. The purpose of covariance-based SEM is to “reproduce the theoretical covariance matrix, unlike the PLS-SEM which focuses on improving the explained variance” (Hair et al., 2011, p. 139). In this paper, partial least squares (PLS)-SEM method, which is a component-based estimation, is used. Table I provides a list of the items used.

### 4.2 Survey administration, sample and data collection

The questionnaire contains several concepts related to BM and BMI, as laid out in the theoretical section of this article. The questionnaire starts with a generic selection question, asking if the company under study has changed its BM in the past 24 months. Next, four specific selection questions were posed giving examples of BMI related to value proposition and market; ecosystem; IT, that is, the use of social media and/or big data; and pricing and related financial issues. The third question was used as a selection question to obtain a subsample of 338 SMEs involved in social media and big data. These questions were included to make sure firms were actually involved in BMI (Langerak et al., 2004; Lee and O’Connor, 2003). Next, the key respondent from each

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<th>Table I</th>
<th>Question items used in the study</th>
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<tr>
<td><strong>Construct and source</strong></td>
<td><strong>Items</strong></td>
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<td><strong>The following internal factors motivate a change on your business model during the past 12 months</strong></td>
<td><strong>Innovation activity</strong> (CIS Survey, 2016)</td>
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<td><strong>Strategy</strong> (Zott and Amit, 2008)</td>
<td><strong>Scale up your business</strong></td>
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<tr>
<td><strong>The following internal factors motivate a change on your business model during the past 12 months</strong></td>
<td><strong>Competitive intensity</strong> (Jaworski and Kohli, 1993)</td>
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<tr>
<td><strong>Technology turbulence</strong> (Jaworski and Kohli, 1993)</td>
<td><strong>Rapid changing technology</strong></td>
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<tr>
<td><strong>How did you deal with business model innovation during the past 12 months</strong></td>
<td><strong>Business model experimentation</strong> (Sosna et al., 2010; Teece, 2010)</td>
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<td><strong>In your enterprise, business models are...</strong></td>
<td><strong>Business model practices</strong> (Ireland et al., 2009; Osterwalder et al., 2005)</td>
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<td><strong>In our enterprise</strong></td>
<td><strong>Innovativeness</strong> (Subramanian, 1996)</td>
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<td><strong>In our enterprise, we are very satisfied with</strong></td>
<td><strong>Overall performance</strong> (Venkatraman and Ramanujam, 1986)</td>
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firm had to prove that he/she was knowledgeable about BMI practices in their company (Atuahene-Gima, 2005).

The questionnaire was iterated and pretested, reading it aloud to managers and academics to improve clarity of questions. The questionnaire was developed in English and then translated into 11 languages (i.e. Dutch, French, Finnish, German, Italian, Lithuanian, Polish, Portuguese, Slovenian, Spanish and Swedish). The German questionnaire was used for Austria. To detect potential problems (e.g. ambiguous expressions) and cultural issues, back translation of the questionnaire into English was performed to ensure translation did not introduce any bias in the measures. Moreover, a final check on translations and consistency between them was made by a research agency. The questionnaire was pretested in every one of the 11 countries.

Data were collected through a professional research agency based in the Netherlands. This agency has extensive experience in data collection in multiple countries. They use native speakers and computer-assisted telephone inquiry. The countries included in this research are spread over Europe and contain, for all European regions (North, West, Central, South and East), a large country with a large number of SMEs and a small country. Quota for micro, small and medium enterprises was established as 33, –33 and –33 per cent, respectively. No quota has been defined for industry sectors. Agriculture, public administration and nonmarket activities in households are excluded in this paper. The sample was based on Dun and Bradstreet database. Dun and Bradstreet collects data on companies, their executives, industry classification and contact information on a regular basis from chambers of commerce and other organizations. Companies were randomly selected from the database and key respondents (owner or BMI manager) were interviewed. Identification data were not known to the researchers. The research agency also took into account the incidence rate that provides the hit rate, that is, the number of times a company is asked if they are involved in BMI before founding one that fulfils this requirement. Results obtained showed similarity patterns between countries. As a further test, respondents’ suitability (Atuahene-Gima, 2005) to answer the questionnaire and their degree of knowledge (1 = very limited knowledge, 7 = very substantial knowledge) regarding the product/service on offer, business process and new product/service development was assessed. The mean responses were 6.7, 6.6 and 5.9, respectively, which indicates adequate knowledge levels.

5. Data analysis and results

5.1 Validity and reliability

Composite reliability (CR) test examines internal consistency and reliability of latent constructs. The CR threshold is 0.70 or higher. More specifically, values between 0.60 and 0.70 are recommended in exploratory research and between 0.70 and 0.90 in other stages of research; values under 0.60 are considered lacking reliability (Hair et al., 2011; Nunnally and Bernstein, 1994). Table II shows that each construct satisfied the recommended value and indicates that all constructs have reliability.

Cronbach’s alpha is a common test for internal reliability of latent constructs (Bryman and Bell, 2011) and recommended to be greater than 0.70 (Hair et al., 2011; Urbach and Ahlemann, 2010). Statistics from Table II show that reliability of all constructs, except for one (strategy), is satisfied.

Convergent validity is presented by average variance extracted (AVE) and should be greater than 0.50 (Hair et al., 2011). All of the latent constructs in Table II have sufficient convergent validity: AVE > 0.649. Factor loading accounts for nondimensionality of the measuring items (Awang, 2012). The value of factor loading for an established item should be 0.6 or higher. It is necessary to remove items from the measurement model if their factor loadings are low, one item at a time. The remaining eligible items, listed in
Table II, show an acceptable convergent validity, internal consistency and reliability of measuring items and are all consistent with the recommended threshold values.

5.2 Discriminant validity

Assessing discriminant validity is a building block of model evaluation (Hair et al., 2010). Discriminant validity guarantees the uniqueness of a measuring construct and indicates that the phenomenon of interest is not captured in other measures (latent variables) within the research model (Hair et al., 2010; Henseler et al., 2015). This paper uses both Fornell–Larcker and heterotrait–monotrait ratio (HTMT) criteria for discriminant validity assessment. Table III shows that AVE value satisfies the constraints and shows that the constructs and the measuring model are adequately discriminated.

Table III Correlation among constructs and square root of the AVE

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<tr>
<td>Business model practices</td>
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<td>Business model experimentation</td>
<td>0.52</td>
<td>0.84</td>
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<td>Competitive intensity</td>
<td>0.24</td>
<td>0.21</td>
<td>0.83</td>
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<td>Innovation activity</td>
<td>0.41</td>
<td>0.47</td>
<td>0.40</td>
<td>0.81</td>
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<td>Innovativeness</td>
<td>0.44</td>
<td>0.45</td>
<td>0.30</td>
<td>0.60</td>
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<td>Overall performance</td>
<td>0.32</td>
<td>0.29</td>
<td>0.13</td>
<td>0.28</td>
<td>0.33</td>
<td>0.92</td>
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<td>Strategy</td>
<td>0.36</td>
<td>0.44</td>
<td>0.42</td>
<td>0.61</td>
<td>0.44</td>
<td>0.25</td>
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<td>Technology turbulence</td>
<td>0.33</td>
<td>0.40</td>
<td>0.43</td>
<td>0.55</td>
<td>0.41</td>
<td>0.20</td>
<td>0.45</td>
<td>0.95</td>
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Notes: Italic values show square roots of the AVE; BMP = business model practices; BME = business model experimentation; COMI = competitive intensity; INNAC = innovation activity; INNO = innovativeness; OPER = overall performance; STR = strategy; TT = technology turbulence
The second criterion for discriminant validity assessment, HTMT, is generally used for assessing discriminant validity in PLS-SEM. However, literature on PLS-SEM shows that scholars predominantly use the Fornell–Larcker criterion and cross-loadings for discriminant validity assessment in variance-based SEM. The classical criterion (i.e. Fornell–Larcker criterion) for discriminant validity assessment requires the square root of AVE to be greater than the correlation of the construct with all other constructs in the structural model. For example, the square root of the AVE is 0.74; however, if the correlation between constructs C1 and C2 is 0.80, it can be concluded that discriminant validity has not been established.

HTMT is an alternative to the classical criterion for assessing discriminant validity. Monotrait-heteromethod is the correlation of indicators measuring the same construct and heterotrait-heteromethod is the correlation of indicators across constructs measuring different phenomena. HTMT value close to 1 indicates lack of discriminant validity; however, some authors such as Henseler et al. (2015, p. 129) suggest a conservative value of 0.85 for HTMT and a more liberal value of 0.90. According to this recommendation, if HTMT values are less than 0.85, one can establish that discriminant validity is not an issue. Table IV shows that HTMT values satisfy even the more conservative criterion, as all the values are below 0.85.

### Table IV  The threshold for HTMT is based on HTMT.90 criterion

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<td>Business model practices</td>
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<tr>
<td>Business model experimentation</td>
<td>0.648</td>
<td>0.294</td>
<td>0.538</td>
<td>0.541</td>
<td>0.386</td>
<td>0.507</td>
<td>0.390</td>
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<td>Competitive intensity</td>
<td>0.254</td>
<td>0.618</td>
<td>0.513</td>
<td>0.556</td>
<td>0.357</td>
<td>0.631</td>
<td>0.472</td>
</tr>
<tr>
<td>Innovation activity</td>
<td>0.254</td>
<td>0.513</td>
<td>0.778</td>
<td>0.348</td>
<td>0.151</td>
<td>0.589</td>
<td>0.504</td>
</tr>
<tr>
<td>Innovativeness</td>
<td>0.254</td>
<td>0.778</td>
<td>0.41</td>
<td>0.358</td>
<td>0.151</td>
<td>0.89</td>
<td>0.961</td>
</tr>
<tr>
<td>Overall performance</td>
<td>0.390</td>
<td>0.472</td>
<td>0.504</td>
<td>0.684</td>
<td>0.478</td>
<td>0.342</td>
<td>0.023</td>
</tr>
<tr>
<td>Strategy</td>
<td>0.390</td>
<td>0.472</td>
<td>0.504</td>
<td>0.684</td>
<td>0.478</td>
<td>0.342</td>
<td>0.023</td>
</tr>
<tr>
<td>Technology turbulence</td>
<td>0.390</td>
<td>0.472</td>
<td>0.504</td>
<td>0.684</td>
<td>0.478</td>
<td>0.342</td>
<td>0.023</td>
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</table>

**Notes:** BMP = Business model practices; BME = business model experimentation; COMI = competitive intensity; INNAC = innovation activity; INNO = innovativeness; OPER = overall performance; STR = strategy; TT = technology turbulence

### Figure 2  Results of the research model

![Results of the research model](image)

**Notes:** ***p-value < 0.001; **p-value < 0.005; and *p-value < 0.01
5.3 Structural model analysis

To test the hypotheses and figure out the statistical significance of the path coefficients in the research model, SEM was used. The fit of the model is satisfactory, chi-square ($\chi^2$) = 669.87 and degree of freedom (df) = 216. The overall performance is explained by a variance of 15 per cent, innovativeness is explained by a variance of 20 per cent and BM experimentation and practices are explained by variances of 28 per cent and 27 per cent, respectively. Figure 2 shows the relationships between constructs in the model; bold lines represent significant relationships and dotted lines insignificant relationships or unsupported hypotheses. Six different fit statistics such as root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), adjusted GFI (AGFI), normed fit index (NFI), Tucker–Lewis index (TLI) and comparative fit index (CFI) were computed. These model fit indices satisfy the recommended guidelines and show that our research model has a good fit with the data (Browne and Cudeck, 1993; see Table V).

5.4 Hypothesis testing

Different alternative models were tested, and the model presented in Figure 2 is the optimal model and fits best the data. Table VI shows the research hypotheses and analysis results. The results reveal significant relationships between innovation activity ($\beta = 0.26$, $p < 0.001$) and strategy ($\beta = 0.23$, $p < 0.001$) with business experimentation, thus supporting H1 and H2, respectively, in the model. The results show no significant relationship between competitiveness intensity (H3) and BM experimentation, thus not supporting H3. The analysis shows that technology turbulence drives BM experimentation and reveals a significant path ($\beta = 0.17$, $p < 0.001$), thus supporting H4 in the model.

Moreover, the results show a significant path between BM experimentation and practices ($\beta = 0.52$, $p < 0.001$), and thus supporting H5 in the model. A strong significant relationship between BM practices and innovativeness is observed ($\beta = 0.44$, $p < 0.001$), thus supporting H6 in the model. BM practices also have a significant relationship with the overall business performance ($\beta = 0.21$, $p < 0.001$), thus supporting H7 in the model. Finally, analysis shows that innovativeness has a significant relationship with overall business performance ($\beta = 0.24$, $p < 0.001$), and thus supporting H8 in the model.

<table>
<thead>
<tr>
<th>#</th>
<th>Hypotheses</th>
<th>Results</th>
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<tbody>
<tr>
<td>H1</td>
<td>Innovation activity has a direct positive effect on BM experimentation</td>
<td>Supported</td>
</tr>
<tr>
<td>H2</td>
<td>Strategy has a direct positive effect on BM experimentation</td>
<td>Supported</td>
</tr>
<tr>
<td>H3</td>
<td>Competitive intensity has a direct positive effect on BM experimentation</td>
<td>Not supported</td>
</tr>
<tr>
<td>H4</td>
<td>Technology turbulence has a direct positive effect on BM experimentation</td>
<td>Supported</td>
</tr>
<tr>
<td>H5</td>
<td>BM experimentation has a direct positive effect on BM practices</td>
<td>Supported</td>
</tr>
<tr>
<td>H6</td>
<td>BM practices has direct positive effect on innovativeness</td>
<td>Supported</td>
</tr>
<tr>
<td>H7</td>
<td>BM practices has direct positive effect on overall performance of a company</td>
<td>Supported</td>
</tr>
<tr>
<td>H8</td>
<td>Innovativeness has a direct positive effect on overall performance of a company</td>
<td>Supported</td>
</tr>
</tbody>
</table>
5.5 Case studies

This research is based on a case study approach (Yin, 2013). As research on BMI in the context of SMEs is a new phenomenon, our approach is relatively inductive. As part of a large European project, a database of 85 BMI cases in SMEs was built. To collect the data, a common case study protocol was used, which is available on request; it included SMEs relevant to the sample and the information collected and also how data from different sources (triangulation) were used. Data sources include interviews, relevant documents and BM descriptions and/or pictures. Data were structured according to an existing template (case study protocol) that contains information on topics such as:

- background characteristics of the firm (information sheet);
- validation of interviews by interviewees and case reviews by other researchers involved in the project;
- assessment of the firm’s strategy focus and innovativeness;
- information on factual R&D information (if available) and market focus;
- information on the value proposition and BM (innovation); and
- information on the impact of BMI on the business logic and business performance of the firm.

Depth and detail of case descriptions vary. Because of the diversity of SMEs in terms of size (from very small to medium sized), industry (from personal services and retail to high-tech industries), maturity (from start-ups to well-established family businesses with more than 300 years of experience) and country within Europe, a wide range of information is

<table>
<thead>
<tr>
<th>Table VII</th>
<th>Design of case studies</th>
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<tr>
<td>ICT users</td>
<td>ICT producers</td>
</tr>
<tr>
<td>Social media</td>
<td>Hamburger restaurant</td>
</tr>
<tr>
<td>Big data</td>
<td>Digital marketing solution provider</td>
</tr>
<tr>
<td></td>
<td>Social media marketing full service provider (FSP)</td>
</tr>
<tr>
<td></td>
<td>Provider of analytics for Brick stores</td>
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</table>

Figure 3  Case studies mapped on the conceptual model

![Case studies mapped on the conceptual model](image-url)
available. Moreover, the cases deal with diverse topics such as new pricing strategies for a pastry shop, the impact of servitization on the BM of a mechanical engineering firm and BM design for social innovation in healthcare. Thus, most of the cases are not related to digital transformation. From the total set of cases, we selected four with a clear focus on BM in combination with social media or big data to enrich the quantitative results with more in-depth insights. Theoretical sampling was used to select our cases based on two dimensions: the technology at stake, social media or big data, and whether the companies were users or producers of social media- or big data-based applications (Table VII for information on the case; Figure 3).

5.6 Case study results

1. This case is about a Spanish family business with multiple hamburger restaurants in Madrid. The second generation of owners is pushing BMI using social media. The first restaurant was opened in 1981 and is a typical American-style hamburger joint venture. Food ratings are very positive, while negative reviews were received for poor service. The owners rely strongly on a loyal customer base. The restaurant has a social media manager who uploads three to four posts per day. Social media use is not focussed on interaction with customers, but only on promotions. Based on the analyses of reviews on Facebook, Twitter and other channels such as Instagram and Foursquare, the problem of the company is mainly related to service delivery. For instance, there are long queues for the restaurant due to its poor reservation system, which relies on telephone and website reservations. People have to wait up to 1 h even if they made a telephone or online reservation, especially during weekends. The BMI concerns the integration of social media in the reservation process. The objective is to develop a reservation system that is able to handle reservations in real time via multiple channels including Facebook and Twitter and connect the reservation system to the in-restaurant point of-sales and table management system. For instance, Twitter can be used to give updates on table availability, invite people to make reservations and respond to possible service-related problems. Making use of data collected through these media, the reservation system can be optimized to reduce mismatch between reservations and table availability. From a BMI perspective, it can be concluded that promoting a value proposition without branding via Facebook and Twitter is in itself not good enough to achieve impact. This Spanish hamburger restaurant is exploring possibilities to combine their social media presence with their in-house restaurant systems. This example illustrates how social media can be used. The case organization is open to innovative activities but not actively reconsidering their BM. Their core business remains the same, and social media only optimize one of their activities.

2. The focus of this Spanish company is on social media marketing. Initially, the female entrepreneur started as a freelancer but later decided to offer social media marketing services. The company changed their BM from a consultancy agency to a full-service social marketing provider. They offer online marketing consultancy, social media management and content creation services. During the economic crisis in Spain, the company survived mainly due to its expertise in social media marketing. The BM components affected by the innovation were related to the change in value proposition, customer relations and key resources. Communication with clients is intensive and driven by a proactive attitude. Due to their direct communication with clients, they gain knowledge about and from their customers, which is a valuable resource also for other projects. In the back end, technical integration of the products and services offered is crucial. Communication and discussion on BMI were a continuous process within this small start-up company. Since its BMI, although operating in a very turbulent market with high competition,
the company has grown in terms of business turnover, brand awareness and client numbers. It is clear from the case that the value proposition change – as BMI –was based on social media, but this did not affect the BM fundamentally. The change from an advertisement content creator to a full-service provider was realized mainly based on market demand and acquiring knowledge on social media marketing.

3. This case relates to a consultancy and digital marketing solution provider operating in the British market. The company’s main activities entail providing consultancy to boost clients’ online visibility and training clients on digital marketing issues. The company is highly dependent on Google Analytics. Changes in algorithms have a huge impact on the operations and BM of the company. Due to changes in Google Analytics’ algorithms, they had to adjust some components of their BM. Big data and big data analytics (BDA) could offer opportunities for this company. This change required new resources such as technological infrastructure and the company’s knowledge base. The (re)use of data and the use of data from third-party providers is paramount for them. Thus, new business units were needed and established, which created a new demand and, consequently, a change in value proposition. These changes have been reflected, for instance, in the company offering training in BDA. BMI was led by core managers, that is, the CEO and the Director of Strategy. Radical changes were made in (a) resources and team management, (b) service offerings, (c) promotion activities and (d) partner network. In the end, these radical changes had only a minor disruptive impact on performance.

4. The core technology of this Finnish business analytics provider for traditional brick-and-mortar stores was initially focussed on collecting in-store behavioural data and providing analytics to help small retailers personalize the customer experience. The technology used is in-store localization technology based on sensors and Wi-Fi. This makes it possible to follow customers as they roam around in a store. The technology can run on existing infrastructure available within stores. The company started offering customized solutions to small retail stores, which led to impressive growth rates. However, the company developed an application to improve in-store design using augmented reality offered through a large technology provider, which led to increased sales. The company is currently being expanded to use their technology and analytics in optimization of passenger flows in airports. Thus, the technology is being reused in a different setting leading to a new customer segment and a new value proposition no longer supporting sales, but optimizing passenger flows. The expansion led to partnering with a large traditional services provider as well as a technology provider. This case illustrates that changes in BMs benefit companies and change their position in different ecosystems. Also, the company of this big data and BDA case became a niche resource provider to others, which shows that the emergence of data-driven BMs enables improvement of sales (channels) and optimizing of key activities.

5.7 Cross-case comparison

The four cases are mapped onto the conceptual model and confirmed earlier findings. It is clear from this mapping that the potential of new technologies and the focus on innovation play an important role in BM innovation experimentation and practices. Strategic considerations are mainly relevant to the big data cases, more or less suggesting that the impact of big data is based on the companies’ strategic value. The social media cases suggest that in cases of both users and providers, social media played only a minor role. While social media involved collecting or disseminating information for users, know-how on social media was a key asset for providers. It is also striking that the impact of big data and BDA on companies’ innovativeness and performance is also evident in big data cases compared to social media. Social media
cases showed growth, and the impact as compared to that grounded on in-depth technology know-how is less fundamental and mainly relates to application or implementation of social media. BM experimentation clearly occurs in three out of the four cases; however, strategy implementation of the new BM, to the core of BM practices, is not explicitly mentioned or discussed in all four cases. The cases partially confirm the validity of the research model.

6. Discussion

Findings from both quantitative data and case studies illustrate that internal drivers related to innovative activities and strategy, as well as technology turbulence, play an important role when social media and big data are part of the BMI. The case studies show some nuances by suggesting that the impact of big data is more extensive than that of social media. This can be explained by observing that social media usage relates more to channels, while big data can affect companies in all their core activities and the activities of their key partners. Making resources and management structure available for BMI, labelled as BM experimentation, is considered important. As illustrated by both quantitative data and case studies, this is a condition for the practice of implementing companies' strategy in their BMs. It was found that BMI and strategy implementation practices in BM led to more innovations and increased performance.

The current study only gives a general picture of the relations between BMI drivers, behaviour and outcomes. The case studies offer more detail; however, more in-depth understanding of BMI is necessary. Specifically, the order in which BM components are changed needs to be studied. Understanding BMI paths and roadmaps to implement them is important for SMEs. BMI paths need to be developed for not only topics such as market expansion, internationalization and starting companies, but also how BMI works with certain technologies, that is, how BMI works when certain technologies are implemented. From the cases, it can be argued that technology characteristics play a crucial role in the incremental or radical nature of BMI. The social media cases yielded different results than the big data cases. With regard to big data and BDA, it is apparent, and discussed by the case companies, that BM experimentation has an impact on innovativeness and performance; this is not evident in the social media cases. A possible explanation is that big data is far more specialized and requires an in-depth mathematical as well as computational know-how, as well as know-how on analytics software and accompanying capabilities. Know-how in the case of social media is more related to the communication and marketing domains and therefore easier to acquire. This would also imply that the conceptual model (Figure 1) needs to be tested not for specific technologies individually.

