

A Two-Sided Market Mechanisms Toward Designing a Big Data-Driven Business Model for Mobile Network Operators (MNOs)

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Abstract—The mobile ecosystem has experienced a dramatic change as a result of a new entrance, new application, and new business model emerged. Recent trends have shown that the mobile industry is amidst a transformation toward platformisation of the key players' business model. This situation puts a traditional business model of mobile network operators (MNOs) under pressure as they failed to catch up due to lesser capabilities for providing a new value proposition and incentives for those sides of the market to achieve the two-sided platform compared to dominated parties. However, the paucity of extant literature has provided practical solutions to enhance MNOs business model leveraging contemporary information technology tools in combination with managerial design principles and concepts. This study investigates the application of Big Data –driven business model in order to transform MNOs from one-sided business model to two-sided business model. The design science research method (DSRM) will be used to build and evaluate the new business model. The proposed model will help the operators better serve their upstream customers and the end-users in order to counter the stiff competition existing in the mobile ecosystem, and contribute to the Big Data - driven business model.

Index Terms—Big Data; Mobile Advertising; Mobile Operators; Two-Sided Market; Design Science Research Method; Business Model.

I. INTRODUCTION

Mobile network operators today are under a great market pressure driven by significant challenges such as decline in return on investment (ROI) and average return per user (ARPU) along with shift in several technologies by competitors. In general, MNO traditional Business models (BM) are affected by the tidal wave of innovative business models and platforms of over the top players (OTTs). Hence, there is a noticeable shift in the provision for power of MNOs services that is from a simple linear to portfolio of convergent services that can counterattack the expected role of growth depletion for mobile ecosystem. Consequently, practitioners and scholars have started to investigate further the causes for and structure of the current business environment. The aim of many of these investigations has been to identify and quantify the factors and revenue streams of mobile ecosystems. Retrospectively, prior studies have a common conclusion that the platformization of OTTs business models within the ecosystem (two-sided market) [1], data-driven services/products (data is the new trend) are the main reasons to dominate and achieve sustainable competition for MNOs, where these operators have failed to bring in business. The

decrease in the business is due to lesser capabilities for providing a new value proposition and incentives for those sides of the market to achieve the two-sided platform compared to dominated parties such as Apple, Google, Facebook etc., [1].

The discussion for applying two-sided market in the MNO business model has been going on for several years but unfortunately very few papers have their research based on this approach of the multiple opportunities and possible avenues to be explored in the business. Moreover, the two-sided market theory has been studied in other industries, the focus of works conducted within a mobile ecosystem has centred on OTT players. Unfortunately, the MNOs business model thinking as per two-sided market theory's applicability in academia is, very few and limited to speculations from experts and white papers. Based the research gap, there is a need for interdisciplinary and comprehensive study to address the applicability of opportunity of two-sided business model to one of the most important retail market sectors in the world. Moreover, the nature of this study is interdisciplinary and dispersed within several disciplines, namely Big Data-driven business model, IT-enabled services, managerial design principles and structure, and two-sided theory and strategies. Thus, the aim of this study will be achieved using dual method: firstly, address this gap by synthesising literature to develop a framework to MNOs, secondly to propose two-sided platform based on this framework using design science research method (DSRM).

This paper is organized as follows: the first section is dedicated to the literature review analysis to define the main concepts (constructs) for our conceptual framework, the second section explicates the research method used in this work, followed by results and discussion section which contains our proposed model. Finally, the last section is devoted to a conclusion and future work.

II. THEORETICAL BACKGROUND

A. Business Model

The study of recent literature highlighted the purpose to develop innovative solutions and services, particularly those driven by ICT such as e-business, e-commerce, IT innovation and mobile technology [2].

