ANALYZING THE ACTOR GAME IN M-BUSINESS

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ABSTRACT

The m-business landscape never stops to change and the impacts on the mobile market are constant as players reposition themselves on the market according to the new opportunities and threats brought by rapid technological developments. This paper provides a conceptual tool to better understand this player arena and its objective is threefold. The first one is to analyse the role of the key actors using an ontology for defining and assessing their business models. The second objective is to analyse and visualize the interaction of actors with each other from a value system perspective. The final objective is to evaluate and represent the dependencies of the actors, their strategies and their convergence or divergence on different issues by using an approach borrowed from policy making.

1. INTRODUCTION

Nowadays rapid developments in wireless networks and mobile information systems, are constantly emerging and can become a major stake in the e-business game, as illustrated by large public- or private-funded research projects, recent reports [23], telecom scenarios [11], strategic conferences [10], and other books of vision [36]. As an illustration of these dramatic changes, a "hot" topic debated in the wireless community is the "ad hoc networks" which runs solely by the operation of end-users, without ground infrastructure. The research described in this paper i precisely related to a long-term research program, called *"Terminodes"*, which aims at studying and prototyping large-scale infrastructure-less, self-organized networks [15].

There are several ways to come to an assessment of the mobile technology, and to identify research issues in m-business. Well-known authors of the IS community recently published research directions and agendas. Varshney and Vetter [34] propose a 4-level integrated framework for mobile commerce, based on important classes of applications such as finance, advertising, and logistics. They also discuss how networking requirements of these applications can be supported by existing and emerging wireless networks. Pedersen and Ling [26] provide an adoption framework based on the end-user viewed as a technology user, a consumer, and a network member, respectively. He also suggests applying the framework to design guidelines that can be used by market players to predict end-user adoption of m-commerce services. Lyytinen and Yoo [22] suggest a framework, which identifies research issues in nomadic computing environment at the individual, the team, the organizational, and the inter-organizational levels. They assess the opportunities and challenges for research into each area at the level of design, use and adoption, and impacts. Lehner and Watson [21] concentrate on a stakeholder perspective, a services and applications perspective, and a market players institutional perspective. In the latter, they proposes relevant research problems such as the business models, the useful alliances and the driving forces for cooperation, the interaction between market players, among others.

Moreover, Bria et al. [5] remind that the infrastructure deployment is a slow and costly process, in a very uncertain future, that demand a long-range strategic planning. The same is true for the broad adoption of new behaviors and practices. Therefore, for guiding research, they suggest to use a scenario-based forecastiong approach, based on global trends in technology, economy and politics, and verified using a *Delphi* survey among leading industrials and scientists.

This paper will focus on the mobile market players arena as suggested by [21], and at the intersection of the inter-organizational and the impact levels in the framework provided by [22]. The paper aims at sketching a conceptual tool for analysing and visualizing the key players, their business models, their interactions and their dependencies. The latter issue should be the first, indispensable, step towards a more general scenario approach with its formal analysis and field interviews, as advocated by [5].

The next section will provide an institutional perspective with the key players of the m-business market, and present an ontology for assessing their business models. Then, section 3 will tackle the interactions between key players, and cope with a value system perspective for cooperation . Finally, section 4 will propose to use a policy making approach for modeling the position and the power of the competitive players on some major issues.

2. ACTORS AND BUSINESS MODELS

The wireless market is highly fragmented and has witnessed a large number of market players to offer an end-to-end solution between the content owner and the end-user[1]. Understanding the role of the players is important. Many experts [23] [21] [9] [28] share similar classifications of the mobile market key players in m-business, which include:

- In the *technology* area, the primary participants are access device manufacturers. The secondary players are device retailers, component makers, network equipment vendors, enabling technology vendors (for operating systems, browsers, embedded software, antennas, battery, …), and platform vendors;

- In the *application*, content or service area, the primary actors are application providers, content providers and content aggregators. Portals are also important players in this category. The other actors are application developers, middleware developers, and system integrators. Some distinguish content owners. E-business players implementing a mobile strategy and professional service providers, such as the consultancies, are also active in this sector.

- In the *access* area, the primary actors are mobile network operators *(MNO)* or carriers, and internet service providers. If mobile network operators certainly are among the most key players in the cellular and other *GSM* or *UMTS* area, we can observe the first self-organized networks, *WiFi* networks, and large scale wireless local area networks [1] [33].