Literature on BMI and new digital technologies such as social media and big data for non-telecommunication or non-IT companies is rather scant, and literature on BM in the telecom and IT domain is mainly focussed on large companies and high-tech start-ups; thus, the way technologies drive or impact BMs of traditional SMEs is largely open for new avenues of research. In the context of understanding businesses’ digitalization, research on the impact of new technologies on traditional as well as emerging industry sectors such as digital marketing is highly relevant. Our research contributes to both fields. It is important to stress that big data might have a huge impact on companies' BMI and performance. Exploring big data-driven BMs might be a very important research domain.

From a regulatory or policy perspective, it is important to emphasize that innovation programs for SMEs should be focussed on not only traditional R&D and innovation approaches, but also BM and BMI to reap the benefits of technological and product innovations. European stimulation programs, such as SME instruments in the H2020
work program, as well as national programs should pay more detailed attention to BMI and experimentation. In the current version of the SME instrument, BMI is mentioned among 12 other topics with a main focus on hard-core technology innovation. It needs to be stressed that for all these projects, attention to BM needs to be an integral part of project proposals, not only as a scapegoat, but as a serious contribution to a project. Including analyses of digital transformation’s impacts on BM is important because some forms of digital transformation, for instance, block chain or Industry 4.0, will fundamentally affect SMEs’ BMs, specifically when they operate in a networked environment.

7. Conclusions, limitations and future work

Our research contributes to a better understanding of internal and external aspects of BMI and the literature on the impact of BMI on performance and outcomes, specifically when social media and big data are implied. It is important to understand how BMI occurs in organizations and how strategies are implemented in the business logic. As suggested, both quantitative as well as qualitative research on BMI matter. This paper contributes to a better understanding of how digitalization in BMI works. It offers insights into drivers and outcomes specifically for BMI driven by digitalization. However, the authors of this paper are aware that this study has only dealt with a small part of a vast area of research. In future, the aim is to focus in more detail on how companies experiment, how BM components are affected and how implementation approaches with regard to human and organizational factors affect BMI performance.

Evidently, this research has some limitations, which are related to both the quantitative as well as the qualitative studies, and to the fact that SMEs are drivers in their field of operations. Moreover, this research was conducted in Europe, with many different languages, cultural and economic differences despite the common market. The case study research illustrates this diversity. Differences between the cases can be attributed to many factors other than differences in technology or in IT provision or usage. Case studies with a focus on SMEs are hindered by the lack of alternative data sources, which makes them highly dependent on information provided by the owner, manager or core spokesperson, with less opportunity to access other alternative interviewees.

The research design has some limitations as well. This paper specifically focuses on companies that are knowingly of subconscious nature engaged in BMI. Research comparing companies involved in BMI and companies not engaged in BMI might provide deeper insights. In addition, measurements used in this paper were based on subjective judgments; connecting these subjective judgments with real performance data would have been interesting, but this was not possible due to European regulations in relation to research ethics and informed consent. In future research, our focus will be on collecting another wave of data to establish causalities more clearly, as well as expanding our insights into how BMI actually takes place. This research will entail both quantitative analyses as well as extending the case studies.

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Further reading


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ITU cost model and methodology to assist national regulatory authorities to engage with international mobile roaming

Simon Forge and Lara Srivastava

Abstract

Purpose – Tariffs for international mobile roaming (IMR) are often viewed by governments as an additional tax on international trade and on tourism. IMR customer bills may appear to be arbitrary and sometimes excessive. The purpose of this paper is therefore to set out a pragmatic approach to assessing international charges for mobile roaming, making use of a realistic cost model of the international roaming process and its cost elements, at a level that is useful to regulatory authorities and operators.

Design/methodology/approach – The discussion presented is based on industry practices for handling voice calls and data sessions with the mobile network operators (MNOs) business model, based on industry sources. The basic mechanisms use two common constructs from business analysis – business processes and use-cases – to provide a simplified form of activity-based costing. This provides a model suitable for national regulatory authorities to move towards cost-based IMR tariffs.

Findings – Using a perspective on costs based on a bottom-up survey procedure for elucidating the key information, the paper presents the cost elements for the various IMR network components and business processes, with an approach suitable for analysing both wholesale and retail pricing.

Research limitations/implications – The method is specifically designed to overcome the key problem of such approaches, the limitations set by differences in network technologies, network topology, operational scale and the engineering, as well as MNO business model and accounting practices, which otherwise would preclude the method presented here from being vendor neutral.

Practical implications – Vendor and network engineering neutrality implies the approach can be used to compare different MNOs in terms of the validity of their IMR charges and whether they are cost based.

Social implications – Impacts on society of so-called “bill-shock” have become quite common, increasingly for data sessions. The cost model presented here was developed with the intention of improving the accountability and transparency of the mobile roaming market. It thus assists in the introduction of cost-based tariffs over an economic region, such as the European Union.

Originality/value – The paper examines the practical implications of building large-scale cost models for assessing the real IMR costs, a modelling exercise that has not been seen elsewhere in terms of its approach and neutrality as to MNO structure and assets.

Keywords Cost model, International mobile roaming

Paper type Conceptual paper

This paper introduces the concepts of cost modelling based on actual network and business systems costs of international mobile roaming (IMR). Its aim is help industry regulators and operators to understand the underlying costs involved in roaming operations. The approach has been used and tested in both developing and developed economies. Its basic principles of cost-based pricing formed the core of the original paper for a committee of the European Parliament delivered in 2007, contributing towards a process that has finally resulted in the abolition of EU-wide roaming charges on 15 June 2017. This approach has been developed much further and expanded since, for the ITU,
offer a detailed guide for regulators and operators. It is now available from the ITU (2015). The kind support of the ITU is acknowledged in the preparation of this paper.

1. The macro-economic impacts of international mobile roaming

1.1 Why is a cost model for international mobile roaming needed?

To understand this need, it is necessary to recognise that the macroeconomic repercussions of IMR tariffs are considered to be a serious hindrance to achieving the goals of multinational trading communities. As EU Commissioner Kroes noted (in 2014):

Roaming makes no sense in a single market – it is economic madness

IMR tariffs may act as an extra tax on trade that is also experienced by tourists as a form of visitors’ tax. In consequence, their impacts are currently being examined by many multistate economic communities such as the ASEAN Economic Community (AEC), the European Union (EU), the Southern African Development Community (SADC) and One Network Area (ONA) in East Africa. Roaming is considered to be impeding trade and tourism through high mobile tariffs, and debates around mobile-roaming tariffs are becoming more important, as modern networks carry higher levels of data traffic than what would be observed in a purely voice/SMS market. In the USA, the FCC has also noted the effects of bill shock (FCC, 2015; FCC, 2010).

1.2 Europe's experience with international mobile roaming tariff reduction using cost-based tariffs

Europe, with its 28 Member States and its move towards a single market, is a key case study. A European Commission survey in 2014 to determine the behaviour of EU citizens when travelling within the EU found that (European Commission, 2016):

- 25 per cent of EU travellers switch off their phone when travelling;
- 47 per cent never use mobile internet; and
- effectively, the mobile industry is missing out on serving 300 million EU customers visiting neighbouring EU Member States.

As stated by the European Commission's 2006 Impact Assessment [European Commission (2006)] analysing the European mobile roaming situation:

- The core problem is that prices for EU-wide roaming at both wholesale and retail levels stand in no meaningful relationship to the underlying costs of providing the service.
- This problem is compounded by a lack of transparency of prices at retail level which means it is extremely difficult for consumers to understand what they will actually pay. The Commission and some national regulatory authorities have attempted to address the transparency problem by creating websites for roaming prices, but these initiatives have not led to sufficient improvements.
- Having studied this market carefully, national regulatory authorities have alerted the Commission services to the fact that they believe the problem is “non-trivial” and requires action.
- A key issue is the cross-border nature of this service whereby no one national regulatory authority can solve the problem.

The EU regulatory group BEREC found that, in the EU in 2012 (after 5 years of price caps), that retail roaming prices were, on average, 118 per cent higher than the underlying costs estimated by what they termed their “conservative estimations”, and that the real costs
assessed by BEREC for EU mobile network operators (MNOs) from its for national regulatory authority (NRA) members (Stuckmann, 2012) could be even lower.

Consequently, a cost model of IMR should be most useful to highlight the financial reality as closely as possible – and so to drive a general change in the industry’s approach to the whole international roaming question.

It is instructive to examine how this may be done globally using the EU case history. The EU experience of international roaming is a 10-year history of moving towards cost-oriented pricing using a glidepath for a common "Eurotariff". This applies to both wholesale and retail prices, as well as reducing called-party receiving tariffs, aiming for zero surcharges in 2017:

- Since the European Parliament vote in 2007, IMR surcharges have been decreasing slowly.
- Retail roaming surcharges on outgoing voice calls were lowered on 16 April 2016 to 0.05 Euro per minute, while data surcharges were capped at 0.05 Euro per megabyte of data.
- IMR surcharges are to end by 1 June 2017, for “reasonable use” – capped at domestic rate (for roam like at home, RLAH) for a visit of several months to other EU countries.

The EU glidepath is shown in Figure 1.

The final reduction shown above stems from a further decision to abolish IMR surcharges taken in a second European Parliament (EP) vote on 3 April 2014, where 534 votes were cast in favour of abolishing surcharges and 25 were cast in opposition. Finally, EU Regulation 2015/2120 was adopted on 25 November 2015, calling for the phased reduction of retail roaming charges to zero by June 2017. The EP also set the requirement that the European Commission submit a report to the EP by June 2016 proposing regulation for the wholesale IMR market targeting the removal of transitional surcharges in June 2017. At that point, the visited network would charge the same wholesale rate for termination, as it would for a non-roaming call, for periods of “reasonable” visiting use spanning a few months.

These terms apply to the 28 Member States of the EU (EU-28) and the European Economic Area, but not to Switzerland. In Switzerland, IMR data tariffs may be 1-10 euro per

Figure 1: The EU Glidepath over 2007-2017 for retail and wholesale IMR tariff reduction for voice

![Graph showing the EU glidepath from 2007 to 2017 for retail and wholesale IMR tariff reduction for voice.](source: Kroes (2013); European Commission (2016))
megabyte, a mark-up much larger than the EU cap of 0.05 euro per megabyte over the subscriber’s local rate within the EU-28 in 2016 (and zero from mid-2017).

Europe’s experience with abolition of roaming charges has been to see mobile roaming especially for mobile data services expand rapidly (Corrata, 2017), although it is too early for accurate EU-wide figures.

1.3 ITU recommendations D.98, D.99 and D.140 underpin the need for an international mobile roaming cost model

MNOs have yet to propose a cost model to justify additional roaming charges. MNOs and related industry associations continue to assert that a significant roaming surplus is necessary to fund infrastructure investments (GSMA, 2012a). This has been the experience of the EU, for example, with the rollout of LTE mobile broadband with 100 Mbps download speeds.

The intention of the cost model presented here is to help improve the accountability and transparency of the mobile-roaming market, following the path set out by ITU-T in its Recommendation D.98 (ITU, 2012a). Moreover, Recommendation D.99 (ITU, 2012b) discusses the question of an indicative rate for international mobile termination and provides some suggestions for consideration by NRAs, based on using the fixed termination rate as an initial basis for negotiations. Additionally, in the domain of international call-termination accounting, Recommendation D.140 (ITU, 2002) proposes a useful principle for setting prices using cost-based accounting, elaborated by clause e.3.1:

Administrations [which have already attained these indicative target rates] should continue to take positive steps to reduce their accounting rates to cost-orientated levels.

This could form the basis for further ITU-T Recommendations with a cost-based analysis of IMR tariffs. It would provide the market-related basis for pragmatic and realistic inputs to NRAs considering the impacts of IMR. In consequence, this paper lays out the basis of a cost model for NRAs to estimate the costs of providing IMR voice services and SMS.

2. Principles of telecommunications costing are the basis of the cost model and data gathering

2.1 The operational questions for an international mobile roaming cost model

Today’s consumer and industry context would be well served by a mobile-roaming cost model able to drive change in the industry’s approach to questions around IMR. A cost model could build a better understanding of the costs underlying the provision of roaming services, offering a basis for decisions relevant to the level of future tariffs. Such a model should answer a key question:

Do the requirements for technical infrastructure inevitably cause international mobile-roaming costs to be higher than domestic costs – and, if so, by how much?

MNOs may argue that high international roaming prices mainly result from high costs of related technical infrastructure and its operation. To assess this claim, we must answer several questions:

Q1. Is the handling and billing of an international mobile call more expensive than a domestic national mobile call and, if so, by how much?

Q2. What technical infrastructure elements are required for IMR?

Q3. What are the actual levels of the extra costs for IMR and the likely future costs of developments due to the extra infrastructure and operations?

Q4. What does a comparison of international mobile prices with their corresponding level of national pricing show?
Answering these questions is complex, as it involves an analysis of three factors, as set out in Figure 2.

The premise put forward by the mobile industry is that calls across borders cost more due to longer distances and because they reflect the different cost bases in the various countries; the extra costs of network and business support; and the costs of agreements between MNOs. But how accurately do retail tariffs reflect the actual costs of these extra factors? The roaming cost model put forward here to answer this question is based on the collection of empirical cost data.

We must emphasise that the retail roaming price to the customer is set by two markets:

1. The wholesale market in international mobile voice calls, data sessions and SMS texts, set by negotiated individual agreements on inter-operator tariffs (IOTs). Thus, the basis of wholesale rates are the prices that the visited operator charges the home operator for allowing the home operator’s subscriber to roam on the visited operator’s network. These wholesale rates may not be based on the actual costs of service provision.

2. The retail market for the final costs levied on the subscriber, which will be at a level above the wholesale price for carrying the call. The dilemma here is that the wholesale price internationally is usually higher than an inter-operator agreement domestically.

Looking more closely at the four questions above, we can summarize our findings as follows:

**Question 1: Handling and Billing of an International Call** – the handling and billing of an international mobile call may be more expensive than a domestic call but this is a relative cost compared to the domestic tariff.

Earlier analysis for the European Parliament (ETEPS, 2007) put this at an additional maximum cost of between 10 and 30 per cent over a domestic call, for the base technical costs of additional network elements and business processes involved,
trending towards the 10 per cent figure. However, these are maximum estimates. As the volume of roaming increases with reduced roaming retail tariffs, the processes become less costly. The marginal prices of further calls should sink towards the floor level of the domestic price. This effect is due to the additional elements of roaming costs being amortised over more calls or data sessions, resulting in the reduction of incremental costs as the volume of roaming increases. The additional elements become a lower portion of the total costs and the technical infrastructure becomes less costly over time.

Taking the EU case, in the absence of cost-based tariffs, roaming prices have varied greatly. In 2007, for example, prices ranged from 1 euro per minute for a voice call from Ireland to the UK up to 7 euro per minute for a call from Italy to the Czech Republic. The overall conclusion is that pricing regulation in the EU will progressively call for roaming prices to converge with domestic prices, making them more likely to align with real costs in a competitive market. The EU’s glidepath for reduction is shown in Table I (European Commission, 2014, updated 2016).

This convergence of roaming and domestic retail tariffs in the EU has only been achieved as a result of constant regulatory and political pressure on the mobile industry over the past decade. We should also note that EU efforts to reduce IMR prices now also relate to data, in addition to voice. Price caps for data are now considered just as important as price caps for voice, if not more so, as the adoption of IP voice and OTT services continues to spread.

Here, the underlying aim is to stimulate the business use of mobile broadband and consumer internet access. Both are a part of EU industrial policy for the next decade, under the pressure for a “digital single market” (DSM). Hence, the emphasis of regulation in Europe is to establish a roaming platform at domestic rates within the EU DSM as soon as possible. The EC initiative sets corresponding caps on wholesale IMR prices and agreements.

**Question 2: Technical infrastructure elements required for mobile roaming:** The basic technical infrastructure elements are explored in more detail in Section 3 but essentially comprise:

- extra software for business support in billing and customer care, with accompanying IT infrastructure such as extensions to data centres;
- staff costs for handling extra call volumes and the IMR business processes; and
- network elements, both hardware and software, including additional capacity for greater calling volume.

**Question 3: Levels of net additional costs for roaming:** The levels of net extra costs are considered in terms of the mark-up over the retail tariffs of domestic calls and data sessions, which vary from country to country. However, there are two forces which impact the levels of costs in a dynamic manner, leading to the potential for future real costs to begin falling faster as they take effect:

<table>
<thead>
<tr>
<th>Table I</th>
<th>Impact of regulatory price caps in the EU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EC retail caps in Euro cents</strong></td>
<td><strong>1 July 2012</strong></td>
</tr>
<tr>
<td>Voice call made/minute</td>
<td>32</td>
</tr>
<tr>
<td>Voice call received/minute</td>
<td>11</td>
</tr>
<tr>
<td>Data (per MB)</td>
<td>90</td>
</tr>
</tbody>
</table>

**Source:** European Commission (2016)
1. **Regulation** – the European case, with prices falling from a 300 per cent mark-up over domestic rates in 2002 to the mark-up of zero targeted for 2017, which also impacts wholesale tariffs of visited MNOs.

2. **Competition** – acting today in limited form, in some regions only (though not in the EU). Examples are found in USA, where T-Mobile offers 20 US cents per minute flat retail voice tariff in over 100 countries, under certain conditions; and in Africa, where Airtel/Zain offers domestic voice pricing for roaming in over 16 countries.

It is important to note that reductions in retail roaming prices affect the wholesale market between operators, as downward pressure is placed on inter-operator tariffs (IOTs) – the wholesale agreements – eroding the potentially high margins within the wholesale pricing market.

**Question 4: International pricing vs national pricing** – What does a comparison of international prices with their corresponding level of domestic pricing show? It is becoming evident that the reductions in roaming prices as a result of regulatory caps (Table I) or market competition indicate that the tariff mark-up for roaming both at wholesale and retail levels is increasingly difficult to justify, as:

- The additional operational and technical infrastructure necessary for the provision of roaming services merges with domestic operations, with the effect that the incremental cost of carrying an extra IMR call or session sinks as the volume of calls or sessions increases.

- There is also the question of whether domestic and international roaming prices could merge – that is, can roaming prices sink to zero? This could happen sooner rather than later for adjacent countries in a region such as the EU, because, in the final analysis for converged billing procedures, the only real extra cost that remains is the transport of the mobile call over a long distance. Long-distance wholesale rates have been decreasing over the past 80 years at an accelerating pace with technology and the move to IP/internet-carried voice can only hasten this, not just for voice calls but also for future broadband video calls. This implies that IMR surcharges would move towards near-zero levels.

Moreover, over the long term, additional traffic due to roaming may well become a valuable source of new revenue and income growth as domestic markets saturate. Mobile market saturation is occurring at rates which vary by region and country. Developing countries still have demand yet to be served, but developed economies may be near saturation in subscriber numbers and possibly also in traffic. Eventually, in all markets, extra revenue streams from (new) roaming customers may be welcome, especially where market penetration is restricted by disposable income. On the other hand, “bill-shock” would continue to restrict the growth of the market.

### 2.2 The key costing principles for the international roaming model

For the IMR cost model, we are most interested in the incremental cost of carrying additional calls for roaming in and out of the home country and the visited country, in terms of impacts on the MNO cost base in two areas, as these are the basic cost items:

1. **Additional load on facilities and support infrastructure due to international roaming traffic.** This includes the infrastructure of at least two MNOs, and perhaps a third MNO and/or a fixed-line network operator (FNO), especially for long-distance carriage.

2. **Additional load on the business processes to handle roaming, from the arrival of visiting subscribers to their exit, for both MNOs and any other operators involved.**
Both of the above will consist of OPEX and CAPEX costs. In addition, the roaming subscriber will be charged supplementary fees due to the wholesale agreements between MNOs for roaming (the inter-operator tariffs, IOTs), which increase the MNO mark-up and the charge to the subscriber for a call. These are agreed under the Standard Terms for International Roaming Agreements (STIRA) framework from the GSMA, and may include agreements for roaming exchanges among many MNOs in a single deal. Agreements are effectively embedded in the SIM card in a mobile phone, with the SIM hosting a list of the other networks with which the SIM provider has roaming agreements. This may effectively “lock-in” the subscriber to using the services of a preferred MNO for each country, as the phone will automatically search for this network when it enters a new country.

This structure produces two “markets” for roaming charges, the wholesale IOTs market as well as the retail market. The retail market reflects the results of inter-operator commercial negotiations on wholesale international tariffs for call termination, which become the floor for retail pricing due the mark-up on the agreed IOTs. The overall cost structure for the roaming business model is illustrated in Figure 3 with the infrastructure’s (incremental) costs over domestic operations, plus the wholesale agreement charges.

2.3 Business processes model of the mobile network operators

How is it possible to cost the elements in the figure above? The operational world of the MNO is organised as a series of business processes and platforms designed to support all operational business process, each with its staff and support assets. Business processes describe and govern all operations, from the signing-on by a roaming subscriber to the billing process and inter-operator charging, including the various negotiations for IOT agreements between MNOs to set up roaming agreements and then monitor them. Business process analysis (BPA) is used here, involving a dissection of each business process into a chain of activities.

2.4 Use-cases enable mobile network operators-independent analysis

The problem with this approach is that each MNO is different, and its implementation of business processes may be subtly dissimilar.

To overcome this, the concept of use-cases is introduced into the analytic model. They may be seen as a type of mini-scenario of typical basic use from the subscriber’s viewpoint, not the MNOs’. Hence, use-cases provide an approach with the power to distinguish costs.
across all types and sizes of MNOs, as this approach is based on subscribers’
requirements, which are largely unchanging when roaming (Figure 4).

Each activity may then be examined as to its needs, with attribution of the resources
necessary, be they human resources, network elements and/or IT support systems,
including the main MNO infrastructure elements such as data centres, call centres or
network operations centres (NOCs).

This may yield the costs, if attributed by element. Breaking down each step of the business
process in this way, and then costing that step, produces a detailed cost attribution, from
the bottom up. This may be viewed as a simplified form of traditional activity-based costing.
A simplified example is shown in Table II.

2.5 Incremental cost modelling

A further principle to understand, as we are focused on the differences in IMR costs over
domestic tariffs, is the incremental cost for each part of the business process due to the fact
that it is used for international roaming.

