

# Churn Management in Telecommunications

## Challenging the innovative Capability of Data Mining Tools

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### ABSTRACT

With growing competition in the telecommunications market, the mobile operators became “victims” of a structure inherited from happy monopoly times of a technologically centred nature, posing limitations that largely frame business values, functions and processes dealing with human behaviour. A good example are data-mining tools that use historical data generated by transactional, billing and contract management technologies for finding patterns of customer behaviour by applying various statistical techniques. This paper argues that a more reliable and sustainable way to reduce customer churn is to look at the reasons why customers churn, rather than which target group is prone to churning, as well as to make greater use of contextual data rather than historical transaction data. One of the ways to get closer to the implementation of such a visionary and complex task, associated with richness and constant emergence of contextual data analysis, is to fully separate the customer service function and break it into contextual groups, such as small firms, dealing with certain groups of customers. Following a discussion on two major problems with data mining tools and their inappropriateness to account for contextual data, the paper proposes a Value Network Analysis framework for the establishment of new market structures and business models for telecommunications operators, capable to cope with the uncertainty of customer intention to churn.

## Introduction

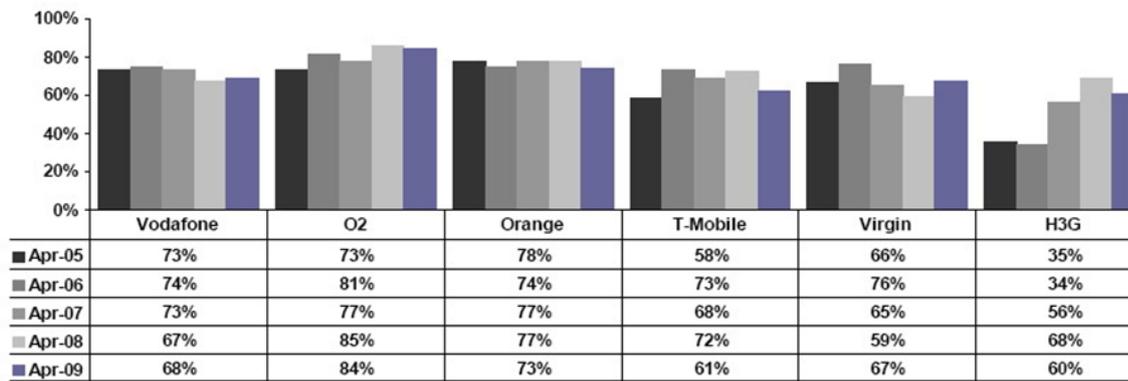
The strategic value of knowledge to organizations The introduction of “competition” in the telecommunications industry gave rise to many issues and situations that are quite “uncommon”, “unnatural” and maybe even “unimaginative” for a utility type industry. Originally vertically integrated, mobile carriers now have to carefully address the needs of millions of customers, understand their behaviour, predict their needs and design products and services that will at best address those needs. The competition becomes even more fierce with the penetration of mobile phone usage steadily reaching its peak, as attracting new customers becomes extremely difficult and losing existing customers very easy, although painful.

Customer churn is a common term used both in academia and practice to denote the customers with propensity to leave for competing companies. According to various estimates in European mobile service markets, churn rate reaches twenty-five to thirty percent annually. On the other hand financial analysis and economic studies are in agreement that

acquiring new customers is five times as expensive compared to retaining existing customers (Berson et al. 2000; Wei and Chiu 2002; Hung, Yen and Wang 2006; Ahn, Han and Lee 2006). In fact, customer churn is now reported in most of mobile industry surveys as an inseparable part of the current market structure in the way it accounts for future market share. “UK mobile user survey 2009” of Enders Analysis shows the dynamics of operator loyalty for five major UK operators for the period of 2005-2009, suggesting that for most of the companies the percentage of loyal non-churners is between sixty and seventy five percent, except for O2 (Harris and Barford 2009) (see Diagram 1).

Consumer data mining tools use various types of data, such as transactional, billing and contractual data, to find logical patterns pointing to customers with churn propensity. The overall aim is to provide guidance for future actions of telecom marketing and product innovation management, as to which customers to target in terms of retention and loyalty measures. Obviously, when a company generates huge amounts of data, as a result of its core activity, there is a need to think how that data can be turned into a competitive advantage. “Churn prediction through data mining” can be seen as the utilization of a by-product, created as a result of the main

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Base: All those owning a mobile phone.  
[Source: Enders Analysis/BMRB survey]

**Diagram 1: Share of current Owners expecting to keep the same Operator Brand (Harris and Barford 2009).**

service provision and aimed to increase customer loyalty towards the company. The increasing use of data mining technologies by telecommunications companies for Customer Relationship Management functions speaks well for this phenomenon.