The justification to use a business model as a conceptual tool to help firms design their business model in term of how they create, deliver and capture value was found in the work done by [3]. To illustrate, this means that it helps them to

identify the customer's needs and requirements and the customer's willingness to pay. Then how firms, in turn, would respond to these by providing products and services that fulfil these requirements and create value for them, to entice them to pay, and subsequently obtain profits from this through the proper configuration of the value chain [3]. Taking a closer look at the definition of a business model we can see that the value is the underpinned element of it. Hence, it is the point of departure to build upon it to structure a good business model. In short, it means the capability of firms to develop a product or service that can fill the gap found in the targeted market [3].

The purpose for this interest is the success of companies for that business model, and not technology. Nevertheless, the traditional business model nowadays that are hard to achieve competitive success in the dynamic ecosystem due to the prevailing theme of dominance and success stems from the deployment of two-sided platforms [4]. Therefore, we consider the deployment of the two-sided business model, as a strategy to create mobile services as, highly applicable in order to design a new successful IT-driven services, where MNO is no exception.

B. The two-sided Market as a Business Model

The two-sided platform, two-sided market or two-sided network all have the same meaning, which is an economic platform that brings together two different groups who get mutual benefit from using it or so-called "network effect." [5]. For example, Facebook is a two-sided market, it provides subscribers with a social place to interact, and advertisers a good place to promote their businesses. Another example is Google, who serves information seeker on one side and advertisers on the other side. There are many other examples, such as Apple store, eBay, Alibaba, and Microsoft.

According to [6], this model distinguishes itself from the traditional one with remarkable characteristics, including successful unique features- positive cross-side network effect; more buyers on a platform attract more sellers, and more sellers consequently attract more buyers. Furthermore, [7] have said that two-sided platform differs from the traditional business model in a fundamental way: the cost and revenue flows from both the sides, while in the traditional platform the flow is in such a way that cost flows to the left and revenue to the right side. Furthermore, the inimitable competitive advantage is another big advantage of creating a successful two-sided platform over a one-sided business model. The well-established model is extremely defensible as a result of "network effect", beside the high "switching cost" incurred by users if they want to move to another similar platform [1]. In comparison with the traditional business model developing a successful two-sided business model are a hard task, and the egg-chicken dilemma persists when to decide which to start with as both sides of the market are crucial to attracting each other for mutual benefit. But the rewards are worth the risk and the hard work to achieve a large scale [8].

Another important strategy according to [9] is to start small with a particular niche in mind, because starting with a large-scale target is not the right step to take. So the question that arises here is: what is your target market?

C. The two-sided Market for MNOs

According to [10] and [9], unlike startups, the established organisations and large corporation thinking to apply

platform business model should build it on the current pipe business model and confine to existing assets, process, customer base, and constraints. Based on that the MNOs thinking to develop platform business model should be restricted to current downstream and upstream customers base. In the context of a mobile ecosystem, this mediation can be done between (e.g., developers, advertisers, government entities, and consumers). Therefore, MNOs have to explore those groups to select the proper two distinct groups, at one side, with the mobile phone users (subscribers) constituting the first group. The selection of the niche market is a necessity as one of the main principles of two-sided market theory to start small. On the other side, critical analysis is needed to choose from the potential portfolio of prospects. So that, the two of the following questions emerged to MNOs:

- i) Who our potential prospect for our current upstream customers is?
- ii) What is the value proposition that can attract two groups on the board and achieve network externalities is?

D. MNOs Opportunities to Develop Two-sided Business Market

The persisted chicken egg dilemma of platform business model has less impact on the MNOs case since the first group (downstream customers) is already determined as we mentioned earlier. However, the niche group has to be explored. The difficulty stems from the selection of a second group (upstream customers), according to [11] the potential upstream customers are app developers, retailers, government entities, content owners and brand advertisers. The extant literature so far does approach the developers and content owners within the mobile ecosystem [12] [13] these studies have revealed that mobile operators are no longer capable of attracting developers. Based on this study, it can be recommended that MNOs should search for different stakeholders to sell their products.