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**Figure 4** Two views of the same assets and their costs – the MNO and subscriber views
identify which assets are used for a specific activity

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**Table II** Business process with activities and the elements for the activity

<table>
<thead>
<tr>
<th>Business process</th>
<th>Activities</th>
<th>Elements involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handling set up of a new visiting subscriber</td>
<td>Receive request from visitor’s handset on arrival to register and be activated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check IMSI and inform home network HLR and verify if permitted to roam</td>
<td>Radio Area Network (RAN) and backhaul network to data centres</td>
</tr>
<tr>
<td></td>
<td>Check if prepaid or postpaid</td>
<td>RAN, mobile numbers database, interconnect, TAP file update, all in data centre</td>
</tr>
<tr>
<td></td>
<td>Check if prepaid, has roaming credit available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If above all verified, register visitor on visited network, in VLR, and activate; update customer care and billing databases</td>
<td>VLR, OTA activation, billing file, customer care DB</td>
</tr>
</tbody>
</table>
Such incremental costs can take various forms. Incremental cost due to roaming (for equipment for instance) is either an extension of capacity or functionality or spent on specialised new equipment by function. Long term, such costs may be absorbed in some way. However, estimation is a moving target, as more extensions and new features become absorbed into the standard processes and support platforms over the long term. Various types of increments in costs are shown in Table III for the MNO operations related to roaming with their long-term trends.

The roaming cost increment can be measured as an additional percentage of domestic-only costs in the model’s results.

2.6 Gathering costing information requires the sharing of input data among national regulatory authorities

In preparations to apply the cost model, it is important that the input data to populate the model is gathered from both the home and visited network. That implies that NRAs in each of the countries involved must share information, usually under non-disclosure agreements (NDAs) signed between the NRAs and MNOs in an economic community. Our experience of this is that, although countries vary greatly in the willingness of their MNOs to cooperate with one another and their NRA, a group NRA project is usually highly successful. To succeed, this inevitably requires strong political momentum at the ministerial level, which tends to set tight deadlines on results, which MNOs must be made aware of. Conditions on MNO operation and the holding of spectrum licences may be attached to such surveys aimed at cost-information gathering.

2.7 The analysis of retail tariffs is complicated by bundling

The complexity in understanding the real price paid by the subscriber increases with the number of different tariff bundles (the combination of a certain number of units of one or more services, in voice minutes, SMS texts and data in megabytes) offered for a fixed fee for a specific period (e.g. day, week or month). An overview of international roaming bundle tariffs shows that many MNOs tend to offer such packages (BEREC, 2013). The easiest tariffs to understand and compare are linear tariffs, but, in many cases, prices may be higher for roamers with a linear-tariff subscription.

3. The cost model’s method, mechanisms and assumptions

This section describes the cost model’s use of a bottom-up process as well as measures to ensure that suitable input information contributes to building an evidence-based model.

### Table III Types of cost increment in MNO assets for roaming

<table>
<thead>
<tr>
<th>Categories of possible cost increments (Opex and Capex) for roaming over domestic costs</th>
<th>Long-term cost trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased capacity for international roaming for existing assets</td>
<td>May become considered part of customary business growth – i.e. normal business expansion cost</td>
</tr>
<tr>
<td>More expensive systems for international calls (e.g. CAMEL for pre-paid roaming subscribers)</td>
<td>Prices reduce rapidly, even in medium term, as they become mainstream, i.e. just a dormant software feature to be optionally activated, rather than an extra module to be licensed</td>
</tr>
<tr>
<td>Specialised and different operational processes (e.g. customer care) and call handling with specific equipment</td>
<td>Prices reduce with time as the specialised operations become mainstream with roaming traffic growth</td>
</tr>
</tbody>
</table>
3.1 The methodology
To construct the cost model, two phases are necessary. First, the design, in outline form, which is described in this section, and second, the phase of implementation in detail. The latter is based on gathering actual input data from MNOs, normally using standard survey questionnaires and costing spreadsheets (ITU, 2015) under NDA.

The model’s design will be based on the operational business processes that identify the major cost elements. A specific approach will be applied for constructing and exercising the cost model, employing the construct from the BPA of use-cases (Jacobson et al, 2010). The cost model approach is shown in Figure 5.

3.2 Identify the business processes
The MNO operates through specific major functional business areas, which may be approximately defined as the operating divisions for network operations, including network build; business support services (BSS) of all kinds, such as billing, and their IT systems; and sales and marketing, possibly including a retail arm. Strategy, finance, NRA negotiations, procurement and inter-operator agreements may be carried out through these three functions, usually with specialised units, e.g. for spectrum auction management.

Here, it is fundamental to understand that these functional business units operate using a set of business processes relevant to a particular activity. For roaming, the business processes may run across network operations and BSS, with the possible involvement of marketing and sales if roaming is used to gain a competitive edge.

In total, at the very least, the business processes observed in the MNO include the following:

- acquire and maintain assets – real estate for BTSs, network equipment, IT applications, IT systems, data centres, offices, etc., as well as cabling wayleaves, ducts, etc.;
- hire and retain staff – from engineers to call centre operatives, management, etc.;
- build network, including site construction, cable laying, NOCs, TMN, etc.;
- rollout network services and value-added services, e.g. Apps Store and mapping;
- operate and extend networks and services – test, commission, run, maintain;
- marketing, with promotions, handset subsidies, etc.;

![Figure 5](image-url)
sales, with contracts and prepaid, signalling sign-up to network operations;
connect acquired subscribers – register, provision, activate, retain for pre-paid/post-
paid;
billing for domestic and roaming services – plan, build, train, operate, maintain;
customer care – services and infrastructure – plan, build, train, operate, maintain;
handle network management, including repair teams – plan, build, train, operate, maintain;
manage logistics for network elements;
manage logistics for retail sales channels, including handset inventory, supplier
contracts;
acquire, equip and manage tied or owned retail outlets, including warehousing space;
accounts, with accounts payable, payroll and other back office functions;
international negotiations for roaming agreements; and
regulatory negotiations and policy with spectrum acquisition.

One assumption underlying the model is that a common set of high-level business
processes exists in most MNOs. Roaming therefore involves these specific business
functions and their specific business processes, in particular ways, with the accompanying
operational processes and platforms. However, this assumption is challenged in major
ways, in two areas:

1. For mobile virtual network operators, where the networking operational processes and
network elements are handled by a third party and some BSS services may also be
outsourced (e.g. in the UK, one fixed-line virtual operator outsources its BSS services
for billing to another operator, an MNO in fact, to avoid too much competitive risk for a
core business process). However, this may make the cost model somewhat simpler, as
the outsourced operations involve bundles of services which are clearly identified and
priced to ensure the efficient execution of outsourcing service level agreements. Such
agreements may be advantageous when identifying costs, more so than the normal
MNO cost accounting which may not have had the same analysis, itemisation and
auditing.

2. In the future: although the same business functions may always be present – and many
of the business processes to a large extent – the operational implementations will move
forward with technology to new business models. That will affect all BSS, especially
billing and customer care.

3.3 Constructing the cost model

The roaming cost model described here will cover the fundamental network elements and
process costs of roaming, i.e. the cost of BSS such as customer care and billing. Essentially, in outline form, the cost model can be summarised as the underlying MNO
costs for roaming (on which data has to be gathered) built up from the business processes
(Table IV).

Various MNOs have tried to include special marketing and sales costs in their roaming
charges. This may seem questionable in terms of a service that thrives without promotion,
given its dependence on domestic subscribers that remain tied to using the services
offered by their mobile service provider. The only case where it might be deemed
reasonable is in the case of IMR as a tool to gain a competitive edge, where special offers
on data roaming and/or voice are used to win over subscribers from other MNOs, as
T-Mobile USA has done since 2014. It may perhaps be possible once IMR charges have been abolished by regulation that a case might be made for advertising as customers are so afraid of bill shock.

Note that OPEX costs are almost always higher than capital investments over a multi-year timeframe. Even for new mobile technologies in the process of being rolled-out, for instance 3G UMTS, the annual CAPEX was typically much less than OPEX (Buchanan, 2001) over the amortisation period. This is especially valid when the prices of network elements fall as a novel technology matures with mass production.

Billing, call-data collection and mediation are fundamental business processes, as the whole revenue stream depends on them. Their total costs are quite variable. They depend on the complexity of charging within pricing plans, the services offered, as well as the number of subscribers. For instance, a billing system for 3 to 10 million subscribers may cost 4 to 10 euro per subscriber for complex rating systems. For flat-rate billing, e.g. for a monthly IP data offering, as for CATV, the cost may amount to less than 1 to 2 euro per subscriber.[2][3]

An MNO may support a wide variety of interconnected networks (e.g. legacy 2G GSM/GPRS, as well as 3G UMTS with HSPD, newer LTE, plus Wi-Fi WLAN with other internet services via internet gateways). This requires a complex billing system, which would likely be a group of specialist billing packages that interwork to handle different billing modes. In these conditions, roaming becomes a relatively small extra set of conditions that would simply be added to the rating engines (at the heart of a billing system), creating a new set of tables, perhaps with a specific database schema and some storage. This roaming/interconnect module will be designed to support the individual IOT billing agreements with the roaming partners for their interconnected networks, taking into account all their specific conditions (e.g. minimum charge of 30 s per voice call).

Here readers should note that, as roaming charges become regulated and retail charges decline as a result of the introduction of cost-based tariffs, the tasks relevant to the negotiation of IOTs will reduce and related numbers of staff and costs will tend to fall.

The call data are connected via interconnect gateways, both international (for IMR) and domestic. Here we should note that for modern mobile operations, real-time mediation and billing are necessary, especially for managing prepaid customers.

However, the OPEX will always account for at least 10 per cent of these figures for a software-maintenance licence, while staff costs for operating the business process of billing may account for at least another 10 per cent to 20 per cent. As a result, over 5 years, OPEX

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital investments – Capex</td>
<td>Capital expenditures include investments in network infrastructure and which may be largely one-time, on start-up, plus regular renewal and upgrade every 3 to 5 years, or longer, for network expansion and renewal demanding phases of capex outlay</td>
</tr>
<tr>
<td>Operational outlays – Opex</td>
<td>Operational expenditures are required for running the mobile business – recurring costs include everything from salaries to electrical bills to annual software licences to consumable items and maintenance of networks, I/T and software. For roaming, the costs include some proportion of the costs for staff for network management and the billing systems with customer care and their software plus the software maintenance costs. It also includes staff for negotiating the IOTs although this may not be a continuous process and may reduce in a regulatory regime where IOTs are cost controlled</td>
</tr>
</tbody>
</table>

T-Mobile USA has done since 2014. It may perhaps be possible once IMR charges have been abolished by regulation that a case might be made for advertising as customers are so afraid of bill shock.

Note that OPEX costs are almost always higher than capital investments over a multi-year timeframe. Even for new mobile technologies in the process of being rolled-out, for instance 3G UMTS, the annual CAPEX was typically much less than OPEX (Buchanan, 2001) over the amortisation period. This is especially valid when the prices of network elements fall as a novel technology matures with mass production.

Billing, call-data collection and mediation are fundamental business processes, as the whole revenue stream depends on them. Their total costs are quite variable. They depend on the complexity of charging within pricing plans, the services offered, as well as the number of subscribers. For instance, a billing system for 3 to 10 million subscribers may cost 4 to 10 euro per subscriber for complex rating systems. For flat-rate billing, e.g. for a monthly IP data offering, as for CATV, the cost may amount to less than 1 to 2 euro per subscriber.[2][3].

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The call data are connected via interconnect gateways, both international (for IMR) and domestic. Here we should note that for modern mobile operations, real-time mediation and billing are necessary, especially for managing prepaid customers.

However, the OPEX will always account for at least 10 per cent of these figures for a software-maintenance licence, while staff costs for operating the business process of billing may account for at least another 10 per cent to 20 per cent. As a result, over 5 years, OPEX
is likely to exceed CAPEX. In addition, are all the OPEX costs of infrastructure, such as the costs of office support, running data centres or outsourcing data-centre systems and/or applications. As such, total OPEX usually becomes the major portion of costs.

Moreover, the total costs of providing, operating and maintaining a billing system with mediation may be a significant portion of all MNO costs (Cushnie and Hutchinson, 2000). It should be noted that a large MNO with wide geographic coverage may have acquired various different billing systems over the years, and consolidating these systems has the potential to reduce the costs of IMR business processes. In consequence, it is difficult to give exact figures covering all classes and sizes of MNO as the costs depend on all of the above factors, including call volume; network infrastructure and the generations of mobile technology it supports; services offered; numbers of subscribers; business processes; and the various ways of integrating business IT systems, such as BSS for billing and customer care and OSS for network operational management. The result is that each MNO will need to be examined individually.

3.4 Identification of input data through mobile network operators surveys – the first step in designing the cost model

The first step in designing the model is to define the information required to build an evidence-based cost model, i.e. the basic cost elements. These data must mirror the operating model within and between MNOs. Examples of data elements include:

- share of the costs of network elements relevant to roaming and their costs of operation;
- and
- costs of BSS infrastructure for mobile services and for any fixed-line carriers which share in the costs of an IMR communication.

The cost model will thus be bottom-up in nature, as the model aggregates total costs from the various elements in the major cost centres with their sub-systems and elements (Figure 6).
The wholesale charges are a separate addition, as illustrated in the figure above. Although these charges are in theory dependent on actual costs, they are often seen as arbitrary in magnitude.

NRAs gathering the required cost data must rely on surveys of the cost structures of the domestic and visited MNOs involved, using confidential questionnaires. Example templates of such questionnaires are available from ITU.

### 3.5 Mechanisms for calculation – business process analysis

As mentioned, the mechanism for cost estimation depends on BPA drawn from the various situations common to roaming. To obtain the functional requirements for roaming, these business processes can in turn be defined and constructed using the common *use-cases*, i.e. the everyday ways in which subscribers use their mobile services, to characterise by the chain of MNO business processes involved in handling a call (Figure 7).

The requirements of the use-cases illustrate and define the business processes and their support needs (e.g. for specific network elements and BSS software, hardware and human resources), and therefore the cost structure of an IMR service. There are four main use-cases, or situations, for roaming in a visited country, i.e. examples of how consumers actually exploit their ability to roam (Figure 8).

These four main use-cases for roaming may vary in their composition by:

- pre-paid or post-paid billing; and
- media – voice, or data, or SMS.

At its simplest, this represents 16 possible use-cases in total, varying by billing mode and limiting conditions (for voice: $4 \times 2 = 8$; for SMS: $3 \times 2 = 6$, as receiving SMS is *usually* free; for Data: $1 \times 2 = 2$, if uploading and downloading data from the internet are the same price and may be in the same session; leading to the total of 16).

### 3.6 Cost analysis based on use-cases for voice roaming

The model then uses the use-cases to identify the BSS elements and networking elements involved. From these, the mark-up of the roaming cost over the domestic cost can be estimated. Doing this in detail demands information from the MNO. In Table V, we give an overview example of what a costed implementation following the use-case of a voice call (use-case (1a) in the above diagram) might yield, following its verification from the MNO survey.

![Figure 7](image-url)
**Figure 8 Roaming use-cases**

Key business processes for the roaming phases

- Handle sign-up when arrive in visited country

**Common USE-CASES that define the roaming business processes**

1. Place call inside visited country  a) to another mobile, off-net or on-net or b) to a fixed line subscriber
2. Place call to home – a) to a mobile or b) fixed termination
3. Receive call from home, a) from a mobile, or b) fixed source
4. Place call while in visited country to a 3rd country a) to a mobile or b) to a fixed termination

Return to home network and re-register

**Table V Use-case for calling inside visited country – example of voice roaming assets and their extra costs**

<table>
<thead>
<tr>
<th>Use-case activity for call to another mobile in the visited country</th>
<th>Assets – to be verified from NRA questionnaire with MNOs, with actual opex and capex costs; includes staff, IT systems and ops centres</th>
<th>Percentage extra on domestic load, capex and opex pa – (to be MNO verified) for all assets – estimated approximations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visited network – receives request for call</td>
<td>Visited RAN, Interconnect Gateway, LD and Core network, TAP file generation, operational staff for home and visited network Billing system assets and operations VLR and network elements</td>
<td>~5% extra network elements over domestic; effort varies with roaming numbers: ~5% extra over domestic in assets and operations; cost/visiting subscriber varies with roaming numbers: reduces with volume</td>
</tr>
<tr>
<td>Visited network - checks IMSI against VLR and call destination and triggers BSS billing subscriber databases to set up charging, according to whether pre-paid or post-paid and any limits and IOT conditions (eg one minute minimum, then by second) Visited network – routes call to local subscriber and then accumulates the CDRs for mediation processes at international wholesale level with fraud and limits checking – real time if pre-paid Visited MNO BSS and Billing system - makes Wholesale charge to home MNO - via TAP file - under IOT agreement for the call, with conditions applied – eg on time and length of call using a pre-set rating involving billing engine and mediation platform Home MNO BSS Billing system calculates subscriber charges Home MNO BSS Billing system: makes retail charge to subscriber for the call – either debits pre-paid credit file or adds charge to post-paid contract, in each case with appropriate with mark-up</td>
<td>Visited MNO’s RAN and core network Visited MNO’s billing system with temporary subscriber file and mediation</td>
<td>Little or no extra over domestic. Also extra volume reduces cost per call transaction</td>
</tr>
<tr>
<td>Home MNO BSS Billing system: makes wholesale charge to home MNO - via TAP file - under IOT agreement for the call, with conditions applied – eg on time and length of call using a pre-set rating involving billing engine and mediation platform Home MNO Billing system using roaming rates and TAP file Home MNO Billing system</td>
<td>Generation of TAP file under IOT policy rules Possible use of EDI system for exchange of IOT data in TAP file</td>
<td>&lt;5% extra for billing and other BSS over domestic in assets and operations; cost/visiting subscriber varies with roaming numbers: reduces with volume</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;5% extra costs for billing system added features</td>
</tr>
</tbody>
</table>

No extra cost
Note that each of the steps above will involve three elements:

1. staff costs of handling extra call volumes and the roaming business processes;
2. network elements, both hardware and software, including additional capacity for greater calling volume, including extra effort and systems in NOCs; and
3. extra software for billing and customer care, with the IT infrastructure such as extensions to data centres and/or IT support systems including call centres.

The assets and their costs as shown are only examples that must be verified with actual OPEX and CAPEX costs using MNO accounts collected by an NRA questionnaire survey. As noted above, in Table II, the added costs for the network elements, systems and processes are for:

- extension (for volume) of inter-operator gateways for data traffic in both the home and visited network[4];
- extension (for volume) of the home network and of the visited network; and
- new components in the home network and the visited network.

These added costs also affect the level of the negotiated IOTs. For all use-cases, the costs of negotiating wholesale commercial agreements with corresponding foreign MNOs must be included. Here, the balance of market power between MNOs and MNO groups may intrude. IOTs can vary in such a way that leads to asymmetric levels of charges for terminating and originating calls. Smaller MNOs may use a roaming exchange to purchase a bundle of pre-agreed IOT packages.

### 3.7 Cost analysis based on use-cases for data roaming

Here, we consider data roaming for applications such as email, Web browsing and file transfer by mobile subscribers – a focus on mobile access to the internet. In the future, this may embrace IP voice with VoIP and VoLTE for LTE. Mobile, or nomadic, devices used are more variable, including smartphone handsets, tablets and laptop PCs with UMTS/LTE modems (‘dongles’).

The cost situation is to some extent more complex than for voice with so many different technology options for data that can affect underlying costs. Roaming data tariffs have changed rapidly over the last decade at both retail and wholesale levels – and the EC claims its price caps have reduced data roaming pricing by up to 91 per cent inside the EU community. But it should also be remembered that these differences usually affect domestic data sessions equally. Roaming for pre-paid data customers may involve some additional investment by operators for signalling and billing systems, to operate in real time or near-real time, to keep up with roaming subscribers’ credit levels. This requires rapid signalling for subscriber authentication and authorisation of roaming. Such measures are less of a requirement for post-paid services when roaming because as soon as the subscriber first switches on the handset abroad, the visited network checks in real time whether the home MNO authenticates the subscriber and then authorises roaming. For pre-paid subscribers, all the call data records (CDRs), are sent to the home MNO[5]. For post-paid, the details on each data session and SMS may be sent to the home MNO with some delay – possibly of several days. For pre-paid roaming, in addition to the initial authentication step, the call-related data must be exchanged between the visited and home MNOs and processed in real time. A specific mediation and billing system enhancement, CAMEL (ETSI, 2017) (Customized Applications for Mobile networks Enhanced Logic) is added to monitor and halt the roaming mobile subscriber pre-paid account before it is overdrawn.
The data carriage architecture, and its costs, depends on the data packet transport technology used. Data advances have evolved from kbps with 2G GSM over circuit switching into 3G UMTS packets, while new generation LTE may offer some forms of backward compatibility. The 2G advances include GPRS and EDGE (Enhanced Data rates for GSM Evolution)[6] and for 3G, extensions such as high-speed packet upload and download (HSPUA and HSPDA) are widely used, wherever 4G (LTE) is not dominant. 3G networks internally do not usually offer end to end native IP-based service, although its evolution, LTE, does. Instead, the data portion of the traffic is carried[7] via gateways into IP-based networks. Whatever generation of mobile network used, subscribers are attached via two major transport routes for data, which impact the networking elements employed and so its cost structure also:

1. via the internal packet switching structure for data only for 3G[8] or its 2G equivalent; or
2. as soon as possible into an internet gateway as an IP packet stream[9] for carriage between MNOs or to intermediate FNOs.

LTE networks, largely following the second model for data transport, may use the Diameter signalling service standard for IMR across the 2G and 3G generations of mobile technology as well as Wi-Fi, via a dedicated IP packet switch (Cellular News, 2013) (Figure 9).

Offloading mobile data carriage, by alternative routing with Wi-Fi, is also being increasingly invested in by MNOs, by connecting to the Wi-Fi interface in the handset over a WLAN. The overall aim is to reduce mobile traffic in the RAN mainly, but also in the core fixed network. If the MNO enters fully into the Wi-Fi offload market it may invest in a high density of Wi-Fi hubs, plus their backhaul, and perhaps co-locate Wi-Fi at its most appropriately sited mobile BTS. Connection via Wi-Fi may require expansion of the sending and receiving internet gateways, if used for Wi-Fi also.

For billing, data sessions may be somewhat different to voice, as the download and upload data streams may be charged at different rates[10]. It is also possible to differentiate tariffs on speed only. Actual bit rates may vary with the radio signal quality and network speeds to particular websites, so that, depending on the MNO, uplinks might be slower (and in theory cheaper). Often the MNO’s “guaranteed” advertised data rates are elusive in practice.

