A TWO-SIDED MARKET MECHANISMS TOWARD DESIGNING A BIG DATA-DRIVEN BUSINESS MODEL FOR MOBILE NETWORK OPERATORS

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MEKANISME PASARAN DUA SISI UNTUK MEREKABENTUK MODEL
BISNES BERPACUKAN DATA RAYA BAGI PENGENDALI RANGKAIAN
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DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged.

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ABSTRACT

Mobile network operators (MNOs) business models are under pressure due to their lesser capability of introducing superior values to their customers in the mobile ecosystem. However, recent research efforts in developing new business model advocate two-sided business model that encompasses the diversity of MNO's activities and capabilities. As a result, a new multidisciplinary service-based two-sided business model needs to be developed that incorporates these activities and capabilities. The small body of extant literature on the subject suggests that it may be possible to enhance MNOs' business model by combining contemporary information technology tools with managerial design principles and concepts. This study designs a two-sided mobile advertising business model to investigate the application of a big data-driven business model to transform MNOs' current one-sided business models to two-sided ones. To accomplish this, it combines the design science research methodology and (DSRM), which aims to create a problem-solving artefact for real-world problems, and the grounded theory approach, which aims to develop substantive theory and increase the rigour of the design process. These two methodologies complement one another because this pluralistic study aims to develop a new business model as a solution to the real-life problems faced by MNOs while simultaneously producing a scientifically rigorous theoretical contribution to the field. Applying the DSRM, this study goes through three iterations to build and evaluate the artefact. The initial business model was generated using deductive and abductive reasoning from the literature. The second iteration refines the artefact using grounded theory data analysis techniques based on data collected from semi-structured interviews with MNOs' experts from Jordan. The third iteration refines the artefact using ongoing data analysis collected from semi-structured interviews with Jordanian advertisers and a two-session focus group with multinational end-users. Continuous evaluation has been conducted in the three iterations using theoretically-derived criteria and a proof of concept prototype to assure that the artefact can be successfully implemented so that it functions in the real world. The results of this study have shown that the new business model can enhance their revenue streams and competitive edge. This study identified that successful business model should be built on established MNOs core competencies and business activities. This study showed the applicability of two-sided theory and big data-driven tools and technologies to create new superior value propositions to both advertisers and end-users and thus innovative business models for MNOs. The resulted business model is promising based on theoretical and empirical evaluation. Additionally, the study developed theoretical contributions stemmed from the applied design process which can be used in future studies and practice. Besides these practical and theoretical contributions, the study contributes to the methodology by demonstrating that an innovative combination of DSRM and grounded theory can be used to produce both practical and theoretical results.

ABSTRAK

Model perniagaan (MP) pengendali rangkaian mudah alih (PRMA) didapati berada di bawah tekanan kerana mereka kurang berkeupayaan untuk memperkenalkan nilai saranan yang unggul kepada pelanggan dalam ekosistem mudah alih. Walau bagaimanapun, pelbagai usaha dilakukan dalam kajian terkini untuk membangunkan MP baru. Kajian tersebut menyokong MP dua sisi yang merangkumi kepelbagaian aktiviti dan keupayaan PRMA. Oleh yang demikian, multidisiplin yang baru berasaskan servis MP dua sisi perlu dibangunkan yang menggabungkan aktiviti dan keupayaan ini. Sebahagian kajian kesusasteraan sedia ada dalam bidang ini mencadangkan bahawa ia adalah tidak mustahil untuk menambah baik MP PRMA dengan menggabungkan alat teknologi maklumat kontemporari dengan reka bentuk prinsip dan konsep pengurusan. Kajian ini membina reka bentuk pengiklanan MP mudah alih dua sisi untuk menyiasat aplikasi MP pemacu-data raya bagi mengubah MP PRMA satu sisi kepada dua sisi. Bagi mencapai matlamat ini, kajian menggabungkan metodologi kajian reka bentuk sains dan (MKRS) yang bertujuan untuk mencipta artifak penyelesaian masalah bagi masalah dunia nyata, dan pendekatan teori bersebab yang bertujuan untuk membangunkan teori substantif dan meningkatkan kerapian proses reka bentuk. Kedua-dua metodologi ini melengkapkan antara satu sama lain kerana kajian pluralistik ini bertujuan untuk membangunkan MP yang baru sebagai penyelesaian masalah dalam kehidupan nyata yang dihadapi oleh PRMA, dalam masa yang sama menghasilkan sumbangan teori saintifik yang rapi bagi bidang ini. Berdasarkan penggunaan DSRM, kajian ini melibatkan tiga lelaran untuk membina dan menilai artifak. Awalan MP dijana menggunakan penaakulan deduktif dan abduktif berdasarkan kajian susasteraan. Lelaran kedua memperhaluskan artifak menggunakan teknik analisis data teori bersebab berasaskan data yang dikumpulkan dari temu ramah separa berstruktur dengan pakar PRMA dari Jordan. Lelaran ketiga memperhaluskan artifak menggunakan data analisis yang dikumpul dari temu ramah separa berstruktur dengan pengiklan dari Jordan dan dua sesi kumpulan tumpuan dengan pengguna akhir daripada syarikat multinasional. Penilaian berterusan telah dijalankan dalam tiga lelaran menggunakan kriteria secara teori-terbitan dan pembuktian konsep prototaip untuk memastikan artifak tersebut berjaya dilaksanakan agar ia berfungsi dalam dunia nyata. Keputusan kajian menunjukkan bahawa MP baru mampu meningkatkan aliran pendapatan dan kelebihan berdaya saing. Kajian ini mengenal pasti kejayaan MP perlu dibina dalam teras kecekapan dan aktiviti perniagaan PRMA yang mantap. Kajian ini menunjukkan kebolehgunaan teori dua sisi dan alat pemacu-data raya serta teknologi untuk mencipta nilai saranan terunggul yang baru bagi para pengiklan dan pengguna akhir berserta MP berinovatif untuk PRMA. Hasil MP yang direka bentuk adalah menggalakkan berdasarkan penilaian teori dan empirikal. Tambahan pula, kajian ini membangunkan sumbangan teori bertunjangkan proses reka bentuk gunaan yang bermanfaat untuk amalan dan kajian masa hadapan. Selain daripada sumbangan teori dan praktikal, kajian ini juga menyumbang kepada metodologi dengan menunjukkan gabungan inovatif DSRM dan teori bersebab yang boleh digunakan untuk menghasilkan keputusan praktikal dan teori.

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AaaS	Analytics as a Service
ARPU	Average Return Per User
B2B	Business to Business
B2C	Business to Consumer
BDA	Big data Analytics
BMI	Business Model Innovation
CFGs	Confirmatory Focus Groups
DaaS	Data Analytics as a Service
DDBM	Data-driven Business Model
DSRM	Design Science Research Methodology
EFGs	Exploratory Focus Groups
GPS	Global Positioning System
LBS	Location Based Advertising
M2M	Machine to Machine
MNO	Mobile Network Operator
OTTs	Over the Top Players
ROI	Return on Investment
S2aaS	Sensing as a Service
SMEs	Small and Medium Size Companies
TAM	Technology Acceptance Model
VOIP	Voice over Internet Protocol

CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

The mobile industry is now immensely different from how it was just 10 or 20 years ago. The explosion of mobile technology is evident in the ubiquity of mobile platforms, mobile sensors, application stores, and mobile applications (or simply, apps). This explosion, accompanied by the ready availability of high-speed network bandwidth for regular consumers and business people, has changed how businesses operate and how competitive the mobile ecosystem has become. Most significantly, changes have occurred following the introduction of Apple's iOS platform, and the subsequent introduction of the Google Android platform. These introductions were a turning point in the mobile sector, enhancing some actors' roles in this ecosystem, such as mobile developers, and inhibiting others' roles, such as telecom and MNOs. According to Basole (2009) and Basole and Karla (2011), since the application innovation unleashed by smartphones and tablets (e.g. iPads), new entrants' aggressive efforts and changes in consumer behaviour and expectations continue to put pressure on traditional business models and services for the MNO. Since then, the software players have put the MNOs on the defensive (Vakulenko et al. 2011) and have forced them to play a secondary role (Basole & Karla 2012).

This dramatic wave that has affected the business models of MNOs encouraged practitioners and scholars to investigate its causes and reconsider the structure of the current business environment. Their approaches aim to seek and quantify the contributing factors and revenue streams of the ecosystems characterised by high turbulence. For example, Juniper's industrial research, "Mobile Operator Business

Models" (2014), indicates that network operators lost the opportunity to gain more than $14 billion in 2014 from consumer adoption of VOIP applications alone. Additionally, it identifies that there is more than $66 billion in potential revenue over the next five years, from areas such as machine to machine (m2m), mobile money, and big data analytics (Holden 2014). These findings and recommendations are reinforced by Accenture's prior study, "How Mobile Network Operators can create competitive differentiation" (2012) that drew the same conclusions. They identfied a decrease in mobile operators' ROI by 32% at the global level.

Meanwhile, many academic researchers have begun to investigate the mobile ecosystem and relevant business models from different perspectives (Bouwman et al. 2008; Al-Debei & Avison 2011; De Reuver & Haaker, 2009; Basole et al. 2011; Ghezzi et al. 2015; Wang et al. 2016). There has been a drastic increase in research on this issue since 2007 because of the introduction of smartphones and application stores and their changing effects on the mobile ecosystem as discussed above. Many of these researchers have tried to explain and define the structure of the mobile ecosystem and the players' business models from a managerial perspective (Basole 2009; Basole & Karla 2011; Xia et al. 2010). The design and improvement of a new business model has been the focus of most of these researchers (Rao & Jimenez 2011; De Reuver & Haaker 2009; Al-Debei et al. 2013; Wang et al. 2016).

In essence, the findings of practitioners' reports and academic publications indicate unanimously that the MNOs represent a paradox. MNOs are not only providers of their digital and value-added services, but they are also enablers for other sectors because they offer connectivity infrastructure for them. However, the market studies and experts' speculations indicate that the revenue streams for MNOs from these services will decrease despite the expected increase in numbers of digital consumers in the next few years and the resulting increase in demand for connectivity services. The major threat causing this decrease in revenue can be identified an influx of new digital natives, or big players, and this will continue as they penetrate the mobile ecosystem with their innovative business models and supercede the role of MNOs by introducing their core services to business and individual consumers in a more convenient and satisfactory manner (Meffert & Mohr 2017; Wang et al. 2016).

Practitioners and researchers are undertaking ongoing investigations into the causes of the power turnover in the current business environment structure. Many of these investigations seek to determine the root causes of this phenomena. Initial results have generally shown that the platformisation of OTTs business models within the ecosystem (two-sided market) (Meffert & Mohr 2017; Wang et al. 2016) and data-driven services/products (data is the new trend) remain the primary reasons big players dominate and attain a defensible competitive position (Morabito 2015; Hagiu & Rothman 2016). Meanwhile, MNOs have failed to bring in business (Basole & Karla 2011; Hagiu & Rothman 2016). Additionally, big players and digital natives recognise that the transformation from simple digitisation or the Third Industrial Revolution to innovation based on incorporation of technologies or the Fourth Industrial Revolution is inevitable, and this pushes these companies to reconsider how they do business. Consequently, the consumers are becoming the epicentre of the new economy and companies are increasingly concerned with how customers are better served (Schwab 2016). For MNOs, it was found that their reduced competence in providing new value propositions and their inability to appeal to the motivations of all flanks of the market led to a reduction in business and prevented them from achieving a successful two-sided platform akin to those of the dominant parties (Meffert & Mohr. 2017; Wang et al. 2016).

1.1.1 Two-sided Market and Platforms

In various industries, platforms host two or more parties that use the platform to interact with one another for their particular purpose in a mutually beneficial way for both parties and for the focal firm that owns the platform (Rochet & Tirole 2004). An increasing number of varied platforms and platform markets have appeared in digital contexts. These include platforms that connect individual customers with individual sellers (eBay), facilitate interactions between customers and a number of firms or sellers (Alibaba, Amazon, media sites, various advertising exchange networks), connect firms with firms (business-to-business platforms) or connect firms with crowds (crowdsourcing and innovation platforms like Kickstarter). In all the above cases, platforms are autonomous self-governing third-party entities that link buyers, sellers, firms, the crowd, and so on. The focal firm offers its host platform the opportunity to

generate revenue from the two-sided platform based on one or a combination of revenue models such as commissions, performance-based fees (for example, Google charges advertisers by cost-per-click), impression-based charges (for example, cost per thousand impressions billed by ad networks) and other revenue models that accommodate the interaction (Parker & Van Alstyne 2005; Kannan 2017).

As previously mentioned, the power dynamic in the mobile ecosystem has changed since 2007. Before this year, MNOs were in a favourable position to leverage these market mechanisms to build their own platforms and e-marketplaces. The MNOs have built their business models to serve mobile application developers on one side and mobile users on the other. Unfortunately, the digital natives like Google and Apple have changed the rules of the game to their advantage by providing the infrastructure to those parties at a lower cost and in a manner appealing to mass audiences. Academic research on this phenomenon can be divided into two streams. The first is to explore the nature of these changes, and several papers have been published examining the structure of the mobile ecosystem, the causes of power turnover, and the possible avenues for each player to consider within the ecosystem (Ballon 2009; Basole & Karla 2011; Ghezzi et al. 2015; Holzer & Ondrus 2011; Xia et al. 2010). The second, to propose solutions for MNOs as the most negatively affected player, however, has received very little attention (Raivio & Luukkainen 2011; Wang et al. 2016). Nevertheless, both research streams reach the common conclusion that the MNOs are no longer able to compete in the application development arena. The few academic studies that tried to suggest solutions were focused on mobile application development. The industry research and white papers, however, speculate that MNOs could embrace other areas and engage with different parties to form new platforms. The two promising avenues to accomplish this are mobile advertising and big data tools and technologies (Meffert & Mohr 2017; van der Lande 2013). The following subsections introduce these two promising possibilities.

1.1.2   Mobile Application Advertising

One of the promising avenues observed in the market and found in the previous literature is mobile advertising. According to eMarketer (2014), at the global level, the spending on mobile advertising increased 105.0%, totaling $17.96 billion in 2013. In

the following year 2014, another considerable rise occurred of 75.1%, totaling $31.45 billion. Until 2014, mobile advertising was estimated to make up almost a quarter of all digital advertisement spending worldwide.

Further, advertisers and mobile service providers have made use of the pervasiveness of mobile devices and users' close relationships to them to push their advertisements using SMS, MMS, and in-app ads. Researchers have also noted there is a high acceptance rate from mobile users for mobile advertisements when compared to web advertisements (Hof 2014). This phenomenon creates new business models for all participants, especially mobile service providers, mobile application developers, and advertising agents (Deng et al. 2015). Despite this big leap on spending and the parallel opportunities for advertising agents, there are also challenges associated with this phenomenon concerning privacy, the context information incorporated into the data; and the proper mining of advertising insights from the mobile user data. Unless these challenges are treated wisely, they may hinder mobile advertising's full potential and create a vast chasm between the mobile end-users' expectations and advertisers' plans (Deng et al. 2015; Wedel & Kannan 2016). The MNOs are not far away from these challenges as they play an advertising agent role and consider advertising as a primary revenue source.

1.1.3   Big Data-driven Business Model

Advertising is only one step MNOs can make to add value to upstream customers (government, advertisers, merchants, application developers, content owners) and end users (businesses and consumers). The second step is to provide them with extensive feedback on their different marketing activities (Deng et al. 2015; Wedel & Kannan 2016). They need to analyse the large quantities of money invested in advertising and keep track of its effectiveness and the return on investment (ROI) to justify this spending. In contrast to in-app analytics that monitors users' activity and time spent in an app or website, advertising analytics draw insights from the advertising data and marketing campaigns to help marketers improve advertising targeting, measure the effectiveness of their spending and accomplish market segmentation based on informed decisions. Hence, for each traffic source or type, the marketers can discern what is

working and what is not and make informed decisions about how to optimise their marketing campaigns accordingly (Tongaonkar et al. 2013).

During the last four years, big data has become a valuable emerging topic in business and academia. Big data is also one of the most significant trends that will play a vital role in reshaping important industries and sectors like advertising, service, manufacturing, retail, telecommunication, transportation, and healthcare (Engel et al. 2014; Morabito 2015). Scholars suggest that the explosion of big data tools and technologies would not only cause disruptions for these industries but that their implications would also enhance and transform these industries' business models (Morabito 2015). One of the intriguing findings of the McKinsey Global Institute report (Brown et al. 2011) is that businesses operate as intermediaries in the value chain. For example, transportation companies have found themselves generating "exhaust data" by opportunity sensing their ordinary business transactions. As a result, they have readily capitalised on those opportunities by selling these data to their partners inside the value chain and thus creating new data-driven business models.

Academic studies have proposed several business models for the telecommunication domain based on two above promising avenues: mobile advertising solutions such as SMS, MMS, in-app ads, and context-aware marketing (Ballon et al. 2008; Chang & Huo 2011; Haddadi et al. 2010; Wang et al. 2015) and a variety of forms of big data analytics such as internet of things (IOT) and sensing as a service (SaaS) (Mizouni & El Barachi 2013; Distefano et al. 2015). These works and others have made valuable contributions to the field of mobile services and telecom business models from theoretical, managerial, and technical perspectives. However, a lack of studies addressing potential IT-enabled business model solutions by connecting design principles of business models to managerial theories and concepts like multi-sided platform, network externalities, and value network to develop, and not merely propose a viable business model. This gap may be due to the educational and background disparity between scholars in the social sciences and their peers in computer science.

The above discussion has noted that the successful business model in the mobile arena with high technology uncertainties are likely to be those that build on

contemporary technologies (i.e. mobile advertising and big data). Such technologies add value not only for end users but also for upstream customers because, for example, they provide insights about their mobile activities like marketing analytics. They further adapt business model design principles, concepts, and methodologies and leverage MNOs' core competencies, their trove of data and customer relationships, to capture the maximum value.

1.1.4 Regulatory Issue

The mobile services and new business models for MNOs are under inspection by government legalisation to prevent monopoly and guarantee a liberalisation of the market (González 2017). As this kind of services is considered as an end-to-end solution, the regulation and licensing issue should be taking into account. Since 1982, the telecommunication policy-makers decreed to divest the AT&T from providing long-distance telephony services and supplying telephone equipment at the same time. Since then, the MNOs are required to subdivide their business into small businesses or so-called Regional Bell Operating Companies to avoid a Breakup of the Bell System law. By doing that, they are able to provide other value-added services without being charged by legislation entities (Coll 2017; Kearney 1998). Consequently, any innovative endeavour by MNOs should consider challenges to the existing legislative and regulatory frameworks (Coll 2017; González 2017).

1.2 PROBLEM STATEMENT

The mobile network operators (MNOs) make a continuing investment in networks, such as 3G and 4G, with the aim to achieve continuous improvement in profitability and a higher, or at least equivalent, return on investment (ROI) rate. This approach sustains and enhances the business models by increasing customer retention, average revenue per user (ARPU) and reducing customer turnover rate (Meffert & Mohr 2017; Wang et al. 2016).

Despite these efforts, traditional MNOs' business models have failed to reach their potential, and this new investment in advanced technology absorbs their capacity

without creating equivalent revenue. This inefficacy is a result of several factors including, growing fierce competitive pressures including those in the value chain, in mature markets, and in service commoditization (Bang 2008; Hasbani et al. 2009; Temraz 2010; Meffert & Mohr 2017; Wang et al. 2016) and disruptive change in technology (Ghezzi et al. 2015). The current business models' inefficiency creates a significant financial burden for the MNOs, which is reflected in a major decline in ROI and ARPU. Conversely, content providers, platform aggregators, and device manufacturers operating in the same value network of mobile ecosystem saw an increase in ROI (Meffert & Mohr 2017; Rouffaert et al. 2012).

Furthermore, in their endeavour to counteract the expected decline, most MNOs have started to adopt platform business models and diversify their product portfolios by utilising contemporary mobile commerce technologies including mobile portals, mobile advertising, and context-aware data services as new revenue streams.They accomplish this diversification by introducing new services for final and upstream customers that are leveraged by their rich trove of customer data, large customer base, and strong customer relationships. (Ballon 2009; Holzer & Ondrus 2011; Nikou & Bouwman 2012).

This new paradigm MNOs are starting to adopt resembles the competition challenges stemming not only from direct competitors but also from those on the value network of the mobile ecosystem (Cortimiglia et al. 2016; Ghezzi et al. 2015; Rohrbeck et al. 2009; Xia et al. 2010). It especially resembles the new players' emerging role in the wireless industry where each actor strives to exercise control within the business model (Meffert & Mohr, 2017; Xia et al. 2010). As these new players expand into the wireless industry, as device manufacturers, carriers, platform aggregators, advertisers, application developers, and content providers, the mobile industry is transforming towards the platformisation of the key players' business model. Consequently, the advantageous time for mobile operators has come to an end as a result of digital natives' and big players' innovative products, services, and applications. These attract organisations' and customers' attention for their ability to collect user data that is sensitive to context and time at the same time as the need for this kind of data has risen

from businesses' and customers' increasingly dynamic environment (Kannan 2017; Power 2013; Raivio et al. 2009; Yoon 2007).

In response to these industrial problems, several studies have been conducted that consider the options that can be explored in new dynamic ecosystems. This is an attempt in order to understand differing business models and their characteristics, strategies, and structures (Ballon et al. 2008; Basole 2009; Basole & Karla 2011; Becker et al. 2012; Schultz et al. 2011; Zhang & Liang 2011) and examine various revenue streams for each actor within an ecosystem (Hyrynsalmi et al. 2012; Xia et al. 2010). What the majority of these studies have found is that the success of all the key players' initiatives in this ecosystem can be attributed to the platform or platformisation of business models. In effect, they usually mediate between different sides of the market (e.g., advertisers, customers, developers) (Goncalves 2010; Wang et al. 2016). This area is where the MNOs have failed to catch up: in contrast to the successful key players, they have lesser capabilities in providing new value propositions and incentives for different sides of the market to achieve the two-sided platform (Hagiu 2014; Meffert & Mohr 2017).