The other promising avenue explored by OTT players within the mobile ecosystem is mobile advertising (e.g., Google and Facebook) where the MNOs are performing well by offering SMS ads and location-based advertising. According to [14] global mobile advertisement spending increased 105% to a total of \$17.96 billion in 2013 compared to \$8.76 billion in 2012. Researchers have also pointed out the high acceptance rate among users of this form of advertising compared to web advertisements. Nevertheless, a more recent study conducted regarding the development of location-based advertising (LBA) by [15], to examine stakeholders' perspectives has interesting findings from mobile operator's perspective, advertisers' perspective, and consumers' perspective. Despite the promising opportunities, the study has identified several challenges that hindered MNOs from reaping the benefits from it which are namely; new competition with LBA app developers, lack of pulled mobile ads, and needs to improve network coverage. On the other side, non-adopters' advertisers are conservative as a result of uncertainty about LBA effectiveness and ROI, whereas adopters' perspective besides uncertainty is the high demand for incentives for consumers to adopt LBA. Based on the above discussion, we can conclude that the mobile advertising in general still has big potential, but the problem that persisted in LBA is the absence of shared platform, where the mobile operators as a platform provider segregate advertisement for consumers. By doing that, they prevent

advertisers from accessing consumer information directly as to formulate insights, measure the actual ROI, and provide them with proper incentives. On the other side, the consumer perception toward LBA depends on other factors rather than location. Hence, the multi-sided platform is of great benefit for new research.

E. Big Data as a Value Proposition

Data itself is not new to companies in this information age, the usage of data to support business is neither new to them. The companies exploit data in their hands to help them manage employees, track their sales and obtain clues about customer behaviour. But over the last few years, the amount of data available is huge as a result of new devices, sensors, social media, and others [16]. According to [17], Big Data is not only about volume, it also has other attributes, which are variety, velocity, value, and complexity, where the value is the most important aspect of it [18] [19]. [17] and [20], have stated the current and future concentration in this field will be on how Big Data create value across domains and disciplines, where the value comes from the ability to analyse data to generate actionable information. Moreover, on their survey of the literature, they have concluded that value can be created from Big Data in five generic ways (Table 1). Nevertheless, the value creation in the two-sided platform is not only confined to new technology, service, or product as in traditional business model but also coming from the presence of one group that attract the other customer group to interact with the platform [13]. According to [21], data will not come in unless we incentivize somebody to get that in the system. Moreover, the question on ‘what is the data we have and what we can do with it’ should be replaced with the question; what is the customer problem we want to solve? What data is required for it? What is the gap in current data? How to incentivize people to give data?

Table 1
Value Created from Big Data adapted from [17] & [20]

Creating transparency by making Big Data openly available for business and functional analysis (quality, lower costs, reduce time to market, etc.)
Supporting experimental analysis in individual locations that can test decisions or approaches, such as specific marketing programs
Assisting, based on customer information, in defining market segmentation at more narrow levels
Supporting Real-time analysis and decisions based on sophisticated analytics applied to data sets from customers and embedded sensors
Facilitating computer-assisted innovation in products based on embedded product sensors indicating customer responses

Therefore, we argue that the selection of Big Data value two-sided platform should consider currently unsolved problems and restricted to currently established business activities and customers.

F. Mobile Advertising Platform

MNOs have recognised the importance of Big Data to improve their internal processes and to utilise it externally in order to provide it as new services to other [22]. Although MNOs generate a deluge of data from daily customers’ activities and logs within their value chain, the Big means nothing if data has no value for someone. Marketers start to recognise the potential of Big Data to extract useful insight about their marketing activities [23]. However, few percentage of them can deploy Big Data analytics to measure their marketing and advertising

performance as they lack the people and IT capabilities, especially the small and medium size companies (SMEs) [24] [25]. The performance of marketing effectiveness becomes a priority for managers, and gradually will turn into competitive factor [26].

For example, in advertising the estimation of optimal budget and ROI to maximise profitability is one of a most addressed issue in marketing research and making a one-shot decision regarding them is illusionary [27]. The trend of exploiting data gleaned from mobile devices has been the focus of marketers to exploit the potential benefit of Big Data, where this data can be used by third parties for different purposes [28].