According to Giussani [12], some new actors are emerging such as virtual operators (who provide services through networks of other operators), multi-access portals (who enable customers to access different personalized services through many communication channels), wireless application service providers (who deploy, manage, and remotely host a range of applications or services for enterprises and operators), and wireless infrastructure service providers (who provide the "software intelligence"

1 The situation in the Japanese market is different, but we consider that difference to be cultural-specific and therefore not relevant for this analysis.

layer necessary to keep together infrastructure that is technologically increasingly heterogeneous).

End-users, corporate or consumer, are also playing in this game. Moreover, it could be necessary to consider some "vertical" players such as found in the travel/transportation, logistics, healthcare and retail sectors. Car electronics is a major topic from this point of view.

Other players which are mentioned by some of the experts are payment agents [20], equivalent to financial service providers, billing parties, or payment service providers, for some others. One observer [9] adds advertising companies as actors. Very few authors [21] explicitly introduce government, regulation authorities, and standardization groups as players. It seems that no expert mentions consumer groups as actors. Yet some of them are very active against *electronic smog*, for example, and will have a true impact on some decision, such as the deployment of *UMTS* infrastructure and antennas.

Finally, if we consider the alternative approach of the *Wireless Local Area Network (WLAN)*, the actors are slightly different from the cellular ones, such as *GSM* or *UMTS*. Hardware suppliers, service-provisioning players, roaming brokers, and wireless internet service providers are certainly the main players. But the "venues" such as airports, hotels and conference centers, sport stadiums, hospitals are to be also considered as actors [1] [33]. The same is true for *Bluetooth* technology, which prefigures more ambitious ad hoc networks. The actors and their roles are different; i.e. mobile network operators are no longer a key player in such infrastructure-less environment [19] [28].

TECHNOLOGY	APPLICATION	ACCESS	FINANCE	REGULATION	USER
Device manufacturer	Content provider	Network operator	Payment agent	Government	User
Device retailer	Portal	ISP	Billing party	Regulation autority	Car manufacturer
Equipment vendor	Content aggregator	Virtual operator	Bank/FSP	Standardization group	Travel/transportation
Technology enablers	Application provider	Venue (WLAN)	PKI provider	Customer union	Logistics
…	…	…	…	…	…

Exhibit 1 – Examples of key players (see Appendix)

A last observation: if many experts mention some company names for illustrating the key players they present, most of them speak about generic actors (Exhibit 1); rare are the authors which focus their research studies on the true actors or companies of the m-mobile market [18].

Business models

For assessing the role of the different m-business key players, it is recommended to briefly but clearly describe their business models. In this research, we adopted an ontology or framework for e-business models we conceived and verified [25].

It has already been shown that a formal e-business model is essential in an increasingly dynamic and uncertain business environment, such as the m-commerce. The process of modelling an e-business model, helps identifying and understanding the relevant elements in a specific domain and the relationships between them. The use of formalized e-business models using an *ontology* helps managers easily communicate and share their understanding of an e-business among other stakeholders. Mapping and using e-business models as a foundation for discussion facilitates change. A formalized e-business model can help identifying the relevant indicators of a *Balanced Scorecard*.

Business models can help managers simulate e-businesses and learn about them. This is a way of doing risk free experiments, without endangering an organization.

The e-business model ontology we adopted is founded on four main pillars:

- The *product innovation* element covers all aspects related to the offering of the firm. This comprises not only its products and services but the manner in which it differentiates itself from its competitors. The element *product innovation* is composed of the *value propositions* the firm offers to specific *target customer segments,* and the *capabilities* a firm has to provide in order to deliver this offering.

- The *customer relationship* element describes the way a firm goes to market and gets in touch with its customers. This is composed of the *feel & serve* element, which defines the customer "touch points" (e.g. distribution channels), the *information strategy* for the collection and application of customer information, and the *trust & loyalty* element, which is essential in an increasingly "virtual" business world.

- The *infrastructure management* describes the value configuration that is necessary in order to deliver the firms offering and to maintain a customer relationship. It is composed of the *activity configuration* (value chain), the in-house *resources and assets* and the firm's *partner network* to fulfil these activities.

- The element *financial aspects* is the culmination of an ebusiness model. The best products and services and the finest customer relationship are only valuable to a firm if it guarantees long-term financial success. The *financial aspects* element is composed of the companies *revenue model* and its *cost structure*, which finally define the *profit & loss* of a firm.

