The Role of Control Points in Determining Business Models for Future Mobile Generative Systems

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Abstract— **This paper investigates how the concepts of value network analysis and control points can be used as a valid methodology to identify profitable business models for the mobile telecoms industry. The paper's focus of analysis is on application platforms that result from the generative system that is the mobile Internet combined with mobile devices, further enhanced by advanced user interaction modalities. Conceptual parallels are drawn between the concerns of "cyberlaw" scholars and those of companies that make up the mobile telecoms industry in order to provide a theoretical basis for this paper. "Cyberlaw" scholarship concerns the need to legally control, or regulate, the Internet against abuse, whilst maintaining its innovative essence. The mobile telecoms industry seeks to control the mobile Internet for profit, whilst maintaining its capacity for innovative and appealing content and services. As part of this research, current and emergent revenue models are identified for the components that make up the mobile industry. Methods of analysing these business models are proposed using value networks and control points, which are functional areas in a value chain or network where power can be exercised, as the unit of analysis. This method of analysis is illustrated with an initial example and an agenda for further research is outlined. The work covered in this paper is part of a current research programme, namely the User Interfaces for Breakthrough Services work area of the Core 5 Research Programme of the Virtual Centre of Excellence in Mobile & Personal Communications (Mobile VCE). The programme is jointly funded by the Mobile VCEs' industrial member companies and the UK Government, through the Engineering and Physical Sciences Research Council (EPSRC).**

Keywords- control points, business models, generative systems, and mobile operations

I. INTRODUCTION

Mobile Service Providers' traditional sources of transaction based mobile revenue, such as voice, SMS and transmission of data are decreasing in profitability as they become more commoditised [22]. Hence these service providers need new sources of revenue and new revenue models, to complement other business strategies, if they are to sustain or grow their profitability [27].

The mobile Internet may have the potential for many new and "unthought-of" applications, which may help drive profitable revenues. However, mobile service providers are presented with a set of challenges. On the one hand, in order to maximise profits from the mobile Internet, service providers have tried to limit and control user access to their own content and applications [1]. This approach has largely failed to elicit demand, as substantial numbers of users are not attracted to limited sets of content and applications [12]. On the other hand, whilst significant demand for content and applications might be generated were users to have open access to the mobile Internet for content and applications, service providers would have difficulty profiting from these services and could only create additional low margin revenue from the incremental mobile data they carry. The conundrum that mobile service providers face is how to control the mobile Internet, in order to profit from it, whilst retaining the generative essence of the Internet that allows for the creation of innovative and popular services, and which leverage new uses derived from mobile devices expanding functionality.

The objective of this paper is to put forward a novel methodology to enable the analysis of business models and the identification of potentially profitable sources of revenue for mobile operators. The motivation for the generation of this methodology is the research being carried out by the LSE as part of the Mobile Virtual Centre of Excellence (MVCE), an industry academic research consortium, into the development of new technologies for user interaction with mobile devices for the generation of breakthrough services [16]. The User Interfaces for Breakthrough Services work area of Core 5 of this project comprises a number of research goals based on new forms of input modalities, such as haptic and pressure based forms of input; and new forms of output modalities, such as components that change temperature and spatially reconfigurable displays. In this paper, user interaction modalities describe ways that users of mobile services interact with their mobile devices. The industrial sponsors of this research represent actors across the mobile industry, from device manufacturers to content providers. Consequently, it is of interest to the sponsors to understand how different parts of the industry can profit from services that future user interaction modalities may enable.

II. GENERATIVE SYSTEMS: THE INNOVATIVE ESSENCE OF THE MOBILE INTERNET

An interest of scholars concerned with the legal regulation of the Internet against abuse [4,14,28], or "cyberlaw", is similar to that of actors who aim to profit from the mobile Internet, namely a means of controlling the Internet whilst maintaining its capacity to enable new

and innovative uses, henceforth known as generativity [28]. It therefore follows that the understanding developed by these scholars as to why the Internet leads to innovative new applications, and how it can be controlled for abuse, whilst maintaining its essence, might be applicable to understanding how the Internet can be controlled for profit. The use of control points for the analysis of mobile Internet business models is founded on this research premise.

Lessig [14] was the first cyberlaw scholar to turn his attention to the innovative essence of the Internet. He provides a theoretical framework for analysis based on Saltzer's [21] notion of an end-to-end architecture to explain why the Internet ecosystem allows for the development of innovative applications by those who are at the endpoints of the Internet network. Saltzer claims that functionality is most effectively developed by and placed close to those who use applications of that function, as this is where the knowledge surrounding the needs and development of an application lie.