Though many studies have been conducted on this problem, few studies have expanded to introduce viable solutions. In one of these, Ballon et al. (2008), Chang & Huo (2011) and Haddadi et al. (2010) suggest that MNOs implement new advertising-based platforms that emphasise advertiser and end-user benefits and incentives to balance the roles within the ecosystem and maintain the central role of mobile operators, while at the same time preventing them from dominating the system as they once did.

Though some research has been done, there is still a need for a more comprehensive platform for MNOs that leverages the new emerging technologies; recommendations addressing the changing needs of advertisers and considering end users as essential pieces of the puzzle are still not there (Deng et al. 2015; Lin et al. 2016; Wedel & Kannan 2016). Furthermore, advertising is only one step toward adding value for upstream customers and end users. In the era of big data, the need for real-time contextual insights about their mobile moments and actions can fuel MNOs' decisions regarding their brand, buying behaviour, and market segmentation (Deng et

al. 2015; Kerschberg 2014; Calabrese et al. 2014). These are considered of paramount importance in such a highly dynamic and turbulent market (Chen et al. 2012; Wedel & Kannan 2016). Additionally, the traditional advertising channels' inability to accurately identify and target potential customer segments leads to a suboptimal campaign and lower return on investment (Deng et al. 2015; Schlee 2013). In their literature review study on mobile marketing, Ström et al. (2014) clearly illustrate the lack of comprehensive studies on how customers, throughout different stages in brand relationships, may be segmented and targeted by customised interaction in real-time. Ultimately, there is a need for more studies that consider these issues.

Moreover, it is not very effective to use business intelligence tools like data analytics to help businesses make marketing decisions (Deng et al. 2015). This inefficacy is because the data has been collected from MNOs' networks covering a short time interval and does not reflect the rapidly changing business environment (Calabrese et al. 2014). It is also because of the urgent need for time-sensitive data (Deng et al. 2015; Calabrese et al. 2014) requiring substantial effort and cost (Laurila et al. 2013) to discern the appropriate data for making relevant marketing decisions (Wedel & Kannan 2016). In this vein, Lin et al. (2016) found that the main factor leading to end-users' low stratification and advertisers' inclination to seek other advertising services introduced by big players is the segregation of advertisers and end-users from each other. This division prevents the advertisers from obtaining real-time feedback about their advertisements and lacks proper incentive mechanisms provided to end-users. In essence, they lack the shared platform when compared with other advertising service agents.

Although some studies have sought solutions, very few studies have tried to introduce a solution to MNOs based on two-sided market theory to create a mobile-based platform. For instance, Raivio and Luukkainen (2011) have suggested applying open innovation and open APIs to transform the mobile operator from a one-sided platform (traditional business model) to a two-sided platform by following the successful experiments of other players in the wireless industry and value network to maximise their revenue and reap the benefits of network effects. They concluded, however, that this model's successful implementation would be hindered because open

telecom APIs have not yet attracted enough developers to build up the critical mass and they tend to gravitate towards adopting other development platforms provided by Google, Apple, and Microsoft. On the other hand, end users have not found interesting services; therefore, the anticipated benefits of network effects and externalities have been invalidated (Meffert & Mohr 2017; Wang et al. 2016). Similarly, a study by Wang et al. (2016) addresses the mobile application service as a two-sided market and produces a system dynamics model to understand mobile application services' diffusion behaviour. The finding of this study resembles that of Raivio and Luukkainen (2011), who noted that MNOs have to present services that immediately attract adoption by end-users and developers because the cross-side network effect is not sufficient. Ultimately, they recommended that MNOs need to fully exploit their resources to sense and seize emerging opportunities, based on their core competencies and solid customer relationships.

Based on the above discussion, innovation in business model design and implementation can be achieved by building up a critical mass from adopting new technologies. There are many advantages to these technologies: they create new value for different sides of the market, they prevent potential heavy spending in the later development stages by testing this technology at front end stages, and most importantly, they apply successful analogies from other industries (Choudary et al. 2016; Sinfield et al. 2011). Therefore, an essential question for MNOs in this dynamic and evolving ecosystem to ask is: which technology has the potential to achieve a platform business model and what consequences and implications will such technology have?

As this background has demonstrated, mobile devices offer enormous opportunities to advertisers and marketers. Nonetheless, there are inherited challenges for MNOs to overcome if they wish to exploit their full opportunities. These challenges stem from areas such as: ensuring data exclusivity, protecting privacy, assessing the data's contextual information, and determining the appropriate marketing data analytics to drive advertising and marketing insights from the mobile user data (Deng et al. 2015; Wedel & Kannan 2016). Data analytics and data-driven insights can help the advertisers and marketer understand the consumer preferences and behaviour, thus targeting them better based on real-time contextual data. In this regard, other industries illustrate these

possibilities and numerous researchers have studied the data-driven insights by collecting the context and location of a user's mobile phone and mining the relevant data residing on mobile network operators' (Calabrese et al. 2014) GPS (Lin & Hsu 2014) or stand-alone mobile applications (Kiukkone et al. 2010). Innovators have been quick to capitalise on these location-based technologies. Many researchers have developed mobile applications designed for crowdsensing. Crowdsensing is to collect location and context data about users. It can be done for an end user's use in apps like CityExplorer (Matyas et al. 2008), in tracking and estimating road-traffic delay (Thiagarajan et al. 2009) and providing toolkits for public-safety data that law enforcement agencies can use to analyse and detect anomalies among criminals and civil incidents (Razip et al. 2014). Additionally, it can be used for commercial and marketing purposes (Michael & Clarke 2013), especially for market segmentation (Hiziroglu 2013; Wedel & Kannan 2016). Rob Schwartz, CEO of TBWA/Chiat/Day New York, which is one of the most lauded ad agencies, argued that data-driven advertising could provide feedback at scale from consumers, which in turn helps advertisers solve their business problems based on real consumer insights (Forbes 2017).

Overall, this body of research reveals that mobile sensing's successful implementation with real-time spatial-temporal data capturing provides solutions for those seeking instantaneous data about their targeted crowd. Developing solid solutions to these issues will open up a myriad of novel applications exploiting those capabilities, making mobile sensing systems key elements of future business environments (Hoseini-Tabatabaei et al. 2013). Sheng et al. (2013) have introduced the new promising branch of mobile sensing, sensing as a service (SaaS). Zaslavsky et al. (2013) and Mizouni and El Barachi (2013) argue that this tool, in the era of mobile' big data, will be able to develop new products and business models as well as provide a competitive advantage for organisations that have big data potential in ways that were previously not feasible.

In addition, Sadovskyi et al. (2014) argued that the telecommunication industry has a high potential to develop innovative big data-driven business models. In that model, the customer analytics, enabled by the vast quantities of data generated, would allow organisations to make real-time decisions at little cost, and to achieve optimised business operations, thus enhancing firm performance (Germann et al. 2014). As

LaValle et al. (2013) have documented, "Top-performing organisations use analytics five times more than lower performers." For instance, in the retail sector, big data expedites the analysis of in-store purchasing behaviour in near real-time to adjust merchandise, stock levels and prices (Hagen et al. 2013). In some industries, big data has led to the creation of entirely new DDBMs (Hartmann et al. 2014; Brownlow et al. 2015). Therefore MNOs' use of this capability to offer it to other organisations in the value network will enable novel value-adding services and value propositions for upstream customers (Hamka et al. 2014). This use, in turn, is considered an essential component to building a successful business model (Johnson et al. 2008).

In sum, the traditional business models and related services of MNOs are low performing and are being gradually replaced by innovative business models and services of digital natives that are mostly based on two-sided market platforms. The literature concerning MNOs confirms the continuity of the problem. Despite these issues, they are trying to compensate for the substantial spending on new infrastructure by exploiting new avenues such as mobile advertising and big data, and the results so far are daunting. In mobile advertising, the literature analyses indicated that several pitfalls were preventing MNOs from fully reaching their potential including low feedback from advertisers about their investment, low stratification and inferior incentives for end-users (Lin et al. 2016). These pitfalls are the result of MNOs' advertising strategy that tends to segregate advertisers from end-users, thus lacking the shared platform exploited by other players on the mobile ecosystem. Recently, marketers and advertisers have recognised the importance of using constant data analysis to glean insights from their advertising media instead of depending on illusionary one-shot data-driven decisions or high-cost traditional market surveys (Mitchell & Makienko 2014; van der Lande 2013). Fortunately, big data and data analytics can resolve these issues if employed appropriately to define the relevant data and decide the associated marketing decision (Wedel & Kannan 2016). As such, the platform business model could solve the segregation problem by creating a shared platform for both advertisers and end-users to interact. Consequently, MNOs have the great potential to offer this platform for them by utilising their already established relationships and a critical mass of mobile users.

The problem to be resolved by this study is whether a mobile platform can be developed that can design a big DDBM based on two-sided platform theory by combining mobile advertising with data analytics tools like sensing as a service that can provide a value-added service to upstream customers, enable them to make marketing decisions in real-time basis, and offer appropriate incentive mechanisms to end users.

1.3   RESEARCH OBJECTIVES

Based on the statement of the problem, the motive for our study is to find a solution to a practical problem and contribute to the knowledge base forming MNOs' business model. Hence, the aim of this research is twofold: The primary goal is to propose a solution-based artefact for MNOs by determining appropriate business model components. The secondary goal is to explore and identify the fundamental requirements and the managerial principles for innovation needed to design these type of artefacts. Accordingly, the study has on primary objective and four sub-objectives, outlined as follows:

The primary objective (RO) is to design a new business model (artefact) for mobile network operators (MNOs) based on a big data-driven business model, mobile advertising, and two-sided market theory. Therefore to achieve the primary objective, four sub-objectives have been determined as follow:

RO1: To identify the main components of the proposed business model.

RO2: To develop a framework of fundamental requirements for designing artefact.

RO3: To develop a framework for managing two-sided platform innovation for MNOs on an abstract level.

RO4: To evaluate our artefact based on relevant DSR criteria using real-life stakeholders.

1.4   RESEARCH QUESTIONS

Based on the above research objectives, there is a need to raise essential questions to guide the research and to meet the research objectives. Ultimately, these research questions are genuinely informed by business model design principles. Therefore, in the context of business model design, the study seeks to answer the following primary research questions as shown in Table 1.1:

Table 1.1 The research questions to achieve the study objectives

Research Objective	Correspondent Research Question(s)
Research Objective 1	RQ1a: How can the proposed business model (artefact) provide a solution to the MNOs that helps them create new revenue streams and achieve a competitive advantage?
	RQ1b: What are the main big data-driven £ building blocks for the proposed artefact?
	RQ1c: Who are the potential customers' segments for the proposed business model?
	RQ1d: What are the appropriate revenue model(s) of the proposed business model?
	RQ1e: What are the value propositions for each stakeholder involved in the proposed business model?
Research Objective 2	RQ2: What are the organisational and environmental requirements to build the proposed business model?
Research Objective 3	RQ3: How can the innovation process of the proposed business model be managed?
Research Objective 4	RQ4: How can the proposed business model be evaluated?

1.5   SIGNIFICANCE OF THIS STUDY

The telecommunication industry is of high importance to each nation's growth and social prosperity. The high significance of telecommunication industry stems from its contribution to nations' economic growth and GDP. This sector also has a central role as a service provider and facilitator to other economic sectors, and the MNO is the cornerstone of this industry (Ghezzi et al. 2015). Research concerning this sector can

contribute to the nation and economy and provide lasting value for businesses and individuals. Underlying this importance are many others. For instance, the research that deals with developing new products and services are likely to benefit consumers and organisations by enhancing their lives or raising their efficacy and productivity. This study's researcher recognised the importance of this concern and also the significant research gaps in the area of mobile advertising, big data, and two-sided market theories. Addressing these gaps can benefit the core business operations and the sustainability of this vital sector.

As this study is classified as multidisciplinary research, its outcome is expected to contribute to several bodies of knowledge including, business model, BMI, big data deployment, and mobile advertising. For instance, this study explores the practical application of mobile analytics, which has been investigated in theoretical contexts, thus establishing the value of using them in the decision-making process. This study is especially significant for the MNOs. The model proposed will help the operators better serve both their upstream customers and end-users to counter the stiff competition existing in the mobile ecosystem. Additionally, this study will provide a significant contribution to the big data-driven model because work in the area is still in its infancy and few practical studies have been conducted. It also presents the creation of a two-sided platform based on other upstream customers instead of focusing on mobile application developers, as most studies' findings showed that, when focusing on developers, the opportunities are narrow. In addition, the design process itself generates a proposed business model that can contribute to areas of business model and BMI, especially in the two-sided business model type. Ultimately, this type of research is of immense importance to these areas above and also to practical knowledge. Rather than focusing only on studying the real phenomena, this research aims to produce academic knowledge and to introduce solutions to MNOs, advertisers, and end-users.

Additionally, this study's theoretical basis is a hybridisation of DSRM and Grounded theory that will be used to create the proposed model and related descriptive knowledge. This theoretical basis can be considered a significant research contribution in itself as this combination rarely occurs in other research endeavours.

1.6   SCOPE OF THE RESEARCH

This work aims to contribute further to the domain of the big DDBM by investigating advertising, mobile sensing, and "analytics as services" as a new business model for MNOs to reach their downstream and upstream customers and to assess the needs and perspectives of those involved. For that purpose, we applied the design science research methodology (DSRM) to design proposed business model to examine its applicability in the real world with robust data validation. Therefore, the results will be of high importance to the mobile industry as an initial step when starting their big DDBMs, and they will also help them understand what enables their successful implementation. Moreover, the benefits of this work's results are not only for MNOs, but they also extend to fields of big data analytics and mobile sensing as a service, and their application in the marketing field. Broadly, it will help the marketing industry because utilising big data tools and technologies will be introduced as a service for advertisers (retailers), and thus increase the feedback apparatus used in this important area.

Since this study intended to enable a platformisation of the MNOs business model that includes advertisers and end-users, a sample of MNOs' experts was selected to refine and develop the proposed model. The interview respondents are top-level managers from international companies based in Jordan. Because this study has several stakeholders, a sample of SMEs advertisers was also selected to test and evaluate the model. The sample consists of advertisers that use online and mobile advertising in their work. Finally, a sample of end-users was selected from university student volunteers who can be a prospected customers for the proposed model. Ultimately, the three beneficiaries of this research are MNOs, advertisers and end-users, and this study's contribution will be considered of significance to several disciplines such as big data, business model, marketing, and mobile advertising.

As previously mentioned, the regulation and licensing issue have an important role to create and design this kind of business models. However, these issues are out of the scope of this study.

1.7 KEY TERMS DEFINITIONS IN THIS STUDY

Several key terms will be used throughout the seven chapters of this study. Therefore, it is necessary to define these terms based on their meaning specific to this research perspective, rather than as general concepts. The operational definitions of each term are as follows:

1.7.1 Business Model

The business model concept has been thoroughly considered in the business and management field. Its prominence is reflected in the increased number of publications using this concept between the 1990s to the 2000s, in line with the internet boom (Ghaziani & Ventresca 2005).

Throughout the last two decades, the business model concept has garnered much attention from academics and managers, resulting in dozens of definitions and much debate about which definitions and component breakdowns for this term are accurate (Amit & Zott 2001; Casadesus-Masanell & Ricart 2010; Chesbrough & Rosenbloom 2002; Johnson et al. 2008; Magretta 2002; Morris et al. 2005; Osterwalder & Pigneur 2010; Teece 2010; Zott & Amit 2010). The aim of this study, however, is not to come up with a new definition or justify the correctness of one of them over others; this is because there is some consensus about the main components that shape a business model. Instead, we are going to adopt the most relevant of these definitions to our work in this study. Overall, we give considerable attention to the number of agreements on the adopted definition by considering a number of citations in related literature.

Osterwalder (2004) provides the following detailed definition: "a business model is a conceptual tool that contains a set of elements and their relationships and allows expressing a company's logic of earning money. Later, in their best-selling book, Osterwalder and Pigneur (2012), define a business model as, "the rationale of how an organisation creates, delivers, and captures value." In this study, we will adopt the Osterwalder and Pigneur (2012) definition as it is used more often by practitioners and it concisely combines all essential elements.

1.7.2   Revenue Model

Some confusion may exist when defining the two terms "business model" and "revenue model" (George & Bock 2011) because many people use them interchangeably. The revenue model is a description of revenue sources, distributions, and volume while a business model concerns what fundamentally enables revenue generation. Therefore, the revenue model is an essential element of the business model, in other words, it is the way in which firms capture value (Zott & Amit 2006). When considered in the context of the above definition of the business model as 'the rationale of how an organization creates, delivers, and captures value,' we can conclude that the revenue model has nothing to do with value creation and does not describe how the organization creates this value, though it is still clearly an important component of the business model (DaSilva & Trkman 2014). For the purposes of this study, we define revenue model as a vital component of the business model that consists of how the firm generates revenue from the value created, how the price is determined, and who will pay for this value.

1.7.3 Business Model Innovation (BMI)

BMI can be defined, according to Björkdahl and Holmén (2013) and Massa and Tucci (2014), as the process of reconfiguring a business model's value creation and value capture, which results in a novel way of doing business. As discussed above, although no universal definition of business model exists in the literature (Weill et al. 2011), there is a consensus on the essential building blocks of any business model definition, and value creation and value capture are found in most sources. In this study, we are concerned with BMI in established firms. Ultimately, BMI is realised by modifying at least one of the constituting elements of a business model (Abdelkafi et al. 2013; Lindgardt et al. 2009). For this study, we technically define the BMI for established firms as a process of modifying one or more of business model building blocks or elements to create a novel way of doing business.

1.7.4 Data-Driven Business Model (DDBM)

The term DDBM originates from a call for a research grant by the British Research Council's, and it refers to a business model that relies on data as key resources (Hartmman et al. 2014). Later, several scholars use this term (Hartmman et al. 2014: Brownlow et al. 2015; Morabito 2015), defining it as a business model that relies on big data to deliver their fundamental value propositions and to considerably enlarge their value propositions to distinguish themselves to achieve a competitive advantage. Technically, this term is defined as a business model in which one or more of their elements infused with data to deliver something new to customers (Schüritz & Satzger 2016). Therefore, in this study, we define DDBM as the business model that relies on big data to innovate the existing services by incorporating data to create new value for the customers.

1.7.5 Value Proposition

In both academia and practice, there are several definitions for value proposition, and the concept is used extensively. For instance, a value proposition can be defined as the promise that the firm makes to its customers that the product or service will deliver a bundle of value-creating benefits (Hassan 2012). Customers, in turn, may recognise this set or package of values to be "superior, similar or inferior to alternatives" (Lanning 1998). Together, according to Anderson et al. (2006), these expected benefits are a list of favourable characteristics and features of services or products that a firm offers its customers as a result of proper knowledge about the customers and the competitors. In this study, the value proposition is defined as perceived values, benefits, and superior features that the firm delivers through its service and offers to its customers.

1.8 THESIS STRUCTURE

This thesis contains seven chapters. The current chapter, the introduction, explored the background and context of the study and then identified the problem statement, research objectives and research questions. Also, it clarified the central terms as they will be used

in the context of this study. Finally, the outline of the thesis is presented (the approach followed in executing this study is presented visually in Figure 1.1).

Chapter two delineates the study's theoretical foundation, and it presents the main constructs and definitions. Additionally, a critical analysis of related studies is conducted to draw the artefact design principles. In detail, the chapter discusses the associated concepts, theories, models and frameworks of business model, two-sided platform, mobile advertising and big data to identify the relevant theoretical knowledge and to design the new artefact. In each section, the arguments are explored, and gaps in the literature are highlighted. Chapter three presents the selected theories and frameworks that will inform the design process. It then explains the detailed initial artefact development process and performs an initial theoretical evaluation.

Chapter four discusses and demonstrates the different approaches used to fulfil the research objectives and to answer the research questions. The chapter also presents the various research paradigms and methods used in the development of the study's research design. In addition, it offers descriptions of DSRM and Grounded Theory and justifies their use in guiding this study. The chapter closes by explaining the design phases with their corresponding data collection and analysis processes, demonstrating the framework of continuous evaluation.

Chapter five presents the inductive analysis of the semi-structured interviews with MNOs using grounded theory thematic analysis techniques. Open coding is employed to generate the detailed requirements of the artefact. Meanwhile, both axial coding and selective coding are employed to develop the descriptive knowledge that is represented by frameworks of the fundamental requirements and the framework of managing two-sided DDBMs.

Chapter six presents additional refinement and evaluation of the proposed artefact based on data collected from advertisers and end-users. The data analysis is applied at a granular level to add new desirable features to the proposed artefact. The final version of the artefact is then explained and discussed. At the end, the final evaluation of the proof of concept prototype is shown.