Exhibit 2 illustrates a couple of possible aspects of the business model for an *APPLICATION PROVIDER*, such as *Aspiro* in Sweden [18].

Value proposition	*Offers services designed to satisfy the individual's needs for entertainment (game, ring tones, horoscopes), information (news, weather reports, translation service), and communication (unified messaging) via mobile media*
Target customers	*Mobile network operators, portals, system integrators*
Activities	*…*
Partners	*Device makers for distribution agreement*
Revenues	*Selling a whole system (with maintenance), hosting a solution with continuous stream of payment, revenues sharing with operators*

Exhibit 2 – Extract of a business models

3. ACTOR NETWORKS AND VALUE CONFIGURATIONS

Since no single player can provide its customers with an end-to-end solution on its own, fostering viable alliances and actors networks is a key challenge of m-business. Therefore most of the firms are partnering, taking equity interest in others, signing contracts, or purchasing solutions to create value and provide mobile customer with value-added services. Partnership management is becoming a core competence of the m-business players; the m-business space will be completely built on partnerships.

Therefore it is not enough to examine the actor's role. The relationships and interactions among the actors have to be assessed too. To define the value creation process in such an actor network, it is appropriate to apply the Porter *value chain* framework and its extension, such as defined by Stabell and Fjeldstad [29]. They extend the idea of the value chain with the *value shop* and the *value network*. Former describes the value creation process of service providers, whereas latter describes brokering and intermediary activities.

As an illustration, the *value network* is particularly adequate to define the activities of a *MOBILE NETWORK OPERATOR*. The model suggest to distinguish the following three main set of activities:

- The *network promotion and contract management* activities, or customer care in the *Telecomms Operations Map (TOM)*: sales, order handling, problem handling, customer *QoS* management, and invoicing & collection.

- The *service provisioning* activities, or service development and operations in the *TOM*: service planning/development, service configuration, service problem resolution, service quality management, and rating & discounting.

- The *infrastructure operation* activities, or network and systems management in the *TOM*: network planning and development, network provisioning, network inventory management, network maintenance and restoration, and network data management.

Value chain analysis has been used for assessing the wireless telecommunication industry [7], mobile internet content providers [9], or the *Bluetooth* emergence [28]. This kind of analysis helps identifying key activities of the actors, analyse the value they create, map the exchanges of flows into and out of activities and actors, and improve resource allocation. The model can be used to visualize the interactions between actors.

Many other alternative models have been proposed to define and analyse value chains and value networks. For example, Gordijn et al. [14] propose a formalized ontology based on the value chain model. His *e*^{3}*-value*^{TM} model contains concepts, relations, and constraints, to describe actors, alliances between them, the exchange of objects of value, value-adding activities, and the value interfaces between them. This model is more rigorous than the original value chain and allows completeness and consistency checks.

For exploring the value networks and their collaborating actors in the m-business industry, we adopted a similar model [27], which we developed for designing situations in the context of mutations, such as alliance, merger, acquisition, and dismantlement. The model consists of the following concepts: activity, value flow entering and leaving activities, rule, and value configuration (the set of the activities performed by an actor). The model also integrates a decision process for migrating from one activity configuration to another, when recombining activities among actors.

Exhibit 3 illustrates the exchange of flows and values between some m-business participants.

Based on this simple illustration and as an example of mutation in an actor network, we could observe that the two actors should decide together to move the *Service distribution* activity from the *Mobile Network Operator* to the *Content Aggregator* value configuration for better serving the customer.