Figure 9 Mobile internet access paths vary with generation of mobile technology

Source: ETSI (TS 101 393 and others)
For the wholesale rates of IOTs for inter-MNO charging for data, there are various models, often reflected in retail tariffing. For instance, two common ones are:

1. a flat rate per MB charged with billing increments, e.g. every 100 kBytes or every kByte for any total number of bytes; and

2. steps in a data session by volume: the steps in data volumes are rated differently e.g first MB at X currency units, then the following 10 MB at Y, with the following 100 Mb at Z – i.e. high-volume sessions have lower rates.

Costs depend on the generation of data architecture in use, but all architectures indicate high entry, or one-time costs, followed by lower expansion costs for major surges in data volumes. Real costs per MByte depend on volume of data. Thus, as traffic builds, the justification for a mark-up over domestic data charges may become less justified. The wholesale charges sought by MNOs reflect the roaming data volume and their revenues from roaming; generally, the higher the volume, the lower the wholesale price sought for IOTs. Thus, IOTs also reflect the volume of traffic expected – and the revenues for the MNO from that, just as for voice – for both the visited and home MNO. However, recent cases indicate that for data roaming, the MNOs may still not be very logical in charges as the so-called “bill-shock” cases illustrate (Cellular News, 2012). Thus, scrutiny of IOTs for data roaming may provide some surprising levels of tariffs (as the case of roaming between Sweden and Norway by overlap error at the frontier, for instance, has shown).

As noted above, tariff bundles complicate the retail pricing side, especially for data. The easiest tariffs to understand are the linear tariffs, as their pricing, such as per MB or used minute for voice or SMS for texting, is easy to compare with other linear tariffs. But in many cases, prices are not linear but volume related with limits, and excess charges per MB, per voice minute and per SMS or (especially for infrequent travellers). The charges for exceeding the limit are at a higher rate. Generally, prices are higher for customers with a linear tariff subscription than for others. Alternative linear roaming tariffs are offered by many MNOs. Most of these tariffs are not restricted to a specific time period, but are applied as long as the customer does not switch to another roaming tariff. Bundles with more than one service included are offered by a significant number of MNOs. For instance, BEREC (2013) found that in the EU, 19 per cent of providers offered tariffs that include all three services (data, voice, SMS), 18 per cent offered bundles with minutes and SMS, 12 per cent offered bundles with minutes and MB and; but just six providers offered bundles with SMS and data services only.

4. Conclusion: expected benefits and further issues

4.1 Potential benefits of the cost model

Essentially, the model provides the NRA with a tool to assess an operators’ claims by going back to first principles, examining the process and its components, estimating any additional capital (CapEx) and operational expenditure (OpEx) to support IMR.

Moreover, the model is flexible, as it consists of a set of itemised costs. It is capable of being extended to forecast the cost implications of changes in operations and technologies. Its structure provides a basis for an evolving model of roaming over the years. Updating it will form an essential task as the industry advances, if NRAs are to understand the trajectory of future roaming costs from the evolving technology and business practices within the industry.

With a suitable cost model for describing expenditure and overheads, it is possible to highlight the sources of costs and compare them with the aggregated increments for roaming being applied by the mobile operators. This has substantial advantages for the
consumer, the public and particularly for the NRA’s duties to the consumer as it is possible to:

- discuss the degree of real transparency of the MNO with far more confidence from evidence of the accounted costs;
- confer with MNOs on any plans for future mobile roaming tariffs in the light of real costs; and
- evaluate MNOs on their value to the public with comparisons of roaming performance and operational profile from the business processes.

The ITU’s Study Group 3 through the international membership of the ITU has been active over the last decade on the challenges of IMR. The first international agreement of its kind on mobile roaming was reached in 2012 (ITU, 2012a, 2012b) for a global standard on roaming, and again in 2016 on methodologies for determining mobile roaming costs, referring to this cost model. In consequence since being presented in overview at the ITU Geneva in May 2014, (ITU, 2014) this cost model has received positive feedback from a number of regions and Member States. Being based on international approved standards (ITU Recommendations D[0].99 and D[0].140), it is now seeing increasing interest in regional standards for instance in the African region. ITU members are already making use of an online tool based on the methodology outlined here (ITU, 2016).

In summary, such a cost model may go further in the direction of roaming accountability and transparency, following the ITU-T in its Recommendation D-98 (ITU, 2012a). It could perhaps form the basis for further ITU Recommendations for cost-based analysis of roaming tariffs, for NRAs considering the impacts of roaming, based on ITU Recommendations D[0].99 and D[0].140, as mentioned.

4.2 The issue of inter-operator tariffs

The model does not specifically look at the gross level of negotiated wholesale agreements, IOTs, but at their underlying costs. This is because the wholesale agreements, set in IOTs, are set by negotiations in commercial consultations between operators and may be subject to various pressures – e.g. the balance of the volume of traffic of each type, inbound and outbound. Thus, IOTs have little to do with costs and are more related to the market power of operators, eventually playing a role in distorting prices. For instance, an operator may agree to a high IOT price on its roaming subscribers to assure a larger volume of visiting traffic from that foreign country MNO, which can be recharged for higher income. For such (arbitrary) conditions, basic cost modelling is less applicable, except to show a comparison of the underlying costs. Thus, the model can only highlight where the IOTs are the major sources of additional cost for a call, taking it well above domestic charges.

4.3 Gathering input data in the field from operators

Note that the cost model depends on regulators efficiently and painstakingly gathering the relevant input data for their cases. Most of the data needed to assess the costing of the operational and technical elements is not publicly available, often considered commercially confidential. This can set a limit on accuracy if it is not dealt with adequately. If NRAs possess such information, they may not be permitted to disclose it or share it with other NRAs (without explicit permission from the MNO). Furthermore, the veracity, completeness and accuracy of the data gathered from the MNOs and relevant fixed line operators define the dependability of the results. The model can be expanded, to add extra sources of costs and to revise costs. But it will always be dependent on the quality and completeness of the data input from the various operators. But if NRAs can access the cost information, usually with confidentiality conditions not to divulge it publicly, they should ensure they are permitted to use it for internal purposes of assessment of fairness and accuracy of roaming.
Sufficient relevant data should provide the mark-up and degree of justification of higher charges.

The first time this is done may be the hardest, as both sides have to go through a learning curve on understanding and performing the accounting and the business process cost attribution. A final limit is the NRA’s jurisdiction – usually national. However, for international roaming, knowledge of the costs of MNOs in foreign countries will be needed to understand if the IOTs being paid out are really cost based. There are several approaches here:

- One is to act in concert with fellow NRAs as a community across the neighbouring roamed countries, with the aim of reciprocal analyses of costs, i.e. as a group of NRAs. Various community associations of NRAs exist through which such action can be taken (e.g. BEREC in the EU and CRASA in SADC).

- The second is to request that communicating foreign MNOs voluntarily co-operate with the local NRA. Again, the regional community’s regulatory framework may be important, as a common set of rules, directives and guidelines covering the mobile sector as a regulated industry (as exists in EU). It may also fall under competition and consumer protection rules of disclosure. These statutes may be cross-border and require the correspondent MNO to reply in cases of telecommunications pricing, preferred partners and also on questions of consumer protection.

- A possible alternative approach is to obtain data from several MNOs of different sizes, using different technologies, to estimate the average of the underlying cost elements. Although an approximation, which may have regional variations, it could avoid the need to share detailed individual MNO information among all NRAs. A generalised average of costs may provide a first indicator to determine termination rates, without gathering detailed data from every MNO.

The ITU offers an online tool to demonstrate the cost analysis used in the ITU-T model and particularly the data required.

### 4.4 Scope of possible further cost areas for the cost model

There are a number of further cost categories that could be added, when significant, although some in the industry may dispute their costing significance, and whether they are appropriate in some cases:

- **Spectrum access** – costs vary by the auction prices paid by the MNOs. Thus, there may be dispute over what to include in cost estimates, as the cost of spectrum when roaming may be cheaper for the RAN (radio access network) for the roaming MNO compared to that of home MNO, indicating a possible lowering of roaming costs against the domestic call. Spectrum access cost for the subscriber may be measured in terms of licence value, estimated in price at auction per MHz, or cost per MHz per subscriber in coverage (sometime termed “cost per pop”). Licence costs may be treated as a time depreciated asset to be written off over the life of the licence, with a decreasing value as the licence progresses. For a 3G UMTS licence written off over 15 years and costing originally 6 Billion Euros (i.e. among the highest of licence fees, as paid in 2000 in the UK and Germany) and serving a peak user population of 3 million simultaneous subscribers, from a total subscriber population of perhaps 15 or 20 million subscribers, the cost per minute is a small fraction of a Euro (under a thousandth) on average. Adding additional recurring annual charges for use of spectrum of even 10 per cent per annum (to increase net licence fees by an extra 150 per cent over the licence’s operational period) would not alter this charge significantly.

- **Fraud** is an additional cost and requires appropriate measures. Fraud when roaming is particularly prevalent in certain countries and conditions – it may amount to between 1 per
cent and 5 per cent of MNO revenues, and globally accounts for some US$6bn (Mistry, 2014) A growing threat is from organised syndicates that may involve their own premium rate numbers, called by their roaming fraudsters with a post-paid SIM card activated for roaming. Individual fraud incidents are often highly organised with costs of single incidents running up to US$15m for the largest occurrences. The antidote is detection of excessive call usage to specific high premium rate numbers. By using embedded triggers in the CDR database for close-to-real-time alerts in both the home and visited MNO BSS, and/or in the roaming exchange databases, such behaviour can be detected. The CAMEL[11] modules for prepaid and real-time post-paid are specifically aimed fraud management. Problems often lie in delays in relaying roaming data. Incidents are fairly evident due to the scale of calls needed to make such sums and the brief period for accumulating charges. The GSMA has recommended a near-real time standard (NRTRDE, near real-time data roaming exchange) to counter this, with a CDR extract to be delivered to all participant MNOs in a call within 4 h. This may be applied in an international roaming and clearing exchange, as a special service in parallel with activities inside the fraud departments of MNOs. Taking roaming as some 5 per cent of total mobile traffic currently (this may increase if roaming charges are cost-based) and an estimated 8 per cent of revenues due to roaming’s more expensive tariffs, at global mobile revenues of US$1.2tn (GSMA, 2012b) then total roaming fraud at the top end may add some 6 per cent to roaming costs on top of call costs. However, when considering the additional cost of roaming fraud, comparison to domestic fraud is necessary. Domestic fraud is typically comparable in fraud rates, of the order of 1 to 5 per cent of revenues[12].

- Costs of opening up roaming routes and monitoring their operations – IMR requires agreements between MNOs and also fixed line operators to deliver calls. This obviously comes at some cost especially if it depends on multiple bi-lateral agreements. One way to reduce this is to use an international exchange, or roaming hub, with many MNO partners physically connected (via SS7 signalling). A roaming exchange hub is especially useful for the smaller operators.

- Termination rates – when fixed and mobile operators connect their customers to local domestic mobile numbers but on a different national mobile network, they pay the MNO managing that called number a wholesale charge to complete those calls. The rates that domestic operators pay each other for delivering off-net calls on their own network are termed ‘mobile termination rates’ (MTRs) within the same country, and also mobile call termination (MCT) charges. Thus, a visitor to a foreign country placing a call within the visited country will also pay local MTRs which may be charged per minute or per appropriate unit for data or SMS. This may apply to both mobile and fixed network operators terminating that call and will add to the cost of local calls while visiting. Such charges may be equally applied to international calls, but the MTR then becomes part of total wholesale (or discounted) Inter-Operator Tariff (IOT) under the GSMA STIRA framework. But the transparency of the costing is more obscure. The introduction of IOTs in the late 1990s produced a significant increase in wholesale roaming charges, as they were now detached from retail prices and MNOs had no pressures to bring IOTs in line with costs. The defence of high IOTs has been made that if they are reduced, then domestic tariffs and possibly MTRs will increase (Schiff, 2008). For instance, “lost” roaming revenues in some regional communities (such as the EU) may be compensated for by higher IOT charges for countries outside the regulated community.

Notes

1. UMTS network elements fell nearly 60% in one year in some countries as the technology rollout accelerated between 2003 and 2006 Light Reading (2004).
2. SCF Associates Ltd, from projects for design of new billing systems.
3. SCF Associates Ltd, projects on systems integration for consolidation of BSS and OSS across the EU, during the acquisition of multiple MNOs, into a single operational platform.

4. For instance, the added components may include a Global/GPRS exchange for data roaming (GRX), with costs varying with MNO size and data volumes.

5. Note that for some MNOs, a data equivalent to a CDR voice record may be used, termed an IPDR, IP Data Record, for use of IP packet streams.

6. For instance, EDGE (Enhanced Data rates for GSM Evolution) is a 2G mobile data transport technology for higher data transmission rates. EDGE can be used for any packet switched application, such as an internet connection. It offers a backward-compatible extension for data for 2G GSM, tripling capacity and performance per radio channel over a GSM/GPRS connection through improved coding and transmission. EDGE was first deployed on GSM networks in 2003 and is now a standardised part of the GSM norms (from 3GPP, ETSI).

7. Packets are carried over SSGN “tunnels”, ie as pseudo packet protocol, to GPRS routers which act as gateways to IP-based networks. The next advance in mobile networks, commonly called Long-Term Evolution (LTE), introduces more IP into mobile backhaul networks, transforming RAN networks into IP RAN networks. In LTE networks, voice packets are encapsulated into IP packets and are transmitted over IP RAN, not over the legacy PSTN network as is the case with 3G.

8. In this case, data are sent via the sending MNO’s RAN (home or visited) and its core network backhaul, into a gateway to be then routed via a fixed line data carrier, perhaps a packet network, into the receiving MNO, or, direct into second MNO, ie via a point to point MNO/FNO network. In this scheme, IP packets may also be carried in public data network packets (eg X25) which adds overhead costs and performance penalties in routing.

9. Here, access is via the RAN and core network backhaul of the visited MNO, then to an internet gateway for standard IP traffic, to be carried internationally (perhaps long distance) via a wholesale internet carrier for delivery to a browsing destination, e.g. shopping website or email server or to a second internet gateway into the (home) MNO’s RAN, for mobile to mobile IP, a cheaper route than over the alternatives described above.

10. Download may possibly be lower cost per byte and delivered at a higher data rate, while upload is slower and may be more expensive per byte, if differentiation is made that way.


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Direct vs indirect e-government adoption: an exploratory study

Rajiv Kumar, Amit Sachan and Arindam Mukherjee

Abstract
Purpose – The purpose of this study is to investigate the factors that influence direct and indirect adoption of e-government services in India.
Design/methodology/approach – A conceptual model has been proposed by integrating the factors influencing adoption of e-government services from extant literature. A quantitative technique is used for the purpose of the study.
Findings – The study classifies e-government adoption in two types: direct adoption and indirect adoption. The study has found that there is some difference between the factors influencing direct and indirect e-government adoption. Perceived awareness, perceived usefulness, trust in internet, trust in government and social influence are found to be positively correlated to direct and indirect e-government adoption. Availability of resources, computer self-efficacy, perceived ease-of-use, perceived compatibility, multilingual option and voluntariness are positively correlated to direct e-government adoption and negatively correlated to indirect e-government adoption. Perceived image is found to be significant for direct e-government adoption but non-significant for indirect adoption. Trust in intermediary is found to be significant only for indirect e-government adoption.
Research limitations/implications – The sample size of 382 may not be a proper representation of a country like India, which has huge diversity and is densely populated. The study has been conducted in India, which is a developing country. The result might not be significant for developed countries.
Practical implications – The findings of this study provide useful insights into the decision-making process of e-government users in India and similar emerging economies. These findings can be important for government officials tasked with providing e-governance services.
Originality/value – Despite the digital divide, how the government is expecting its citizens to access e-government services and derive benefits and how the needy will be able to cope with the mandatory e-government services is an interesting topic to study. This leads to a new concept of indirect adoption.

Keywords India, Adoption, E-government, Direct adoption, Indirect adoption, Intermediary

Paper type Research paper

1. Introduction

Information and communication technologies (ICTs) can serve multiple purposes from providing education to being a medium for accessing public services (Garcia-murillo and Velez-ospina, 2017). ICT has been shown to be an innovation enabler and one of the most important factors for economic growth in developed markets (Amiri and Woodside, 2017). A primary goal of United Nations, World Bank and other international organizations is to have digital equality in developing nations. Hence, governments in such developing countries are driving efforts focused on providing access to e-government services for their citizens. In India, through ICTs, government is enhancing its effectiveness and efficiency in delivering public services and empowering its citizens as well (Digital India, 2018; National E-Governance Plan, 2018). Framing e-government strategies and policies are complex exercises which encompass a variety of issues. In India, most of the state governments have taken initiatives in e-governance, which have resulted in varying degrees of success (Second Administrative Reforms Commission, Promoting E-Governance, 2008). Most of the
states/union territories in India either already have an information technology policy in place or are in the process of finalizing one. Present government has announced INR 1 lakh crore (approximately US$15bn) investment for the Digital India program (Digital India week to bring investment worth billions of dollars, 2015).

Despite these efforts, reports have consistently shown that a majority of these initiatives fail (Success and Failure in eGovernment Projects, 2008). High failure rate of e-government projects brings severe direct and indirect financial costs. Further, it damages morale, credibility and trust, preventing the benefits of e-government from being delivered. One primary reason for failure is the lack of access by citizens to these online-delivered government services. E-government project failures could be due to various other factors. It is, therefore, important to understand the adoption from a citizen’s perspective.

In developing countries, inadequate resources and limited citizens’ awareness regarding new e-government services have resulted in low diffusion and adoption of e-government services (Al-sobhi and Weerakkody, 2010). Some citizens are bound to be excluded from benefiting from e-government services, creating a gap and inequality in accessing these e-government services because of limited access to internet and little exposure to associated ICTs (Weerakkody et al., 2013). Despite low internet penetration in India (34.8 per cent of total population) (India Internet Users, 2018) and low computer literacy (less than 18 per cent of total population were computer-literate in 2014) [National Sample Survey Office (NSSO), 2018], Government of India has made it mandatory that few government services can be offered online only. A question arises that how citizens, incapable of operating computer and without internet connectivity, can access these mandatory e-government services. It is also important to understand, despite the digital divide, how citizens are getting benefited from e-government services. In this regard, many countries worldwide have established solutions and strategies for increasing access to public services by effectively facilitating the use of information technologies (Phang et al., 2005). One of these strategies involves using third-party intermediary organizations to offer additional support to citizens, thus facilitating c-adoption of e-government services (Bailey and Bakos, 1997; Weerakkody et al., 2013). Literature has classified these intermediary organizations in different forms, ranging from digital firms, such as Amazon, eBay and PayPal, to physical organizations, such as post office, travel agents and estate agents (Bailey and Bakos, 1997; Janssen and Klievink, 2009).

There are two categories of people who access public services through internet. One section accesses public services on their own directly from computer devices. They are capable of accessing government services electronically. There is another category of people who do not access e-government services directly. This category can be further classified into two. Some people are capable of operating computers and internet and have resources to access e-government services. However, they do not access these services themselves as they do not find accessing e-government services on their own to be beneficial. They generally take help of intermediaries who access these e-government services on their behalf. Another category of this type are not computer-literate and are unable to access public services electronically on their own. Such people also adopt e-government services indirectly through intermediaries or other mediums. Studies have argued that given the low literacy rate, the ability to indirectly use an e-government portal – i.e. get information from the portal with the help of a kiosk attendant who would use the portal, retrieve information and share it with the villager – was vital in making the portal accessible (Venkatesh et al., 2014). As an example, retail service providers (RSPs) are authorized agents who can book a train ticket on behalf of citizens, especially for those who are not able to book train ticket by themselves. This is an example of indirect adoption of one of the popular e-government services in India [Indian railway catering and tourism corporation limited (IRCTC), 2018]. A large number of citizens are getting benefits of online train reservation system through these RSPs.
As prior literature in the information systems and e-government realms show, there is a paucity of research that has carried out studies that investigate the indirect adoption of e-government services and explored if adoption behavior differs from the direct adoption of e-government services. As many researchers in the information systems field build their argument from a theoretical background (AlAwadhi and Morris, 2008; Carter and Belanger, 2005; Shareef et al., 2011; Viswanath Venkatesh et al., 2014), it is essential to present a practical model or framework that helps to understand the factors that affect citizens’ level of adoption for both directly and indirectly accessed e-government services. Also, given the increasing importance of intermediaries, it is important to explore adoption behavior of e-government services indirectly. This paper aims to explore indirect adoption of e-government services. It would be reasonable to expect that successful introduction and adoption of ICTs in e-government services would depend on many factors, including social and attitudinal factors. Are these factors the same for direct and indirect adoption? This study tries to answer this question.

2. Literature review

E-government adoption is a key area of research. Studies associated with e-government adoption have mainly focused on factors that impact citizens’ attitudes toward e-government (Al-Shafi and Weerakkody, 2010; Carter and Belanger, 2005; Rana et al., 2016; Shareef et al., 2011; Sharma et al., 2012; Venkatesh et al., 2014; Wangpipatwong et al., 2005). A primary condition for successful implementation of any information technology project is users’ acceptance and adoption (Weerakkody et al., 2013). Users’ attitude to use and adopt new technologies may determine the success or failure of such projects (Pinto and Mantel, 1990). Users’ acceptance of technology refers to the “initial decision made by the individual to interact with the technology” (Venkatesh et al., 2003). Numerous theories and models have been used to examine users’ adoption of information technology. For example, technology acceptance model (TAM) (Davis, 1989), diffusion of innovation (DOI) theory (Rogers, 1995), theory of reasoned action (TRA) (Fishbein and Ajzen, 1975), theory of planned behavior (Ajzen, 1985), motivational model (Igbaria et al., 1996), model of PC utilization (Thompson et al., 1991), social cognitive theory (Bandura and Cervone, 1986) and the most recent unified theory of acceptance and use of technology (UTAUT) (Viswanath Venkatesh et al., 2003) have been used. These models aimed to explain user behavior and usage of new technology with a variety of independent variables. The UTAUT model was proposed on the basis of similarities of the independent variables from the models cited above. Similar to technology adoption, there are proposed e-government adoption models that applied previous technology adoption models.

The literature on citizen adoption of e-government initiatives is somewhat fragmented. However, in recent years, researchers have begun to integrate approaches into models to identify significant factors and the relationships among factors, which influence the adoption of online government services by citizens. A major advantage of this technique is that the integration of approaches can reduce the limitations of the individual approach (Gilbert et al., 2004).

E-government adoption model by Gilbert and others (Gilbert et al., 2004) combines attitude-based constructs from DOI theory (Rogers, 1995) and TRA (Ajzen and Fishbein, 1980) with aspects of service quality from TAM theory (Davis, 1989). Attitude-based approaches are supported by the behavioral theory that links perceptions to user intentions so that they can be useful in linking attitudes to behaviors by combining attitude-based approaches with service-based approaches. The dependent variable in these models is the willingness of citizens to use e-government services, while independent variables are perceived relative benefits and perceived barriers in using e-government services. The perceived relative benefits variable includes the avoidance of personal interaction, control, convenience, cost, personalization and time. The perceived barriers variable includes confidentiality, ease-of-
use, enjoyment, reliability, safety and visual appeal. This model includes age as a factor that can influence the adoption of e-government initiatives.