Finally, the seventh chapter concludes this thesis. The chapter provides the discussion of outcomes and explains how they answer the research questions and fulfil the research objectives. More broadly, the chapter definitively demonstrates this study's contributions to the field, presents the limitations of the research, and suggests future work that could be done based on the study's findings.
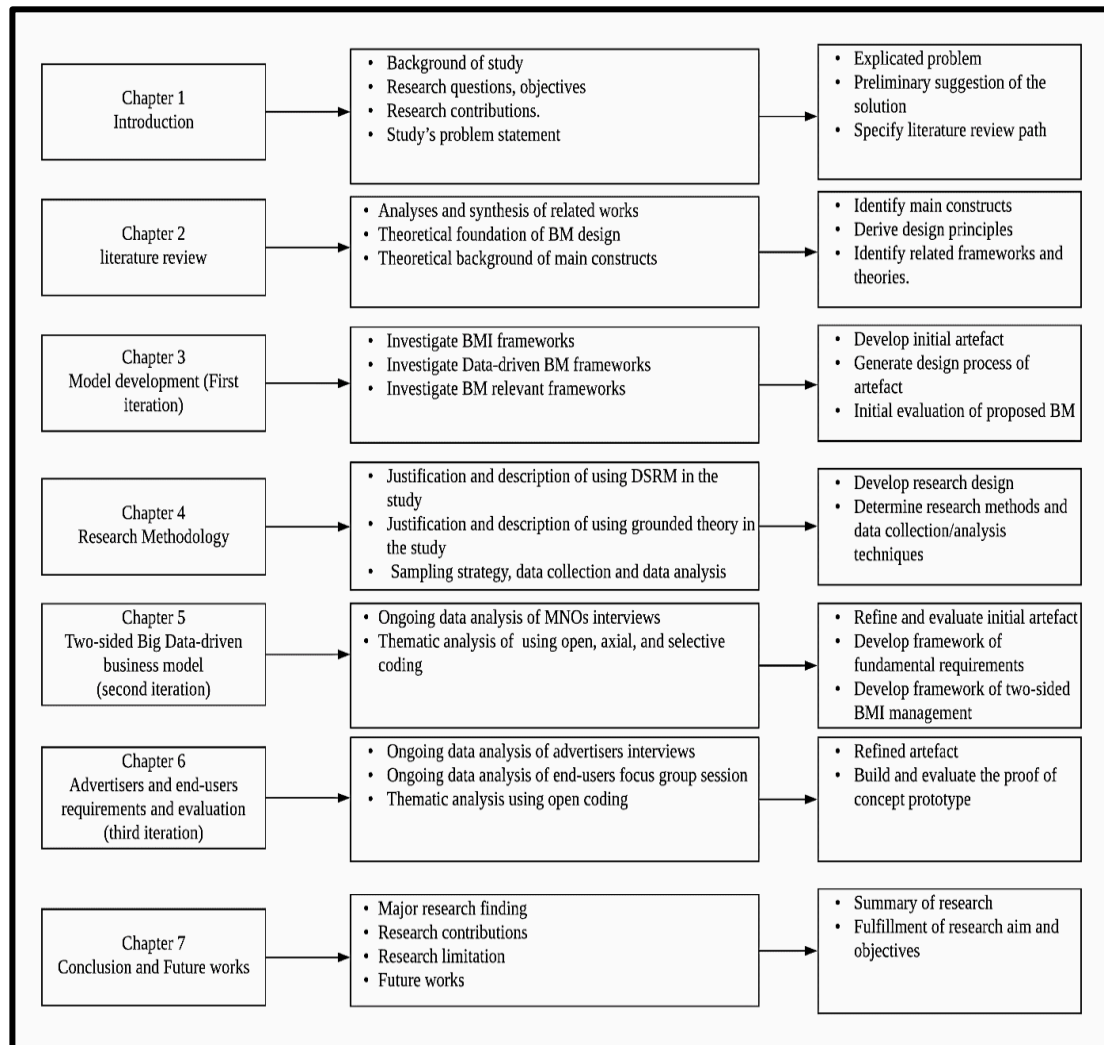
Figure 1.1Structure of the thesis

CHAPTER II

LITERATURE REVIEW

2.1   INTRODUCTION

This chapter reviews the related literature with the concern of introducing a solution in the form of business model for MNOs. The literature review in this work, followed the prevailing theme in conducting DSRM, which the main intention is to build an artefact that adds to the current knowledge base. According to Gregor and Hevner (2013); the useful body of knowledge that underpins this theme of research is divided into three types (i) Descriptive knowledge: the DSR work must include the relevant literature from descriptive theories in the related fields. (i) Prescriptive knowledge: the literature review must consist of prior prescriptive knowledge and existing artefacts. (iii) Any knowledge that contributes to the problem at hand. They argued that the survey of the previous work should be conducted carefully to include all relevant works that may have been performed under different labels with similar aims. Otherwise, the risk of building an artefact that is not new and the lesser possibility to demonstrate that research claims contribution to knowledge.

In this section, the literature of business model for MNOs is reviewed. Considering that the works related to this topic are mostly under the mobile ecosystem, and mobile service umbrella, where MNOs have been mentioned partly, with exception to few works that are solely dedicated to studying MNOs business model. The business model concepts, strategies, and design principles in the general topic of business model, have been applied whenever required. The other sections were dedicated to explaining the related concepts and justifications to the proposed model. The related works for

MNOs are dispersed under several disciplines and research titles, so there is a need to sum up and categories these works before extending further to explain all relevant concepts, theories, and frameworks that would build the main constructs of the model. This section approaches these works according to their aims, where further explanation and issues are presented consequently.

The chapter begins by reviewing the related works conducted to examine the business model of mobile operators and mobile ecosystems. Such a review can show the recommendations and existing solution, thus mapping the current study accordingly. Moreover, this review is also fruitful in determining and extracting the design principles through thematic analysis of them. Therefore, the proposed artefact will be considered as a valid theoretically based on descriptive and perspective existing knowledge. The review was divided into four main constructs, MNOs business model design principles, two-sided market theory and platformisation of MNOs business model, advertising in MNOs, and lastly the big data role and deployment for MNOs. The literature of available models and frameworks are reviewed, to select the theoretical lens to design the proposed artefact, this includes literature related to business model and business model innovation (BMI) and big data-driven business model (DDBM). In this review, the gaps are exposed in relation to each construct, as a secondary aim of conducting the review.

2.2   RELATED WORKS

The analysis of related works in different relevant disciplines was conducted in this study as a warrant for three objectives; (i) identify the gap in each construct to ensure that the solution is new, according to DSRM principles (ii) identify the possible opportunities, challenges, and design principles for new artefact (iii) build the new artefact on the basis of existing knowledge (kernel theories), so that the solution is derived from a rigorous base. In this line, taking a novel look at literature and the industrial report is the first step to identifying the potential opportunities for mobile operators to exploit.

2.3   MOBILE NETWORK OPERATORS (MNOS)

Despite the high importance of telecommunication industry and its contribution to economic growth and GDP of nations, in addition to a central role of this sector as a service provider to other sectors, where mobile operators are the cornerstone of this industry (Ghezzi et al. 2015). Unfortunately, little scholarly attention has given to this area, especially in the last four years. Though the technical aspects of networking and data management have adequate attention from scholars, little has given to business model enhancement as one of the critical issues facing MNOs within their dynamic market. On the other side, several industrial and consulting reports, expert blogs, and white papers had a remarkable concern on this issue and focused on creating and enhancing MNOs business model by utilising emerging technology such as big data to drive new products and services. In the next section, we provide a review of extant literature that has exposed to MNOs business models to extract tendency; then we consider works on Big Data and mobile advertising to connect with studies focusing more on the data-driven business model as a new trend of the business model domain.

2.4   MNOS MANAGERIAL PERSPECTIVE

Studies have focused on giving both administrative solutions through covering managerial aspects such as the design principles of the business model and highlighted the opportunities and challenges faced by companies through the process of developing or expanding their business model. Through our review of mobile ecosystem works, scholars have aimed to analyse and understand the complex structures and design of business model of different players of this ecosystem. For example, Basole (2009) stated that the emerging technologies have transforming effects on business model design and there is need to respond to this surge of technical potentials, yet this study's results were applied to the ecosystem as a whole without focusing on a particular segment. Xia et al. (2010) conducted a study to examine the different revenue streams of ecosystem key players. They stated that MNOs generate revenue from participating in application stores as a content provider, utilising their vital role in the network as data bandwidth providers. Later on, a study by Basole and Karla (2012) revealed that the reverse was happening, and the MNOs failed to keep up and share the expected benefits.

The transformation wave hitting the mobile sphere has tremendous effects on the main actors, where mobile device manufacturers, platform aggregators, and application providers have more successful business models than MNOs. Ballon (2009) and Basole and Karla (2011) have concluded that the platformisation of services by those successful players was the reason for their success, where MNOs still struggle to adapt as their central role has been weakened (Jing 2014).

Several scholars address the issue of the mobile ecosystem business model so as to suggest possible solutions to MNOs and other players, which is relevant for this study. Most of these works have concentrated on developing a set of design principles and methods to reinvent the business model of MNOs (Bouwman et al. 2008; Al-Debei et al. 2008; De Reuver & Haaker 2009; Al-Debei et al. 2011; Becker et al. 2012; Al-Debei et al. 2013). Despite the substantial base that these works have brought to this field, these works have neglected the technological innovation aspect. However, the common assumptions are that the technological innovation connected to the organisation's high performance, and the case of overlooking the role of the business model also persists on the other side of the equation. The business model literature, in general, faces a gap with using technological innovation and on the other hand, the technological innovation scholars overlook the role of business model in deploying this innovation in organisational context model (Amit & Zott 2001; Baden-Fuller & Haefliger 2013). Nevertheless, a business model is a cognitive device that describes how an organisation creates and capture value (Aversa et al. 2015). That being said, a successful business model connects the technological and economic domain by articulating latent technical potential and converting it to economic value propositions (Chesbrough & Rosenbloom 2002).

However, these studies revealed that the MNO's role in the mobile ecosystem is declining dramatically, and a little room is available for MNOs in the mobile ecosystem, as a result of the fierce battle for platform leadership among the players within the ecosystem (Gonçalves et al. 2010; Holzer & Ondrus 2011; Ghezzi et al. 2015; Wang et al. 2016). Consequently, some of earlier studies advised that the MNOs should stick to their core business (Holzer & Ondrus 2011), where others suggested them to seek for collaboration with the OTT players to generate additional revenue and adapt

their current business model accordingly (Basole 2009; Liu & Huang 2017; Limbach 2014). Nevertheless, the MNOs have started cooperating with OTTs to create new customer value and value proposition, by playing several roles as an industrial study by Limbach, (2014) has documented. He taxonomized these roles into promotion, bundling, special OTT tariffs, customer data access, core service access, and cooperative technological integration. Notwithstanding, these offers are divided into value and revenue creation using MNO infrastructure, which yet imposes more burden on their networks and local facilitator to disseminate the OTTs services using MNO core competencies such as strong customer relationship and data with very marginal revenue.

Similarly, Liu and Huang (2017) stated that the MNOs have two options to cope with challenges from OTTs services. First, MNOs can elect to be dumb pipes and, strategically adopting and alliance with OTT service providers, make aggressive upgrades to their infrastructures. Second, they can aggregate contents by developing their own platforms that compete with those of other OTTs service providers. This study explored the second option and analysed what the extant literature has proposed, related to this issue. The central construct of MNOs business model was used to guide the analysis which was divided into three categories: general findings, challenges for MNOs, and opportunities for them. A sample of these findings is presented in Table 2.1, to show how the themes emerged based on valid results.

Currently, the study of the MNO's business model cannot be done in isolation from the others in the mobile ecosystem namely; mobile device manufacturers, mobile application developers and mobile platform providers. As a result, the structure of the mobile ecosystem has changed. thus, the conceptualising of the MNO's business model as a linear one-way value chain is inadequate, and the need to consider the inter-firm relationships is crucial in building new service, and consequently to the related business model. The conversion from value chain to value network becomes essential to sustain MNO's business model (Basole 2009; Basole &Karla 2011). The value network stems from the complex business ecosystem with various inter-firm relationships (Li & Whalley 2002; Peppard & Rylander 2006). In this line, Rao and Jimenez (2011) have

stated that the shift from value chain to value network should include a parallel shift of thinking from consumers, into thinking of co-creator of value.

Table 2.1 Managerial design principles for MNO's business model based on literature thematic analysis

MNOs business model within the Mobile Ecosystem the Managerial and Design Perspectives (sub-constructs)	Main Findings and recommendations (Design Principles)	Supporting Literature
Build services based on business model logic and BMI	Any successful mobile service must be created with a business model in mind. A venture and innovation of business model are an inevitable business decision to consider as a way to sustain the competitive position. Adapt their new business model to their core competencies.	(Bouwman et al. 2008; Al-Debei et al. 2008; De Reuver & Haaker, 2009; Al-Debei et al. 2011; Becker et al. 2012; Al-Debei et al. 2013; Ghezzi et al. 2015)
Exploit new technologies and opportunities	Adapt to new customers expectation and demands. Seizing the new opportunities based on organisation core competencies. New business models based on current technologies. Convert new technology to new customer value propositions.	(Basole 2009; Liu & Huang 2017; Limbach, 2014; Wang et al. 2016; Ghezzi et al. 2015)
Platformisation of business model	Platformisation of business model is the new trend for successful players in the ecosystem. MNOs should adopt platform mind-set. Creating value and innovation using technological platforms The transition between the value chain and value network. The design of successful value network is an essential element to innovate the business model. Create their own services platforms.	(Gonçalves et al. 2010; Faustino & Picoto 2014; Liu & Huang 2017; Limbach 2014; Raivio & Luukkainen 2011; Wang et al. 2016)

Since the Bled conference held in 2003 about e-transformation, a profound concern from academia and practitioners has emerged about the importance of designing a business model in the ICT sector, and to create a successful innovative mobile service (Faber et al. 2003). Since then, several studies have been conducted to

delineate the design principles from a business perspective (Bouwman et al. 2008; De Reuver & Haaker 2009; Al-Debei et al. 2011; Al-Debei et al. 2013). A common theme underpins these works and others in the mobile ecosystem field in general and mobile operators as a part of it, can be summarised as follows:

a)   Any successful mobile service must be created with a business model in mind.

b)   The design of successful value network is an essential element to innovate the business model.

c)   A venture and innovation of business model are an inevitable business decision to consider as a way to sustain the competitive position.

d)   Creating value and innovation using technological platforms.

e)   Platformisation of business model is the new trend for successful players in the ecosystem.

f)   Seizing the new opportunities based on organisation core competencies.

While the early focus of studying business model in this field was in conceptualising and business model design, the latest focus is on tooling of design and further integration of business model research and IS research (Bouwman et al. 2012), where the practical solution is missing. Noticeably, the major findings of most of the literature have shown a shift of most player towards the platfomrisation of their business models. Therefore, the question raised in this study is what the platformisation opportunities are for MNOs, and how these opportunities are related to their core competencies. The answers to these questions are covered in the next sections.

2.5   PLATFORMISATION OF MOBILE OPERATORS SERVICES

In the mobile service domain, all initiatives from actors in the mobile ecosystem struggle for a competitive position. These initiatives have some common constructs and can be considered platforms. The mobile ecosystem has converted towards adopting a platform strategy by OTTs, while the MNOs are still lagging behind in this competitive arena (Gonçalves et al. 2010). As we mentioned earlier, the platformisation means that the company plays a central role as a mediator between two sides. In the context of a mobile ecosystem, the company can mediate between developers, government bodies, advertisers, and consumers. According to Telco 2.0 (2011), the MNO operate between different entities and end-users. Figure 2.1 shows these business entities who represent the upstream customers and end-users; and also represent the downstream customer of potential MNOs platform.
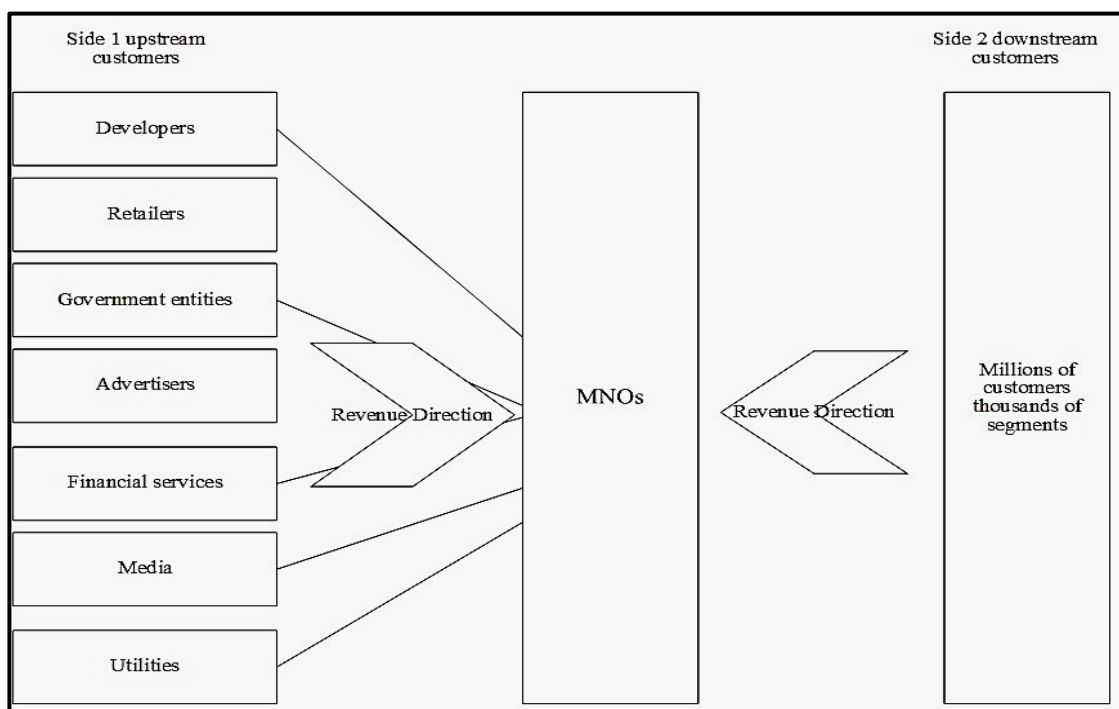
Figure 2.1 Potential Sides of Two-sided Platform for MNO

Source: Own Representation Based on (Telco 2.0 2011)

In academia, several scholars have investigated the current situation of MNOs, to answer a profound question of what kind of platform type the operators should adopt based on their aims. To this extent, Gonçalves et al (2010) analysed the four possible

platforms as shown in Table 2.2 in term of advantages and disadvantages, plus the core competencies that mobile operators have to leverage in their endeavour to achieve success in this area. In their work, the analysis was done to examine the relationship between the following two sides: mobile apps developers and consumers (end-users). But later studies revealed that mobile operators are no longer capable of attracting developers (Raivio & Luukkainen 2011; Hagiu, 2014; Wang et al. 2016).

Table 2.2 MNOs platform types

Platform Type	Competences
Enabler	Developing and continuing to maintain IT infrastructure supporting the services the platform offers
System Integrator	Also applying here are the enabler platform competences.
	Upstream customer: establishing an inviting revenue share rate and a good development platform with options for feedback.
	Downstream customer: establishing competitive pricing and billing schemes.
Neutral	Being organised to enable productive collaboration. Overseeing relationships and ensuring partners' internal and external interests are balanced. Establishing public relations between businesses to raise awareness of the platform.
Broker	Providing upstream customers incentives to publish on the platform, like a plan with revenue sharing. Giving upstream customers the tools for tracking statistical data on their products. Concentrate on user experience and offer a competitively priced and user-friendly environment.

Source: Adapted from Gonçalves et al. (2010) and revised based on platform theory
literature for generalisation purpose

In this essence, Raivio and Luukkainen (2011) have suggested to apply open innovation and open API to transform mobile operator from a one-side platform to a two-sided platform in order to maximise their revenue and reap the benefits of network effects. However, they have concluded that successful implementation of this model would be hindered because open telecom APIs have not yet attracted enough developers to build up the critical mass and tend to turn to adopting other development platforms provided by Google, Apple, and Microsoft. On the other hand, end-users have not found interesting services, therefore, the anticipated benefits of network effects and externalities have been eliminated. Similarly, Wang et al. (2016) conducted a study that considers the mobile application services to be a two-sided market and designs a system

dynamics model to explain their diffusion behaviour. The findings of this study is similar to Raivio and Luukkainen (2011), who stated that MNOs must offer services that attract end-users' and developers' adoption because the cross-side network effect is currently insufficient. MNOs must use a localisation strategy, which can be achieved through collaboration with third-party IT vendors, thus convincing developers and end-users to consider their stores to be another "home base." Furthermore, they concluded that MNOs must not only harness their resources to discern and grasp emerging opportunities but also reshape their resources in accordance with market dynamics to reconstruct their core competencies in a way that maintains their competitive advantage.

Based on the above, we argue that MNOs should explore other stakeholders to build their platform strategy. The current study's role is to collaborate with operators to find the best bet based on shared aims and needs among platform members. Therefore, we analysed the findings of these works and others, which theoretically addressed this aspect of extracting the design principles using content and thematic analysis protocol. Table 2.3 shows this analysis and the resulting design issues and principles.

According to Amit and Zott (2012) and Choudary et al. (2016), established organisations, in contrast to start-ups, must use large corporation thinking to platformise their business model, which should be built on the current pipe business model and should focus on the existing assets, constraints, processes, and customer base. Based on this thinking, MNOs should restrict their business models to the current base of downstream and upstream customers (Wang et al. 2015). Therefore, MNOs have to explore which groups in the mobile ecosystem (i.e. developers, advertisers, government bodies, and consumers) will be selected as their two distinct groups, with mobile phone users (subscribers) will make up the first group. Additionally, one of the primary principles of the two-sided market theory is to start small. Thus it is necessary to select a niche market (Choudary et al. 2016). Therefore, there is a need to perform a critical analysis to make selections from the potential prospects. Ultimately, MNOs should ask the three following questions: (i) who are our potential prospects for our current upstream customers? ii) What value propositions (incentives) will bring in two groups and achieve network effects? (iii) What kind of technology platform is able to create this value?