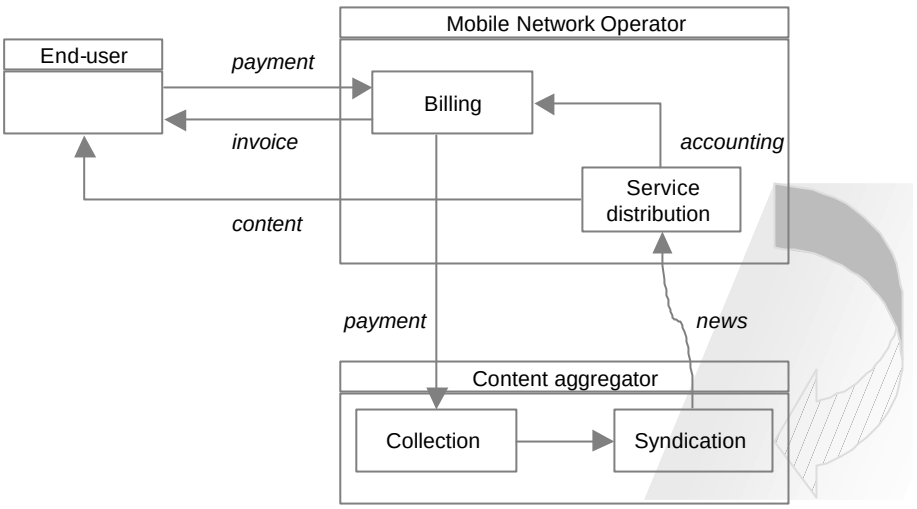

Exhibit 3 – Extract of a value configuration

4. ACTOR NETWORK DEPENDENCIES AND STRATEGY

A classical starting point for exploring the competitiveness of a market and the power of the participants is *Porter's Five Forces model* [7]. The model can be used to assess the firm rivalry, the supplier power, and the buyer power, as well as the new entrants and the market substitutes.

This model is not sufficient to clearly visualize the key players arena and its evolution. We explored some other approaches inherited from sociology, information systems engineering, industrial prospective, and policy making.

Lyytinen and Yoo [22] suggest to use the *Actor-Network Theory (ANT)*, initially developed by a sociologist (B. Latour) and already used in the IS community for assessing socio-technical innovation [32]. This theory draws on the strengths of qualitative research and extends ethnography to assess how technology is socially constructed or aligned. The analysis assumes that the stakeholder interactions have to be investigated, in terms of extent of communication, power, trust, resource control, irreversibility of position, and influence (inhibitors and promoters).

The notion of goal is increasingly being used in requirement engineering today, as advocated by [37]. Their *i** model allows to describe networks of intentional relationships among actors. Actors depend on each other for goals to be achieved, tasks to be performed, and resources to be furnished. These dependencies are intentional in that they are based on underlying concepts such as goal, ability, commitment, belief, and so on. The model also describes the reasoning that each actor has about her/his relationships with other actors, her/his alternative means to achieve goals. Yu et al. [37] explained that actors are strategic because they seek to protect their interests and they evaluate their social relationships in terms of opportunities, and vulnerabilities that they may bring.

In industrial forecasting, the *Mactor* analytical tool [4] [13] provides the observer with an interesting approach to analyse the actors strategies and moves, confront their plans, and examine the balance of

power between them. Mainly based on the position of each actor on each strategic issues of the battlefield (in favour of or opposed to an objective), the importance they assess to the outcome of each issue, and their power relationships on each other, a matrix calculus allows to detect, visualize and evaluate the influence dependencies , the divergences and the convergences over goals of the actors.

Mueller and Lovelock [23] exploit a game-theoretic approach for analysing the way four Chinese players interacted over access to foreign investment in telecommunication services.

Having also adopted a game-theoretic practice, some authors in policy making [6] [30] argue that it is reasonable to analyse policy choices using expected utility calculations. The objective of such decision models is to attach a probability statement to alternate actions and reduce risk of undesirable outcomes. Allas et al. [2] simplify theses decision models based on game theory for supporting negotiators in multiparty deals, helping them to predict the behaviour of the stakeholders and guiding them to favorable strategies.

In the last three families of models, experts are asked to specify the following elements for each actor on each issue:

- the actor's stated *position* regarding the issue, given his preference and his interest
- the potential *influence* (*power* or *clout*) of the actor over the decision outcome on this issue
- the actor's interest or *salience* in the outcome of the decision, indicating the importance he will attach to the realisation of his position.

Based on these input, the model [2] can calculate and visualise the (un-)stability of the situation; the actor classification with divergence and convergence; the decision landscape with the followers, the shapers, the influencers and the bystanders, when crossing the salience and the influence of the actors; the relationship analysis with the bargainers, the deal breakers and the easy winners for some issues.

All the methods described above assume that relevant issues and goals have been defined. For m-business, we could borrow some main issues from [31], and [5] based on their vision of *"mobile multimedia to all at today's price for fixed telephony"* and their working assumptions: tele-presence, information anytime and anywhere, inter-machine communication, security, one-stop shopping, non-homogeneous infrastructure, public and private access mixed, ad-hoc unlicensed operation, multi-mode access ports in public systems, and large range of bandwidth for terminals.