A comprehensive e-government adoption model developed by Carter and Belanger (2005) combines constructs from TAM (Davis, 1989), DoI theory (Rogers, 1995) and Web trust theory (McKnight et al., 2002). It combines compatibility, relative advantage, image and complexity from DoI theory (Rogers, 1995), perceived ease-of-use (PEOU) and perceived usefulness (PU) from TAM (Davis, 1989) and trust of internet and trust of government from Web trust theory (McKnight et al., 2002). This model can be applied to a wide range of e-government initiatives at local, state and federal levels.

3. Theoretical framework

As we have mentioned in the Introduction, the existing literature on e-government has not adequately presented a comprehensive framework for direct and indirect e-government adoption. We have tried to identify the constructs from our detailed literature review in conjunction with the insight from different theories related to DoI, technology adoption and behavioral, social and cultural characteristics. Consequently, this study is exploratory in nature. Rather than testing any specified theory of e-government adoption, we are conducting this research with the objective of developing a theory of direct and indirect e-government adoption. For such an exploratory study, refinement of variables and hypotheses is typical and also a part of the theory development process (Stevens, 2012). So, we continue to refine exogenous variables and hypotheses to develop final paradigms of direct and indirect adoption of e-government services. Table I lists the hypotheses for direct and indirect adoption. A model depicting the factors influencing adoption of e-government, both directly and indirectly, is presented in Figure 1.

4. Research methodology

4.1 Measures

To assess the research model proposed for this study, a questionnaire survey was used. Survey items were adapted from previous studies (Carter and Belanger, 2005; Carter et al., 2016; Davis, 1989; Gefen and Straub, 2000; Jarvenpaa and Staples, 2000; Moore and Benbasat, 1991; Pavlou, 2003; Shareef et al., 2011; Slyke et al., 2004; Vassilakis et al., 2005; Weerakkody et al., 2013) with modifications keeping in mind the context of e-government adoption in India. A five-point Likert scale (interval scale) was used to measure responses to the statements in the research questionnaire on a scale from 1 (strongly agree) to 5 (strongly disagree). Because English is not the first language of India and most Indians are not fluent in English, the questionnaire was also prepared in Hindi, which is the popular mother tongue spoken in India. Back translation was used, with the questionnaire translated from English to Hindi first and then from Hindi to English.

The questionnaire consisted of 56 questions, including demographic queries. A pre-test was done using five researchers and three practitioners to improve the questions and enhance the comprehension of respondents before final distribution (Saunders et al., 2009). This pre-test resulted in a minor amendment to the wording in five questions.

4.2 Data collection

Both paper-based and online survey were used to collect data. To test the hypotheses by using a proper sample, the self-administered questionnaire was distributed randomly among 671 citizens across a broad diversity of citizens from several communities during the period from August 2016 to January 2017. We also personally met the respondents and requested them to fill the questionnaire. The selection of participants, from different geographical areas, was deemed essential to obtain increased generalizability of results.
Data were collected from village, town, city, academic institutions and government and private organizations. Academic institutions were targeted because students with diverse background from all corners of the country study here. Similarly, government and private companies have employees from a diverse background. We received a total 439 responses; however, 57 of these were discarded because of incomplete answers. Ultimately, we used 382 responses for our statistical analysis, which indicates an effective response rate of around 87.02 percent.

### 4.3 Data analysis

We used factor and regression analyses to analyze our data. The specific tool we used was SPSS (version 20). We verified the sample’s representativeness by demographic analysis,
as shown in Table II. As ICT behavior and e-government usage is a relatively new trend in a developing country like India, the sample shows that interested respondents are relatively young, which is logically acceptable.

Identifying influencing factors for indirect adoption of e-government services is a new area. As the nature of the study is exploratory, we revised the adopted questionnaire. Scales were also modified accordingly to suit the Indian context. Reliability and validity were assessed for the multi-item scales variables. Reliability was assessed based on Cronbach’s $\alpha$ values (Cronbach, 1951). All constructs were found to be reliable ($\text{Cronbach’s } \alpha > 0.70$) (Table III). Cronbach’s $\alpha$ values were chosen to examine the internal consistency of the collected data. We have conducted exploratory factor analysis (EFA). Those items which were loaded less than 0.40 or cross-loaded more than one factor were removed (Stevens, 2012). Table III shows the loading and cross-loading from a factor analysis (varimax rotation). All loadings were greater than 0.60, and cross-loadings were below 0.35, supporting internal consistency and discriminant validity.

EFA analysis retained all the 13 independent constructs as the pursuing factors of e-government service adoption. Among the 56 measuring items, items AOR1, TG2, TOIR2, TOIR4, and PI3 were removed. The remaining measuring items were loaded according to the definitions of the respective constructs. Finally, we retained 13 constructs with 51 measuring items.

4.4 Results

Table IV shows the results of the model testing. The various determinants well predict e-government portal use. The results show that only $H7b$ was not supported. The model explains 77.27 per cent of the variance in citizen adoption of e-government. Because the overall model is significant ($p = 0.000$), significance of each variable on e-government adoption (both direct and indirect) was tested. Table IV illustrates which hypotheses were supported.
5. Findings and discussion

Researchers and practitioners have paid little attention to the factors related to a citizen’s adoption of e-government initiatives. Moreover, a majority of e-government studies have focused on developed countries such as the USA and UK (Bélanger and Carter, 2012; Carter et al., 2016). As stated earlier, there is a paucity of research discussing influencing factors for indirect adoption of e-government services. As intermediaries play an important role in reducing the digital divide, adoption of e-government services through intermediaries (i.e. indirect adoption) is an important phenomenon that requires further understanding. This study has taken a step forward in this regard. This study did a comparative analysis of the factors that influence direct and indirect adoption of e-government services. We also discussed prior research on e-government adoption and also extended the discussion on ICT adoption and use in developing countries (Ahmad et al., 2013; Bélanger and Carter, 2012; Carter, 2008; Liang and Lu, 2013; Rehman et al., 2012; Shareef et al., 2011; Weerakkody et al., 2013).

The results depict that when citizens are aware that there exists an alternative to the physical mode of delivering of government services, such as e-government, they might be interested in it. Perceived awareness (PA) about e-government services and its benefits influences citizens’ intention to adopt this mode of service. If e-government services are perceived to be advantageous, citizens will most likely adopt it. Further, if they have resources and sufficient technological and psychological ability to use it, they will access it directly. Otherwise, they try to adopt it indirectly via intermediaries. Hence, PA is found to be

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significant for both direct and indirect adoption. On the other hand, availability of resources (AOR) and computer self-efficacy (CSE) are found to be significant for direct adoption and negatively significant for indirect adoption.

When citizens perceive that accessing e-government services is useful, they use it either directly or indirectly through intermediaries. System acceptance will suffer if users do not perceive a system to be useful and easy to use (Davis, 1989). Hence, PU is a significant predictor of direct and indirect e-government adoption.

Multilingual option (MLO) could be a major issue for citizens, whose first language is not English, in accessing e-government websites. The result also shows that MLO is significant for both direct and indirect adoption. MLO is negatively significant for indirect adoption because citizens who are not able to understand a website’s language may approach intermediaries. However, from demographic analysis, we found that almost 51.30 per cent of the respondents have their vernacular different from English and Hindi. Most of the Indian government web pages, especially central government websites, are written in English; some are also in Hindi. However, some state government websites are designed in their respective local language. Hence, it was found that language is an influencing factor in

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**Table III** Reliability and factor loadings and cross-loadings (EFA)

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**Cronbach’s α** 0.871  0.888  0.899  0.867  0.873  0.878  0.844  0.828  0.806  0.776  0.828  0.735  0.776

**Note:** Loadings less than 0.40 are not shown.
adopting e-government services, both directly and indirectly. Results show that MLO is significant for direct adoption and negatively significant for indirect adoption of e-government services. A similar argument is drawn for PEOU.

We also find that perceived image (PI) influences the direct adoption and use of e-government, whereas it does not influence the indirect adoption of e-government. As discussed, PI refers to citizens’ perception that adopting e-government services portray them superior to others in the society. Direct interaction with e-government systems, instead of using traditional government offices or adoption through intermediaries, reflects a perception of superior status. This is also supported by Dol and theory proposed by Moore and Benbasat (1991). However, adoption of e-government services indirectly, i.e. through intermediaries, does not reflect any superiority to others in the society. Therefore, PI was not found to be significant for indirect adoption of e-government services.

Results show that higher levels of perceived compatibility (PC) is associated with increased intentions to adopt e-government directly. Compatibility construct has cultural, behavioral and social aspects. It is dependent on individual characteristics, such as avoiding personal interaction and social influence (SI) (Shareef et al., 2011). Several researchers have indicated that specific characteristics of e-governance that allow citizens to avoid personal interaction might create the perception of compatibility among citizens while adopting an e-government system (Gilbert et al., 2004). However, PC was found to be negatively significant for indirect adoption of e-government. We argue that individuals not compatible with e-government services will either use conventional mode of accessing e-government services or access e-government services through intermediaries. However, government offices are limited by their office hours. Indian government offices are less easy to access, besides the involvement of corrupt practices. Citizens tend to avoid these limited office hours and corrupted general atmosphere. Hence, they may reach out to intermediaries to access e-government services indirectly.

Trust in intermediary (TIR) was found to be positively significant with indirect adoption and insignificant for direct adoption of e-government services. Study of Weerakkody et al. (2013) revealed that building trust in an intermediary would be closely relevant to e-government services adoption. Citizens need to submit their personal information to the e-government portal through an authorized third-party organization, which is an intermediary (Al-Sobhi et al., 2010a, 2010b). It is therefore critical toward indirect adoption that intermediaries

### Table IV
Predicting e-government adoption (direct and indirect)

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>Hypothesis</th>
<th>Direct adoption</th>
<th>Indirect adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Beta value</td>
<td>p-value</td>
</tr>
<tr>
<td>PA</td>
<td>H1a</td>
<td>0.419</td>
<td>0.000</td>
</tr>
<tr>
<td>AOR</td>
<td>H2a</td>
<td>0.756</td>
<td>0.000</td>
</tr>
<tr>
<td>CSE</td>
<td>H3a</td>
<td>0.548</td>
<td>0.000</td>
</tr>
<tr>
<td>PEOU</td>
<td>H4a</td>
<td>0.547</td>
<td>0.000</td>
</tr>
<tr>
<td>PC</td>
<td>H5a</td>
<td>0.698</td>
<td>0.007</td>
</tr>
<tr>
<td>PU</td>
<td>H6a</td>
<td>0.322</td>
<td>0.000</td>
</tr>
<tr>
<td>PI</td>
<td>H7a</td>
<td>0.185</td>
<td>0.015</td>
</tr>
<tr>
<td>MLO</td>
<td>H8a</td>
<td>0.175</td>
<td>0.000</td>
</tr>
<tr>
<td>TI</td>
<td>H9a</td>
<td>0.197</td>
<td>0.002</td>
</tr>
<tr>
<td>TG</td>
<td>H10a</td>
<td>0.578</td>
<td>0.000</td>
</tr>
<tr>
<td>TIR</td>
<td>H11</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>H11a</td>
<td>0.154</td>
<td>0.000</td>
</tr>
<tr>
<td>VO</td>
<td>H12a</td>
<td>0.208</td>
<td>0.024</td>
</tr>
</tbody>
</table>

**Notes:** S (+): positive significant; S (–): negative significant; NS: non-significant; and NA: not applicable
perform their jobs honestly, giving utmost importance toward safety and security of personal information.

Trust in internet (TI) and trust in government (TG) are found to be significant for both direct and indirect adoption of e-government services. Citizens who perceive the reliability and security of the internet to be low will be less likely to adopt e-government services either directly or indirectly. The direct adopters and indirect adopters are well aware of internet-related risk through news channels, peers or from other source(s) of information. Hence, they are concerned about internet risk, and therefore, TI becomes important. Through accurate and consistent delivery of services, government must assure citizens that e-government is both safe and beneficial. Government must take necessary steps to provide a robust and secure infrastructure backbone and convey the steps taken through multiple communication channels to assure citizens that online transformations are safe and secure for them. Respondents have expressed that TI and TG are significant predictors of e-government adoption. Privacy and security are critical issues in e-government adoption (Belanger and Janine, 2006; Carter and Belanger, 2005). Hence, fear of misuse of data and threat to their privacy may restrain citizens from using e-government service either directly or indirectly.

The findings of this study suggest that SI plays an important role in determining the direct and indirect acceptance and usage behavior of e-government. SI is found to be positively significant for both direct adoption and indirect adoption of e-government services. The study by Fishbein and Ajzen (1975) argued that SI is the determinant of behavioral intention. SI has a direct effect on intention because people may choose to perform a behavior, even if they are not inclined toward this behavior or its consequences. If citizens believe one or more important referents and think they should access e-government services, then they are sufficiently motivated to comply with the referents (Venkatesh and Davis, 2000).

Voluntariness (VO) is found to be positively significant for direct adoption and negatively significant for indirect adoption of e-government services. This finding of VO being positively significant for direct adoption is consistent with previous studies (Agarwal and Prasad, 1997; Karahanna et al., 1999). The influence of VO on the intention to use is also similar to previous findings, which noted the perception of freedom of choice has a positive effect on intention to use. On the other hand, inverse significance of VO for indirect adoption indicates that if certain government services are mandatorily made available only through online, users who are incapable or have a lack of resources to access e-government services will be forced to access these services through an intermediary. The argument is also supported by earlier research by Karahanna et al. (1999), who stated that “the less voluntary the behavior, the less one’s attitude toward usage predicts use”.

In addition to extending knowledge in this area, our study is one of the first to provide a comprehensive model regarding the adoption of e-government services, both directly and indirectly. We found support for our model in some variables that were found significant for direct adoption; some other variables were inversely significant for direct adoption. Moreover, we found few variables to be significant for indirect adoption, and few other variables negatively influenced indirect adoption of e-government services. The variance explained is 77.27 per cent. The significance of the predictors and the magnitude of variance explained suggest that our model provides a good explanation of e-government adoption.

6. Conclusion

The objective of this research was to understand factors that influence citizens to use e-government services directly and indirectly. Specifically, we hypothesized 13 adoption factors as predictors of e-government services use. Our study on Indian citizens supported our proposed model. Our work explores knowledge regarding the factors that are related to
using e-government portal indirectly. As our study focuses on a developing country, i.e. India, this research not only contributes to and extends previous research on e-government but also has significant implications for research about the digital divide and ICT use in developing countries. As many governments, especially in developing countries, around the world are increasingly implementing ICT-based initiatives, our study is timely and provides insights that could drive the success of ongoing initiatives to bridge the digital divide.

The findings can be put to use by the practicing managers for reducing the digital divide between rural and urban areas in developing countries. The discussion and recommendations presented in this paper would be valuable for various agencies, both from public and private sectors, as well as policy-makers, for the effective implementation of e-government services and bridging the digital divide. The approach discussed in this paper offers an effective way to diffuse e-government applications and services in other developing countries, particularly in ICT resource-constrained nations.

7. Limitations and directions for future research

As an adequate empirically supported research is not available, this study is at an exploratory level. Thus, limitations of exploratory research apply to this study. It has several other limitations. First, the sample size of 382 may not be a proper representation for a country like India, with huge diversity and having a population of around 1.25 billion. Though we have considered a sample that is representative of the target population, certain inherent bias could not be avoided, despite the best efforts of the researcher. Though India is a good place to study the e-government adoption behavior, this study can be replicated in several other countries to generalize the study and to validate the theory.

We have developed our theoretical framework considering the general aspects of a developing country. As a result, we have predicted some exogenous (explanatory) variables (AOR, CSE and TIR), which might not be significant for developed countries. However, these might have enormous value for developing countries. Also, MLO may not be significant for countries having a single language. Therefore, for generalizing the model, this study should be conducted in some other developed countries.

References


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Perception of corruption in e-government services post-launch of "Digital India": role of demographic variables

Stuti Saxena

Abstract
Purpose – The purpose of this paper is to underline the role of demographic variables as far as the perception of corruption among the Indian respondents is concerned.
Design/methodology/approach – Hierarchical regression analysis is conducted to ascertain the role of demographic variables in line with the study’s objectives.
Findings – Gender is a demographic factor that influences the perception of corruption by the respondents. Other demographic factors including education, marital status, professional status and age do not have any influence on the user perception of corruption in e-government services. Implicitly, there are differences in the manner in which men and women perceive the prevalence of corruption in India. Therefore, males perceive that corruption has decreased in e-government services post-launch of “Digital India” initiative and women perceive the opposite.
Research limitations/implications – On the one hand, the study holds significance, in that no empirical investigation has been conducted which seeks to underline the impact of the “Digital India” initiatives on the citizen’s perception of corruption in public services. On the other hand, the present research is limited in the sense that only demographic variables are being probed in the present study with a small sample.
Originality/value – Studies in developing countries have remained few and far between despite the growing concern for existence of corruption in government services. The present study seeks to fill the gap by underlining the role of demographic variables as far as the perception of corruption in public services is concerned in the Indian context.
Keywords India, Corruption, E-government, Digital India
Paper type Research paper

1. Introduction

The call for transparency and public accountability in administration has remained a major concern in developing and developed countries (Singh et al., 2010). Therefore, government innovations are being undertaken for ensuring that public services are delivered in a smooth and efficient manner. However, in societies ridden with the menace of corruption, achieving the over-arching goals of governance is difficult (Foo et al., 2014; Krishnan et al., 2013). For this purpose, governments have been introducing a series of innovations to ensure transparency in administration. Government innovations are conducted to ensure social transformation (Barrett et al., 2001; Krell et al., 2016) and reform of administration (Walsham and Sahay, 1999). One of these innovations is that of e-government by which information technology (IT) applications are tapped for public service delivery (Ndou, 2004) and to bring about efficiency, economy and effectiveness in administration (Ciborra, 2005; Zhao and Xu, 2015). Research has underlined that e-government initiatives help in checking red tape and inefficiency in government (Cullen, 2009). Corruption is a measure of government inefficiency (Asogwa, 2012; Belwal and Al-Zoubi, 2008; Ciborra, 2005; Valle-Cruz et al., 2016) and while
e-government reforms facilitate governments to promote good governance (Ciborra and Navarra, 2005; Shim and Eom, 2008) by delivering timely, economic, efficient, effective and consistent services (Bussell, 2011; Dominguez et al., 2011), corruption in e-government services may fail to achieve such aims. From a developing country’s perspective, the Indian government has initiated a number of administrative reforms with the underlying purpose of instituting a transparent administrative culture in the country (Pathak et al., 2009; Singh et al., 2010). Recently, India launched its “Digital India” initiative with the aim of streamlining its public service delivery and furthering transparency in administration. For the present research, we will underline the role of demographic variables as far as the perception of corruption in government services is concerned with particular reference to the “Digital India” initiative.

In this study, the theoretical framework is being provided using the institutional theory view. Hitherto, institutional theory has been probed to study the public sector (Currie, 2009). Institutional theory has also been invoked to probe the innovation adoption and implementation dimensions in different contexts (DeVaujany et al., 2014). The theory also helps in underlining the extent to which information and communication technologies are being adapted to suit the interests of users (Zorn et al., 2011). The fundamental basis of this theory rests on the assumption that institutions adopt different practices and mechanisms for legitimizing their authority and to impress upon the stakeholders the utility and sustainability of these practices and mechanisms (Scott, 2003). Institutional theory is based on a multi-level analysis with the involvement of a multitude of stakeholders who are impacted upon or impact the planning and implementation of any institutional innovation (DiMaggio and Powell, 1983; Thelen, 1999). In the present study, the applicability of institutional theory rests on the fact that “Digital India” is an “institutional” measure introduced by the government to gain legitimacy and trust of different stakeholders. In particular, the programme was conceived as a measure to garner support of the citizens in terms of reducing corruption in public service delivery.

The key significance of this study lies in the fact that while a number of studies have been conducted to probe the theoretical dimensions of e-government innovations (for instance Anwer et al., 2016; Saxena, 2005; Sharma et al., 2015; Srivastava et al., 2016; Sutherland, 2014; Ziemba et al., 2016), there are limited studies that seek to investigate the role of e-government initiatives in curbing corruption in developing countries (Singh et al., 2010; Sutherland, 2016). Besides, there has been no study which has sought to probe the role of demographic factors in user perception of corruption in public services. This study seeks to cover the aforementioned lacuna keeping the overarching rubric of institutional theory to address the research question:

**RQ1.** What is the role of demographic variables in user perception of corruption in public service delivery in Indian context?

The paper is organized as follows: literature on e-government and institutional theory has been scanned in Section 2. Section 3 provides an overview of the hypotheses to be investigated in the study. Section 4 details the context of the study besides underlining the research methodology adopted for the present purpose. Section 5 discusses the findings of the study. Section 6 provides discussion of the findings and conclusion is given in Section 7. Finally, Section 8 provides an account of the study’s limitations alongside further research directions and Section 9 briefs the study’s implications for practitioners in government.

2. Literature review

2.1 E-government

E-government has been researched extensively. With the help of information and communication technology, governments have been making transitions to e-governments and for the achievement of this purpose, public services are being provided over the internet (Davison et al., 2005; Hasan, 2004; Mistry and Jalal, 2012;
Mutula and Mostert 2010; Naz et al., 2006; Neupane et al., 2014; Schwarze and Deane, 2003). E-governments result in improvement of quality in public services (Foley and Alfonso, 2009). For the better implementation of any e-government initiative, it is important that there is proper diffusion of e-government initiative such that the benefits post-implementation of such an initiative are being realized by the targeted stakeholders (Dehkordi and Dehkordi, 2014; Fourie, 2010; Garcia-Murillo, 2013; Zhang et al., 2014). Implicitly, the interaction between the governments and the citizens improves on account of e-government initiatives (Koutrakou, 2006). The benefits of launching e-government initiatives lie in their being targeted for citizens and reduction of corruption as well as reduction of operational cost (Saxena, 2005). E-government benefits the users in terms of saving their time and energy (Alshawi and Alalwany, 2009; Hiller and Belanger, 2001).

However, where inadequate e-government initiatives exist alongside corrupt practices in administration, users have to spend a lot of their time and money in getting the tasks done (Asogwa, 2012). At the same time, it is important that the public personnel in charge of implementing the e-government initiatives be trained adequately so that the implementation is eased at different levels (Vasiu and Vasiu, 2006). Often, e-government initiatives fail because they are unable to check corrupt practices in public service delivery. Red-tapism is one of the major factors that impact e-government initiatives adversely (Al-Madi et al., 2016; Kalsi and Kiran, 2013; Singh et al., 2010).