Benkler [4], another cyberlaw scholar, extends Lessig's argument by claiming that its is the addition of easily programmable terminals in combination with the end-to-end architecture of the Internet that provides the basis for innovation in the Internet.

Zittrain [28] takes this argument further by proposing that the success of the Internet is as a result of its "generative" nature. In his perspective, generativity is defined as "a technology's overall capacity to produce unprompted change driven by large, varied, and uncoordinated audiences". Generativity is thus the capacity of a system to enable new or innovative use. Zittrain terms the PC and the Internet as a generative system that is open, flexible and an enabler of unthought of innovative uses. Hence, the characteristics of a generative system are:

- **Leverage** - the extent to which tools make possible a set of activities which would be impossible or prohibitively expensive to achieve otherwise
- **Adaptability** - the scope of uses tools can be put to and the ease to which they can be modified to extend this range of uses
- **Sense of mastery** - how easily tools are adopted and adapted for use by a broad audience
- **Accessibility** - the ease with which tools can be obtained, along with the information to use them
- **Transferability** - how transferable any change or new uses of tools are to others.

The question that remains open to researchers is whether the mobile Internet is a generative system fullfilling the characteristics listed above.

The mobile Internet is defined as the use of the Internet via hand-held devices such as mobile phones or personal digital assistants (PDA) [13]. Hanseth and Nielsen [9] present a number of case studies to compare the generativity of mobile application and content platforms and the Internet. These authors conclude that two, and at the time of writing, more modern mobile platforms, Content Provider Access (CPA) and i-Mode, resemble the combination of Internet and PC to some extent. They identify that recent platforms and handsets were more generative and open to innovation than older systems they investigated. They also show how mobile operator policies and technical capabilities can be used to alter the generative characteristics of the mobile Internet in comparison to the fixed Internet. For example, the technical architecture of the Scandinavian CPA platform allows for services to be billed via premium SMS, which increases its generativity. This leads to increased service innovation as it becomes possible for third party content and applications providers to generate profitable revenue models. In contrast, the walled garden policy of NTT DoCoMo limits the range of billable applications [9] on its i-Mode platform, which reduces the generative capacity of the mobile Internet.

It can be argued that the mobile Internet may become more generative, as mobile handsets take on new interaction modalities, such as those under development in the MVCE project. These new user interaction modalities extend the leverage, adaptability, sense of mastery and accessibility of mobile devices and services. It is intended that these interaction modalities will enable new uses for mobile technology, ease the use of mobile devices and applications as well as increasing the presence and accessibility of services to users.

The understanding of generativity in the context of mobile Internet as an ecosystem of products, services and devices, provides the grounds for a revision of current business models used by mobile operators aimed at determining new models for increasing potential revenue.

III. Business Models in the Mobile Internet

However, before moving on to examining methods of analysis to help identify profitable business models within the mobile Internet, it serves to briefly review current and emerging business models within the mobile Internet industry.

Business models describe how an organization creates, delivers, and captures value, whether economic, social, or of some other form [18]. Different sources vary in their approach regarding business model components [5, 15, 18]. In this paper, the proposed method of analysis focuses on revenue models, which, as all these research sources confirm, is a key component of a business model.

There are numerous studies of revenue models within the mobile Internet industry [5, 7, 10], which largely agree on the range of options that currently exist. To summarize the options available, Table 1 illustrates revenue models identified by Coursaris and Hassanein [7], which the authors of this paper have identified as representative of other studies in this area. By way of comparison, Table 1 also includes the range of fixed Internet models identified by Afuah and Tucci [2]. This comparison serves to illustrate that mobile Internet revenue models are largely

and currently derived from the fixed Internet. In the table the main sources of revenue that make up the components of the mobile Internet industry are similar to those in the fixed Internet. The differences in the table can be attributed to the different perspectives the respective authors were taking.

Mobile Internet Revenue Models		***Fixed Internet Revenue Models***	
Access	Paid access to mobile network	Subscription	Periodic access to services, e.g. Internet access, content or value added service
Subscription	Purchasing mobile value added services are by subscription		
Pay-per-use	Service components are paid for each time they are used.	Fee-for-service	Users pay for the amount of service/product consumed
Advertising	A service is free to use and revenue is derived from advertising	Advertising	Service costs subsidized by advertising income.
Transaction	Fees charged between constituent parts of a value chain	Commission	Fees charged on transactions through third parties
Point-of-traffic	Payments to VAS providers based on the incremental traffic they generate	Markup	Revenues from purchasing and reselling goods and services
Hosting	Charges for the hosting of content and applications	Production	Internet as a direct marketing and sales channel
Payment clearing	Commissions charged by the billing provider	Referral	Commissions earned by directing visitors to other websites

Figure 1. Representative Mobile and Fixed Internet Revenue Models (after Coursaris and Hassanein [7] and Afuah and Tucci [2])

Further mobile revenue models may emerge as new uses evolve, for example Elaluf-Calderwood [8] examines potential models based on community currencies in future medical applications of the mobile Internet. Methods of analysis need to be flexible to accommodate the existing range of models and new ones that may emerge. Although alternative business models have been used in other production sectors, their introduction to the mobile Internet ecosystem is relatively recent and there are many open questions to be answered on estimating the monetary value of revenue. This is, in part, due to the lack of a comprehensive understanding of the generative processes intrinsically linked to these new business models.