Recent European Union conference proceedings [10] also suggest ambient intelligence (or user in foreground), sustainable human development, cyber-terrorism, internet control, information warfare, digital divide, democracy, and generation gap. Another European Union report [35] proposes the following strategic challenges: vanishing revenue streams, from selling capacity to "monetising" content, increased convergence & competition, expanding core business & climbing up the value chain, reaching critical mass, and increasing concentration and competition. We also add the following issues: workforce mobility, standardisation, privacy, self-organisation, *electronic smog*, multi-operator infrastructures, personalisation, technology evolution (from 2nd to 3rd then 4th generation), etc.

We have the list actors and issues necessary for assessing the dependencies of actors with each other. The next step of this research is to assess the position, salience and influence for each actor for each issue, based on the expert interviews we are starting now using a *Delphi* survey. Exhibit 4 gives an overview of the matrix defining the position, the salience and the power for each m-business actors (identified in section 2) on each issue (suggested in section 4). This matrix is the input for calculating and visualizing the position landscape, the dependencies, and the relationships between actors.

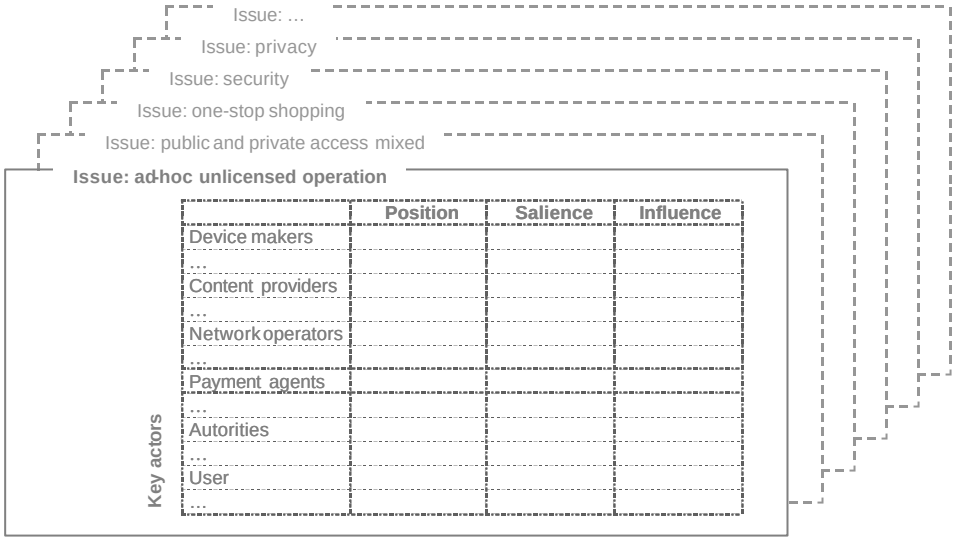

Exhibit 4 – Position of actors on issues (Allas, 2001)

5. CONCLUSION

The approach sketched in this paper should allow to better assess the actor game in the m-business industry.

The objective of the future research is twofold. On one hand, this research project plans to keep the picture of the m-business battlefield up-to-date. If the study is transversal and regularly actualised, this research should confirm or invalidate the hypothesis affirmed by [8] that *"wireless operators are best placed to assume the role of kingmaker because they control the wireless network and own the subscriber relationship"*. If the trends towards self-organized infrastructure-less networks, which we presented at the beginning with the *ad hoc* networks, *Bluetooth* technology and other *WLANs*, is confirmed in the future, this could bring interesting changes in the inter-relationships and balance of power. On the other hand, the latter analysis of actor network dependencies is a prerequisite for a more ambitious scenario-based forecasting approach [13] that could be helpful in the so uncertain context of m-business.

Finally, compared to similar recent papers [21] [22] [34], this one suggested a more elaborated way to deal with the game of the stakeholders in m-commerce. It proposed an original framework to describe and compare them taking into consideration their business models, their inter-organizational systems and their relative influence.

ACKNOWLEDGEMENT

The work presented in this paper was partially supported by the *Swiss National Science Foundation (FNRS)* in the *CNEC Mobile Communication and Information Systems.*

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APPENDIX 1: WIRELESS ACTORS' MAP