Research on e-government initiatives in developing countries has revealed diverse insights. E-government initiatives have been successful in curbing corruption in Iran (Saghafi et al., 2016). E-government initiative in Kazakhstan has also yielded significant results in terms of curbing corruption (Sheryazdanova and Butterfield, 2017). However, there are many instances where e-government initiatives failed to earn their desired outcomes. For instance, nepotism and favoritism marred the e-government initiatives in Nigeria (Akingbade et al., 2012). Egypt faced problems in terms of digital divide as far as e-government implementation is concerned (Reddick et al., 2012). In Bangladesh, there are challenges in achieving e-government outcomes owing to the lack of IT infrastructure, corruption, lack of trained personnel and other macro-economic factors such as poverty and illiteracy among the citizens (Faroqi and Siddiquee, 2011). Furthermore, favoritism, observance of government secrecy and lack of motivation among public officials led to difficulties in e-government implementation in Jordan (Al-Madi et al., 2016).

Academic research on e-government initiatives in the Indian context has been underway in which different dimensions have been probed. For instance, success factors responsible for implementing e-government initiatives have been probed in the Indian context wherein it has been underlined that there is immense need for taking into account the human resource policies, vision and objectives of e-government initiatives, institutionalization of a robust e-government roadmap, availability of a suitable infrastructure, establishing an action plan with definite targets and deliverables and clarity in policies regarding privacy and security (Kalsi and Kiran, 2013). In a conceptual study where five different e-government initiatives have been probed, corruption was found to be a major factor in the failed e-government implementation (Ojha and Palvia, 2012). In another study, it was found that e-government projects fail owing to factors such as lack of training, sustained leadership and commitment, institutionalization and evaluation of e-government initiatives (Kumar and Best, 2006). Likewise, it has been underlined that the lack of transparency is a major concern in developing countries such as India, Ethiopia and Fiji (Singh et al., 2010). Besides, there are issues related with cost incurred in availing public services, time taken to avail public services and red-tapism involved in availing these public services.

In the extant literature, there are many lacunas that are clearly evident. First, empirical studies seeking to establish a linkage between prevalence of corruption and the implementation of e-government initiatives have been visibly lacking. Second, most of the studies are focused on the conceptual framework and few studies have been conducted in
the Indian settings. Third, institutional theory has not been invoked in previous studies. Finally, despite the significance of “Digital India” initiatives in the Indian context, academic probe has been wanting. The present study seeks to address these concerns by appreciating the impact of “Digital India” initiatives in curbing corruption.

2.2 Institutional theory

The basic fundamentals governing institutional theory lie in appreciating the role of the symbolic, material and cultural considerations that influence the institutionalization of any innovation or policy (King et al., 1994) with the overall objective of establishing a practice, policy or innovation and ensuring its acceptability by the concerned stakeholders over a period of time (Scott, 2001; Zucker, 1977). Institutional theory has been invoked in research based on information systems (IS) and the theory serves to explain the complexity involved in predicting social phenomena (Currie, 2009). In the context of IS, institutional theory holds relevance in the sense that an entity or a process may be considered as an institution (Currie, 2009). Furthermore, the theory holds relevance in assessing the manner in which technologies are designed, used and implemented by the organizations. Conceding that “Digital India” is an e-government innovation, we aim to deploy institutional theory for the present purpose.

Institutional theory has been used to investigate the extent to which e-government initiatives have succeeded in attaining their goals of transparency and accountability in government. For instance, political, social, organizational and technological challenges have been identified as critical failure factors for implementing e-government initiatives in Qatar (El-Haddadeh et al., 2013). Institutional theory is linked with the study as it helps appreciate the underlying challenges in the implementation of e-government initiatives conceding that such initiatives were a part of the aim of the government to gain legitimacy from different stakeholders including citizens, international politics and the like. In another study focused on appreciating the success of ICT initiatives in India, South Africa and Brazil, institutional theory was referred to underline the challenges in attaining the aim of digital inclusion. Finally, in the third study based in Nigeria, it was underscored how the introduction of electronic voters’ registration (EVR) system led to problems owing to lack of political will and commitment on the part of the government (McGrath and Maiye, 2010). Therefore, the institutionalization of the e-government reform posed difficulty there. The crux of this review is that institutional theory has not been referred to appreciate the impact of instituting an e-government innovation on curbing corruption in public service delivery.

3. Hypotheses

Demographic variables may be used for understanding the willingness of citizens to adopt e-government services (Al-Somali et al., 2009; Hernández et al., 2011; Tarhini et al., 2014a, 2014b). There have been limited studies that seek to probe the direct impact of demographic variables on the adoption of e-government tools (Teo, 2001; Chan and Chong, 2013). For the purpose of the present study, five demographic variables are being examined to understand the extent to which corruption is perceived in government services post-launch of “Digital India” initiative.

The demographic variable of gender has been investigated in terms of adoption of internet technologies (Teo, 2001; Al-Somali et al., 2009; Chan and Chong, 2013; Venkatesh et al., 2014; Tarhini et al., 2014a, 2014b). The relationship between gender and internet usage was explored by Teo (2001) wherein it was found that women use internet more for messaging as compared with men. It was further shown in the same study that men use internet for downloading and purchasing items but the same was not the case for women in a significant manner (Teo, 2001). In another study, it was found that there are no differences among men and women as far as the usage of mobile technologies is concerned (Chan and Chong, 2013). In the context of the present study, it may be underlined that:
H1. Men are more likely to perceive corruption in e-government services, in comparison to women.

The second demographic variable taken into consideration is age wherein past research has shown that age has a significant influence on the adoption of computer and internet technologies (Teo, 2001; Cutler et al., 2003; Chan and Chong, 2013). Besides, research has shown that there are age variations in the ownership and usage of computers. Lower internet usage is witnessed among older users as compared with younger users (Teo, 2001). In another research, it was demonstrated how younger people are more engaged in the usage of mobile technologies as compared to the older generation (Chan and Chong, 2013). Thus, contextualizing the aforesaid for the present study, we posit that:

H2. Age is negatively associated with the perception of corruption in e-government services.

Finally, the third demographic variable considered for the present study is education. As such, limited research is focused on exploring the relationship between education and computer usage (Teo, 2001). It has been shown in the South Korean context that individuals with higher educational qualification are more likely to use internet. However, in another study, it has been found that individuals with higher educational levels are less likely to use internet for messaging and browsing activities (Teo, 2001). In another case, it was found that individuals who are highly educated tend to use computers in a more liberal way than those who are less educated (Brown and Venkatesh, 2005). It is presumable that highly educated people have relatively less time to spend on the internet (Teo, 2001). In another study, it was found that highly educated people tend to use internet for conducting transactions (Chan and Chong, 2013). Likewise, in the Indian context, it was demonstrated that there is a relationship between education and personality traits with the usage of e-government services (Venkatesh, et al., 2014). Contextualizing the aforesaid in the present study, it may be hypothesized that:

H3. Education is positively associated with the perception of corruption in e-government.

The fourth demographic variable taken into account for the present study is related to the marital status of the individual users. Previous research has underlined the implications of marital status on internet usage (Ani et al., 2007; Lu et al., 2002) wherein it has been demonstrated that married people are less likely to use internet as compared with the single users. Implicitly, we hypothesize that:

H4. Single users are more likely to perceive corruption in e-government than the married users.

The fifth demographic variable under consideration pertains to professional status and its relevance for perception of corruption in e-government. Studies have been conducted to link internet use with different professionals. For instance, the extent of internet usage among quantity surveying professionals has been probed in Hong Kong (Shen et al., 2003). In another study, internet use was investigated in terms of its usage for academic purposes among Australian academics (Applebee et al., 2000). Finally, the extent of internet usage was investigated among health care professionals (Moseley, 2004). Contextualizing the aforesaid in the present study, we hypothesize that:

H5. Professional status is a determining factor in perception of corruption in e-government.

4. Research design

4.1 Research methodology

For the purpose of the present study, we refer the Good Governance Week report published in December 2015, “Best Performing Districts Per State/UT”. In this report, examples of successful e-government initiatives were identified and ranking was done for Indian districts
across different States/Union Territories (Good Governance Week, 2015). In the present study, our purpose was served by conducting an email survey to ascertain the perceptions of users in tapping e-government initiatives post-launch of “Digital India” initiative in the country. We purposively selected respondents from the “Best Performing districts in States/Union Territories” and by adopting a convenient sampling technique, we emailed actual users of e-government “Digital India” platform to submit their responses.

4.2 “Digital India” initiative

“Digital India” (www.digitalindia.gov.in/) initiative is a combination of e-government services across different public services. As such, “Digital India” initiative has its origins in the National e-Government Plan (NeGP) which was launched in 2006. The initiative was launched under the aegis of the Ministry of Electronics & Information Technology (www.meity.gov.in). Launched by Prime Minister Narendra Modi, top CEOs from abroad committed to invest Rs. 4.5 lakh crore towards sustaining this initiative. To ensure the smooth implementation of the “Digital India” initiative, a monitoring committee was instituted under the leadership of Prime Minister. Also, there is a Digital India Advisory Group chaired by the Ministry of Communications and IT as well as an Apex Committee chaired by the Cabinet Secretary. The initiative has three “vision(s)”: to install digital infrastructure for being utilized by all citizens, provide on-demand public services and ensure digital empowerment of citizens. Besides, there are nine “programme pillars”: Broadband Highways, Universal Access to Mobile Connectivity, Public Internet Access Programme, e-Governance-Reforming Government through Technology, e-Kranti-Electronic delivery of services, Information for All, Electronics Manufacturing, IT for Jobs and Early Harvest Programmes. In total, there are about 2400 e-government services that are being provided as a part of the “Digital India” initiative. These e-government services are provided across diverse domains like election rolls, marriages, employment, etc. However, at present, only a few services may be availed by the users. While the underlying premise of launching the “Digital India” remains curbing corruption in public services, there have been vociferous demands and appeals from different quarters to curb corruption and nepotism in public service delivery and ensure greater transparency and public accountability in administration. For instance, political leaders like Anna Hazare (www.annahazare.org/anticorruption-movement.html) and Subramanyam Swamy (www.fcchk.org/tag/subramanian-swamy/) have been actively involved in voicing their demand for a transparent administration at all levels.

4.3 Data collection

For the purpose of the study, 383 email surveys were conducted across three cities (West Delhi, Chandigarh and Panchkula) which have been identified as the “Best Performing districts”. While some of the respondents were known through formal or informal channels, others were contacted through indirect or direct references. Overall, the response rate was 67 per cent out of which the percentage of actual usable questionnaires reduced to 56.65 per cent (217 responses). A five-point Likert scale was used to gauge respondents’ perceptions across different dimensions of checking corruption (perception regarding corruption in public services, extent of red-tapism in public services, time taken for securing public services, cost incurred in procuring public services, provision of a single portal for procuring public services, increased government inefficiency, extent of favoritism in public services, easier procedures to secure public services, extent of transparency in public services and grievance resolution procedures) post launch of “Digital India” initiative. We posit that with the launch of “Digital India” initiative, red-tapism, time taken for availing e-government services and cost incurred in availing e-government services should reduce; a single portal should be made available for availing e-government services; government inefficiency should decrease; favoritism
should decrease; easier procedures should be instituted for availing e-government services; transparency should increase in administration and grievance resolution procedures should not be taxing. Counted age, marital status, gender, education and professional status may be some of the demographic factors (Table I).

4.4 Scale reliability

As we invoked ten items to gauge the perception of corruption in e-government services, we calculated the reliability and internal consistency of items for which Cronbach’s alpha was computed. Cronbach’s alpha is 0.96 which is greater than the recommended value of 0.7 (Hair et al., 2010); we conclude that our scale is reliable. Furthermore, item-wise Cronbach’s alpha (Table II) supported the internal consistency in the sample in line with the general recommendations that the Cronbach’s alpha should be greater than 0.7 (Hair et al., 2010). Therefore, this provides robustness to our initial steps.

<table>
<thead>
<tr>
<th>Table I</th>
<th>Demographic profile of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td>(%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>Under 25</td>
<td>1.8</td>
</tr>
<tr>
<td>26-39</td>
<td>40.5</td>
</tr>
<tr>
<td>Over 40</td>
<td>57.7</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
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<tr>
<td>Married</td>
<td>50.2</td>
</tr>
<tr>
<td>Single</td>
<td>49.8</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>24.9</td>
</tr>
<tr>
<td>Male</td>
<td>75.1</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>4.1</td>
</tr>
<tr>
<td>University</td>
<td>12.9</td>
</tr>
<tr>
<td>Professional (specialized diploma and degree courses)</td>
<td>73.7</td>
</tr>
<tr>
<td>Others</td>
<td>9.2</td>
</tr>
<tr>
<td><strong>Professional status</strong></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>32.3</td>
</tr>
<tr>
<td>Housewife</td>
<td>16.6</td>
</tr>
<tr>
<td>Others</td>
<td>0.5</td>
</tr>
<tr>
<td>Service</td>
<td>26.3</td>
</tr>
<tr>
<td>Students</td>
<td>13.8</td>
</tr>
<tr>
<td>Unemployed</td>
<td>10.6</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Table II</th>
<th>Item-wise Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
<td>Cronbach’s alpha is variable is removed</td>
</tr>
<tr>
<td>Perception of corruption in public services</td>
<td>0.952</td>
</tr>
<tr>
<td>Extent of red-tapism in public services</td>
<td>0.967</td>
</tr>
<tr>
<td>Time taken for securing public services</td>
<td>0.956</td>
</tr>
<tr>
<td>Cost incurred in procuring public services</td>
<td>0.955</td>
</tr>
<tr>
<td>Single portal for procuring public services</td>
<td>0.967</td>
</tr>
<tr>
<td>Increased government inefficiency</td>
<td>0.952</td>
</tr>
<tr>
<td>Extent of favoritism in public services</td>
<td>0.952</td>
</tr>
<tr>
<td>Easier procedures to secure public services</td>
<td>0.951</td>
</tr>
<tr>
<td>Extent of transparency in public services</td>
<td>0.951</td>
</tr>
<tr>
<td>Grievance resolution is taxing</td>
<td>0.951</td>
</tr>
</tbody>
</table>
5. Results and analysis

5.1 Correlations

For measuring the linear association between the 15 variables under study, we calculated Pearson’s correlation coefficients (Table III). Correlations show that gender has a significant relationship with the perception of corruption in e-government services. However, there is no significant relationship among other demographic variables (age, marital status, educational status and professional status) with the perception of corruption in e-government services. Furthermore, gender continues to have a significant relationship with items such as increased government inefficiency, transparency in public services, time taken for availing e-government services, grievance resolution mechanisms, cost incurred in availing e-government services, favoritism in e-government services and user-friendly procedures for availing e-government services. Implicitly, males perceive decline in corruption in e-government services post launch of “Digital India” initiative. Males perceive that government inefficiency has declined and less time and cost are incurred while availing e-government services. However, males perceive that transparency in availing e-government services remains a challenge. Males find that grievance resolution procedures are more favorable post launch of “Digital India” initiative. However, the procedures for tapping e-government services are not user friendly and there is favoritism in availing e-government services. Correlations also show that educational status is linked with the provision of a single portal for availing e-government services. Conceding that there is an absence of a single portal for availing e-government services, highly educated individuals find it difficult to procure e-government services through multiple portals. Also, professional status is linked with the cost incurred in availing e-government services. Implicitly, students or housewives might have to pay less income tax or professional tax as compared with the salaried individuals or business professionals.

5.2 Hierarchical regression. In the second part of the analysis, we invoke hierarchical regression analysis for our purpose. The dependent variable in this case is “perception of corruption in public services” and the other items are included as independent variables. In this way, we will be able to assess the impact of independent variables on the dependent variable in terms of the variance explained by the former in the latter. First, we include the demographic variables into the analysis. Thereafter, other items are included in the analysis. It may be underlined, however, that hierarchical regression models hold their limitations in the sense that in social science research where individual responses (averages) are used as group-level predictors, misleading conclusions may result when one interprets them as “contextual effects” (Gelman and Hill, 2007). Finally, hierarchical regression models do not imply causation.

In the present case, we invoke the model as follows:

\[
\text{Perception of corruption in public services} = \beta_0 + \beta_1 \times \text{Professional status} + \beta_2 \times \text{Educational status} + \beta_3 \times \text{Gender} + \beta_4 \times \text{Marital status} + \beta_5 \times \text{Age} + \beta_6 \times \text{Extent of red-tapism in public services} + \beta_7 \times \text{Time taken for securing public services} + \beta_8 \times \text{Cost incurred in procuring public services} + \beta_9 \times \text{Single portal for securing public services} + \beta_{10} \times \text{Increased government inefficiency} + \beta_{11} \times \text{Extent of favoritism in public services} + \beta_{12} \times \text{Easier procedures to secure public services} + \beta_{13} \times \text{Extent of transparency in public services} + \beta_{14} \times \text{Grievance resolution is taxing}
\]

The first step involved in the analysis is to assess the impact of demographic variables on the perception of corruption in e-government services. In the second step of hierarchical regression analysis, the remaining variables are being inserted in the equation. Hierarchical regression results are reproduced in Table IV. It is shown that in the first step, $R^2$ is 0.042 which increases to 0.949 when the remaining variables are entered thereby contributing to the variance of the model. In addition, variables other than demographic ones contribute 94.6 per cent to the variation of perception of corruption in e-government services.
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<th>12</th>
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<th>15</th>
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<tbody>
<tr>
<td>Age (1)</td>
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<tr>
<td>Marital status (2)</td>
<td>0.03</td>
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<tr>
<td>Gender (3)</td>
<td>0.058</td>
<td>-0.152*</td>
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<tr>
<td>Educational status (4)</td>
<td>-0.07</td>
<td>-0.152*</td>
<td>0.236**</td>
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<tr>
<td>Professional status (5)</td>
<td>0.385**</td>
<td>0.041</td>
<td>0.05</td>
<td>0.047</td>
<td></td>
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</tr>
<tr>
<td>Perception of corruption in public services (6)</td>
<td>0.02</td>
<td>0.085</td>
<td>-0.182***</td>
<td>-0.069</td>
<td>0.052</td>
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<tr>
<td>Increased government inefficiency (7)</td>
<td>0.016</td>
<td>0.106</td>
<td>-0.158*</td>
<td>-0.07</td>
<td>0.012</td>
<td>0.955**</td>
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<td></td>
</tr>
<tr>
<td>Extent of transparency in public services (8)</td>
<td>-0.04</td>
<td>0.08</td>
<td>-0.164*</td>
<td>-0.089</td>
<td>0.022</td>
<td>0.928**</td>
<td>0.208</td>
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<td></td>
</tr>
<tr>
<td>Time taken for securing public services (9)</td>
<td>0.038</td>
<td>0.084</td>
<td>-0.136*</td>
<td>-0.029</td>
<td>0.02</td>
<td>0.813**</td>
<td>0.375</td>
<td>0.042</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Grievance resolution is taxing (10)</td>
<td>-0.04</td>
<td>0.101</td>
<td>-0.169*</td>
<td>-0.056</td>
<td>0.007</td>
<td>0.934**</td>
<td>0.361</td>
<td>0.012</td>
<td>0.014</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cost incurred in procuring public services (11)</td>
<td>0.047</td>
<td>0.034</td>
<td>-0.146*</td>
<td>-0.057</td>
<td>0.155*</td>
<td>0.788**</td>
<td>0.052</td>
<td>0.132</td>
<td>0.527</td>
<td>0.146</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extent of favoritism in public services (12)</td>
<td>-0.02</td>
<td>0.048</td>
<td>-0.148*</td>
<td>-0.113</td>
<td>0.026</td>
<td>0.847**</td>
<td>0.031</td>
<td>0.052</td>
<td>0.027</td>
<td>0.075</td>
<td>0.022</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Easier procedures to secure public services (13)</td>
<td>-0.06</td>
<td>0.066</td>
<td>-0.172*</td>
<td>-0.123</td>
<td>0.001</td>
<td>0.865**</td>
<td>0.185</td>
<td>0.631</td>
<td>0.142</td>
<td>0.631</td>
<td>0.175</td>
<td>0.163</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extent of red-tapism in public services (14)</td>
<td>-0.03</td>
<td>0.005</td>
<td>-0.059</td>
<td>-0.075</td>
<td>-0.02</td>
<td>0.385**</td>
<td>0.378</td>
<td>0.462</td>
<td>0.336</td>
<td>0.373</td>
<td>0.463</td>
<td>0.418</td>
<td>0.433</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single portal for procuring public services (15)</td>
<td>-0.08</td>
<td>0.014</td>
<td>-0.133</td>
<td>-0.179**</td>
<td>-0.12</td>
<td>0.326**</td>
<td>0.353</td>
<td>0.358</td>
<td>0.348</td>
<td>0.380</td>
<td>0.426</td>
<td>0.449</td>
<td>0.797</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Notes: **Correlation is significant at the 0.01 level (2-tailed); *Correlation is significant at the 0.05 level (2-tailed)
Implicitly, among the demographic variables, only gender has a statistically significant relationship with the dependent variable “perception of corruption in public services”. This result corroborates with the correlation results and indicates that males perceive decline in corruption in e-government services post launch of “Digital India” initiative. Considering the second step, we find that availing e-government services is costly. This finding may be owing to the fact that face-to-face interaction is also required in many cases to avail public services. Furthermore, while favoritism seems to have witnessed a decline, there is an increase in government inefficiency. This mixed result may be attributed to the fact that only few e-government services are active as of now and ground realities may be different from the visionary ideals espoused under the “Digital India” programme. Finally, there is low transparency in availing public services post launch of the “Digital India” initiative.

6. Discussion

The present study has underlined that while India’s “Digital India” initiative is underway, the key visions of the initiative are yet to be realized. Our results are in line with the previous research that e-government initiatives are yet to curb corruption (Belwal and Al-Zoubi, 2008; Lio et al., 2011). Correlations and hierarchical regression results show that demographic variables, except gender, have less significant influence on the perception of corruption in e-government services. Our results are in sharp contrast with the findings of a recent research where no significant difference was found to exist between men and women as far as the willingness to use e-government services is concerned (Sharma, 2015). This may be attributed to the context of study because Sharma (2015) conducted his study in Oman – a Middle East country with an entirely different culture than India (Yeganeh, 2014). Further studies are required to include more demographic variables such as income, number of dependents and assets because they might determine the extent of availing e-government services. For instance, for an elderly couple living with dependents, availing e-government services might be difficult than for the younger couple with no dependents. Furthermore, this would have an impact on the frequency with which e-government services are being availed.