The decision-making process regarding some important issues such as promotion, segmentation, and advertising for those firms is almost based on intuition and experience of managers [29]. Hence, they are lagging behind in term of competition and marketing investment. The MNOs have recognised this opportunity to utilise the trove of data residing on their networks to offer Big Data analytics services to their business customers (e.g., advertisers) and consequently creating new business models. However, such kind of services are still immature and most of them still focus on utilising these data to create internal value, but this value-added services still hold potential for new revenue streams [30]. [30] has identified two successful opportunities for MNOs to drive income from Big Data related to advertising and marketing:

1. Mobile advertising: personalised ads SMS/MMS and mobile advertising platform owned by MNO.
2. Market Research: provide detailed data for retail, government and infrastructure planning. For example, retail outlets that want to plan for the optimum location for their new stores or shopping malls, and bill board advertisers that want to optimise locations and content.

Although these value-added services hold a significant potential, the MNO that want to create of Big Data-driven services should consider the following challenges:

1. The increasing number of data mobile applications downloaded by users, with a lot of market details are hidden for MNOs which makes the large chunks of the picture missing [31].
2. The regulation and privacy constraints imposed by regulators and consumer concerns compared to fewer restrictions imposed on OTT players providing similar services detect that MNOs should incentivize end users to opted-in to services and applications that would then enable MNOs to use their data more widely [30].
3. Real time and near real time data required from marketers and advertisers to continually adjust their budgets, make timely decisions, and measure the ROI of marketing activities.

Drawn from above discussions, MNOs are in a strong position to leverage two-sided platform for advertisers based on Big Data as a value creator if they develop this platform with a proper selection of its components compelling with previous insights and propositions provided.

III. METHOD

Looking at the problem on hand, the motive for our research is to find a solution to a practical problem and contribute to the knowledge base of MNOs business model.

To achieve that Design Science Research Method (DSRM) [32] will be used to build and evaluate the business model. In the context of a business model, design science means the process of creating a new business model framework that helps organisations to express their business logic [33], or applied research that applies knowledge to solve industrial or practical problems [34]. According to [35], the business model can be innovated answering the four associated questions depicted in (Figure 1.1). The [35] business model conceptualisation will be used as a theoretical lens to build our artefact.

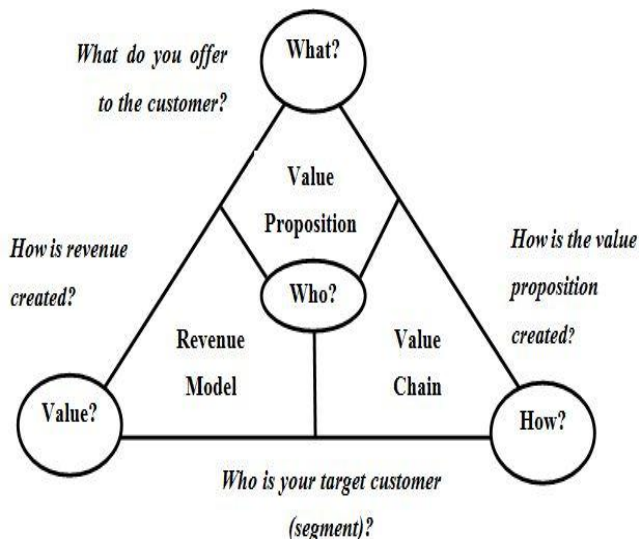


Figure 1: Business model definition – the magic triangle (Source: [35])

The business model with some modification will be used to fit with the two-sided business model theory. It will be a special form of business model, which will have the network effects as the focal point as was mentioned in the previous section

DSRM is a multi-method or pluralist design methodology, where several research methods can be incorporated. According to DSRM principle to find a solution to real life problem, the literature review is the first iteration to build the main constructs and propose a solution [36] [34]. Based on that we critically analyse the secondary literature, and applied abductive, deductive and inductive reasoning [37] to build the main constructs of our artefact and propose a solution. However, for the purpose of completeness semi-structured interviews with three large mobile operators company namely; Zain, Orange, and Umniah were conducted, and secondary data was collected from their websites to complete the missing chunks of the picture. The grounded theory approach with some modifications (start with axial coding) was used to analyse the interviews and secondary data; the reason is that the main categories were early determined from literature.