Academic literature on data mining tools for customer churn prediction, specifically concentrates on the use of techniques, such as association rules, classification, multiple clustering, decision trees, neural network and other algorithmic solutions for finding various relations between a variety of datasets in order to draw patterns of similar behaviour in the past to predict the future (Berson et al. 2000; Wei and Chiu 2002; Hung, Yen and Wang 2006; Ahn, Han and Lee 2006; Sohn and Kim 2008; Owczarczuk 2010; Bose and Chen 2009). Interestingly, all the above-mentioned studies are claimed to be successful and all the findings proved to be useful for telecommunications operators. However, an intuitional question rises, as to how success and failure are measured, when every case is a success? This paper argues that current approaches and data mining technologies, that use historical data for customer churn management in the telecommunications industry, have limited capability to innovate.

In the second section, this argument is supported by a discussion of the notion of economies of scale and the technological centrality of the telecommunications industry, revealing why “prediction of churners” is considered to be an efficient means to address the churn problem. Hence the first question: “Is predicting churners (instead of finding and elaborating on reasons behind customer churn) the right thing to do?” is identified and discussed (Baurdeau and Liebenau 2005; Davies 1996; Fontenay and Hogendorn 2005). In the third section, we will elaborate on the conflict between “innovation” and science in order to limit the aspirations of “data miners” to predict customers’ intentions based on historical data through the application of mathematical models, while ignoring the allmighty “context”, from which the second question emerges: “What ‘data is mined’

and how?” (Nightingale 1998, 2000; Sorensen and Pica 2005).

In “Meeting of Mice”, Armenian fabulist Khnko Aper tells a story of a gathering of mice to decide how to render a big cat harmless that was brought in by the owners of a grocery store to get rid of the mice. Finally, when the solution is found to hang a bell around the cat’s neck, so that everyone hears when the cat comes, the biggest issue turns out to be “who will hang the bell?” In the fourth section, an attempt is made to use technological centrality and the innovation/science directional conflict to propose a possible restructuring of the mobile market and to set an arena for new players that will actually take the responsibility to “hang the bell” i.e. understand the context of mobile interaction and use it to find the true reasons behind churning. Overall, the paper attempts to comment on the current state of affairs in churn management in the telecommunications industry by reviewing the relevant literature and by grounding them within two theoretical perspectives. It is obvious that for increased practicality and usefulness further research needs to be done and empirical evidence collected and analysed. At this level, however, the paper concludes with an idea about possible structural changes in the telecommunications industry.

### **Technological Centrality and the Notion of Churn Management**

Churn prediction is a case in point in terms of the discussion on the efficiency of various tools and techniques of manipulating data. Hung, Yen and Wang (2006) present churn management as a framework of two analytical modelling processes: first, predicting “who?” are about to churn and, second, coming up with the most effective way to react to the targeted customers. Owczarczuk’s (2009) study of data mining models for identifying “betrayers” among prepaid customers in the telecommunications industry is another example, where the question of which client is to churn is called natural, hence remains un-

questioned. In summary, a common aspect observed in the literature is that the objectives of the studies and presented technologies or techniques are discussed to answer precisely the question of “Who will churn?”

It would be hard to disagree with Baurdeau, Liebenau and Savin (2005) that technological innovation in the telecom industry is not customer centric even in today’s free market, where addressing customers needs is an utmost priority. The authors clearly demonstrate the endogenous nature of innovation in telecommunications serving its internal objectives, addressing non-customer-driven rationales behind the choice of technology in telecommunications. One of these objectives is largely admitted to be the recovery of sunk costs, which is a result of a monopolistic business strategy, as a disincentive to invest in a new technology, as it may devalue the existing technology before it becomes obsolete (Davies 1996).

Customer churn analysis, which is a purely marketing and customer service functionality, is limited with and heavily dependent on the technological capabilities of the mobile service infrastructure in order to identify people predisposed to churn. It can be argued that infrastructure technology limits the interpretation of customer churn management to the prediction of who will churn rather why they churn. Davies (1996) explains growth in large technical systems, such as telecommunications, in terms of economies of scale and scope as a cost saving economic drive. On the other hand Baurdeau, Liebenau and Savin (2005) argue that economies of scale and scope, even in today’s “free” market telecommunications industry, are to be observed as characteristics of technologies that are designed and adopted by carriers. Not guided by market efficiencies, they are rather a response to existing market structures.