IV. Determining Value in the Mobile Internet

This paper presents the initial theoretical research, which aims to understand the interaction of revenue models within the industry that makes up the generative mobile Internet. If this interaction can be determined, a process can be established, in order to identify where and how its constituent members can extract value. Two steps are proposed to enable this to be done.

- The first concerns the use of value networks in order to map the various constituent actors within the industry and the analysis of the interplay of their revenue models.
- The second concerns the use of *control points* to examine where and how members of the value network can extract value.

The first step concerns the use of value networks to examine actors within an industry. Value networks have their origins in Porter's [20] original concept of value chains. Value chains were originally used as a strategic tool to analyse the value adding activities across an organisation, for the purpose of examining the source of competitive advantage, and have subsequently been extended to analysing whole supply chains within an industry. The concept of value networks [3, 17] came about in response to the fact that many modern industries consisted of constellations or networks of organisations in a constant flux, rather than in static linear chains. The concept was developed to better model the generation of value, both tangible, for example in terms of revenues, and intangible, for example in terms of brand, across networks of organizations. Value networks have been successfully applied to the complex constitution of the mobile industry [24]. The value networks to be constructed in this proposed research will be based on the framework that Hanbo [10] used in his analysis of mobile Internet revenue models. His framework moves beyond the simple analysis of monetary exchange to examine exchange in terms of goods and services, monetary benefits and intangible benefits circulating within a value network.

These ideas are illustrated in Figure 2 by using the Apple App Store, as an example. In the figure there is an outline of the value network, including the actors that make up the Apple App Store, which makes up a generative system. The types of exchanges in this value network consist of goods, services and monetary benefits. From this value network it can be seen that the end user has a transaction relationship with Apple (rather than with a mobile Internet network operator) in order to purchase an application from the App Store. Similarly Apple has a transactional relationship with the developer of the mobile application, such that a revenue share is paid to the developer by Apple each time an application is bought. The end user has a data subscription relationship with the mobile operator so that the mobile Internet can be accessed and the application can be delivered to the handset. Finally the mobile operator has a subscription with Apple in terms of its right to distribute the iPhone.

At this stage of the research, that has been undertaken by the authors, this model is purely illustrational, and it is intended over time to develop more sophisticated value networks for the distribution of content and services on the mobile Internet. It is envisaged that these may include additional actors that may become involved in the mobile Internet as a result of interaction modalities. In addition more sophisticated revenue models, such as advertising based revenues will be incorporated. Finally, these more

sophisticated models may incorporate other forms of transactional benefits such as loyalty, attention and information and perhaps community currencies valid within the ecosystem in which the transactions may occur.