Table 2.3 Platform design principles for MNO's business model based on literature thematic analysis

Two-sided business model (platform) as a solution for MNOs. Design perspectives (sub-constructs).	Main Findings and Recommendations (Design Principles)	Supporting Literature
Mobile ecosystem competition issues.	Non-adopters of mobile platform within the mobile ecosystem will lose the competition battle. MNOs platform strategy is unable to attract mobile application developers. MNOs platform strategy should seek other network actors.	(Ghezzi et al. 2015; Raivio & Luukkainen 2011; Hagiu 2014; Wang et al. 2016).
Platform construction issues.	Platformisation of MNOs business model based on their core competencies. MNOs and large corporation thinking to platformise their business model, which should be built on the current pipe business model and should focus on the existing assets, constraints, processes, and customer base Select a proper technology platform to convert customers' expectations and needs to value.	(Ghezzi et al. 2015; Raivio & Luukkainen 2011; Hagiu 2014; Wang et al. 2016;)
Roles of MNOs within the mobile ecosystem.	Various roles of MNOs within the mobile ecosystem including models of enabler, system integrator, neutral or broker. These roles depend on the control over assets that the platform owner has, and also their control of the customer relationship.	(Ballon et al. 2008; Gonçalves et al. 2010)

In this vein, the persistent questions of what comes first in a platform business model has less impact for MNOs because their first group (downstream customers) is already established. However, the niche group needs to be considered. For MNOs, the challenge is selecting the second group (upstream customers). According to Telco 2.0, (2011), potential upstream customers are app developers, government bodies, content owners, retailers, and brand advertisers. So far, the existing literature does consider developers and content owners within the mobile ecosystem (Raivio & Luukkainen

2011; Hagiu & Ha laburda 2014). However, these studies have also demonstrated that MNOs are struggling to attract developers. Therefore, the recommendation is that MNOs should seek different stakeholders for their products. Another favourable avenue that OTTs have explored is mobile advertising (e.g. Google and Facebook). Generally, MNOs perform well when they offer SMS ads and location-based advertising. Thus, in the next section, we analyse the mobile advertising construct with the aim of defining its potential, unfulfilled needs and expectations of involved stakeholders, to propose the suitable technology platform that enables value co-creation among them.

2.5.1 Mobile Advertising Platform

Advertising is an effective marketing strategy designed to promote and sell the product or service. It involves targeting certain segments of consumers and provides communication-based on psychographic and demographic behaviours and the other essential features used in marketing. Today, the mobile advertisement has developed into a flourishing business. For instance, in the U.S, the mobile advertisement was projected to have grown to more than $19 billion in 2014. This growth is not about to stop: current projections still anticipate that the mobile advertisement will continue to grow in the future. Most of the projections anticipate that the mobile advertisement industry will develop to more than $65 billion before the end of 2019. With this growth, it will account for almost three-quarters of all the spending on the digital advertisement (eMarketer 2015a). Nevertheless, the global advertising market in the mobile industry is expected to pass the $100 billion mark which will comprise the most spending when it is compared to another digital advertisement in 2016 (eMarketer 2015b). This growth is brought about by the massive spread and adoption of mobile devices as well as smartphones.

Early works that tried to propose solutions for mobile operators were concentrated on advertising as a base to build a business model (Ballon et al. 2008; Chang & Huo 2011; Haddadi et al. 2010), though these studies may be considered outdated in this industry characterised by high turbulence. For instance, Ballon et al. (2008), after reviewing the four platforms for service provision within the ecosystem, have proposed a fifth model to balance the gatekeeping role among different actors. In this model, they

try to leverage mobile advertising as a promising emergent tool. However, this model lacks the validation of its assumptions. Other work by Chang and Huo (2011) has proposed an advertising framework with discounted fees to increase broadband subscription even though the problem most of MNOs face now is not the number of subscribers, but their proposed framework is suitable for new entrants or hitchhikers that try to reposition their brand. Haddadi et al. (2010) have introduced a promising advertising platform for MNOs, MOBIAD, which is a location-aware and personalised advertising tool that handles the privacy and security issues. In fact, their proposed platform has many fruitful contributions technically, but the role of the business model was missing as we mentioned earlier. These works have documented the importance of mobile advertising as a potential revenue stream for MNOs to sustain their business models.

The most recent industrial studies have reflected that there is a big opportunity for mobile operators to leverage on mobile advertising, as a revenue stream in the next coming years (Hof 2014). Another evidence was found in recent academic studies, for instance; Brownlow et al. (2015) have documented that mobile operators still explore advertising as the primary revenue stream for them. Moreover, according to eMarketer (2014), spending on global mobile advertising increased 105% to a total of $17.96 billion in comparison $8.76 billion in 2012. This form of advertising's high acceptance rate among users compared to web advertising has also been noted by researchers. However, as we alluded earlier, the mobile operators are struggling, as some stakeholders are not satisfied with the advertising services in its current form, where some of their needs are overlooked.

According to some recent work, mobile advertisement and targeting has been found to be very effective in providing location-based services (Li & Du 2012). With the incorporation of both the local and geographical limitations, the retailers will gain more freedom to offer discriminated prices (Fong et al. 2015) and expanded sales (Luo et al. 2014). In this vein, a recent study conducted by Lin et al. (2016) on the development of location-based advertising (LBA) in analysing stakeholders' perspectives has promising findings relevant to the perspectives of MNOs, advertisers and consumers. Despite such promising opportunities, the study also delineated several

challenges preventing MNOs from profiting from LBA's benefits. These challenges are additional competition with LBA app developers, an absence of pulled mobile ads, and the need for network coverage improvements. Overall, due to the uncertainty surrounding LBA effectiveness and ROI, the advertisers of non-adopters remain conservative, while the uncertainty faced by adopters creates a demand for incentives to persuade customers to adopt LBA. Ultimately, we can conclude that the mobile advertising has strong prospects, but that the issue that endured in LBA is the lack of a shared platform where the MNOs, as platform providers, can create segregated advertising for consumers. This absence of a shared platform prevents advertisers from directly retrieving consumer information to devise insights, measure the actual ROI, and offer consumers relevant insights. Additionally, factors other than location contribute to the consumer perception towards LBA. Therefore, an advertising business model that fulfils these requirements is needed to raise the success potential, whereas the multi-sided platform is of great benefit to overcome the persistent problems with segregation.

Despite the scarcity and datedness of academic studies conducted to propose a solution for MNOs, the non-academic publications revealed that mobile advertising is still achieving high potential, as we mentioned earlier. Therefore, these studies can contribute to the base of designing a business model that adopts mobile advertising. That said, we conducted a simple thematic analysis to extract the main principles from them so as to aid in designing our artefact (Table 2.4 shows this analysis and the generated themes). The central construct, mobile advertising, was used to guide the analysis which was divided into three categories: general findings, challenges for MNOs, and opportunities for them. A sample of these findings is presented in Table 2.4 to show how the themes emerged based on valid results.

In summary, the mobile advertising still has significant potential, but in case of MNOs, the SMS and LBA current models suffer from some obstacles that hinder them from reaching their maximum potential as industrial reports indicated. The advertisers' need a data about their advertising activities to help them evaluate and assess their investments as compared to the dominated parties such as Google, Facebook, and others (eMarketers 2014). On the other side, end-users have an overwhelming wave of pushed

ads that effect to a large extent their privacy and intrude their devices and time. In addition, the end-users need effective incentives mechanism to attract them to adopt these models and be loyal to them.

Table 2.4 Mobile advertising design principles for MNO based on literature thematic analysis

Mobile advertising as a solution for MNOs issues (sub-constructs)	Main Findings and recommendations (Design Principles)	Supporting Literature
Opportunities and Challenges	The mobile advertising applications have high potential. Context-aware mobile advertising is beneficial to advertisers and MNOs. Mobile advertising creates many opportunities such as; Enhancing organisational innovativeness, strengthening competitive advantages, and creating value-added mobile ad services. Additional competition with LBA app developers. Uncertainty about LBA effectiveness and ROI from advertisers	(Ballon et al. 2008; Emarketer 2014; Hof 2014; Fong et al. 2015; Li & Du. 2012; Lin et al. 2016)
Requirements	Advertisers need feedback apparatus about their advertising activities. Time convenience, security and privacy have high priority for end-users. Both end users and advertisers need monetary and information incentives to participate in mobile advertising platforms effectively	(Grover & Kar 2017; Haddadi et al. 2010; Lin et al. 2016)

Thus, a proper strategy is required to overcome this and reach a trade-off between advertisers and end-users interests and hence, adequate incentives are required to make this more attractive and convenient. Several questions have arisen from the past discussion, and they include: First, what available feedback tools can MNOs create for advertisers to attract them to advertise more while also increasing end-users adoption with a proper incentives mechanism? Second, how to protect end-users' privacy and data and make mobile advertising appealing and more time convenient? In the context

of the business model, this means how to create value with superior value propositions to involved parties.

2.5.2 MNOs and Big Data

Telecommunications companies have a distinct advantage in comparison to other industries because can control communications infrastructure, which their customers use to access a variety of services. The industry's access to vast quantities of data, more than other industries, provides the opportunity for tracking their prospective customers' locations, interactions, and business transactions. Essentially, this customer information can be leveraged to transform the industry from its outdated 19th Century business model to one involving real-time business and consumer insights that meets modern demands (Jony et al. 2015). According to CITO Research, (2012) and Jony et al. (2015), 54 percent of telecom operators asserted that big data is currently a strategic priority for their organisation. ITU (2013) predicted that, in the near future, nearly all mobile operators would begin considering big data to be a strategic priority for both their external and internal use (Jony et al. 2015).

MNOs have noted the power of big data in improving their processes internally, and also in utilising it externally to offer it as new services to others (Zheng et al. 2016). Although MNOs generate extensive data within their value chain from customers' daily activities and logs, big data is meaningless if it is not utilised (Morabito 2015). Marketers have begun to recognise big data's potential in extracting useful insights about their marketing activities (Erevelles et al. 2015). However, very few are able to use big data analytics to quantify their marketing and advertising performance due to a shortage of people and IT capabilities, particularly in small and medium-size companies (SMEs) (Gnyawali & Park 2009; European Commission 2013; Ardagna et al. 2016). Marketing effectiveness performance is becoming a priority for managers, and gradually become a competitive factor (Solcansky & Simberova 2010). For example, the process of estimating the very best budget and ROI to maximise profits in advertising is a frequently addressed issue in marketing research that shows that only making one-shot decisions on them is not sufficient (Mitchell & Makienko 2014). Marketers have also focused on exploiting data gathered from mobile devices to reap

the benefits of big data where third parties may use this data for different purposes (Eastin et al. 2016). In those firms, the process of making decisions on central issues like promotion, segmentation, and advertising is almost always based on the instinct and experience of managers (LaValle et al. 2011). As a result, they fall behind when it comes to competition and marketing investment. Despite MNOs' recognition of the potential for providing big data analytics services to their upstream customers and in developing new business models, their services are still immature, and most are primarily concerned with utilising their trove of data in creating internal value. Value-added services could hold even more potential for creating revenue streams (van der Lande 2013). Van der Lande (2013) delineates two effective opportunities for MNOs to use big data to bring in income from advertising and marketing: (i) Mobile advertising, including personalised ads, SMS/MMS, and an MNO-owned mobile advertising platform. (ii) Market research to provide comprehensive data for retail, government, and infrastructure planning. To exemplify, retail outlets could use this service when optimising the locations for new stores and shopping malls, and billboard advertisers could use it to determine the optimal locations and content. Despite these potential benefits of value-added services, MNOs creating big data-driven services should take into account the following challenges:

(i) The growing number of mobile data applications downloaded by users that do not share market details with MNOs, which creates gaps in the whole picture (Bohé et al. 2011).

(ii) Regulators' imposition of privacy constraints and restrictions, and consumer concerns, of which there are more than those imposed on OTT players who provide similar services, make it so that, in order to enable MNOs' use of end-user data, they should incentivise opt-in services and applications (Van der Lande 2013).

(iii) They need to receive real-time and near-live data from advertisers and marketers to repeatedly rework their budgets, make choices at the right time, and measure marketing activities' ROI (Grover & Kar 2017).

In summary, MNOs are in a favourable position to make use of a two-sided platform for advertisers based on big data as a value creator if they are able to establish this platform with properly selected components and considering previous insights and propositions provided.

Many scholars have made the arguments that big data would be a key basis for competition (Brown et al. 2011; Bughin 2016). Consequently, several research questions stem from this phenomenon such as; what kind of business models can firms deploy to leverage big data? What are the industries and organisations that have the most potential to use big data? What is the associated risk of doing that? What is the suitable technological platform to deploy and thus develop a business model upon it? What are the design principles for building this kind of business model? And many other questions.

According to Buhl (2013) and Grover and Kar (2017), the field of big data research can be divided into two aspects:

(i) A technical aspect, which is devoted to managing data acquisition, storage, and analysis, which is beyond the scope of this study

(ii) A business aspect which is devoted to the deployment of big data to optimise organisation's processes and functions, aid tools to help managers in decision-making activities, and to create innovative products and services (create new customer value).

The hype surrounding big data has induced the scholars to conduct several works in the field of BMI, value creation, developing new products and services within various industries and sectors such as retail, healthcare, manufacturing, finance, education, government, e-commerce (Akter & Wamba 2016; Wamba et al. 2015). However, despite the importance of big data in the telecommunications industry as an industrial research tool, sponsored white papers have shown that there is a lack of studies that address this important sector (Grover & Kar 2017). The MNOs and telecommunication sector have been addressed partially in general purpose studies (Morabito 2015)

(Brownlow et al. 2015) or, in the form of conference paper (Mizouni & El Barachi 2013), white papers, consulting reports, and industrial reports. Therefore, there is a need for the study to address the big data-driven business model type. Grover and Kar (2017: 21) in their review paper was called for this kind of academic study when they stated,

> *"Studies using big data in industries like materials; real estate; telecommunications; agriculture; forestry, fishing and hunting; accommodation and food services and waste management are yet to be published."*

Where these industries would be most helped from studies would be those that extend the theoretical understanding of the domain, since the analysis in published literature is predominantly descriptive.

From the solution proposition prescriptive side, the only study proposing a new business model for MNOs is the one conducted by Mizouni and El Barachi (2013). In this study, they proposed a DDBM by using mobile phone sensing as a service involving crowdsourcing their subscribers based on an incentive mechanism for the telecommunication sector and provide this service to specific entities in need. Nonetheless, the application of this model in the real world will impose more burdens on MNOs to form a new strategic partnership with these new entities, while the ROI for new infrastructure may not be satisfactory for them. In addition, the related theories and concepts are missing for validating the business model. Nevertheless, few studies were identified as relevant to this construct, and the design principles were extracted from them to advise the artefact design. The themes are presented in Table 2.5.

In general, companies can sell and profit from the four following big data products: raw big data, big data analytics services, big data experts, and big data technologies (Morabito 2015). However, not all companies can play all these roles if they want to embrace big data as a selling point. On the other hand, these activities are not confined to companies that specialised in big data solutions. According to Forbes (2014), many companies have started selling their customer data generated from ordinary business transactions to their partners to make more revenue and reinvigorate their business models.

Table 2.5 Big DDBM design principles for MNO based on literature thematic analysis

Data-driven business model for MNOs	Main Findings and recommendations (Design Principles)	Supporting Literature
Opportunities	External deployment of big data to design new business model has high potential. Crowd data are precious to create value propositions and therefore DDBM. Analogies of other industries business model can be leveraged by MNOs based on their core competencies. The MNOs are less affected by reputation risk regarding data collection. Aggregate data has great potential to create DDBM and avoid privacy and regulation issues. Brand extension considered advantageous to MNOs to sustain their competitive position. The mobile phone sensing to collect users' data is advantageous due to increased coverage, on-demand sensing, and social value.	(Forbes 2014; LaValle et al. 2011; Mizouni &El Barachi 2013; Morabito 2015; Van der Lande 2013; Zheng et al. 2016)
Challenges	Not all required data is within reach of MNOs Three inhibitors for data-driven implementation according to their significance namely cultural issues, perceived value or benefits of DDBM, data quality and integrity. Speed is a central factor for value creation from big data. Privacy and security.	(Bohé et al. 2011; Van der Lande 2013; Brownlow et al. 2015)
Requirements	Purposeful analysis of raw data. DDBM for established companies is assembled on their current value chain and customers base. Proper incentives to users	(Forbes 2014; Brownlow et al. 2015; Morabito 2015; Mizouni & El Barachi 2013)

According to Chesbrough (2007) and Gassman et al. (2013), the innovation can be achieved by following a successful business model, or so-called analogies of others, even if they belong to other industries. Gregor and Hevner (2013) have argued that applying other solutions from another field (exaptation) can be considered innovative

and contribute to research as well. Another important conclusion from those companies that have succeeded in selling data and analytics are the following (Forbes 2014; Morabito 2015; Brownlow et al. 2015) and they include:

(i) The prior relationship that has been established between these companies for ordinary business practices.

(ii) The second issue which also related to the previous one is the data and analytics services sold with pre-specified purposes.

Consequently, the companies that are seeking to expand their original business model to include big data should explore current business partners and their needs (Forbes 2014; Morabito 2015); this makes the research more focused and opportunities easy to detect. This conclusion is compatible with Choudary et al. (2016), who stated that the platformisation for established companies is restricted to the current value chain and is customer based.

As in the two-sided business model (platforms), the concept of introducing proper incentives to lure the participants to join applies to DDBMs, and in most cases, data are captured from end-users and individuals (Mizouni & El Barachi, 2013). These entities require something in exchange for their data, and not only that but also the privacy and other related regulations issues should be considered to ensure their data security (Morabito 2015).

In sum, the external deployment of big data to design a new business model has high rewards for organisations, if they exploit it according to warranties provided previously. Real business cases are required to be explored by scholars to provide the MNOs with prospected avenues to exploit.

2.6   REGULATORY ISSUES

This kind of services and business models are under the scrutiny of regulatory commissions and governmental entities to ensure the freedom of competition, services

quality, and privacy and consumers satisfaction— for example, Telecom 1.0, which was monopolistic in market structure and led to regulation 1.0. Later on, Regulation 2.0 came into the scene to stress on privatisation, entry, liberalisation, and competition (Noam 2010). A clear example in history which created the buzz is the case of AT&T Company in the USA. This case has a lasting effect on telecommunication regulatory and policies as a result of Breakup of the Bell System law. According to this law, the MNOs are not able to provide multiple services and should stick to their core business activities. These challenges could hinder the MNOs from providing this kind of services directly. For instance, in Malaysia, the licensing provisions under the Malaysian Communications and Multimedia Commission are divided into four categories of licensable activities (i) Network Facilities Providers – are the owners/providers of network facilities, namely infrastructure (ii) Network Services Providers – provide the basic connectivity and bandwidth to support a variety of applications (iii) Applications Service Providers – provide particular functions such as voice services, data services, Internet access and electronic commerce. (iv) Content Applications Service Providers – these represent a special a subset of applications service providers such as television and radio broadcast services and the provisioning of information services (CMA 2015). Due to this problem, the telecommunication companies forced to split their business into separate companies to gain several licenses. Thus they can exploit new technologies to develop new products and business models (Coll 2017; Kearney 1998).

Despite this business split may seem to impose a financial and managerial burden to MNOs. We can argue that this split can create a competitive advantage to MNOs within the mobile ecosystem. According to a study finding conducted by Grove & Baumann (2012), the OTTs a pure service providers have an advantage over MNOs that they can improve the performance of their offerings speedily, as they can focus on configuring the service-related activities only. Meanwhile, the MNOs as Integrated operators that control both infrastructure and service activities have to adjust both domains. Thus, splitting the activity for MNOs can make the efforts dedicated as in the pure service providers' case. In sum, developing and designing new innovative services should consider the regulation issue of the country.

2.7   THEORETICAL BACKGROUND

In this section and subsections, the definitions of central concepts and terms in the current study have been explained. Additionally, the supporting arguments of value creation and value proposition have been discussed in detail.

2.7.1   Value Creation, Value Proposition and Value Network

In business model definitions, the value is the underpinning element that becomes the starting point when structuring a good business model. A basic definition of a business model is the firm's ability to develop a product or service fills a gap in the target market (Teece 2010). It could then be argued that value creation and value capture are business model's end goals and that the value proposition delineates how the company achieves them. Johnson et al. (2008) suggested that the value proposition has three parts: the problem that has to be solved, the target group of people experiencing the issue directly, and the offering that solves the problem or fulfils the need.

This study discusses the creation of intangible mobile service as a customer value (value proposition) rather than the innovation of a tangible product. According to Maglio et al. (2006), service innovation is different from straightforward product innovation because it depends on balancing interdisciplinary knowledge and skills across several domains such as business, technology, social, and demand innovation. The proposition that the customer participates in creating value is central to service-dominant (S-D) logic (Vargo & Lusch 2004); therefore, value-creating methods involving the customer being a value co-creator are essential (Lusch & Vargo 2006).

In the process of co-creating value, the supplier creates the best possible value propositions for the good or service, and customers determine the value of it when consumed. Superior value propositions that apply to the supplier's target customers should prompt both better co-creation opportunities and advantages, thus value, for the supplier such as revenues, referrals, profits, and others (Payne et al. 2008). Payne et al. (2008) noted that co-creation provides strategic opportunities for value creation. The types of the opportunity accessible to an organisation depend primarily on their

industry's nature, what they offer their customer, and who their customers are. Nevertheless, they provide three general avenues an organisation can explore when it wants to innovate using value co-creation:

(i) Opportunities arising from technological breakthroughs: New technological solutions, such as digital TV, broadband, and third-generation mobile services, offer suppliers with fresh ways to interact with customers to co-create new and exciting goods, services, and experiences. For MNOs, there have been several technological breakthroughs in the past few years such as big data, M2M, and IOT (eMarketer 2014). Exploring how these technologies are utilised and could be better utilised by MNOs to innovate their business model and co-create value is one of the aims of the current study.

(ii) Opportunities arising from transformations in industry logics: Industry transformation is moved forward, to a certain extent, by the formation of new channels for engaging customers. As noted earlier, mobile ecosystems studies found that some players initiated the change in industry logic within the current ecosystem, and others followed them by using a platform driven business model. However, MNOs are still behind in this niche. Therefore there is an urgent need for studies that explicate how the MNO could leverage this change towards achieving new opportunities.

(iii) Opportunities arising from transformations in customer lifestyles and desires: Based on what they know of the customer, suppliers should continuously be looking for chances that come from customers' transforming behaviour and attitudes. For instance, mobile applications have dramatically changed as a result of customers' new preferences for online shopping in how they search, compare options, and buy as well as their growing preference for individualised and personalised products and services. MNOs could exploit these changes to build new mobile services, as they are the central part of the complex ecosystem in which they offer connectivity services.

In the mobile ecosystem, platforms blur business boundaries, inverting firms' traditional inward focus into an outward one (Parker et al. 2016). The next section will explore how the value created in the platform drives business.