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>(Step I) Dependent variable: perception of corruption in public services</th>
<th>(Step II) Dependent variable: perception of corruption in public services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0 (0.01)* (0.12)**</td>
<td>0 (0.02)* (1.35)**</td>
</tr>
<tr>
<td>Marital status</td>
<td>0.12 (0.06) (0.93)</td>
<td>–0.01 (–0.01) (–0.32)</td>
</tr>
<tr>
<td>Gender</td>
<td>–0.36 (–0.17) (–2.44)</td>
<td>–0.05 (–0.03) (–1.53)</td>
</tr>
<tr>
<td>Educational status</td>
<td>–0.03 (–0.02) (–0.29)</td>
<td>0.01 (0) (0.21)</td>
</tr>
<tr>
<td>Professional status</td>
<td>0.03 (0.06) (0.76)</td>
<td>0.01 (0.01) (0.75)</td>
</tr>
<tr>
<td>Extent of red-tapism in public services</td>
<td>–0.03 (–0.02) (–0.61)</td>
<td>–0.04 (–0.03) (–0.81)</td>
</tr>
<tr>
<td>Time taken for securing public services</td>
<td>–0.11 (–0.08) (–1.99)</td>
<td>0.08 (0.08) (2.13)</td>
</tr>
<tr>
<td>Cost incurred in procuring public services</td>
<td>0.04 (–0.06) (–0.95)</td>
<td>0.04 (–0.03) (–0.81)</td>
</tr>
<tr>
<td>Increased government inefficiency</td>
<td>0.57** (0.54) (10.13)</td>
<td>0.06 (–0.11) (–2.13)</td>
</tr>
<tr>
<td>Extent of favoritism in public services</td>
<td>–0.06 (–0.06) (–0.95)</td>
<td>0.53** (0.49) (8.38)</td>
</tr>
<tr>
<td>Grievance resolution is taxing</td>
<td>0.15 (0.14) (1.73)</td>
<td>0.06 (0.3)</td>
</tr>
<tr>
<td>Constant</td>
<td>4.21*** (9.48)</td>
<td>0.06 (0.3)</td>
</tr>
<tr>
<td>Observations</td>
<td>217</td>
<td>217</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.042</td>
<td>0.949</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.019</td>
<td>0.946</td>
</tr>
<tr>
<td>$F$-Statistic</td>
<td>1.833**</td>
<td>401.821***</td>
</tr>
</tbody>
</table>

Notes: *Beta weights in parentheses; β-t-statistics in parentheses; *Significant at 0.10 by the standard criteria; **Significant at 0.05 by the standard criteria; and ***Significant at 0.01 by the standard criteria
Results also show that corruption has not declined post launch of the “Digital India” initiative even in the “Best Performing districts”. Citizens have to incur costs in availing e-government services and conceding that the “Digital India” platform is yet to realize its full-fledged aims by providing a single portal and inclusion of many other government services, the government innovation requires much to be accomplished. Hence, as per the institutional theory, the Indian government must institutionalize the “Digital India” initiative in a streamlined manner to ensure efficiency, economy, effectiveness, transparency and public accountability.

7. Conclusion

By responding to the call of previous research that challenges and concerns of launching and implementing e-government initiatives in India should be researched (Alathur et al., 2012; Alathur et al., 2014), our study showed that despite laying down the fundamentals of the “Digital India” initiative, the actual goals are yet to be realized in terms of decreased corruption and increased transparency in public service delivery. While “Digital India” may be conceived as an anti-corruption strategy (Anderson, 2009), the actual implementation of the initiative is fraught with loopholes and citizens are not perceiving a decline in malpractices like corruption, nepotism, favoritism, etc. Furthermore, in the absence of a single portal to avail e-government services, users find the “Digital India” platform as complex and not user friendly. Finally, with few public services open for being availed through the “Digital India” initiative, it is clear that the initiative is in its early stages of growth. In line with the institutional theory that requires sustainability of any government innovation or practice (Kim et al., 2009), we conclude that “Digital India” is yet to be institutionalized in a robust manner. Apparently, “Digital India” initiative requires further diffusion and adaptation among the users (Currie, 2009).

8. Study limitations and future research directions

The study holds some limitations. First, we included respondents from three cities only and convenience sampling was used to identify the respondents. Further research is required with the inclusion of more cities and increase in the number of respondents. Second, we picked only demographic variables as the main focus variables and it would be better if more demographic variables are included in the study. Third, further research is required using a longitudinal approach wherein the impact of “Digital India” may be appreciated over a period of time as far as curbing corruption is concerned. Fourth, the quality of e-government services (Anwer et al., 2016) provided under the “Digital India” initiative needs to be probed further. Our study may be replicated in other contexts (Siddiquee, 2016) to ascertain the differences in perception of corruption among citizens via-a-vis the extent of maturity of e-government services. Fifth, theories other than institutional theory – Public Service Motivation theory (Kim and Kim, 2016), principal agent theory or self-determination theory (Andrews, 2016) – may be explored in further research. Finally, factors such as infrastructure, literacy and government size may be included as determining factors in further research to assess the extent of corruption in e-government services in India (Weerakkody et al., 2009; Zhao and Xu, 2015).

9. Practical implications

There are different implications for practitioners. First, it is important that sustained leadership, trained human resources and ethical public officials should be responsible for manning e-government services (Kumar and Best, 2006). Public officials should be provided the required tools and techniques for facilitating the launch and implementation of e-government services in the country. Grievance resolution mechanisms should be made more robust such that citizens perceive e-government services as transparent and user-friendly. Government should aim at instituting a robust IT infrastructure across the country and launch measures for digital inclusion. Finally, more government departments should spearhead their initiatives in conducting paperless transactions and providing public services in a transparent and efficient manner.
References


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Universal service in Vietnam: the role of government

Manh Thai Do, Morten Falch and Idongesit Williams

Abstract
Purpose – This paper aims to look at the universal service policy in Vietnam interval 2005-2010 from a stakeholder perspective to clarify the role of stakeholders as well as initiatives used to implement the policy.
Design/methodology/approach – This paper applies the stakeholder framework of Papazafeiropoulou and Pouloudi (2000) to identify which actors implemented the universal service policy and what initiatives were used by the central government. In addition, this paper also uses the qualitative method to clarify the stakeholders’ position on performing the universal service policy. The qualitative interview is recruited to verify and triangulate the result of the secondary data.
Findings – This paper finds that the Vietnamese government controlled the universal service policy via an administrative regime that the central government ordered and other stakeholders followed; the universal service policy focused much on delivering universal service and infrastructure; however, there was lack of initiatives rising awareness of rural users about the benefit of the internet, or training courses on improving rural users’ skills to use the internet; and stakeholders implementing the universal service policy were state entities in which the national government played a central role, and there was no involvement of the private sector and the civil society.
Originality/value – Little research on universal service policies in Vietnam has been made. By analyzing the Vietnamese case, achievements and drawbacks in implementing universal service policies are identified and lessons for other developing countries are derived.
Keywords Telecommunications, Universal service, Stakeholders, Government, Initiatives, Vietnam

1. Introduction

Today, Information and Communications Technology (ICT) in general and telecommunications realm in particular, plays a vital role in the social and economic development across countries. Promoting the application of advances of ICT to build the Information Society as well as to achieve the Millennium Development Goals is one of the critical missions that the International Telecommunication Union has suggested nations to carry out (WSIS, 2003).

In past years, there has been profound research on universal service, especially concentrating on study of the role of government/policy (Samarajiva, 2000; Lee et al., 2003; Gillett et al., 2004; Lee and Chan-Olmsted, 2004; Fan, 2005; Frieden, 2005; Gillwald, 2005; Falch, 2007; Picot and Wernick, 2007; Lam, 2013). Or on finding the models/tools furthering the penetration rate of universal service (Peha, 1999; Falch and Anyimadu, 2003; Long, 2010). However, there are only few studies on the role of stakeholders in implementing the provision of universal service, especially research in the role of the central governments in developing countries and their initiatives used to enhance the development of universal service.

This paper examines the role of stakeholders in carrying out the Vietnamese universal service policy and their strategies in Vietnam in 2005-2010 to identify their impact and relationships in the course of the implementation of the policy. The paper attempts to answer the following questions:
Q1. Who participated in the implementation of the universal service policy in 2005-2010 in Vietnam, and what kind of initiatives were applied?

Q2. What kind of policy initiatives should be recommended to the Vietnamese Government?

The paper uses the stakeholder theory to categorize the stakeholders who took part in deploying the universal service policy in Vietnam. On the basis of the qualitative methods, the authors analyze secondary documents and conduct interviews with officials working in the Vietnamese Ministry of Information and Communications (MIC), Departments of Information and Communications, the Vietnamese Public Utility Telecommunications Service Fund and local telecom providers.

The paper is structured as follows: Section 2 presents the theoretical framework and research methods, Section 3 highlights the telecommunications market in Vietnam, Section 4 analyzes key stakeholders and Section 5 provides discussion, conclusions and a few recommendations.

2. Theoretical framework and research methods

2.1 Theoretical framework

The stakeholder theory introduced by R. Edward Freeman has nowadays become a central component of the management theory (Mitchell et al., 1997; Harrison and Freeman, 1999). According to Freeman (2010, p. 46), a stakeholder is "any group or individual who can affect or is affected by the achievement of the organization’s objectives.” To manage organizations effectively, it is indispensable to take stakeholders into account in a systematic fashion (Freeman, 2010). However, this theory is applied and explained in various ways with diverse and often contradictory evidence and arguments (Donaldson and Preston, 1995). To make this theory more clear, Donaldson and Preston (1995) categorized it into three distinct types, namely, descriptive/empirical, instrumental and normative, in which the normative is fundamental. Mitchell et al. (1997) categorised stakeholders based on their attributes, such as power, legitimacy and urgency to generate a typology of stakeholders which includes domain stakeholder, discretionary stakeholder, demanding stakeholder, dominant stakeholder, dangerous stakeholder, dependent stakeholder, definitive stakeholder and non-stakeholder. They call this the “theory of stakeholder identification and salience”.

Although, the stakeholder theory is primarily applied for analysis of private companies, the insights from this theory can be applied in part in public sector settings as well, particularly within e-government services (Scholl, 2001). On the basis of the stakeholder theory by Freeman, many scholars have designed approaches/frameworks to explore views/roles of stakeholders in inter-organizational systems and in information systems (Pouloudi and Whitley, 1997; Papazafeiropoulou and Pouloudi, 2000). More practically, various researchers have applied this theory to analyze the role of stakeholders in the implementation of policies, or in the running of a system. Choudrie and Papazafeiropoulou (2003) applied the stakeholder theory to examine the strategies used by the government in diffusing the broadband take-up in South Korea. Lük (2009) and Scott et al. (2004) used this theory to investigate the success and failure of e-government systems in Hong Kong and Ireland, respectively. Zhang et al. (2005) explored potential benefits for stakeholders and the barriers towards inter-organizational knowledge sharing in an e-government setting.

Studying attitudes and expectations of multiple stakeholders as well as the involvement of the widest players might reduce conflicts and increase the rate of success in the implementation of information systems (Papazafeiropoulou and Pouloudi, 2000; Scott et al., 2004). Hence, the application of this theory as a tool to identify and analyze the impact of stakeholders in the field of ICT is useful.
On the basis of the categorization by King et al. (1994) on government intervention in IT innovation and the categorization of the environment (institution and regulation) layer by Damsgaard (1996) (Choudrie and Papazafeiropoulou, 2003), Papazafeiropoulou and Pouloudi (2000) applied the stakeholder theory to analyze the roles of stakeholders in the electronic commerce market. They recognized five groups of stakeholders in this market:

1. The national government.
2. International organizations.
3. Policy intermediaries.
4. Companies.

Furthermore, they also designed a web of stakeholders that demonstrates the relations among these stakeholders via national strategies.

Figure 1 depicts the five groups of stakeholders and the relations among them via the following six types of national strategies (King et al., 1994):

1. “Knowledge building” is undertaken to provide the scientific and technical knowledge base required to produce and exploit innovations, e.g. funding of universities and research.
2. “Knowledge deployment” is used to stimulate the dissemination of new knowledge, e.g. the provision of education to the population; the encouragement of already knowledgeable individuals and organizations to come into a country or region and establish operations; and training of a cadre of potential users.
3. “Subsidy” is financial support for actors involved in the electronic commerce innovation.
4. “Mobilization” basically means the encouragement of decentralized actors and organizations to think in a particular way with respect to an innovation, e.g. promotional and awareness programs or advertisement to support the use of innovations.
5. “Innovation directive” is a command to produce innovations, to use them or to engage in some activity that will specifically facilitate production and/or use.

Figure 1: The web of stakeholders

Source: Papazafeiropoulou and Pouloudi, 2000
6. “Standard setting” is a form of regulation aimed at constraining options of decentralized actors and organizations in line with larger social or institutional objectives.

The figures in the web present the six types of national strategies that stakeholders can apply to impact other stakeholders. This paper applies the framework to analyze the role of stakeholders as well as to demonstrate the relations among them in the deployment of the universal service policy in Vietnam.

Although this web places the government in the center and the arrows only go out from the government to other stakeholders, it is useful to look at the relationships among other stakeholders as well (Choudrie and Papazafeiropoulou, 2003).

2.2 Research methods

To identify stakeholders and their relationships, this paper has applied the stakeholder framework of Papazafeiropoulou and Pouloudi (2000). The paper has used a qualitative method to clarify the stakeholders’ impact and position on performing the universal service policy. Almost all data were mainly collected from the Vietnamese MIC, the Vietnamese Public Utility Telecommunications Service Fund (VTF) and some incumbent providers in Vietnam. Eight officials were interviewed, which include two officials from MIC. One of them is a former director of VTF; two local government officials (Department of Information and Communications – DIC); two officials from VTF; and two telecom providers’ managers. These interviews were carried out face to face and lasted from 1-2 hours. Almost all these interviews were recorded and made note for ensuring the validity and reliability of the data.

In addition, available secondary data, e.g. from specialty newspapers, have been applied and triangulated with the data collected from the interviews.

The definition of universal service is various across countries. This paper uses the same definition as the Vietnamese Government did in 2005-2010. Universal service in Vietnam (or the so-called public telecommunications service) included universal and mandatory telecommunications services. Here, the universal telecommunications service was defined as the standard telephone service and the standard internet access service; the mandatory telecommunications service included mainly emergency calls. The targeted subjects of this policy were individuals and households living in communes having the tele-density under 2.5 lines per 100 inhabitants (Decision 74 issued on April 7, 2006 by the Prime Minister).

In this paper, stakeholders involved in the universal service initiative between 2005-2010 were analyzed; in this period, the Vietnamese Government deployed the “Program on provision of public telecommunications services until 2010” (hereafter in the Program 74). The Program 74 is considered as the first universal service policy program in Vietnam. The provision of universal service was almost delayed in the years following. In 2015, the government issued the second program “the Program on provision of public telecommunications services until 2020” (Decision 1168 dated July 24, 2015).

3. Overview of the telecommunications market in Vietnam

Like other countries, Vietnam has reformed and liberalized its telecommunications market since 1994. They separated the regulatory and business function from the Department General of Post and Telecommunications – DGPT (a governmental body, predecessor of MIC today). Consequently, DGPT was responsible for making telecommunications and post policy, and regulation. Vietnam Posts and Telecommunications Corporation (VNPT), a state-owned company was in charge of business in telecommunications and post field (previously, VNPT’s business activities did follow the directions of DGPT). In 1995, the government ended the monopoly of VNPT on the provision of telecommunications services as it granted licenses to two new entrants (Viettel and SPT). In 1997, two other companies were licensed to provide internet services (FPT and Netnam).
The telecommunications development goals in Vietnam from 1996 to 2020, extracted from the national development strategies in 1996-2000 (Decision 110 issued on February 22, 1997), 2001-2010 (Decision 158 issued on October 18, 2001) and 2011-2020 (Decision 32 issued on July 27, 2012), are demonstrated in Table I.

Figures in Table I show the ambitious targets of the Vietnamese Government, especially for mobile phone and internet services in different periods. When Vietnam did set up the first telecommunications development strategy (Decision 110, 1997), the only objective was that the national tele-density should reach five fixed lines per 100 inhabitants before 2000. There were no targets for other kinds of telecom services. However, five years later, in 2001 the target for fixed lines until 2010 was raised to 16 phone sets per 100 inhabitants, the targeted penetration of internet subscribers was set to 12 per cent and the target for mobile phone subscriptions was set to 26 per cent (Decision 158, 2001). In 2012, Vietnam defined even higher targets that should be fulfilled by 2020. The penetration rate for fixed broadband internet should be 20, the percentage of mobile broadband internet subscriptions should be 40 and the target for mobile telephone subscriptions should be 140 per cent (Decision 32). In 2012, Vietnam was ranked 10 in Asia in terms of the volume of internet users.

Vietnam did not emphasize on specific universal service goals, before 2005-2006, where the first universal service policy was introduced (Program 74). VTF, an entity belonging to MIC, was established in 2005 to support the provision of universal service. Subsequently, in 2011, the second program on the provision of universal service was approved by the Prime Minister and would have been deployed in a five-year interval, from 2011 to 2015 (Decision 1643 issued on September 21, 2011 by the Prime Minister). However, this second program was postponed and reformulated because of the underestimation of the pace of technology development and the lack of compatibility with other existing ICT infrastructure and national rural development policies (Report of MIC on the implementation of the Program on the provision of public-utility telecommunications services toward 2010 – Report 74). Ultimately, on July 24, 2015, the government issued another program, the “Program on provision of public telecommunications services until 2020” (Decision 1168).

4. Key stakeholders in implementing the program

4.1 The Program 74

In this section, the paper outlines the key contents of the Program 74 that was deployed from 2005 to 2010.

In response to the commitments from the World Trade Organization, in which Vietnam became a member in 2006 and to bridge the digital divide between urban and rural areas, the Vietnamese Government focused on developing universal service by eliminating the

| Table I: Overview of the telecommunications development goals |
|---------------------------------|-----------------|-----------------|-----------------|
| Indicators                      | 1996-2000       | 2001-2010       | 2011-2020       |
| Fixed telephone subscriptions per 100 inhabitants | 5               | 16              | 25              |
| Mobile telephone subscriptions per 100 inhabitants | –                | 26              | 140 (in 2015)   |
| Internet subscriptions per 100 inhabitants | –                | 12              | 20 (fixed broadband internet) |
| Proportion of households with fixed lines at home | –                | –               | 45              |
| Proportion of households with internet access at home | –                | –               | 40              |
| Proportion of communes with fixed lines | Almost           | 100             | 100             |
| Proportion of communes with internet access | –                | –               | 100             |

*Note: No data

*Source: MIC (Decision 110, 1997; Decision 158, 2001; Decision 32, 2012)*
cross-subsidization mechanism, establishing VTF and formulating programs on the provision of universal service and integrating them into other national programs.

In 2006, the government issued the first universal service policy, the Program 74. The Program 74 was carried out within five years, from 2005 to 2010. The total budget was approximately US$260m, mainly collected from a share of the annual revenue of incumbent providers: 5 per cent of the revenue from mobile services, 4 per cent of the revenue from international telephone services and international leased – line service, and 3 per cent of the revenue from domestic distant telephone services and domestic leased – line service (since 2007, these rates were reduced to 3, 2 and 1 per cent, respectively – Decision 186 issued on December 3, 2007 by the Prime Minister).

The main targets of the Program 74 were that the tele-density should reach five phone sets per 100 inhabitants in areas (communes) with a tele-density below 2.5 sets per 100 inhabitants (universal service areas); all communes throughout the country should have at least one tele-center; 70 per cent of communes in the whole country should have at least one public internet access center; and all citizens should have access to the emergency telephone services (Decision 74). This was the first time Vietnam introduced a clear definition of universal service. Accordingly, universal service, the so-called public telecommunications service in Vietnam, included universal and mandatory telecommunications service. In that, the universal telecommunications service was the standard telephone service and the standard internet access service; and the mandatory telecommunications service was emergency calls (such as medical first aid, social order and security incidents, fire extinguishment, telecommunications service in searching and rescuing, and preventing and fighting of natural disasters) and fixed telephone number inquiries. The Program 74 benefited all inhabitants and households that either got their own connection or used the services offered at public telecommunications service centers. All beneficiaries living in universal service areas were eligible to receive subsidies from the Program 74 (Decision 74).

After five years, the Program 74 achieved remarkable success: the tele-density reached 16 lines per 100 inhabitants (increased threefold from the initial objective); the penetration rate of internet was 0.32 per cent in 2009 (increased almost twofold compared to that in 2004); 97 per cent of communes in the whole country had at least one public telephone center; and all citizens were free to have access to the mandatory service (Report 74). These achievements made a great contribution to the reduction of the digital divide and facilitated the development of society and economy. To gain such the achievements, the role of MIC, incumbent providers and other stakeholders was substantial. Moreover, the establishment of VTF has been considered as an ideal starting point to implement reform of universal service provision (Lee, 2011).

However, some objectives of the Program 74 were not met. Merely 55 per cent of communes throughout the country had one public internet access center and only 40 per cent of households in universal service areas had a fixed line (Report 74). The type of universal service was still limited as the majority had only dial-up internet access (Decision 43 issued on November 2, 2006 by MIC). The provision of universal service was mainly implemented via the form of “order place” or “plan assignment”[1] and not by bidding/auction regimes to select the lowest subsidy telecom providers offer (Circular 05/2006/TT-BBCVT).

4.2 Initiatives and key stakeholders implementing the Program 74

4.2.1 Initiatives implemented in Vietnam. In this section, the authors analyze initiatives implemented by the Vietnamese Government and look at stakeholders in deploying the Program 74 to clarify their role.
4.2.1.1 Subsidy. To enhance the development of universal service, MIC introduced various types of subsidy for inhabitants, households and telecom providers.

4.2.1.1.1 Regarding inhabitants and households. To make access to telecom services affordable for rural users, MIC subsidized dwellers and households living in universal service areas to install telephone and internet connections. Accordingly, individuals and households paid a reduced installation, the monthly subscription fee was subsidized, and they received end-devices (such as modems and telephone sets) for free. Local inhabitants without their own telephone or internet connections at home could access the services available at public tele/internet centers financed by the government as well. Subsidies were not granted to rural users directly. Instead, telecom providers were compensated by MIC for installing and operating telephone and internet connection services for rural users below the costs.

4.2.1.1.2 Regarding telecom providers. To assist telecom providers in delivering universal service, MIC issued Decision 17 dated June 15, 2007 (the Decision was later replaced by the Decision 40 on July 2, 2008). This decision stipulated that telecom carriers should receive subsidies to maintain and develop new telephone/internet subscribers and public tele/internet centers. Basically, this was the funding that supported telecom providers to sustain their infrastructure in the unprofitable areas. However, it could not offset the cost of the telecom providers’ infrastructure building. This funding was just a catalyst to lead them to preoccupy the place prior to their rivalries.