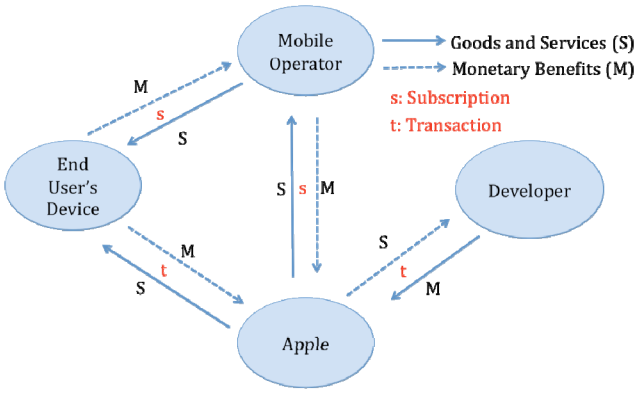

Figure 2. The Apple App Store Value Network

The second concern is to examine where and how members of an industry can extract value based on the economic power that they control over parts of the value network within which they sit. This economic power can be understood from the perspective of transaction cost theory of the firm [6, 25] in terms of which economic tasks are best determined within the firm or within in the market. Tasks, which are best, determined within the firm, and where economic power can be derived due to their uniqueness (so that they can be controlled) and non transferability (so that they can be sustained) can be identified from resource based views of the firm [26] and the concept of core competencies [19]. The mechanism proposed to express areas of economic power with in the value networks identified within this research is that of control points. Control Points [23] are functional areas in a value chain or network where power can be exercised. The concept was developed by the Value Chain Dynamics Working Group at MIT [23] in order to understand how commercial benefit could be gained from business models emerging in and around the telecommunications industry. Trossen [23] shows how control points can be identified and implemented within communications architectures, and how they can facilitate the construction of potential business models that in turn can be evaluated in terms of viability and sustainability. They also show how external triggers, arising from different domains (e.g. changes in technology, business cycle, industry structure, regulatory policy, customer preference, capital markets and corporate strategy), can lead to control points increasing or decreasing in importance, which then in turn affect the strength of business models. The four key characteristics of control points by which they are defined and evaluated are:-

- **Interchangeability** - The ease by which alternative players can own a similar control point asset
- **Demand** - The extent to which a control point is accessed by players within a value chain.
- **Value** - As a function of interchangeability and demand, determining where and how value can be captured
- **Time** - Affecting the other parameters, as they are dynamic and may change over time.

These concepts were subsequently extended by Herzhoff et al [11] in the MVCE Flexible Networks programme. Herzhoff et al [11] were able to ground this work in social theory by explaining how the dynamics of control points are driven and led by Lessig's [14] modalities of regulation: Law; Social Norms; Markets; Architecture.

Figure 2 identifies the various possible control points within this arrangement of actors belonging to the Apple App Store ecosystem. Apple owns control points within the App Store and within the end user's iPhone device. The mobile operator owns control points in terms of network connectivity and the distribution of the iPhone. According to the power that owners have of their control points, they can flex them in order to maximise profitable revenues. In the case of the Apple App Store, mobile operators have relinquished stewardship of control of applications to Apple, which uses the Application Aggregation Control Point to guard which applications are accessible to end users. Whilst this platform is broadly generative on the basis of the five characteristics that Zittrain [28] identifies, it is a limited generativity [29] nested within a potentially more generative technical environment.

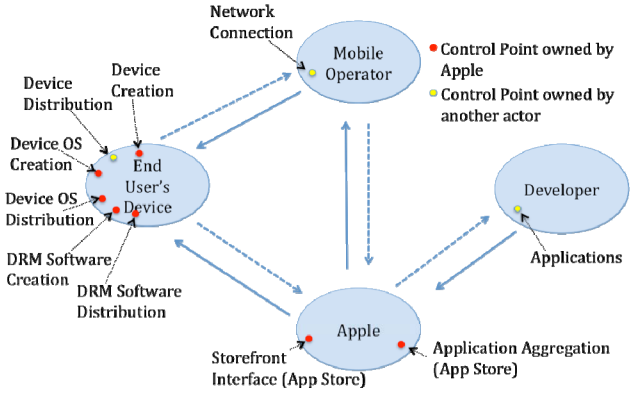

Figure 3. Control Points applied to the Apple App Store Value Network

As research progresses, the authors propose that analysis of future value networks is carried out on multiple and variable layouts of this model, in order to analyse how and in what form of revenue model these control points can be flexed.

V. Discussion and Conclusion

This paper is a first step on the development of a methodology to enable the analysis of business models and the identification of potentially profitable sources of

revenue. This research proposes that value networks and control points are the means for carrying out this analysis. The novel approach is given in the knowledge that whilst the tools, discussed in this paper, have only been used [10, 11, 23] individually in the past to analyse revenue models within the telecommunications industry, it is an incremental extension to combine them to study the mobile Internet as a generative ecosystem.

The premise of this paper is that drawing upon concepts sourced from "cyberlaw" specialists such as Lessig, Benkler, Zittrain, a powerful unit of analysis can be developed. Although cyberlaw knowledge is used to identify how the Internet can be controlled to prevent abuse, whilst maintaining its generative essence for innovation, the knowledge can be applied for commerce in the mobile Internet. The overall goal is to control the mobile Internet for profit whilst retaining its generativity. Whilst methods proposed in this paper to carry out analysis of the mobile Internet are grounded in concepts from cyberlaw and a brief example of analysis of the subset of the mobile Internet, that is the Apple App Store, was presented, further work needs to be carried out.

It is proposed that further data is collected through interviews, so that case studies of mobile Internet platforms can be generated and analysis of value networks and control points carried out. This analysis may be able to inform actors within the mobile Internet as to how profitable revenues can be generated. Understanding of where and how controls points in value networks can be tightened or loosened is an area of research where there is a keen interest for all actors involved in the mobile Internet ecosystem, and in particular for mobile operators.

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