2.7.2 Value Creation in the Platform (Two-Sided Market)

The rise of the platform has already transformed many major industries and will continue to do so. In a platform business, positive network effects are a primary source of value creation and competitive advantage (Parker et al. 2016). An example used to simplify the concept of the network effect is the telephone system, later called Metcalfe's law. In this law, the value of a telephone network grows non-linearly: as the number of subscribers to the network increases, more connections among subscribers is made possible (Gilder 1993). However, a two-sided network effect, as coined by Eisenmann et al. (2006), differs between network effects and two-sided network effects. For example, in Metcalfe's telephone example, phone users bring in more phone users. However, with a platform like Uber, two sides of the market interact: riders bring in drivers, and drivers bring in riders. A dynamic like this is seen in many other platform businesses: in Google Android's case, app developers bring in consumers, and consumers bring in app developers; on Upwork job listings bring in freelancers, and freelancers bring in job listings; on PayPal, sellers bring in buyers, and buyers bring in sellers; and on Airbnb, hosts bring in guests, and guests bring in hosts. All of these businesses attract two-sided network effects with positive results.

The value of these effects in encouraging network growth is so great that platform businesses will frequently invest in ways to attract participants to one side of the market knowing that once one side joins the platform, the other side will follow.

In the telecom industry, MNOs try to compete by lowering prices or by providing new services and imitating others in thriving industries. In economics, these two strategies called "price effect" and "brand effect" respectively. Parker et al. (2016) documented that these two strategies, however, conflict with two-sided network effects. Price effects and brand effects do have their place in a start-up's growth strategy, but only network effects create the virtuous cycle described above that establishes a long-

lasting network of users—a phenomenon called "lock-in." To illustrate, the inherent problem is that price effects are evanescent, disappearing the moment the discounts end or another firm offers a better price. Typically, only 1-2 percent of customers convert from free to paying. In contrast, brand effects are more permanent, as they arise when people come to associate a particular brand with quality. Nevertheless, brand effects, like price effects, are often difficult to sustain and can be very expensive.

In this chapter's opening, we stated that the MNO could face stiff competition from over-the-top players (OTTs) whose platforms have attracted the same potential customers such as mobile application developers and advertisers. However, Parker et al. (2016) stated that if the firm launching a platform knows the value propositions offered by its competitors, it can structure its own to claim a relatively untouched market niche, even if the basic value unit may seem similar on the surface. Therefore, this raises the following question: what market niche can the MNO exploit, and what superior value propositions can be offered to attract them to join? To answer, we initially proposed that the advertisers could be good prospects to develop the proposed business model. However, advertisers do not all have the same needs and capabilities. For instance, large companies have recently gained the expertise and systems to gather and analyse data, while such solutions may impose a burden on small and medium-size companies (SMEs) (Ardagna et al. 2016). Therefore, selecting a proper niche is vital to the success of the platform. On the other hand, big data has high potential to create value, but the selection of suitable tools and technology and how these tools can create the value is still a question to be answered in this study.

2.7.3 Value Proposition in the Two-Sided Market Context

The extant literature shows that the added value or value proposition can be created in several ways to consumers and business firms. However, most previous works discuss the value propositions creation only for one or the other. Some do however, discuss the concept of value co-creation for both of them such as Larivière et al. (2013) and Kim et al. (2015). According to Muzellec et al. (2015), two-sided internet platforms must create two different value propositions: one for the end-user side (B2C) and one for the business side (B2B). Furthermore, they stated that in two-sided internet platforms, end-

users are a component of the value proposition for business customers. Therefore, we argue that value creation is a pertinent element comprising the platform or two-sided business model. While the literature on E-commerce and M-commerce has identified several avenues to create value, the elements of value creation in this study were identified based on the central constructs of the proposed solution. Furthermore, additional underlying elements are identified that can formulate superior value propositions for the upstream and downstream customers, namely value created by the mobile device, by branded mobile applications, and by big data.

Questions arise here concerning how these elements can co-create values for the stakeholders involved in the proposed business model. The sections and subsections that follow will address these issues and summaries how the proposed solution components generate values for them. The result of this analysis process can prove the utility factor of the proposed solution in compliance with both two-sided business model (Muzellec et al. 2015) and DSRM principles (Hevner et al. 2004).

a.   **Value from Mobile Devices**

Mobile devices are essential and exceptionally individualised tools for personal communication (Bacile et al. 2014). They have provided consumers with all-around access to digital information, regardless of place and time, allowing marketers to reach consumers instantly and continuously. Since consumers use their smartphones for many purposes beyond talking or texting, advertisers have new ways to target their messages. On their mobile devices, users browse the web and use a multitude of mobile applications, and many of these enable their reception of advertising content. Social media sites, such as Facebook and Instagram, too, are accessed by hundreds of millions of users through mobile devices, thus providing advertisers with vast and valuable insights due to their analytic capabilities (Grewal et al. 2016). In this vein, several studies have addressed whether the value created using a mobile device directed to individual consumers or business customers (Balasubramanian et al. 2002; Okazaki & Mendez. 2013; Watson et al. 2002). Nevertheless, seminal work conducted by Larivière et al. (2013) approaches this issue by summarising mobile device enabled value co-creation for both of them simultaneously, and creating the concept of value fusion,

defined as "Value that can be achieved for the entire network of consumers and firms simultaneously, just by being on the mobile network. Value fusion results from producers and consumers." Concerning value fusion, Larivière et al. (2013) list the value derived from mobile technology for the firm and consumer and note that for individual consumers, the value can be created in tangible and intangible or psychological means.

There is some consensus in mobile marketing literature about the importance of "informational value" in increasing adoption and acceptance among consumers of the electronic message (Chowdhury et al. 2006; Oulasvirta et al. 2012; Larivière et al. 2013). Larivière et al. (2013) pointed out that for the consumer, mobile technology can offer the means of searching for and finding relevant information, such as information from product feedback and reviewing, location-based map and trip-planning apps, and organisation websites, to inform consumption decisions. Chowdhury et al. (2006) found out that informational value has a direct and positive influence on consumers' attitude towards mobile advertising. Therefore, it can be argued that mobile devices are an essential part of creating the informational value that enables the consumer to make an informed decision regarding their buying behaviour.

Another value appearing in the literature is the identity value wherein mobile services are a means of publicly expressing character, social status, and image (Larivière et al. 2013; Leung & Wei 2000; Moon 2002). Further, the use of mobile devices can elevate this value (Larivière et al. 2013). Similarly, "social value" is defined as one of the prominent values derived from a mobile device by consumers (Kim et al. 2007; Larivière et al. 2013; Sweeney & Soutar 2001). Together, mobile devices and social media enable a variety of social interactions (Larivière et al. 2013) and can be a tool for achieving social approval and enhancing self-image within social groups (Bearden & Netemeyer 1999). While social value perceived to have low significance in the context of location-based services (Pura 2005), it was found to have a high significance in social interaction media and applications (Kim et al. 2007; Larivière et al. 2013). For instance, platforms like Facebook, Instagram, and Twitter, and their associated apps allow customers to share pictures, ideas, and experiences with others anytime and anywhere.

In addition to the above values, mobile devices can provide consumers with "entertainment and emotional value". Emotional value is what comes from emotions and states that a product engenders (Sweeney & Soutar 2001). For example, it was found that people's sense of pleasure linked with advertisements presents an exceptional role in accounting for their overall attitudes towards them (Chowdhury et al. 2006; Shavitt et al. 1998). Generally, the mobile device offers many forms of entertainment for its users who can stream music or video, play online games, or browse news headlines (Larivière et al. 2013). They may also offer entertainment in the form of emotional release. Many users of mobile networked technology feel instant pleasure from its use that is separate from its more practical value (Kim et al. 2007; Leung & Wei 2000).

Larivière et al. (2013) suggested that another significant added value derived from mobile devices is a "convenience value". Convenience value comes from performing a task easily and expediently (Pura 2005; Mathwick et al. 2001; Anderson & Srinivasan, 2003). Berry et al. (2002) presented a wide-ranging model of service convenience that delineates six forms of convenience pertaining to what consumers perceive to be their time and effort expenditures throughout different stages of activities surrounding the service offered: decision convenience, access convenience, transaction convenience, benefit convenience, and post-benefit convenience. Convenience can also mean that the product is easy to use and does not require physical or mental effort or have a high learning curve (Davis 1989). Mobile technology provides customers with convenience value because it allows customers to locate useful, targeted, location-based and well-timed information, so they can compare offers and make purchases in the time and place of their convenience. Additionally, mobile devices provide multitasking convenience by making it possible for customers to accomplish multiple tasks all at once. Further, mobile devices also provide transactional convenience by making purchasing goods and services easy, regarding both the ordering and payment processes (Larivière et al. 2013). Finally, convenience comes from mobile devices' potential for personalisation, as services are adapted to the customer's individual style and needs. Research has further found that customers perceive personalisation as something that has aesthetic, practical, and emotional value (Piller et al. 2004; Abidi 2003; Sigala 2006; Moon 2002).

Finally, the mobile device introduced an outstanding added value to consumers, namely "monetary value" (Pura 2005). In this regard, mobile devices offer methods of choosing between competing offers and selecting the best option, based on price or other qualities like reliability and durability (Larivière et al. 2013; Sheth et al. 1991). Mobile devices' monetary value is especially evident in location-based services, offers, or promotions, like those available in geocoupon apps. Table 2.6 summarises the forms of consumer value creation as discussed above:

Table 2.6 Forms of consumer value creation

Value	Description	Supporting literature
Informational value	Search for relevant information that aid consumer in making a purchase decision regarding good or service.	(Chowdhury et al. 2006; Oulasvirta et al. 2012; Larivière et al. 2013)
Identity value	Allows public expression of character, social status, and image.	(Algesheimer et al. 2005; Larivière et al. 2013; Leung & Wei 2000; Moon, 2002)
Social value	Enables social interaction for gaining social approval and boosting self-image.	(Bearden & Netemeyer 1999; Kim et al. 2007; Larivière et al. 2013; Sweeney & Soutar 2001)
Entertainment and emotional value	Provides entertaining activities such as games, movies, and music. Pleasure or feeling of affective states from using technology	Chowdhury et al. 2006; Kim et al. 2007; Larivière et al. 2013; Leung & Wei 2000; Sweeney & Soutar 2001
Convenience value	Achieving task easily and expediently.	Anderson & Srinivasan 2003; Berry et al. 2002; Mathwick et al. 2001; Pura 2005; Larivière et al. 2013.
Monetary value	The opportunity to choose between competing offers and gain discount based on different factors.	Larivière et al. 2013; Pura 2005; Sheth et al.1991

Like the consumers, the firms in the two-sided market seek to achieve new value by participating in the platform. They need to attract new business to their organisations by the expected derived values. On this, the value fusion theory by Larivière et al. (2013) contended that these firms could reach their goals as the mobile devices can guarantee them at least three prospected values. The first potential value is "additional revenue through deeper relationships," which is directly related to monetary benefit. The studies have found out that the use of promotions that are in real time and based on location can propel incremental purchases. For instance, geolocation allows firms to design promotions that are relevant and customised (Dickinger & Kleijnen 2008; Shankar & Balasubramanian 2009). Furthermore, firms can personalise their offers to consider customers' interests, geographic profile, and other factors by way of information gathered through their Facebook account or other shared information

(Varnali &Toker 2010). Recently, social login for shared platforms, when site visitors can log in using their Facebook, Google, Twitter or other social media accounts instead of creating a new account for that website (Drebes 2011), has become popular among e-businesses. Social login gives online retailers the chance to retrieve to rich demographic and psychographic data from the user's social media account(s) (e.g. user's location, interests, hobbies, and so on) and enables them to develop a fuller image of the customer and to optimise customised offers. Shankar et al. (2010) stated that since the customer is constantly online, firms can offer their promotional material at all times, and customers can meet their needs and desires, too, at all times, often instantaneously. Similarly, Bellman et al. (2011) noted that mobile apps provide companies with a greater number of points of connection and episodes of service delivery with the customer, which can strengthen their relationship and boost brand loyalty.

Another outstanding value for the firm from mobile device technology is the cost reduction. It was found that marketing costs can be greatly reduced by sending promotional text messages and emails (targeted to customers who opted in), as they are less costly than creating and disseminating other media (e.g. catalogues) (Larivière et al. 2013). Furthermore, mobile technology has the potential to lower the cost of customer services, as they can perform routine tasks on their mobiles instead of queuing at customer service desks. Additionally, the customers themselves can reduce promotion and marketing costs by posting their reviews, comments, and rating regarding products and services on these apps (Larivière et al. 2013). Besides these cost reduction factors, the mobile devices' ability to collect instant consumer feedback from their experience gives useful information to firms and their competitors. Utilising these features correctly can help firms gain more market insight, customer knowledge and accomplish this in real time, thus contributing to the company's market intelligence with minimal cost (Hennig-Thurau et al. 2010; Kumar et al. 2013; Kleijnen et al. 2009).

In addition to the above values, Larivière et al. (2013) and Blazevic et al. (2013) contended that the firms could increase the "customer influence". They stated that mobile devices enable content sharing that allows firms to benefit from feedback in the form of reviews, shares, likes and other forms of customer recommendations. Customers influence one another through the growing customer connectedness offered

with online platforms and mobile technologies. Table 2.7 summarises these prospected values:

Table 2.7 Forms of firm value creation

Value	Description	Supporting literature
Additional revenue through deeper relationships	The instant connectedness with customers can strengthen the relationship and therefore the generated revenues	Bellman et al. (2011); Dickinger & Kleijnen 2008; Larivière et al. (2013); Shankar & Balasubramanian 2009; Shankar et al. (2010) Varnali &Toker 2010;
Reducing costs	The reduction of customers' data collection and marketing activities by capabilities of mobile technology and customers' feedback.	Larivière et al. 2013; Hennig-Thurau et al. 2010; Kumar et al. 2013; Kleijnen et al. 2009
Customer influences	Growing customer connectedness within online platforms and mobile technologies: customers influence one another	Blazevic et al. (2013); Larivière et al. (2013)

b.   Value from Mobile Apps

Alongside mobile devices values, mobile apps have been studied to unveil their capabilities to provide extra added values to consumers (Kim et al. 2015). For instance, location-based apps provide essential information to users while away from home, such as showing times at a nearby movie theatre, price comparisons between nearby stores, or directions to nearby outlets (Larivière et al. 2013). Kim et al. (2015) noted that, in order to provide location-based services, mobile devices must have sensors to display the context of each user and his or her precise location, for example, using GPS)and viewing direction (e.g., compass, built-in camera). This allows advertisers to target the content and format of their advertising to the probable needs of consumers in that specific situation. Physical location is, however, only one of many things that mobile devices can detect from within consumers' environments that may impact their behaviours and attitudes (Bargh & Chartrand 1999). To exemplify, time of day, weather, and the environment associated with the location (e.g. home or work) are also contextual factors that trigger different goals, thus influencing consumer responses to mobile ads (Bargh et al. 2001). Andrews et al. (2015) and Baker et al. (2014) presented some compelling empirical results on this: they demonstrated that SMS promotions' effectiveness varies with the time of day and amount of local crowding. Luo et al. (2014)

similarly noted an effect arising from interactions between different types of time and location. Additionally, they found that mobile ads targeted to the mindsets of customers either at home or work were more effective. Furthermore, advertisers can collect this data for marketing insights and assess, based on hard facts, the temporal and monetary investments for their ads (Grewal at al. 2016).

As noted earlier, Larivière et al. (2013) argue that mobile devices are unique because they are personal, portable, interactive, both textual and visual, and converged. Prompted by convenience and value, at first, customers may adopt a branded app, but their interactive nature, allowing users to experience the brand through its advanced features, makes branded apps more powerful (Bellman et al. 2011; Mollen & Wilson 2010). Kim et al. (2015) also documented the value of interactive features in promoting the branded apps' persuasive effectiveness. Their findings indicate that, in contrast to computer-based sites, branded apps offer "anytime, anywhere" interactivity with easy to use control and navigation features. Moreover, these apps, by offering customers a sense of agency, also heighten customers' pleasure, and their inclination to extend the relationship with the brands. In sum, branded apps provide customers with easily accessible information, entertainment, customised coupons, and portability. Consequently, the branded app's adoption increases subsequent spending with the brand (Kim et al. 2015).

Additionally, mobile applications can facilitate person interactivity, the interactions between individuals through a medium that can provide a feeling of social inclusion and empowerment, by offering communication channels between customers and the brand and also between customers and other customers (Kim et al. 2015). Gu et al. (2013) showed that person interactivity impacts customers' perceptions of a site's reliability, thus increasing the brand's financial performance. Interactivity heightens the perception of practicality, ease of use, and pleasure among adopters of the technology (Coursaris & Sung 2012). Another recent study of retail apps that were location-based demonstrates interactivity's positive impact on active involvement, leading to more app downloads and users (Kang et al. 2015).

Overall, mobile devices' unique characteristics make relevancy a more concrete concept, and users' data benefits both mobile users and advertisers. Data-driven advertising can achieve more convenience, interactivity, personalisation and monetary value to mobile users while concurrently providing advertisers with data-driven marketing insights, increasing their revenue, and reducing the costs of traditional advertising. All these values can formulate some superior value propositions for mobile users and advertisers. As Larivière et al. (2013) and Kim et al. (2015) stated, other values might be there, and not all of these values are mutually exclusive for mobile usage. These other values most relevant to our study will be investigated later in the second and third iterations.

Nevertheless, In the case of an individual customer, Picking the appropriate product or services online can be an exhausting process. The broad assortment of products on retailers' websites is usually overwhelming. To control such wide-ranging varieties, online customer reviews have surfaced as a vital source of information for buyers to assess sellers before purchase (Cui et al. 2012; Kostyra et al. 2015). However, in the case of big platforms and branded mobile apps, the ability for customers to go through all these reviews could be an overwhelming process in itself. Furthermore, the customers can see the statistics summary for the overall rating only where other supporting information is missing such as supply and demand, unbiased price comparisons and so on unless they visit the third-party website every time they want to make a transaction. Dixon et al. (2010) study findings documented that exceeding customers' expectations during service interactions by offering a refund, a free product makes customers only marginally more loyal than just meeting their actual needs. Additionally, a study conducted by Spenner and Freeman (2013) showed that the primary driver of the customers that increase their stickiness to marketers and retails apps and websites is the ease with which they can collect information about a product or service and confidently and efficiently classify their available choices. They added that the marketer could accomplish that by providing customers with trustworthy sources and tools to gather product and service information and recommendations based on customer-specific requirements. Here we argue that this problem could be solved if the branded mobile apps add this features by utilising the big data analytics tools by attaching it to the platform or app (Wixom 2014) and thus adding a new value for

customer. Figure 2.2 shows a sample of this mobile branded app which has overwhelming features and options to go through by customers as appeared on Kim et al. (2015)
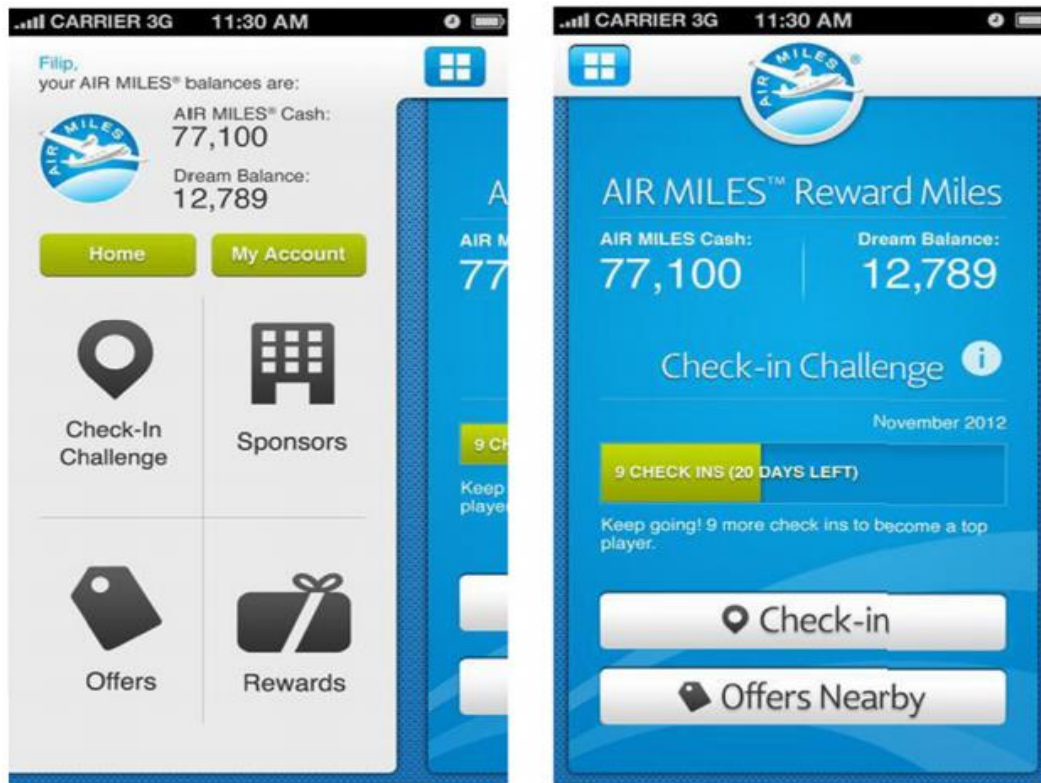
Figure 2.2 Sample of branded mobile app

Source: (Kim et al. 2015)

c. Value from Big Data

Neither data nor the use of data to support business activity, are not new concepts for information age companies. Companies exploit data to help manage employees, follow sales, and acquire clues about customer behaviour. In recent years, the amount of data available has increased as a result of several factors including new devices, sensors, social media (Brown et al. 2011). According to Kaisler et al. (2013), big data not only concerns volume, but also concerns the following attractive attributes: value variety, velocity, and complexity, the value being paramount (Chen et al. 2014; Hashem et al. 2015). Kaisler et al. (2013) and Wamba et al. (2015), both note that this field, in the present and future, will increasingly concentrate on how to use big data to establish

value across domains and disciplines, where the value not only derives from analysis of the data, but also from actionable information generated from the data. Moreover, in their survey of the literature, they list five generic ways that value can be created from big data (shown in Table 2.8).