Furthermore, MIC also provided soft loans to these operators to support them to upgrade and develop new infrastructure. However, because the loan procedure was complicated and time-consuming, this was not attractive for the operators. The amount of money disbursed reached only 25 per cent of the planned budget (Report 74).

4.2.1.2 Standard setting. “Standard setting” is a form of regulation aimed at constraining options of decentralized actors and organizations in line with larger social or institutional objectives (King et al., 1994).

To deploy the Program 74, MIC issued the Circular 05 asking DICs, VTF and telecom providers to follow its instructions. DICs were the provincial government entities in charge of both making regulation and policy in terms of telecom, post, frequency radio, spectrum license and the press within their locale. VTF, a body belonging to MIC, had the responsibilities of collecting financial contributions from telecom providers as well as providing them subsidies in compliance with MIC’s plans. Telecom providers delivering universal service were state-owned companies providing both telecommunications services and networks.

MIC requested telecom providers who were keen on providing universal service to prepare proposals and then submit to MIC for approval. Telecom providers’ plans basically outlined and depicted their capability and budget needed to deliver universal service. These plans also consisted of estimated numbers of fixed lines, internet connections and public internet access centres to be developed.

On the other side, MIC requested VTF to construct a plan and submit to MIC for approval. This plan should include information on the level of subsidies funding universal service provision to be allocated to telecom providers and how much of incumbent providers’ annual revenue that should be collected to cover these expenses. On the basis of the approved plan, VTF delivered telecom providers funding. Meanwhile, DICs were mandated by MIC to supervise the provision of universal service of telecom providers. They also verified telecom providers’ plans to ensure that these plans were consistent with other provincial ICT initiatives within their areas.

Indeed, the role of DICs was relatively modest. They could not supervise telecom providers to execute the provision of universal service or to adjust the Program 74 if this Program did
not fit with the need of rural inhabitants in their province. As an official of MIC said, “the participation of DICs in verifying the amount of universal service delivered by telecom providers was late (due to no detailed instructions from MIC). Hence, this impacted supervision and delivery of subsidies to telecom providers.” In addition, a Vice Director of one DIC in an interview conducted in July 2015 said, “Many of our ideas in terms of improving provision of universal service were not considered by MIC. Consequently, some of the universal service provided was not appropriate with rural users’ demand”.

4.2.1.3 Knowledge building, knowledge deployment, mobilization and innovation directives. The Vietnamese Government did not deploy any initiatives to support research institutes or universities to do research in matters related to universal service. Neither did they take any initiatives to improve rural users’ knowledge about the internet, for instance through provision of training courses. This was the first time universal service provision was addressed by the government. The budget was limited, and Vietnam did not have adequate experience to deploy this kind of program. They did not stimulate research and development in universal service, such as which technology or types of universal service were best suited to meet local users’ demand. The government only implemented some simple ways to subsidize rural dwellers and telecom carriers.

In 2009, although MIC and Bill and Melinda Gates Foundation (a nongovernment organization) cooperated to run a pilot project to improve the computer usage and the internet access ability of rural dwellers. The total budget of this project was US$2.6m aimed at equipping PCs and delivering training courses to staff of 99 public tele/internet centers and community libraries in three provinces (Thai Nguyen, Nghe An and Tra Vinh province). This pilot project also coordinated with these libraries and public telecommunications centers to organize events for local dwellers about the benefits of the internet. This project was not part of the Program 74 and did not make a considerable contribution on rising awareness of all rural users about the advantage of the internet in the whole nation. However, it also got the involvement of MIC, DICs, VTF and two major telecom providers in subsidizing the provision of internet connections to 99 public tele/internet centers and community libraries (VNPT and Viettel funded these libraries and public internet centers at least 50 per cent of monthly connection fee).

4.2.2 Stakeholders. This section shows how the stakeholders carried out the Program 74 or how the initiatives mentioned above related to these stakeholders.

4.2.2.1 The government. At the national level, MIC played a critical role in formulating and deploying the Program 74 and influenced other stakeholders via these initiatives depicted above. In 2005, MIC established VTF to support delivering universal service to rural areas. This was done to meet the requirements of international agreements (WTO and the Bilateral Trade Agreement between Vietnam and the USA), and to promote further the provision of universal service in rural areas. In 2006, MIC submitted to the Prime Minister the Program 74 to provide universal service. The Program 74 provided subsidies targeted to inhabitants and households in universal service areas. This program also offered telecom providers soft loans to develop infrastructure as well as subsidies to maintain public internet access centers.

Following the approval by the Prime Minister, MIC clarified the Program 74 by issuing a series of decisions and legal documents to instruct and guide other actors to implement the Program 74 (around 40 different documents were issued by MIC within five years, 2006-2010). In an interview in 2015, an official of MIC, who participated in the management and supervision the Program 74, said, “Apparently, MIC played an important role in building up and instructing other actors to implement the Program. Besides, the role of telecom providers was also critical. If MIC had not formulated the Program 74, and telecom providers had not followed MIC’s instructions, the Program 74 would not have been carried out and the rural users would not have been able to enjoy the universal service as now”.
4.2.2.2 Policy intermediaries. According to Papazafeiropoulou and Pouloudi (2000), policy intermediaries are organizations acting between the government and companies or citizens (not between providers and end consumers). As such, in the Vietnamese case, policy intermediaries were the incumbent operators.

One of the key factors leading to the boom in universal service provision was the fierce competition between telecom services providers. In that, the subsidy from the government was a catalyst leading them to enter the rural market.

In that period, there were nine carriers licensed to provide telecommunications services. Because of the infrastructure competence, only four operators took part in supplying universal service: VNPT, Viettel, Electricity Telecom Company (ETC) and Vietnam Maritime Communication and Electronics (Vishipel). In that, Vishipel was funded to provide universal service to fishermen. The rest were assigned to deliver universal service to citizens living in rural and mountainous areas.

With the position as a dominant operator equipped with an infrastructure with national coverage, VNPT had a great advantage over its competitors in providing telecommunications services. However, this position was strongly shaken by the emergence of Viettel and ETC. In 2004, Viettel started to provide mobile phone services[2], and in 2005, ETC was the first player to introduce the GSM-fixed wireless phone (a new device in Vietnam at that time). To attract more customers or citizens, Viettel and ETC introduced several promotion programs, such as abolishment of installation fees, free subscription the first 3-12 months (or longer, depending on each promotion program of these carriers) and free telephone sets. Under the high pressure of these rivals, VNPT had to reduce the price of telephony and mobile services and adapt the way charging mobile phone service, shifting from charging phone calls per minute to charging for the first 1 min and every 6 subsequent seconds time.

The provision of the GSM-fixed wireless phone in Vietnam was also a reason behind the growth of telephone subscribers in rural areas, especially after VNPT and Viettel also introduced this device in 2007. This phone helped consumers easily to bring anywhere with a certain distance. Besides, the subscription and calling fee was the same as that of the fixed line service.

By intense competition between these providers and the subsidy from the government, the volume of telephone subscribers increased considerably. In 2005-2010, VNPT acquired 1 million telephone subscribers, Viettel 1.2 million and 400,000 telephone subscribers for ETC (Report 74). This made a great contribution to the growth in tele-density in rural and remote areas from 2.5 lines in 2004 to 16 lines per 100 dwellers at the end of 2010.

4.2.2.3 Users/households. Basically, the Program 74 brought a great benefit to rural dwellers. According to the Report 74, till the end of 2010, more than 20 million inhabitants (approximately 24 per cent of population in Vietnam) in 4,349 communes across the country got subsidy from this Program. They did not only get support for getting telephone sets and modems but also the monthly subscription fee was subsidized. Moreover, citizens living in mountainous and isolated areas were also accessible to more than 3,000 tele-centers as well. However, they could not receive direct subsidy from the government, instead telecom providers would grant them.

5. Discussion and conclusions

This paper analyzes the universal service policy in Vietnam by applying the web of stakeholders introduced by Papazafeiropoulou and Pouloudi (2000). The empirical findings show that the stakeholders who participated in the provision of universal service were MIC, DICs, VTF, telecom providers and rural users. The leading roles were played by MIC and
the telecom providers. The paper also indicates that initiatives carried out by the central
government (MIC) were mere standard setting (regulations) and subsidy (Table II).

Figure 2 shows that the initiatives taken by the government to provide universal service were
regulations. In other words, the provision of universal service was implemented via an
administrative regime, in which MIC was an order and other stakeholders were the
followers. It is likely that the provision of universal service carried out under this regime in
rural areas (the government-assigned tasks and state-owned telecom providers
implemented) might be undertaken quickly (because all directors of these telecom
providers are appointed by the government. The success or failure in carrying out the state
tasks affects their career in future). It is apparent that since Vietnam introduced the first
universal service policy in 2006, the usage of universal service was considerably
accelerated, the number of telephone subscribers (in 2010) tripled compared with the initial
objective of the Program (in 2004) and 97 per cent of communes in whole country had at
least one public telephone center. To gain such results, MIC and the incumbents’ carriers
(VNPT, Viettel and ETC) played a critical role. The role of MIC was considered as a central
position in creating the rules of the game and issuing the rules for other stakeholders as
well. By its jurisdiction, MIC introduced initiatives to subsidize usage of universal service as
well as to fund telecom providers to maintain and develop public tele/internet centers and
infrastructure. Meanwhile, these state-owned carriers were considered as tools used by
MIC to deliver universal service. They, on the one side, had to undertake their tasks (for
instance, providing universal service) assigned by MIC. On the other hand, they also had to
compete with each other to gain more market share and ensure their turnover goal. These
missions made their role more important in the chain of the provision of universal services in
Vietnam.

Figure 2 also illustrates that Vietnam focused much on subsidies to develop infrastructure,
maintain the existence of public tele/internet centers and provide rural users with universal
service. There was little focus on rising awareness of rural users about the benefits of the
internet and provision of training courses improving their skills to use the internet. Focusing
only on the supply side might increase the development of universal service in short time;
however, it will not be sustainable. In the case of Vietnam, many users gave up their
subscription when the government stopped subsidizing subscription. Some rural users
used universal services only because it was free of charge.

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DIC, VTF → MIC → Telecom Providers → Users/Households
It is clear from Figure 2 that all stakeholders who participated in the provision of universal service were state entities, and there was no involvement of private sector or civil society, except for the beneficiaries, rural users, who had little influence on the actual implementation of the program.

This administrative regime revealed many shortcomings, such as lack of interaction between MIC and DICs that caused an overlapping in the provision of universal service (because of the lack of DICs’ supervision, one household could receive funds from two or more telecom providers for using one telephony service/internet service). Universal service delivered was not reflecting rural users' demand. As Lam (2013) argued, the top-down model of funding administration in Vietnam led to an ineffective monitoring of the deployment of universal service, because of the lack of accountability and responsibility amongst departments involved (between MIC and other ministries) as well as a paucity of transparency in selection of universal service providers. This resulted in ineffective and inefficient subsidies, and unsustainable outcomes.

South Korea also applied a top-down approach to develop the national information infrastructure (IT839) (Shin, 2008). However, their measures relied on influence rather than regulations. They promoted the competition based on deregulation and market principles, and stimulated high-speed internet businesses by the “hands-off policy” (source: Park and Lee [2002] cited by Choudrie and Papazafeiropoulou [2003]). South Korea has been one of the leaders of broadband penetration in the world for many years (Lee and Chan-Olmsted, 2004). Moreover, in a free market, private partners play an important role in developing the telecom market. They could reduce the government's budget deficit (Koppenjan and Enserink, 2009) and deliver better services with lower costs, whereas public sector was assumed not to be efficient (Gómez-Barroso and Feijo, 2010). Hence, in the case of Vietnam and other developing nations having features similar to Vietnam, encouragement of participation from the private sector and the civil society as well as adopting an approach based on deregulation and market principles is also to be recommended, if a sustainable universal service coverage is to be achieved.

Notes
1. “Order place” meant that authorized state entities based on their budget and cost of the provision of universal service to address subsidy and sign contracts with enterprises to deliver the service. “Plan assignment” meant that authorized state entities based on their budget and state-owned enterprises’ capability and business plans to assign these enterprises to deliver universal service (Decision 256/2006/QD-TTg).
2. Although Viettel provided landline service (PSTN) in 2003, it initially developed aggressively since 2004 when it supplied mobile phone services, ended the monopoly of VNPT (in mobile phone services) and brought a new charging way to consumers.

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The word “Google”, used as a synonym for “search”, is now ubiquitous in conversational English. When the author was a young academic, the term “search” meant going to the library and examining the contents of books and journals, but libraries are now learning centres where you go to chat while googling the vast expanses of the world’s knowledge on the internet. Even the most die-hard of researchers cannot deny that their task has become much more efficient and productive even if they worry, with good reason, that those who google as a matter of course often cannot tell truth from fiction in what they discover.

This phenomenon is of surprisingly recent vintage even if, by now, more or less an entire generation has grown up using search engines. In practice, Google was by no means the first of these, but who remembers its predecessors (or, indeed, the predecessors of Facebook)? Hence, it is highly pertinent to ask how Google has managed virtually to corner the worldwide search engine market of which it currently controls more than 70 per cent – but 10 per cent more in the case of mobile-based searches, as its Android operating system (O/S) is far and away the most commonly used in mobile devices, and it pays Apple $3bn a year to be the default search engine on devices using the Apple iOS.

Historically, the efficient organization of knowledge in such a way as to facilitate directed searches was a matter for human intervention. However, although other companies preceded Google in the realization that algorithms – sets of rules that can be used in problem-solving, especially by computers – could be used to sort through the rapidly growing volume of material being deposited on the internet, Google introduced a more sophisticated range of factors for ranking the relevance of responses to a search enquiry, and then continued to make its algorithms increasing sophisticated until its competitors fell by the wayside. Google became the near-default search engine simply because it was better than its rivals.

However, as is immediately evident, simply providing a free search engine for users is the road to ruin, and, as with all start-ups, the key issue rapidly became a need to make money from one source or another. The solution adopted by Google some three years into its existence was to charge advertisers to have their names and services appear alongside search results. This so-called AdWords model struggled initially but took off rapidly once Google introduced an automatic pay-per-click version that remains in force today.

AdWords was followed by AdSense which is a system for Google to sell

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advertising on its approved partner sites. For a fee, Google provides text, images, videos and interactive media. It then keeps part of the money paid to the site owner by an advertiser whenever a user clicks on an advertisement on a partner’s website. By 2010, the Google Display Network had well over one million partners and the figure is currently claimed to be roughly 14 million. This has proven to be an indispensable source of revenue for many of its partners, but it is not so profitable for Google – especially compared to AdWords using Google’s own websites – as AdSense partners take 68 per cent of the revenue generated by advertising alongside their content and 51 per cent of the revenue generated by searches on their websites. Traffic acquisition costs accordingly constitute two-thirds of the costs incurred by Google on top of which Google has to pay for more than 20,000 people employed on research and development (R&D) and nearly as many on sales and marketing.

It is easy to assume that Google – which is now a subsidiary of Alphabet Inc. – has been growing primarily as a result of the expansion of its original search engine business. However, this is far from being the case in practice. Since the beginning of 2001, Alphabet (primarily via Google) has acquired, in their entirety, more than 200 companies – for a full list see Wikipedia (2017). Although the price paid is generally only known where the target is a publicly quoted company, these tend to be the most expensive, and certain ones stand out as follows, as they all cost in excess of $500m:

- August 2011: Motorola Mobility (mobile device maker): $12.50bn;
- January 2014: Nest Labs (home automation): $3.20bn;
- April 2007: DoubleClick (online advertising): $3.10bn;
- October 2006: You Tube (video sharing): $1.65bn;
- September 2017: HTC assets (staff and R&D-related): $1.10bn;
- June 2013: Waze (GPS navigation software): $966m;
- April 2011: ITA Software (travel technology): $676m;
- July 2017: Postini (communications security): $625m;
- January 2014: DeepMind Technologies (artificial intelligence [AI]): $625m;
- September 2016: Apigee (cloud activities): $625m; and
- June 2014: Dropcam (home monitoring): $555m.

In addition, Alphabet has made a considerable number of other acquisitions each costing in excess of $100m, so it would not seem unreasonable to be talking in terms of a total outlay in excess of $50bn. To finance this level of spending requires either large cash reserves or the willingness of targets to accept the acquirer’s shares. It is very noticeable that almost every company in the aforementioned list works in an independent sector, so Alphabet has clearly been engaging in a massive exercise to become a wide-ranging conglomerate, although it is worth observing that the great majority of its purchases have been of companies based in the USA – with some significant exceptions such as Israel-based Waze and parts of HTC – and generally in the San Francisco Bay area in proximity to Alphabet. It is also notable that Alphabet has rarely made disposals – only four are listed in Wikipedia (2017). The underlying rationale for the choice of targets was stated by CEO Larry Page in the New York Times in August 2014 to be a product/service that would be useful on a day-to-day basis and improve users’ lives.

As it happens, Google has made some mistakes – for example, there is a tendency to view the acquisition of Motorola as a failure, although the reality is more ambiguous as noted below – but in any event, four businesses remain the main money-spinners. These are Adsense (which generates over 20 per cent of revenue), DoubleClick (generating over $30bn of annual revenue), Google Maps (thought to generate $1.5bn of annual revenue although this is not specified by Google) and, of course, YouTube. In practice, YouTube may not be making a lot of profit because users tend to ignore the adverts as they home in on cats with funny faces and the like, but, crucially, it enables Google to dominate the online video business and its role as a disruptor of traditional TV, abstracting large amounts of advertisement revenue, has been highly significant.

All told, Google generates roughly 90 per cent of its revenue from advertising, of which roughly two-thirds is generated by adverts on Google’s own websites. In recent years, this business has appeared to have massive growth potential, driven by such factors as growth in the number of clicks and expansion into new less-developed countries, although Google still depends on the USA for over 40 per cent of its revenue. The counterpart is that that advertisers will not pay as much per click in the newer markets, and the fee per click is on a gradual downward progression. It may also be noted that Google deals primarily in US dollars and hence, despite hedging, can be affected by exchange-rate fluctuations. Non-advertising activities are by no means insignificant, but market power is lower and as a consequence, margins are more erratic.
In practice, only one thing has ever halted the almost inexorable rise in the Google share price since it was first listed at $50 per share in August 2004, and that was the recession commencing in 2007. The share price fell from $357 to $131, but it had fully recovered by 2011. Google shares were split in April 2014 with “A” shareholders gaining one vote per share, whereas “C” shareholders were left without a vote – there are also “B” shares with ten votes that are held by those controlling the company. Google does not pay dividends but shareholders have no cause to complain, as the “A” share price increased to a high of $1,004 in June 2017 and currently (01/10/17) resides at $930. This places a value of $640bn on the “A” shares, making Google one of the top five most valuable companies in the world. The price-earnings (P/E) ratio of 34 may appear to be on the high side, but investors do not seem to mind much where high-tech companies are concerned.

It is worth pausing to consider that Google is toying with the mobile equipment sector. Although Google established the Android O/S, it did not initially seem interested in building the devices to house it but rather partnered with the likes of HTC, Huawei and LG. However, in 2011, Google paid $12.5bn for Motorola which was no longer a force in the smartphone market. In reality, it was the patents held by Motorola that Google wanted and the manufacturing side was sold on to China’s Lenovo in 2014 for $2.9bn. This necessitated a massive write-off in the accounts but was in reality far from disastrous.

In 2016, HTC produced the Pixel and Pixel XL with an Android O/S on behalf of Google – these were top-end models with no mention of HTC on the devices or packaging. The HTC purchase in September 2017 did not include its entire smartphone business – HTC will continue to sell own-branded devices – but Google did acquire half of HTC’s R&D team and a non-exclusive licence for HTC’s intellectual property. The main issue appears to be that as the likes of Samsung seek to set up services for their devices, and Google is threatened by the European Commission, which may force Google to stop enforcing the pre-installation of Android on third-party devices. Google has seen the need to increase its control over the equipment-making sector even though Pixel devices sell only roughly two million units a year.

However, it must also be noted that with the introduction of voice assistants – Google’s own so-called Assistant is a recent innovation – comprising a significant step forward in the use of AI, Google understands the need to put more resources into the integration of hardware and software.

When a service is provided for free, there is no moral ambiguity, but when fees are levied, it can creep in no matter how high-minded company founders claim to be. When Alphabet was established, the Google slogan was changed from “Don’t be evil” to “Do the right thing”.

Unfortunately, practice can diverge from principle in the real world and since the turn of the decade, Google has been fighting attempts by the European Commission to curb what the Commission regards as illegal practices under EU anti-trust law. These practices include the accusation that Google restricts how a website that offers a Google search function can show advertisements sold by other companies and that it limits competition by requiring smartphone manufacturers to pre-install the Chrome browser and the Google search engine in their devices or forgo access to other Google apps. To these practices has recently been added the charge that when responding to searches, Google gives prominence to its in-house shopping comparison service, Google Shopping.

In June 2017, the EU Competition Commissioner lost patience with Google’s seeming refusal to seek a settlement and fined Google €2.4bn ($2.7bn). Google was required to pay within three months or find itself subject to a daily fine of 5 per cent of Alphabet’s worldwide turnover. Google is undertaking an appeal, although it has now instigated a change in the way that it presents the results of shopping searches. Ultimately, even fines of billions of euros/dollars will not make much of a dent in Google’s cash mountain.

This case epitomizes the core issue that a company such as Google has to address. On the one hand, it has an enviable record for producing innovative products and services that have improved the lives of their users; on the other hand, it cannot resist protecting what it has achieved by shutting out prospective competitors. To do so is not anti-competitive as such – it ultimately boils down to a question of how much protection is reasonable. Clearly, the EU no longer accepts that Google is “doing the right thing”.

In summary, it is evident that Google has been a great innovator and has reaped the rewards of such behaviour. It has also built up a war chest that has made it possible to take big risks – but which also serves as a means to buy up most prospective rivals (but not, of course, Amazon and Facebook).

However, the ethical dimension is increasingly coming into play where the goliaths of the online world such as Google are concerned. The bottom line is that the more people use Google the more data it collects, and the more data it collects the more it can charge advertisers for access. This is a virtuous
circle for Google, but it is beginning to create a backlash among the general public. Whereas “creative disruption” is hardly a new phenomenon, the likes of Google, Amazon and Facebook have driven the process at unprecedented speed. While it is evident that anyone brought up in the smartphone era tends to have a more relaxed attitude not only to disruption but also to placing most of the details of their lives in the public domain, this has been seen as essentially a trade-off: you get my data and I get free searching and other services. But privacy ultimately matters. The question is whether it is already too late to restore it.


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