Notwithstanding an overarching perception in the industry that the vertical and horizontal integration of the mobile carriers has economies of scale and scope effects, it may not be significant at the retail level as delicately noted and mathematically proven by Fontenay and Hogendorn (2005). Even if we admit that telecommunications service infrastructure networks have economies of scale, it doesn’t necessarily imply that all networks of various mobile operators have aggregate scale of economies. Nor does it imply that the functionally integrated operation, innovation, sales and service dimensions can collectively make use of economies of scale and scope.

Churn management as a functionality evolved from the current market structure and its current interpretation as a technology dependent customer attrition prediction is not producing the desired result.

Diagram 1 shows that the problem of loyalty still remains one of the most vital problems. To address the current limitations of churn prediction technologies in terms of determining the right customers as well as on whom to spend retention and loyalty resources, the mobile carriers need to re-evaluate or redefine the notion of churn management. Analysing the reasons behind churning, rather than the customers with churn propensity, may raise issues of designing new technologies and of changing the operational and managerial strategies from a “business around technology” to a “business using technology” perspective.

### **The Science – Innovation Directional Conflict**

All data mining techniques and tools described in the academic literature for prediction and management of churn mainly use historical transactional, billing and contractual data provided by the underlying technology for the purposes of metering, billing and the collection of the revenues (Wei and Chiu 2002; Hung, Yen and Wang 2006; Ahn, Han and Lee 2006; Sohn and Kim 2008; Bose and Chen 2009). A discussion of the kind of data used for churn prediction is very important since it is not based on data collected for that specific purpose but rather on databases designed for mobile service metering, billing and revenue collection purposes. Table 1 below is an example of used data, mining techniques and expected outcomes described by Wei and Chiu (2002).

We have now set the scene to discuss the “directional conflict between science and innovation” observed by the Cognitive Model of Innovation by Nightingale (1998; 2000). His basic argument is that science is going from “known starting conditions” through certain patterns to predict an “unknown future”. Whereas, innovation is headed in the opposite direction: from a “known end result”, the result we try to achieve by innovation, to “unknown starting conditions”. He concludes that mathematical models are not appropriate for predicting human behaviour.

This directional conflict is challenging the previous linear model where the output of science, e.g. mathematical models and methods that can calculate who is about to churn, can be directly applied to create innovative technologies, products, services or business propositions for retaining the churners. As noted by Nightingale (1998), this approach cannot explain key features of innovation, such as tacit knowledge. Tacit knowledge in churn prediction is primarily the contextual insight that is able to provide a key to the question of “why?” the customer is to churn. Another interesting dimension of the science-innovation directional conflict can be observed from an INPUT-PROCESS-OUTPUT perspective.

We can consider the customer’s positive “intention” (output) as our known and desired end result we are trying to reach by analyzing unknown starting points. In terms of churn prediction, we need to be careful about the first delusive impression, that our starting conditions (input) are well known since we seem to have all the data we need. Although, the statistics may show elements critical to service provision, metering and billing, they do not necessarily reveal the most important information; what was the “intention” behind using those services?

Type of data analyzed INPUT	Techniques used PROCESS	Data or patterns extracted OUTPUT
Contractual Data <ul style="list-style-type: none"> <li>• Phone Number</li> <li>• Length of Service</li> <li>• Contract Type</li> <li>• Payment Type</li> </ul> Call Details <ul style="list-style-type: none"> <li>• Caller’s Number</li> <li>• Receiver’s number</li> <li>• Date</li> <li>• Starting/Ending time</li> <li>• Duration</li> <li>• Charge Applied</li> </ul>	Classification analysis based churn prediction Decision tree Decision rule AQ family CN2 Neural networks  Evaluated by: Miss and false alarm rates	Churners Non-churners

Table 1: Type of Data and Analysis Techniques used to predict Churn (Wei and Chiu 2002).