Table 2.8 Value Created from Big Data

Value created from big data
Establishing transparency by providing openly available big data for business and making a functional analysis (e.g. quality, reduced costs, lower time to market)
Supporting experimental analysis in specific locations that are able to test decisions or approaches, like specific marketing programs
Helping, using what is derived from customer information, determine market segmentation at narrower levels
Supporting live analysis and choices derived from complex analytics applied to data sets from customers and sensors
Enabling computer-assisted innovations in products that come from embedded product sensors showing responses from customers.

Source: Kaisler et al. (2013) and Wamba et al. (2015)

Ultimately, when it comes to two-sided platforms, value creation is not only limited to new technologies, services, or products, as it is in traditional business models, but it also arises from how one group attracts the other to engage with the platform (Hagiu 2014). According to Lin et al. (2014), data will not be received unless entry into the system is incentivised. Moreover, questions concerning what data is available and what can be done with it should be superseded by the following questions: What customer problem should be solved? What data is needed to solve it? What gaps exist in the present data? How can people be incentivised to provide data? These questions are compatible with early conclusions about the deployment of big data to drive a new business model.

Noticeably, the big data value is mostly pertinent to marketing activities, as it can analyse and convert data to purposeful marketing insights that will benefit the organisations' internal processes, find market opportunities and gaps, and open the door for new business models, facilitating their innovation. Therefore, we argue that selecting big data value for a two-sided platform should approach currently unsolved problems and restrict itself to already established business activities and customers. In

this study, the focus will be on advertising, unmet requirements, and how big data will create value for all stakeholders involved.

In the following section, the big data analytics concepts are explored, and the relation of big data analytics and advertising are explicated.

2.7.4   Big Data Analytics

According to Zakir et al. (2015), big data analytics is a means of extracting value from huge volumes of information, and it propels new market opportunities and maximises customer retention. Rajaraman (2016) has identified four types of data analytics as follow:

i.   Descriptive analytics: These describe and present clearly what has happened in the past. The data gathered may be organised in charts (e.g. bar charts, pie charts) for clear visualisation of findings. This type of presentation is often called a dashboard, as it is reminiscent of the car's dashboard which provides descriptive information on things such as speed, engine status, petrol quantities, and distance travelled. A frequently used example would be census data on age, gender, and income displayed in charts.

ii.   Predictive analytics: It extrapolates from available data to predict what is expected to happen in the near future. This is often accomplished using tools such as time series analysis using statistical methods, neural networks, and machine learning algorithms. Predictive analytics is common in marketing by understanding customers' needs and preferences. A good example of this would be advertisements for similar items showing up after purchasing from an online store.

iii.   Exploratory or discovery analytics: This form of analysis discovers unexpected relationships among parameters big data collections. Collecting data from a many of places and analysing them offers extra

chances for insights and fortuitous discovery. One common application is when companies discern patterns in customers' behaviour through their reviews, blogs, tweets, emails, Facebook data, buying trends, and so on. Using these behavioural patterns, companies may be able to predict their actions such as choosing to renew a subscription, or making an accommodation booking cancellation, then use that to offer something to convince them to change their mind.

iv. Prescriptive analytics: This form of analysis identifies opportunities to optimise solutions to current problems from the gathered data. The analysis demonstrates what is needed to be done to meet a goal. For example, airlines base their prices on a variety of factors including past data from patterns of travel, popular places for travel, and significant holidays.

Chen and Zhang (2014) call this new phase of analytics Business Intelligence and Analytics 3.0. While there is no consensus on a definition of analytics, some use "analytics" and "data mining" to mean the same thing (Kohavi et al. 2002) or use "analytics" synonymously with "business intelligence" (Davenport & Harris 2007). It is also common to differentiate between basic analytics and advanced analytics (Kobielus 2010; Fromm et al. 2012). For the purposes of this study, we will merely consider analytics to be the extensive use of data that applies methods from research in statistics and operations fields. These methods can be descriptive, predictive, or prescriptive (Delen & Demirkan 2013) and are intending to propel action (Davenport & Harris 2007). Additionally, we will treat data and analytics as one phenomenon, since both concepts are closely linked.

Both researchers and practitioners consider data and analytics to be something that will be soon considered one of the best sources of competitive advantage, impelled by the growing refinement of the methods that are available (Opresnik & Taisch 2015; Davenport & Harris 2007). Many studies indicate that firms have taken an interest in making use of data for a variety of applications. Moreover, many are interested in exploiting data for creating new business models or are opting to monetise it directly

(Kart et al. 2013). This raises the following research question: How exploiting data with analytics influences the business model?

2.7.5 The Role of Big Data Analytics in Marketing and Advertising

Insight from big data can enhance the dynamic capabilities of firms' data, which in turn leads to value creation (Liao et al. 2009; Erevelles et al. 2016; Tellis et al. 2009; Wei & Lau 2010). Ongoing research in big data and big data analytics showed the promising value creation capabilities of them in marketing and advertising (Erevelles et al. 2016). This research introduces several examples of how value is created through the place, promotion, price and products benefit from big data (Fan et al. 2015; Xu et al. 2016). Big data sets are generated from what customers have purchased, websites that have been clicked on, social media usage, and information from smart connected devices, geolocation, and other activities. Customers are constantly creating new data, from structured data from website clicks to unstructured data from posts and comments on Facebook or similar platforms. The current research findings revealed that marketers could combine, mine, and analyse both forms of data almost immediately using big data technologies and analytics methods. The process of discovering interaction patterns between various groups can be very productive because it is a necessary variable that influences consumers' buying decisions. With this method, they can discover hidden patterns like how different customer groups interact and how it contributes to purchasing decisions. Using these insights, firms can create targeted marketing campaigns applicable to the customer's personal preferences. Marketers gather the data produced from many real-time customer touch points to form a better understanding of individual customers' behaviours. Analysing this vast quantity of live data facilitates marketers' fine-tuning of their models for customer segmentation and application of the insights to create strategies for customer engagement and ameliorate the quality of customer interactions (Svilar et al. 2018).

For their big data initiatives, firms must comprehend their customers' digital footprint. Therefore, top management needs to commit to investing in solutions for data storage and practical analytics. With these, the firm achieves an increased ability to take advantage of its customer data by using contextual information, such as location, to

create customised offers (Grewal et al. 2016). For instance, with regards the targeting, Zubcsek et al. (2016) and Molitor et al. (2014) presented a co-location effect where consumers that accessed the same mobile app in the same area at approximately the same time have similar inclinations (Zubcsek et al. 2016; Zubcsek et al. 2015). Therefore, information about co-location ameliorates consumer preference predictions targeting. Therefore, properly analysing this data can help firms to reallocate their marketing activities accordingly.

Big data's chief pretext for deployment in advertising contexts is digital brand touch points, or any contact between a prospective customer and a brand in all stages of interaction (before, during, and following the purchase). Malthouse and Li (2017) noted that traditional offline touch points, like seeing an ad in a print newspaper, have always been challenging to monitor and record. In contrast, touch points occurring in the digital sphere, such as online, social media, and mobile ones, can be recorded over for millions of consumers, over time creating extensive data sets. Additionally, when brand touch points occur in digital environments, big data can be used to make, or at least influence advertising decisions. For example, digital advertisers may have to make decisions like whether or not to purchase an exposure, the appropriate amount to bid for space, and the most appropriate message to show (Malthouse & Li 2017). Big data can theoretically inform these decisions. It was found that these digital environments are entirely changing the advertising field because they allow consumers to formulate and disseminate brand messages to vast audiences (Kumar & Gupta 2016). Digital brand touch points and big data have a collaborative relationship: digital interactions create big data, which then informs subsequent digital touch point decisions. Hence, big data's scope may be understood by exploring the digital environments of current brand touch points or where they will appear in the near future (Malthouse & Li 2017).

According to the research findings of Malthouse and Li (2017), the use of big data can improve advertising decisions, like whether to avoid showing an ad to some customers, the kind of message that will be displayed (personalisation), and how much to spend on exposure. Furthermore, they suggested it can be utilised for uncovering exploratory insights to create better promotion messages. For instance, social media can be considered to be a huge focus group, and it can offer insights on consumers' opinions

of a brand. Monitoring a brand's use can also offer new insights into the customer/brand relationship. Additionally, big data creates situations that are very new and where prediction is necessary. For example, when an advertiser decides whether or not to invest in a banner ad impression he/she needs to calculate if it is worth it by estimating whether or not the customer who sees it will buy and, if so, how much they will spend (Perlich et al. 2012; Wang et al. 2016). In this regard, Malthouse and Li (2017) contended that statistical learning and insight could be conducive in this aspect (Malthouse & Li 2017).

Despite its utility, the level of complexity and the lack of standardisation of big data management architectures create a barrier in the adoption and execution of analytics, most notably for those organisations and SMEs that lack the sufficient competences and knowledge (Ardagna et al. 2016). These firms are not adapted to the current wave of deploying big data analytics; this represents a major market gap as well as opportunities for those who can provide them with this analytics as a service. In this vein, Chen et al. (2011) already suggested that the growing quantity of data and developing new methods of analysing them will generate new services, namely Data-as-a-Service (DaaS) and Analytics-as-a-Service (AaaS). DaaS provides its customers and aggregates access to an extensive range of data, while AaaS offers many analytic services at request. These new services will aid in harnessing the potential and magnify "value for the overall ecosystem by eliminating common costs and delivering high-value data and analytics services" (Chen et al. 2011).

Davenport stated that the most recent wave of analytics' essence, called Analytics 3.0, reaches entirely new potentials in data exploitation. For him, Analytics 3.0 means "… to compete on analytics not only in the traditional sense (by improving internal business decisions) but also by creating more-valuable products and services" (Davenport 2013). He calls this the "enrichment" of the present product or service portfolio. Other researchers stated that data and analytics bring entirely new "data-based" or "data-driven" business models and define them generally by explaining that all businesses using data as their key resources are applying a DDBM (Hartmann et al. 2014; Manyika et al. 2011).

Schüritz and Satzger (2016) stated that data had been traditionally in certain types of businesses like when weather forecasting companies use meteorological data for their forecast, or when energy providers use level capacity to record and predict energy usage data. Because this is how these businesses traditionally run, they would not be considered running "data-driven" or "data-based" business models. Creating added value is the purpose of business, thus harnessing new technologies and utilising data to improve is a logical way of moving forward, and it is already widely done. They also postulated that the increasing quantity of data and the potential value to be gained from it through analytics would prompt businesses to include more data and analytics in their business model. This means that data will eventually be an essential component of every existing business model in markets that offer products or services if companies wish to remain competitive. Therefore, the core business model of every business will likely gradually become more "data-driven".

Based on the above, we argue that marketing and mobile advertising are one of the business model of MNOs that can be infused with data analytics to create the two-sided big data-driven business model. In this model, MNOs will represent the focal firm who provide the platform, the advertisers (especially SMEs) are the upstream customers who will need data analytics services attached to their advertising activities to generate marketing insights, and the end-users are the downstream customers who will need to be incentivised in order to join and give away their data.

2.7.6 Revenue Models

As it was with the value creation component of the business model, there is little academic research on how the firms can capture value from a big data-driven business model (Hartmann et al. 2014; Schüritz et al. 2017). In the context of business model literature, appropriate selection of a revenue model can realise the value capture (Gassmann et al. 2013; Teece 2010; Zott & Amit 2007). It was contended that new service business models are being structured around value propositions derived from data and analytics (Brownlow et al. 2015; Hartmann et al. 2014; Schüritz et al. 2017). Therefore, appropriate revenue models must exploit the advantages of these value propositions (Schüritz et al. 2017).

Many use the terms business model and revenue model interchangeably. Therefore there is some confusion when defining those (George & Bock 2011). The revenue model is a description of revenue sources, distributions, and volume; it delineates how the firm captures value (Zott & Amit 2007). On the other hand, a business model presents the fundamental enablers to generate this revenue. The revenue model is thus an essential component of the business model, but it does not describe the process of value creation. According to De Reuver et al. (2009), revenues rely upon the price associated with a service. Price refers not only to the money paid by the customer for the services but also to any other form of sacrifice customers are required to make when they purchase and engage with the service. For example, in telecommunications, "switching cost" of services can be very high. Pricing is a dynamic process taking both internal factors like cost consideration and external factors like competition into account.

In the context of DDBM Brownlow et al. (2015), it was stated that;

"Without the target of a quantifiable benefit to a business, it is difficult to justify DDBM construction and implementation. Incorporating a revenue model into a DDBM is integral to its operational success."

Wixom et al. (2014) added that money could be earned from data by either selling just the data, exchanging it for goods or services, or including it with another good or service.

Revenue models can be identified using various criteria like the form of product or service being sold (Timmers 1998), the customer's role (Mahadevan 2000), how value is decided, or whether the revenue is produced by direct or indirect means (Wirtz 2001). In non-academic literature, particularly, many additional detailed distinctions and listings of revenue models can be found (Board of Innovation 2016). Unfortunately, there has been little previous work done on the topic of this study: revenue models for DDBM or data-driven services. To our best of knowledge, two works have studied the revenue model of DDBM and services.

Hartmann et al. (2014) identified seven revenue streams: asset sale, selling a good or service's ownership rights, lending, renting, leasing, temporarily providing exclusive rights to use an asset for a predetermined time frame; licensing, providing permissions for using protected (copyrighted or patented) intellectual property for a licensing fee; charging a usage fee or a subscription fee for use of the service; charging a brokerage fee for an intermediary service; and advertising. Brownlow et al. (2015) found that these models see many variations from within industries and sectors. In addition, each business had a preferred revenue model depending on the relevant value proposition and embedded business model.

Schüritz et al. 2017 conducted a qualitative study of 100 start-ups providing data-driven services. They presented a group of often used revenue models. These were subscription, usage fee, gain sharing and four types of multi-sided revenue models. These four models are summarised as follow:

i. Endure-ads: In this model, advertising is the prevailing revenue stream, where the downstream customers are exposed to advertising from upstream customers (platform provider is intermediary or facilitator). Revenue may come either from upstream customers through one-off advertising fees for each issued advertisement or through a subscription model. The downstream customer pays no fee, and they provide data in exchange for that. The platform provider utilises their data to target and personalises the advertising. The platform provider can earn extra income by brokerage fees if the downstream customer responds to the ad.

ii. Data-tailored-offering: In this model, downstream customers provide access to specific parts of their personal data to receive offers targeted to them from upstream customers. The platform provider thus runs a platform that facilitates the interactions between two customer groups. Upstream customers receive access to data through a subscription model or a usage fee approach. There may also impose a brokerage fee to produce additional revenue.

iii. Buy-and-sell-data: In this model, unlike the above one, there is no communication between the upstream and the downstream customer over the service provider's platform. With this one, the service provider serves in the role of a data broker. The provider is engaged by its downstream customers to seek prospective buyers for their data. The provider is tied financially to its downstream customers based on a profit based payment, which may come about following the successful matching between customer groups.

iv. Pay-with-data: In this model, downstream customers pay for using the service by offering access to pieces of their private data. The data is gathered, sometimes analysed, and ultimately provided to upstream customers, paying a subscription or usage fee. Schüritz et al. (2017) documented that within their pay-with-data cases, they did not observe any direct interaction between upstream and downstream customer. They postulated that this approach might be helpful for companies not wanting to depend on including an advertisement with their services, or to those who offer services that produce downstream customer data that is of use if collected from many users.

In short, revenue models are value proposition and business model specific, and several revenue models can fit the current study's proposed artefact. The most appropriate revenue model's selection remains a something to be determined by the study. Eventually, after making the main arguments of the proposed business model (artefact) and justifying all its propositions and assumptions, in the next section, we investigate the extant literature with the aim of identifying the available tools and models to guide us in designing the components of the two-sided DDBM. The next sections thus present the theoretical framework from the extant literature to delineate a research path to develop and design the artefact.

2.8 THEORETICAL FRAMEWORK

In order to answer the questions raised in the previous sections, a theoretical lens is needed to build the initial model (first iteration) of the proposed artefact. In the next sections, the extant literature is investigated with the aim of identifying the available theories, tools and models to direct the designing process for the components of the two-sided DDBM. Hence, this section and subsection presented the theoretical framework from the extant literature to delineate a research path to develop and design the artefact.

2.8.1 Business Model And Business Model Innovation

The concept and theory of business model are discussed in several disciplines and for many purposes. In the context of this study, the business model and BMI concepts and theories are disclosed to clarify the role of it in creating competitive advantage and new service-based business model.

A business model describes "how a firm organises itself to create and distribute value in a profitable manner" (Baden-Fuller and Morgan, 2010). Whether or not they know it, every firm has a business model (Casadesus-Masanell & Ricart 2010; Chesbrough 2007). Business models in practice have become increasingly important in the last few years; in particular as they are associated with attaining and developing competitive advantage (Johnson et al. 2008). There exist many definitions of business models, and several studies have compared and discussed various definitions and lists of business model components (Birkinshaw & Ansari 2015; Zott et al. 2011). In this study, we adopt a definition that has frequently been adopted by scholars in recent years, and this is that a business model describes the how the value is created, delivered, and captured. Simply defined, the business model main purpose is in defining how the business provides its customer with value, persuades customers to pay for it, and profits from the payment (Teece 2010) In more detail, the business model identifies customer needs that are unmet, sets out the technology and organisation that will address them, and most importantly, captures value from activities. Without achieving an appropriate equilibrium of creation, delivery, and capture, the model cannot work for long.

In the last decade, changes in markets have shown the value of innovative business models and completely inverted the dominant logic of whole industries. For instance, Apple's new place in the music industry is a frequently cited example (Giesen et al. 2007). Therefore, a new concept business model innovation has emerged and received a considerable research interest. In this regard, a BMI is a new way of creating and capturing value by changing one or many parts of the business model (Amit & Zott 2001; Chesbrough 2010; Demil and Lecocq 2010; Mitchell & Coles 2003; Teece 2010). BMI went beyond the scope of simply introducing a new product or service, and instead presented entirely new opportunities for engaging in economic exchange (Hamel 2000; Mitchell & Coles 2003).

More and more, established firms realise that, on its own, the innovation of their products and processes is not enough to remain competitive in the modern dynamic economy (Massa & Tucci 2013). Thus, efforts in innovation need also to be expanded to comprise the company's governing logic of doing business, thus the business model itself. By doing that, new business models have the potential to uncover market possibilities in technological innovation (Chesbrough 2007, Chesbrough & Rosenbloom 2002), push competitive advantage (Teece 2010), and make the firm develop and be profitable (Baden-Fuller et al. 2010; Casadesus-Masanell & Ricart 2010). In addition to this interest in business models is the suggestion that "a mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model" (Chesbrough 2010). From statements like this and supporting empirical evidence, the business model has been recognised as an essential tool for developing and maintaining firms' long-term competitive advantage.

BMI is acknowledged as an essential means of achieving sustaining successful competitive advantage (Amit & Zott 2012). It is also a crucial component of technology's successful commercialisation (Chesbrough & Rosenbloom 2002; Chesbrough 2010). There exist, however, many standard strategies and guidelines that companies can follow when they are innovating their business model (Amit & Zott 2001, 2012; Giesen et al. 2007; Markides & Oyon 2010; Mitchell & Coles 2004). According to Weiblen (2015), no recommendation is a panacea for all forms of industry

and context, but one specific direction, however, is followed in BMI across industries: they have adopted open business models that involve novel methods of collaborating with partners. It is, for example, difficult to imagine the success of the Apple iPhone if it were not for the vast numbers of independent software developers maintaining a steady influx of apps for Apple's customers (Amit & Zott 2012). The open business model concept was coined by Chesbrough (2006) when he introduced a distinction between two types of business models (firm-centric vs network-centric). Initially, it described value creation in the open innovation context (Chesbrough 2007). Later, it came to describe more generally the openness in all the aspects of business model (Sandulli & Chesbrough 2009).

Similarly, a study by Giesen et al. (2007) demonstrates that 'network plays,' new relationships, and collaboration are the most often embraced forms of BMI in established firms. They are especially useful for older companies, as they facilitate leveraging existing assets with new contexts. Chesbrough (2007) suggests, from the analysis of important cases, that firms wishing to remain successful in the long term must be open to opportunities to adapt their traditionally closed business models. The task most often attributed to business models is to describe how the firm in question generates and captures value from within the ecosystem for both itself and its stakeholders.

In addition to the openness of business models to facilitate and enhance the innovation process, the focal firm needs to address other design issues and undertakings regarding designing new business model. In this regard, Teece (2017) stated that the dynamic capabilities of the focal firm are the determinant factors to consider when choosing to innovate their current business model. The decisions rely partly on the endowment of the firm's dynamic capabilities (Teece et al. 2017). Teece (2017) contended that good business model design requires an in-depth understanding of the needs of customers and of the technological and organisational resources required to meet them. Consequently, seizing this opportunity from the firm requires proper identification of potential customer segments in order to examine the viability of new business model success through proof of concept prototype.

In sum, BMI is a crucial step towards achieving a new competitive advantage, sustaining the business and therefore making new profit and revenue. Even though this undertaking by the established firm is risky and uncertain, it may be an inevitable step to bring in business. The dynamic capabilities and business environment of the focal firm are the determinants of the successful implementation of it. Nevertheless, the design of new business model is not a straightforward process and, though, with the plethora of directions and strategies found in the literature, none of these is well fit to all industries and context (Weiblen 2015). In the context of this study, it can be argued that MNOs need a dedicate study to show how they might be innovating their business model in accordance with their core competencies, dynamic capabilities and business environment. The agreement has been found in MNOs and general business model literature that the traditional business model is no longer capable of creating competitive advantage, nor of making new profit and revenue. The dynamic environment and ecosystem of MNOs force them to follow an n-sided market theory. How the value created and captured in the context of the two-sided market theory needs further exploration. The next section explores this issue.