IV. RESULTS AND DISCUSSIONS

A. The Framework of Fundamental Requirements to Develop a Model

The results of literature analysis and interview can be divided into three categories namely two-sided platform, mobile advertising, and Big Data driven services. Which comprise the main constructs to build an artefact (first iteration). According to DSRM setting the process of research

is to build and evaluate in a cyclical process to reach the final solution. Therefore, a framework of basic requirements to early developed constructs, comprising basic components of proposed solution (artefact) was developed Table.2. We argue that this framework has a great benefit to MNOs to follow when designing two-sided business model. Thus, we will use the guidelines in this framework to evaluate our proposed model and generate the second iteration accordingly.

B. Two-Sided Platform

The two-sided business model still has a great potential to be exploited by MNOs. While the OTTs and start-ups have dominance and nimbleness respectively, MNO has core competencies that can build on them such as close customer relationship and already established business relationships and cooperation with the upstream customers (e.g., advertisers, retailer and government). The need to generate new innovative ideas is the first step to start with to distinguish themselves from others.

C. Big Data-driven Services

While MNOs start to leverage Big Data to develop new value-added services to their partners and stakeholders, they still face significant challenges that hinder successful implementation namely; immature service, competition from start-ups and OTTs, and privacy and regulation issues. Nevertheless, the analysis of literature and semi-structured interviews that applied in this work shows a grounded guidelines and insights to follow by MNOs to build such services.

D. Mobile Advertising

Mobile advertising is not a new activity to pursue by MNOs in their endeavour to create revenue streams, unlike Big Data-driven service. However, these services still lagging behind compared to big players' platforms due to several challenges namely, limited and not real time feedback to advertisers and end-users' acceptance due to insufficient motives. The results of our work show that offering suitable feedback apparatus to advertisers and proper incentive mechanism could elevate the user's acceptance and convert non-adopter advertisers to adopters. Table 2 explains these requirements in detailed level.

E. Proposed Business Model

Figure 2 illustrates the initial two-sided business model that is proposed based on the theoretical perspective elucidated from the literature analysis and interviews and developed framework. This model seeks to deploy a two-sided business model strategy by identifying the potential two sides that could form it, as well as the underlying technologies and tools that MNOs need to build such a platform. The constructs of the initial model are as follows:

1. A mobile advertising platform that provides advertisers with spatiotemporal data on customers to enable market segmentation and targeting as added value (value proposition), by using Big Data tools and crowdsourcing.
2. A winning customer proposition with a proper incentive mechanism to encourage ordinary mobile users to adopt the platform.

Table 2
Framework of fundamental requirements

Component	Requirements	Explanation	Current Challenges
Platform (two-sided market)	Need for innovative ideas	Have distinctive features Not easy to imitate Analogies of other industries	
	Start small at first	Find a niche market Start with narrow segments Low-risk services	
	Identify and exploit gaps in the market	Profit potential Based on customer needs Seeking underserved prospects Not enough to subsidise end users	OTTs are dominating start-up companies are nimble Dynamic ecosystem
	Incentivize end users (downstream customer)	Need Monetary incentives Need Information incentives Need Incentives for permission	
	End users' data are the actual incentives to upstream customers	Data-driven services Capitalise on proper data Create data not only existing data	
Mobile advertisement characteristics	High potential of mobile ads	Several ad media Not reached its maximum potential Effectiveness of ads	Limited feedback for advertisers Not real time feedback A limited user acceptance
	Need feedback apparatus	Privacy and regulation obedient Target marketing Real-time Real interest	
	User acceptance	User Incentives Appropriate ad	
	Real business cases for external deployment	Relevant to Customers' needs and requirements Quick time to market	
	Agility Relevancy and validity of data	Relevant and valid data for upstream customers Serve different sectors	Immature service provision
Big Data-driven characteristics	Has high potential externally	Customer centric approach Build on value creation	Competition from OTTS and start-ups
	Real time or near real time data provision	Constant provision of data Focus on the business problem	Privacy and regulation
	Problem-oriented	Enough data to solve the problem Look for new markets	
	Exploit none served sectors and markets	Matching targeted market with suitable data. Build on competencies	