2.8.2   Value Creation and Value Capture in Two-Sided Market Theory

As discussed previously, the literature on two-sided markets does not offer much information concerning each side's role. Ideas surrounding reciprocal value propositions provide some additional awareness on the roles of each side (Muzellec et al. 2015). As dictated by service-dominant logic, businesses cannot deliver actual value, but instead, present value propositions that, to be realised, require customer usage (Vargo & Lusch 2004). As service-dominant logic suggests, customers are a part of value co-creation by sharing and consolidating resources with suppliers.

This idea of a reciprocal value proposition is a recent one. Glaser (2006) claims that if those involved in the process of creating value acknowledge that their objectives are harmonious: all parties will see greater value outcomes. In this way, the value is less of a strategy or combination of benefits to customers, and more of an inclusive process, where participants negotiate methods of sharing in value creation. Therefore, in any marketing exchange, two or more negotiators' views of value are connected by

reciprocal promises (Ballantyne & Varey 2006). While a value proposition that is reciprocal works in a value chain where consumers and customers are the same, two-sided online platforms are more complex because the business customers and services' actual end-users are different. Though the most basic model of reciprocal exchange is when goods or services are exchanged for cash (Ballantyne et al. 2011), in several online platforms, the consumers' reciprocation is not financial and receive, instead, a value proposition where they do not have to pay money for what is offered.

To be considered a reciprocal value exchange, the reciprocal value proposition needs to be open about how the value will flow and should be viewed as a fair exchange of value (Ballantyne et al. 2011; Payne et al. 2005). It could be argued that two-sided platforms do not have the conditions for openness and transparency. Often, the exchanged value is the provision of personal data where the end-user gives personal data in order to use the service for at no cost. Many internet users are reluctant to provide this data, as a recent PEW survey showed 73% of respondents feeling that "they are against search engines harvesting personal data about them because it is an invasion of privacy." Therefore, end-users are engaging in an exchange, but they may not be knowingly or willingly exchanging data. End-users then become, to the key players and those receiving the value proposition on the B2C side, what is being exchanged (Muzellec et al. 2015). Therefore, it could be argued that end-users themselves are the value proposition for the B2B segment. This proposition's value is in how the end-user is an audience to be monetised either due to its size, hence the interest in the number of visitors or because of the audience's demographic, psychographic or behavioural traits. Along with IP addresses, most websites record users' activities such as web pages viewed, how often the visit and the time frames between visits, how long they spend on each page, and many other activities. With behaviour analysis and profiling, data becomes useful to other business parties and can be monetised.

According to Muzellec et al. (2015), when it comes to online two-sided platforms, end-users are a component of the value proposition for business customers and additionally, the monetisation of the business model is B2B oriented. Many experts stated that no business plan or model is impervious to the first customer contact (Osterwalder et al. 2010). To stay competitive, businesses need to constantly work on

and adapt their business models based on the evidence gleaned from customers' responses to value propositions (Wirtz et al. 2010). The capture of value for financial stakeholders and engaging business partners within the network may be accomplished by developing a value proposition specified to consumers while also expanding the revenue streams coming from business stakeholders (Muzellec et al. 2015).

To conclude, the innovation on the two-sided market theory is built on three primary pillars: innovative value propositions, proper selection of business partners (upstream and downstream customers), and selection of the revenue model widening strategy. To elaborate on this in the next subsections, we investigate the literature to find out how value is created by using mobile platforms, and what types of values are obtained from each element; then we review the literature to come to conclusions about the available revenue models that can suit the two-sided business model.

2.8.3 Two-Sided DDBM Relevant Design Tools and Theories (Kernel Theories)

After defining the business model and BMI concepts, it is necessary to investigate the existing literature to find available tools and models that can inform the artefact design process. In the present study, the issues under scrutiny are (i) BMI general framework to guide the design process, showing the directions and essential steps for innovating two-sided DDBM thus informing literature analysis. (ii) Adaptive business model framework that can define the major components of the artefact and inform data analysis process. (iii) The DDBM framework that advises the selection of artefact components concerning data types, analysis tools, data sources and others. In the following sections, the available business model and BMI literature that can advise the design of two-sided business model were examined. Similarly, the data-driven and data-infused business models related works were reviewed.

To this end, it was found out that many frameworks were developed as a theoretical foundation to build, evaluate, and test business models. Unfortunately, very few works have been found concerning data-driven frameworks and two-sided BMI. In this study, the "4i-framework of BMI" is adopted (Bonakdar & Gassmann 2016) as a guideline for two-sided BMI steps with some modification, and a magic triangle

archetype of the business model (Frankenberger et al. 2013; Gassmann et al. 2014) as a theoretical lens to discuss the four components of business model. Eventually, a DDBM blueprint (Hartmann et al. 2014; Brownlow et al. 2015) has been chosen as a conceptual guide in the building of related data components. The justification and explanation of the selection of these frameworks and associated tools will be discussed in the next subsections.

2.8.4 Design Components of Business Model:

In this study, the business model will be the unit of analysis to examine how using data and analytics as a new technology, influences the business model and elicits transformations and innovations in the creation and capture of value presented to the customer. This work, rather than providing new definitions, builds upon already completed work in the area. To accommodate the different business model definitions and to focus on the most essential concepts, a basic business model definition is applied as a foundation for our analysis.

Though there is little consensus in business model literature on the components of a business model, the developed thought on how to represent business models can be separated into two research streams (Burkhart et al. 2011). First, flow-based perspective is used to capture a business's value flow, as presented by Gordjin (2003). The second, and more often used approach is the component-based perspective, a textual representation that describes a business model by pointing out individual components (Burkhart et al. 2011).

Representations of business models show that their components are wide-ranging (Osterwalder 2004). They include crucial activities, essential resources, value proposition, channels, customers, revenue and cost structure. Since there is no agreed definition of a business model and there is a lack of theoretical anchoring (Teece 2010), the component division varies from author to author (Morris et al. 2005). The components are often either a combination or union of other relevant research (Hartmann et al. 2014; Morris et al. 2005; Osterwalder 2004) or the perspective is informed by the individual author's background, leading to specific added components.

Ultimately, it is nearly impossible to discern precisely what business model components are most widely accepted (Schüritz & Satzger 2016).

Despite the lack of agreed business model definition, several frameworks have been proposed to build and evaluate the business model. A notable trend is to adopt a component-based approach in building these frameworks (Burkhart et al. 2011). For instance, one of the first and most cited works is the framework provided by Chesbrough and Rosenbloom (2002) which describes the business model on the functional basis of this model. Moreover, the value proposition is the centre of any business model, and this value is created by offering based on technology as an enabler. The other component is to identify the market segment to which that this technology is most relevant and draw on the revenue generation mechanism suitable for them.

Al-Debei and Avison (2010) have provided a business model framework for the digital business world; this framework consists of seven elements namely: value proposition, essential resources, essential activities, market segment, revenue stream, cost structure, and value network. Another important framework was presented by Osterwalder et al. (2010) based on his distinctive work "business model ontology" (Osterwalder 2004) which is considered the most applied one recently by both start-up and corporate companies (Stuckenberg et al. 2011; Hartmann et al. 2014). The similarity of the first six elements presented in Al-Debei and Avison (2010) was found, excluding the value network (value co-creation) while another three elements were added namely customer relationship, channels, and key partners.

Despite the variations, a generally stable pattern in the meaning becomes can be derived from the literature on business models. Scholars generally agree that a business model consists of four central components: value creation, value appropriation, value chain organisation and the value network. Table 2.9 shows the summary of proposed components of business model from different works.

However, a dense, but reasonably exhaustive, list of components can be found in Frankenberger et al. (2013) and Gassmann et al. (2014). Their scheme resembles that

of Osterwalder and Pigneur (2010). Nevertheless, it is additionally divided into four main question categories of what, who, how, and why.

Table 2.9 Summary of business model available frameworks in literature

Elements \ Author(s) & Year	Chesbrough & Rosenbloom (2002)	Hedman & Kalling (2003)	Morris et al. (2005)	Johnson et al. (2008)	Al-Debei & Avison (2010)	Osterwalder & Pigneur (2010)
Value proposition	√	√	√	√	√	√
Key resources		√	√	√	√	√
Key activities		√		√	√	√
Market/customer segment	√	√	√		√	√
Revenue streams	√		√	√	√	√
Cost structure	√		√	√	√	√
Other elements	Value chain, value network, competitive strategy	Competitors	Competitive strategy factors, personal factors		Value network	Customer relationship, channels, and key partners.

To describe the business models in our study, we conceptualise the above four central dimensions: the who, the what, the how, and the why (Frankenberger et al. 2013; Gassmann et al. 2014). The reduction to four dimensions is ideal because it is straightforward to use and also comprehensive enough to present a clear view of the business model architecture. The business model magic triangle, being the heart of the design phase, helps in the description of the business model dimensions and framework. It is also essential in the explanation of the value propositions of the business model, the product and service offering to the consumers and many more functions. The "what" clearly presents the value proposition of a business model, the "who" involves the customer segments identified in the business model, the "how" indicates the way in which the value is created, and the "why" illustrates the business model's revenue model. A more detailed explanation for each dimension shown in Figure 2.3 are described below:
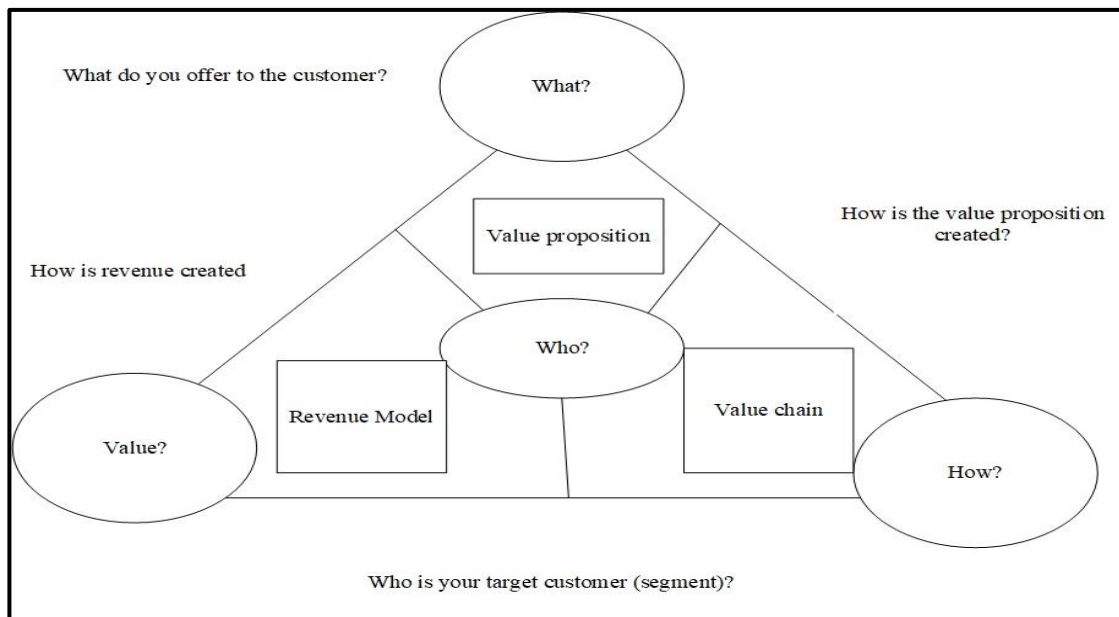
Figure 2.3 business model definition – the magic triangle framework

Source: adapted from Gassmann et al. (2014)

i. Who: Every business model serves a specific group of customers (Afuah & Tucci 2001; Chesbrough & Rosenbloom 2002; Hamel 2000; Teece 2010), so this explains who the customer is (Magretta 2002). Drawing on the argument from Morris et al. (2005) that the "failure to adequately define the market is a key factor associated with venture failure," therefore, we consider defining the target customer as a key component of business model design.

ii. What: This explains what is offered to the target customer, or the values held by the customer. This component is often called the customer value proposition (Johnson et al. 2008), or, concisely, value proposition (Chesbrough & Rosenbloom 2002; Chesbrough 2010; Morris et al. 2005; Teece 2010). Osterwalder (2004), defines it as an "overall view of a company's bundle of products and services that are of value to the customer."

iii. How: To form and disseminate the value proposition, a firm must perform several tasks, which alongside the connected resources (Chesbrough & Rosenbloom 2002; Hedman & Kalling 2003; Johnson et al. 2008; Osterwalder

2004) and abilities (Morris et al. 2005), and their orchestration in the company's value chain, form the "how" of new business model design.

iv.   Why: This explains why the business model is feasible in a financial sense and pertains to the revenue model. Its part in business model conceptualisation is supported by the work of many authors including Chesbrough and Rosenbloom (2002), Johnson et al. (2008), Mahadevan (2000), Magretta (2002), Morris et al. (2005), and Teece (2010). It brings together things like the structure of costs and the mechanisms of revenue that are applied and indicates the fundamental concern of any business: how to earn money.

2.8.5   Business Model Innovation Framework

Many scholars are in agreement on the value of BMI as essential in pushing firm performance forward (Chesbrough 2010; Teece 2010; Zott & Amit 2007) and a method of making organisational change and renewal (Demil & Lecocq 2010; Johnson et al. 2008; Sosna et al. 2010). There is also an agreement in the literature that the most successfully adaptive firms are those that are able to adapt to changes and, from them, innovate current business models to compete 'differently.'

However, there is some disagreement BMI literature concerning whether BMI happens at the moment when the firm adapts one of its central business model elements (Abdelkafi et al. 2013; Amit & Zott 2012), or when it creates a completely changed business model (Markides 2006; Khanagha et al. 2014). This lack of consensus on BMI definitions displays a foundational difficulty in discerning the BMI construct's scope, significance and relevance. Although most concur that BMI is a process of change, the extent of the change is debated. Some contend that BMI is an adaptation of one or more elements of the business model, considering it a transforming business model that will possibly supersede the current one (Khanagha et al. 2014). In essence, not many business model scholars consider it to be a process of procedural steps or specific phases. Teece (2010), does provide a list of steps that, if followed, should lead to a sustainable business model; Mitchell and Coles (2004), consider BMI to be an ongoing process and present examples of what can be learned from those companies that were

successful; and Osterwalder and Pigneur (2010), propose five steps to create new business models. Nonetheless, none have explored the business model's innovation process as a unified entity and how it can create an integrative framework.

In this regard, Serrat (2017) postulates that the greatest benefits will be realised when organisations ready themselves for a successful business model design project, research and analyse the components needed for the task, generate and test feasible options and choose the best, put the prototype into practice in the field, and continually adapt and change the business model in response to industry (or market) response. In this vein, Teece (2017) has identified three core elements to consider when the new business model is in question: identify and sense unmet customer needs in the current situation, selection of technology that might fulfil these needs, deploy hybridisation of existing business models. For example, a firm is especially proficient in a specific type of operation can leverage its proficiency into a service business such as customisation. Likewise, but in more depth, Bonakdar and Gassmann (2016) established an integrative framework encompassing the structure and issues that come with BMI. The framework involves four stages that coming from the literature on innovation management and adapted them to BMI processes, analysing 14 cases. For each stage, they noted challenges that would be encountered. The challenges in the initiation phase, or the study of the ecosystem, would be to comprehend players' needs and discern what may drive change. The challenge of the ideation or idea-creation phase is that there may be potentially outdated logic that needs to be overcome before creating innovative business model ideas and using new tools. The challenges of the integration phase, the new business model's construction, are to make certain all components of the new business model come together and that there is sufficient involvement of necessary partners. Finally, the implementation or realisation phase includes the two following challenges: First, potential internal resistance must be overcome, and this can be done through gradual exposure like through pilots and experiments. The initial three stages, initiation, ideation and integration, can be combined as "design," since they concern the development of business model contents. The last phase, implementation, instead focuses on the content's commercialisation and thus the realisation of the new business model. While this framework is the most detailed one, using it alone without taking into consideration other assumptions made by Serrat (2017) and Teece (2017) could lead to

incomplete guidance and some details will be illusionary for innovating a business model, therefore, these findings were synthesised into tentative guideline blueprint. Table 2.10 depicts the blueprint in detail based on Bonakdar and Gassmann (2016) and amended based on Serrat (2017) and Tecee (2017) propositions:

Table 2.10 Tentative guideline blueprint for two-sided BMI

Phase	Activity	Consideration	Sources
Initiation	Study the ecosystem to sense the unfulfilled needs by stakeholders and identify the possible opportunities.	Existing business model and activities	Bonakdar, and Gassmann (2016) and Teece, 2017
Ideation	Select the best option and opportunities according to current organisation capabilities and existing business models. Select proper technology that can create value for all stakeholders and achieve good revenue for the focal firm.	Leaving product or service thinking behind.	Bonakdar, and Gassmann (2016); Teece, 2017; and Serrat (2017)
Integration	Integrate the pieces of business model (who, what, how, why) Apply a trial and error proof of concept prototype to evaluate and test the interests of all stakeholders in an iterative manner.	Ensuring alignment among business model components. involving partners early	Bonakdar, and Gassmann (2016) and Serrat (2017)
Implementation	Commercialisation of the content, the "realisation" of the new business model.	Overcome the internal resistance and introduce the new business model in stages	Bonakdar, and Gassmann (2016) and Teece, 2017

2.8.6 Data-Driven Business Model (DDBM)

Modern firms are struggling to make sense of the vast amount of data flow that is generated from different resources (internal and external) and in various formats (Kiron et al. 2014). Wong (2012) stated that the ability to harness big data to generate useful insights for decision making and innovation is a crucial factor in value creation and in maintaining a competitive position in the modern constantly evolving business environment. The ability to use big data lets firms achieve superior performance against their competitors (Oh et al. 2012). To capture the most out of big data, companies are

required to implement an analytics process (Tan et al. 2015). This process is called big data analytics (BDA), defined as an approach to manage, process and analyse data related features (volume, variety, velocity, veracity, and value) to discover helpful information to form ideas for better decision making, measure performance, and establish an advantageous competitive position (McGuire et al. 2012; Wamba et al. 2015). The implementation of BDA increases an organisation's ability to capture vast amounts of data, integrate it, analyse various formats and structures, and transform it into the knowledge for decision making. BDA has become a critical competition resource and over the last several years has been ranked among the top agenda items of senior executives. Previous studies presented BDA as "a next big thing for innovation", " new paradigm of knowledge asset", " a source of knowledge management" (Côrte-Real et al. 2017; Manyika et al. 2011; Wamba et al. 2015; Hagstrom 2012). The main role of BDA is to provide firms with the recognition of what has happened, what is happening now, what is likely to happen next, and what needs to be done to produce more optimal results (Lavalle et al. 2011). BDA presents insights by uncovering hidden patterns to enhance decision making, make more real-time decisions, support innovation and improve a firm's performance (Manyika et al. 2011).

Using the combination of big data and analytics appears promising (Hartmann et al. 2014). Therefore, the goal of garnering competitive advantages based on utilisation of big data propels researchers and practitioners to transform existing businesses incorporating data (Brownlow et al. 2015). Some organisations already profit from data's use. The majority of initiatives still focus on optimising internal processes and costs (Manyika et al. 2011, Hartmann et al. 2014; Morabito 2015). Nevertheless, exploiting data as a central resource for the BMI is gaining momentum. Therefore, leveraging data presents a continuum of transformation possibilities, from optimising existing internal processes to developing completely new, DDBMs (Schüritz & Satzger 2016; Hartmann et al. 2014).

However, how to leverage business model by exploiting your new valuable assets of big data, is a new emerging trend in the field of business models and related literature. Here, the concept of the DDBM has received more attention in research in big data contexts. Moreover, the concept's early emergence found in research in the form of

sponsored white papers from Hagen et al. (2013); Manyika et al. (2011); Schroeck et al. (2012), and from solutions vendors Petter and Peppard (2012); CEBR (2012) which have contributed to the attention drive. Notably, the main focus of these works was on the big data's role in the value creation process, where the companies may explore to enhance or create a business model.

In academia, the research on the data-driven business model is limited. For example, Otto and Aier (2013) have investigated the business models of data providers, concentrating on why the business partners have a different business model. Another valuable study by Hartmann et al. (2014) proposed DDBM taxonomy framework. The researchers began by synthesising the literature on business model, big data, and other related literature to present their framework with a concentration on start-up companies. While the study is conducted based on a sample of start-up companies, Hartmann et al. (2014) have argued that this taxonomy can also be applied to established companies.

The DDBM framework, demonstrated in Figure 2.4, is a basis for the analysis and clustering of business models. These dimensions and various features may guide practitioners in ways to form a business model for their venture. The framework enables the identification and evaluation of available possible data sources to be used in the DDBM. Additionally, it provides exhaustive sets of potential core activities and revenue models. Moreover, the delineated business model types can work as both inspiration and blueprint for businesses looking to create new data-driven business models. The different types offer a methodical overview of the various ways to create DDBMs, and the pattern can be transformed to apply specific industries or firms. It also permits practitioners to consider their own business in a competitive landscape, thus providing the opportunity to identify possible gaps in the market.

In the same vein, Brownlow et al. (2015) conducted an extended study to validate the framework of Hartmann et al. (2014) on established firms. They found that this framework is valid for established firms and that it provides a step-by-step process for them to develop their own data-driven business models. Moreover, they documented that, as the benefits of big data utilisation become continually greater, organisations are required to include forward-thinking data-driven practices in their business plan, or

potentially lose their competitive position, market share, and above all, revenue. For most businesses wishing for growth or long-term survival, becoming data-driven is necessary. Eventually, the frameworks enable organisations to build their own DDBM, specialised to their business and environment.
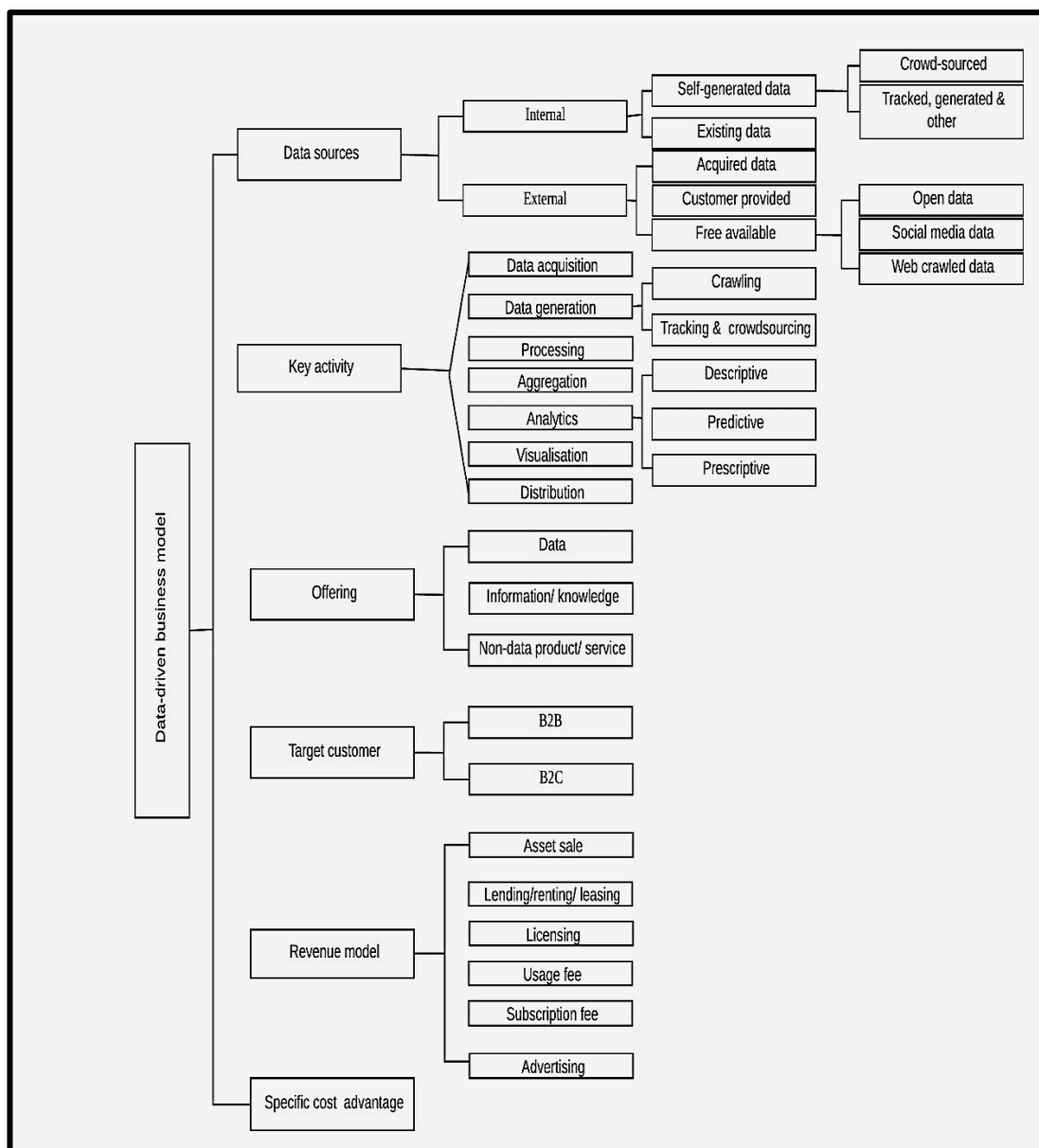

Figure 2.4 The data-driven business-model framework (DDBM)

(Source: Hartmann et al. 2014)

It has been reported that data-driven businesses are 5–6 percent higher in output and productivity than comparable organisations not utilising data-driven processes.

There are some industries where big data has generated entirely new business models. To exemplify, after moving towards a digitally-oriented distribution model and seeing lowering advertising revenues, some publishers started to gather data pertaining to their online users, a demographic especially good for advertisers. This data could then be sold, allowing for personalised and successful advertising. Data-driven business can also increase the speed of value capture; ad became clear when, in the financial services sector, trading algorithms analysing vast data sets could capture value in milliseconds. (Brynjolfsson et al. 2011; Brownlow et al. 2015).

Overall, the initial step to reaping the possible rewards of big data for business is choosing what the business model(s) will be (Bulger et al. 2014). Bulger et al. (2014) categorise big data businesses in the following way: data users, data suppliers, and data facilitators (Table 2.11 details of each role). These categories, however, often overlap, and many firms participate in a range of activities.

Table 2.11 The roles played by big data organisation

Role	Definition	Sources and challenges	Key questions to organisations
Data users	Organisations using data internally—either for business intelligence activities such as predicting demand or as an input into other products and services such as credit scores or targeted advertising.	They either produce data internally, receive it from third parties, or from a combination of the two. A central challenge is putting together the physical infrastructure and developing skills necessary to harness big data.	The key question for this group is "what data we have, and how can this data be used for value creation in the business?"
Data suppliers	Organisations are offering data as a product for the use of others.	This encompasses organisations that generate data of inherent value to others and those that inhabit a brokerage role by offering access to a combination of first and third-party data.	Key questions are what data is available, what value might that data have and for whom, and how should data be delivered to boost its value?
Data facilitators	Organisations that assist others in exploiting data	This encompasses businesses offering outsourced analytics services and that provide services either infrastructure or data strategy consulting	The key question here is who the potential customers or customer segments of our model are?

Source: Bulger et al. (2014)

Many business models are primarily concerned with data usage in business-to-business contexts. For example, more and more, consumers find themselves faced with copious data. These results in an expanding market for businesses offering data-driven products and services to end-users like the market for personal health and fitness devices and smart home technologies. Moreover, the entire spectrum of business models also applies in the consumer-facing segment: more and more, consumers will request data analysis tools and services, products with a data focus, and assistance for managing data.

Based on the service-oriented paradigm, new services like data-as-a-service or analytics-as-a-service emerge (Hartmann et al. 2014; Chen et al. 2011). Within DDBM, data acts as an enabler of such innovative services. With enabling technologies, like sensor technology and cloud computing, companies can exploit data from and about their customers. In their own environment companies get enabled to generate new profitable know-how-based services (Engel et al. 2014). Therefore, a business model can be said to be very relevant in the development and growth of business because its transformations guide the enterprise in their transactions and also dictate how revenues are being generated. Requiring such new technologies to develop and innovate business model can transform business model into a digital one. Veit et al. (2014) stated that a business model is digital if shifts in digital technologies bring about structural alterations in the way business is run, and revenues are generated. According to Hartmann et al. (2014), DDBM is defined as "a business model that relies on data as a key resource" Brownlow et al. (2015) similarly state that "data is obviously fundamental to a DDBM" and Bulger et al. (2014) agree, that "data should be central to the business." These definitions are rather simple and differentiate business models on their use of data or not. However, there is not enough understanding of how these business models function and how businesses can transition into them. Therefore, a more complex perspective on DDBM is proposed by Schüritz and Satzger (2016). According to their account, there is no DDBM per se; rather, there is a continuum of options how to provide data-driven service. Hence, there is a smooth transition between business models that use little data and those that enrich all areas of its business model with data analysis (Schüritz and Satzger, 2016). Therefore, existing data or new data can be used to either create new business models or enhance existing ones (Zolnowski et al. 2017). In the

latter case either the value creation, the value proposition or the value capturing or combinations of these can be enhanced by data (Schüritz & Satzger 2016). Schüritz and Satzger (2016) identify five separate patterns where using data might change the business model, demonstrate them with relevant case studies, and then assess the patterns by analysing 115 industry business models as a sample. The main aim of their research is how using data and applying analytics may trigger BMI (see Table 2.12). They argue that the identified patterns would guide practitioners in how to utilise (big) data and analytics, especially those still underutilised for innovation.

Table 2.12 business model data-infused pattern in organisations

Name	Infused Component(s)		
	Value Creation	Value Capturing	Value Proposition
I. Data-Infused Value Creation	✓		
II. Data-Infused Value Capturing		✓	
III. Data-Infused Value Proposition via Creation	✓		✓
IV. Data-Infused Value Proposition via Capturing		✓	✓
V. New Data-Infused Business Model (DIBM)	✓	✓	✓

Source: Schüritz and Satzger (2016)

The identified patterns were based on the three main components of business model: value creation, value capture, and value proposition as the main driver of value creation. Their study found that while over 70% of analysed cases at least briefly consider value creation or value capturing (patterns I, II), a value proposition infused with data is still rare. Therefore, Davenport's "Analytics 3.0" phase where data-driven changes appear in the offer to the customer has not happened yet for the majority of enterprises (Davenport 2013). In addition to infusing the current core business model with data (pattern III and IV), companies may also make use of data and analytics to formulate entirely new business models (pattern V). Nevertheless, Schüritz and Satzger (2016:140) made a call for further research on the following aspect to reap the benefits of data-infused business models:

i)   How the company's value proposition is infused with data needs to be examined to provide practitioners with a more detailed image of options.

ii) The ways in which added value may be monetised in viable revenue models: Existing businesses have revenue models that work with the present offering, but will they transform when the business model is infused by data? It might be difficult to gather empirical evidence to develop theories because a few business models utilise data and analytics in their value proposition at this moment in time.

iii) Methods for identifying chances to use data and analytics: Many businesses may have a great volume of data currently accessible but are not yet aware of how they should utilise them. Therefore, systematic methods and straightforward tools that can assist businesses in identifying solid opportunities.

iv) As soon as a data infusion opportunity is identified, how an organisation should transition the current business model into the new data-driven one is still something to be considered.

So far, only Schüritz et al. (2017) have responded to the second call concerning the revenue model within the data-infused or data-driven business model. Their study delineated common revenue models: subscription, usage fee, gain sharing ones, and four multi-sided models. They found that subscription models were the most commonly used revenue model in their sample, but more innovative models like gain sharing and multi-sided revenue models are picking up momentum in start-ups with data-driven services. Overall, their study revealed that the revenue model is firm-specific, and each business model will be unique. A more detailed discussion was presented in the revenue model section (2.6.6).

Ultimately, general purpose frameworks and models are conducive to delineate the paths for organisations, we argued that all of these aspects in their call for research have the same problem, and each sector and sometimes each firm has to develop its own answers for these raised inquiries as posited by Brownlow et al. (2015). For example, MNOs and mobile application developers are operating in the same business ecosystem, but the possible opportunities and revenue models are not the same. Each organisation

or sector has its own strategies, dynamic capabilities and business environment that needs to be addressed within these restrictions to determine the best for innovating strategy and path.

To conclude, the framework developed by Hartmann et al. (2014) and validated by Brownlow et al. (2015) was deployed in this study to delineate the path for designing the proposed business model (artefact). The six questions that each organisation needs to answer during the design and development of DDBM are presented in table 2.13 with examples for each. In this study, all these questions are answered in the third chapter, where the justification of each selection is provided based on early extracted arguments. Hence, in the next chapter (conceptual framework) all the arisen questions in the current chapter guided the development of the initial artefact (first iteration). The data-infused business model pattern (Schüritz & Satzger 2016) will also be used to clarify what components of business model infused are and how. Finally, the revenue models proposed by Hartmann et al. (2014) and Schüritz et al. (2017) will be thoroughly analysed to select the most suitable for our artefact.

Table 2.13 The blueprint for an organisation to design DDBM

DDBM Required Development Questions	
Question	Examples of answers
Target outcome: What is it we trying to accomplish?	Customer insight, brand awareness, better competitive position, amelioration of product or service.
Offering: What is our desired offering?	Non-data product or service, information, knowledge, data.
Data Source: What data do we need and from where are we going to acquire it?	Free available data, Customer-provided data, operations data, current data, self-generated data (e.g. crowdsourcing), external data, internal data
Key Activities: How are we going to utilise this data?	Prescriptive and descriptive analytics, data acquisition and analytics, predictive analytics, aggregation.
Revenue Model: How can we monetise it?	Advertising, subscription, lending, renting, usage fee.
Inhibitors: What are the obstacles to us accomplishing our goal?	Cultural issues, perceptions about value of DDBM, data privacy barriers, value perception, Personnel challenges, data availability and ease of access, Data quality and integrity, legal challenges, data accessibility and integrity.

Source: Adapted from Brownlow et al. (2015)

2.9   SUMMARY

In this chapter, the researcher presented a review of the relevant literature under the main constructs for three purposes. First, as advised by DSRM principles, the related works are captured under four constructs MNOs' business model, MNOs' two-sided business model, mobile advertising, and big data. These were analysed to show the gap in knowledge and extract the design principles and the proposed solutions by using thematic analysis. The review revealed that the MNO still has a problem in gaining a competitive advantage in the existing mobile ecosystem. The traditional business model is suffering from commoditisation, and few academic works have investigated possible solutions. These few studies proposed a two-sided business model as a possible avenue to be explored by MNOs. The studies proposing a two-sided business model, however, have examined the application developers as an upstream customer, while neglecting the prospects of other business sides (e.g. advertisers, retailers, government entities, and so on). Meanwhile, industry reports and white papers postulate that MNOs still undermine mobile advertising as a result of the segregation of advertisers from end-users. As a result, the advertisers are unable to obtain feedback about their advertising activities such as ROI and exposure and unable to obtain further marketing insights to make relevant decisions. Hence, MNOs are still struggling to gain the maximum benefit from mobile advertising. On the other side, non-academic research also pinpointed that the big data could be useful for MNOs for external deployment to create invaluable business cases, but the underlying uncertainty about the real possible usage is hindering them from going further. In the same vein, a DDBM has been found by later scholars to formulate a new avenue for MNOs to invest in it and design new business models. They indicated that the data analytics as a service could be sold out for those who need to obtain feedback and marketing insights about their daily activities. Hence, the primary study argument has emerged, in that, a new two-sided business model that combines mobile advertising with DDBM to remove segregation in current advertising business models can be leveraged as a new business model for MNOs.

Second, the theoretical background of the study was investigated to further identify the relevant concepts and variables in the proposed solution and to aid in data collection and analysis. The analysis shows justification for the arguments that have

been made in the first part, including how the concepts such as value network, value creation, and value propositions can contribute to creating a new competitive advantage and what values are created, and how they are created, by deploying the mobile device, mobile apps, and big data. The review extended to show how the DDBM could generate advertising feedback and marketing insights. Finally, as the main component of business model design, potential revenue models were discussed to select the proper model for the proposed artefact.

Third, the theoretical framework of relevant concepts, models, theories and frameworks was analysed and discussed to develop a blueprint for this study and to build and design the proposed artefact. Consequently, the general tentative framework has been generated to aid in analysing the current situation of MNOs and thereby suggest a solution to innovate business model, based on extant literature and expert speculations. The two available frameworks on extant literature have been chosen to guide this study for designing the new artefact namely, DDBM framework and business model definition – the magic triangle.

CHAPTER III

MODEL DEVELOPMENT (FRIST ITERATION)

3.1   INTRODUCTION

In the previous chapter, we discussed the fundamental constructs and the theoretical lens to build an intended model (artefact). In this study, the model development is informed by the prevailing theme of DSRM. In this vein, March and Smith (1995) identified that the artefact development consists of constructs, models, methods, and instantiation. Later on, Purao (2002); March and Smith (1995); Gregor and Jones (2007); Gregor and Hevner (2013); and Vaishnavi and Kuechler (2015) decomposed those outputs of DSR into constructs, models, methods, frameworks, design principles, architecture, instantiation, and design theory. Having said that, the constructs represent the vocabularies of the problem and solution domains (Vaishnavi & Kuechler 2015); as discussed earlier in chapter 2, whereas design principles have to do with creating a solution as extracted from relevant constructs.

In this chapter, three other outputs were presented, namely; model, method, and framework of fundamental requirements. It is important to mention here that the model represents, according to Vaishnavi and Kuechler (2015) "a set of propositions or statements expressing relationships among constructs," and it can be used to inform and to support the construction of other artefacts. For example, the drawing may inform the software development (Johannesson & Perjons 2014).

Moreover, the model in DSR differs from natural science. The traditional science model focus on describing the truth, whereas model in DSR intent to prescribe a solution or deliver utility (Vaishnavi & Kuechler 2015; March & Smith 1995). On the other hand, a method is a set of prescriptive steps or guidelines for manipulating constructs to accomplish the goal and realise a solution (Johannesson & Perjons 2014; Vaishnavi & Kuechler 2015). Finally, the framework in simple words shows real or conceptual guides to serve as a support or guide (Vaishnavi & Kuechler 2015).

3.2   MODEL INNOVATION FRAMEWORK

The two-sided platform has been considered as a type of business model. The extant literature that was exposed to guide the two-sided BMI per se is not there. In this study, therefore, we tried to develop a tentative two-sided BMI framework to support the design of an artefact as we discussed in chapter 2. This framework, which was developed based on a 4I framework created by Bonakdar and Gassmann (2016), with some adjustments made to it was driven from a set of propositions stated by Serrat (2017) and Tecee (2017). It has been deployed to guide the review and analysis of extant literature so as to generate the artefact components. The details of deployment are presented in Figure 3.1, wherein the three phases were depicted namely; Initiation, Ideation, and Integration and the fourth one, Implementation were excluded as it is beyond the scope of this study.

In the Initiation phase, the literature from Mobile ecosystem was analysed to elicit the needs of players and infer the underlying change drivers. The conclusion of this phase is that the MNO are losing their competitive position and their traditional business models are struggling to generate revenue and profit. The OTTs players within the mobile ecosystem have converted towards platformisation of their business models. The MNOs are in a weak position to rival in attracting application developers to form a digital platform, and the customer bargaining power is stronger than ever before. These needs and moves have influenced the MNOs to make a change in their business model. The underpinning drivers of change for MNOs are stemmed from environmental change within the ecosystem, such as new ways of competing and new technologies such as big

data, M2M, data-driven services. Eventually, the sensed opportunities for MNOs are a two-sided platform, mobile advertising, big data and DDBM.
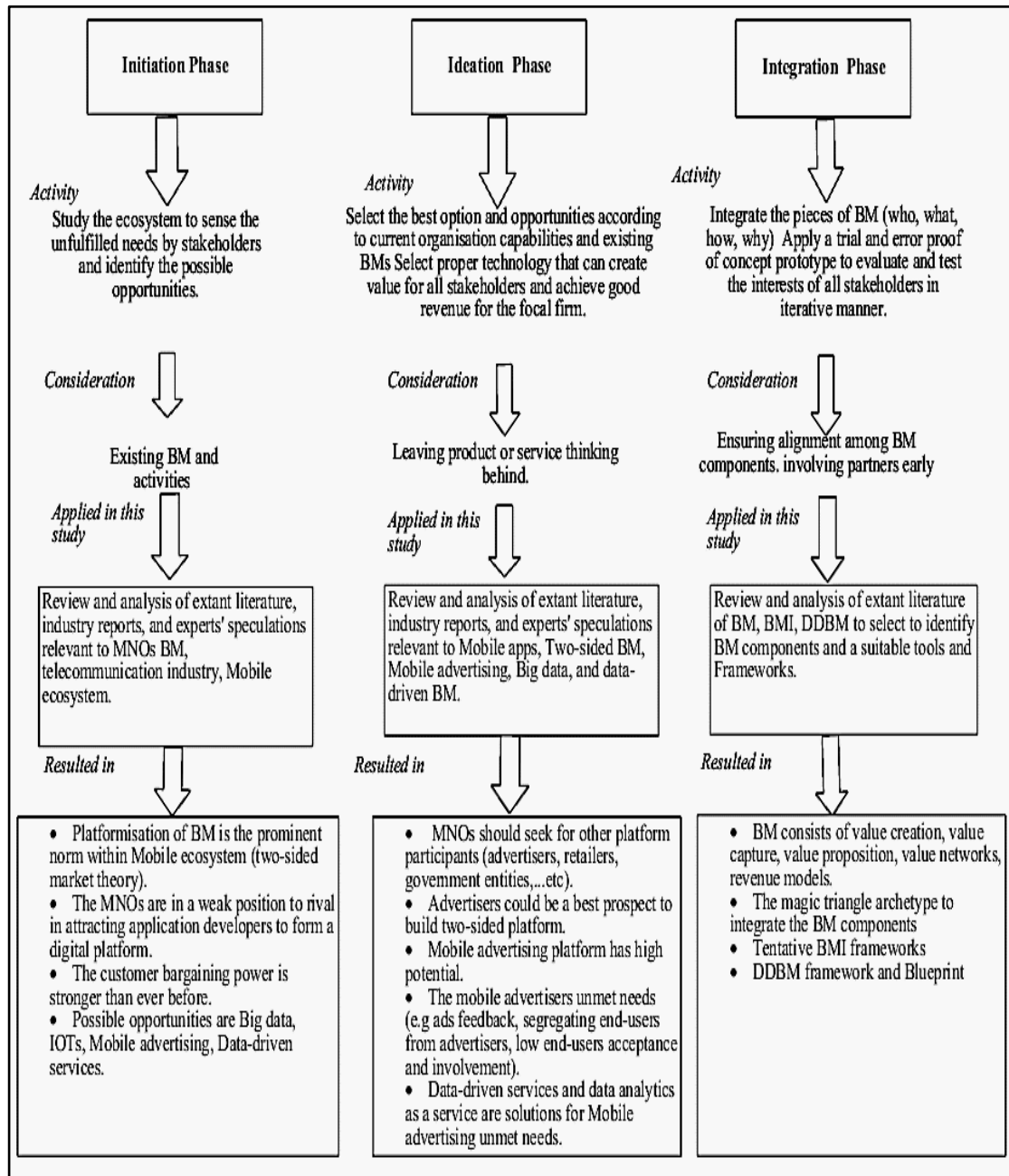

Figure 3.1 A two-sided BMI framework

Source: adapted from Bonakdar and Gassmann (2016); Serrat (2017); and Tecee (2017

In the ideation phase, the cautions of thinking solely to develop a product or service from these opportunities are essential and incorporating these opportunities into