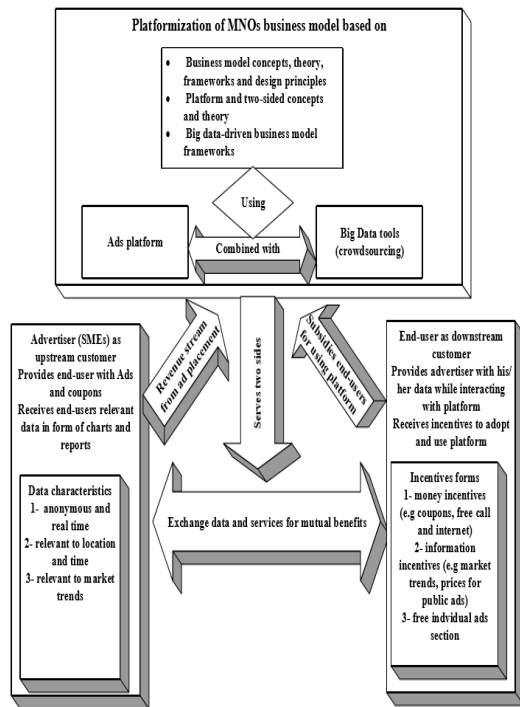


Figure 2: Proposed Two-sided business model for MNOs

We would argue that the two-sided platform strategy combined with Big Data-driven business model tools and

technologies will be of huge importance to MNOs in their attempts to reinvigorate their traditional business model.

F. Evaluation

The outcome of DSRM is a valid artefact in the form of construct, model, method, and instantiation; in this paper the first three are developed and evaluated. According to [38] design process cannot be considered an academic research contribution unless it achieves two important criteria firstly; build the construct with justificatory knowledge (kernel theories) that inform the construct development and leads to innovative and original ideas. In this work, two-sided market theory and business model innovation conceptualization were used to build and test the originality of the work. Secondly, to avoid the caution of the artefact is not new, we analysed all relevant works under different research titles. The evaluation of artefact was conducted against relevant literature of two-sided business model design, and the developed framework.

V. CONCLUSION

The MNO business models presented in previous studies are conceptual, and the main objective of prior research has been to introduce successful design principles from the managerial perspective based on analysis of the mobile ecosystem. However, a new era of business model design is emerging from the use of Big Data and analytical tools and techniques, which may be used internally to enhance an

organization's business model, as well as externally to provide value-added services to partners. Moreover, the two-sided market theory (platform theory) has a lot of hype and success deployment in the era of Mobile technology and Big Data to design new business model. Although the few existing works have pointed out that the firms with Big Data capabilities have started to utilise this powerful asset, there is a paucity of scholarly works that apply these tools and techniques to specific fields and sectors to evaluate their effectiveness. In this paper, we want to investigate whether MNOs can design a new business model based on a two-sided market theory by exploiting Big Data-driven services and the findings showed the MNOs could leverage their core competencies such as strong relationships with upstream and downstream customers to design new business model. MNOs can build their two-sided business model for mobile advertising platform, which is also the emerging aspect for increase in their revenue. A framework of the requirements to develop each component of the model was developed. To conclude, we propose a business model based on two-sided market theory where the advertisers and mobile users comprise the two sides of it. The DSRM theme was used to develop and evaluate the proposed business model. As a design science research dictates the comprehensiveness and completeness, the framework and the proposed business model will investigate mobile end-users and advertisers perspectives as a future work. The fourth outcome of DSRM is instantiation, in this case, the mobile platform prototype could be the next step to test the proposed model in action.

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