**The Context of Churning and its Complexity**

A review of the literature reveals that studies on the – from a business perspective more important - question of “Why customers are churning?” are limited in two ways; limited in terms of resources allocated to this type of broad and complex analysis as well as limited in the face of the unlimited ways for answering this fundamental question (Berson et al. 2000; Wei and Chiu 2002; Hung, Yen and Wang 2006; Ahn, Han and Lee 2006; Sohn and Kim 2008; Owczarczuk 2010; Bose and Chen 2009). Finding the reasons for customer churn is a highly complex exercise for most of the businesses, as most of the decisions to churn, if not all of them, are situated in an uncountable variety of contexts. To understand the individual motivation for churning and not churning, we need to go far beyond examining the codified variables of service usage and customer’s demo-

graphics.

The discussion on the contexts of mobile interaction or usage of mobile services is an immense and vague theme, unless we concentrate on a certain group of customers with similar contextual attributes according to their professional life, demonstrated life style, or even activities around certain types of project (e.g. university life of students, work practices of real estate agents, construction of a building etc.). These groups may have common communication patterns and may be framed, for example, in terms of “rhythms of coupling and decoupling” with mobile services (Sorensen and Pica 2005).

**Who Will Hang the Bell?**

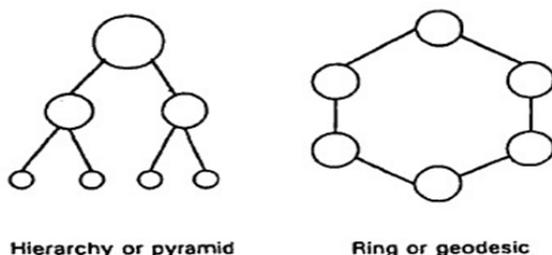
Technological centricity discussed in section 2 reveals how vertical functional integration frames the notion and effectiveness of data mining tools for churn management. Whereas, the Science – Innovation directional conflict observed in the section above underlines the importance of context that guides the customers’ decision to churn and why mathematics alone provides for limited capabilities to innovate in terms of customer retention and loyalty mechanisms. In this section we contrast the functional integrity of mobile operators against the richness and diversity of contexts in terms of the use of mobile services in order to demonstrate the deadlock that the telecommunications industry has driven itself into, while trying to compete with inherently monopolistic technologies. This contrast suggests that structural and functional unbundling, predicted long time ago by Davies (1996), becomes more and more necessary. Value Network Analysis will be proposed as an effective framework for telecommunications industry practitioners to consider while forming future strategies on churn management.

Given the diversity of contexts of the use of mobile services, one cannot imagine a single organisation to be able to collect and analyse all contextual data related to its customers and their intentions for churning or not churning. The bigger the company’s customer base, the more it relies on technology to guide management in terms of customer service and product innovation. One of the ways to fill the huge gap between technological limitations and prediction of human behaviour could be to demolish that big technological bridge in the first place and instead to rely on small companies and even individuals to build their own small bridges instead.

In Baurdeau, Liebenau and Savin’s (2005) terms, one of the best ways to do this is to desegregate all intermediate functions or “wholesale markets”. Thus, customer insight analytics and product/service in-

novation can be integrated with customer service functions rather than to be directed by technological limitations. However, functional desegregation should not be only a question of opening incumbent operator resources for new entrants, as it is discussed by the authors. New entrants, standing very close to specific groups of customers, should develop to an appropriate level in order to be considered as valuable resources for utilizing all the capacity of the network infrastructure.

In his attempt to trace major trends of changes in the telecommunications industry, Davies (1996) clearly substantiates the evolution of the telecommunications network from a hierarchical structure of the network towards, what he calls the ring or geodesic architecture. Davies supports this course of evolution with Noam's (1987) view that the development of services tailored to customer needs has undermined the system-wide economies previously attributed to centrally controlled telephone networks. Although Davies's discussion of pyramid and ring network architectures (see Figure 1) is primarily related to technological infrastructures, it can be a useful tool to depict how small customer service firms, concentrated on catering for a specific group, can make use of the architecture of customer databases by allowing information to be shared in a geodesic way.



**Figure 1: Competing Network Architectures by Davies (1996)**

In the next section, the evolving framework of Value Network Analysis will be elaborated. Based on the work of Peppard and Rylander (2006), who aligned Value Network Analysis with the telecommunications industry, we will explore an alternative starting point to guide our mindset in the future discussions of reconstructing business models in the telecommunications industry.

### Using Value Network Analysis to Pave the Way for New Players

Value Network Analysis is an alternative framework to the well-founded notion of value chains. The latter helps to depict the process of value creation and to signify the competences that companies need to develop in order to harvest the best results from a

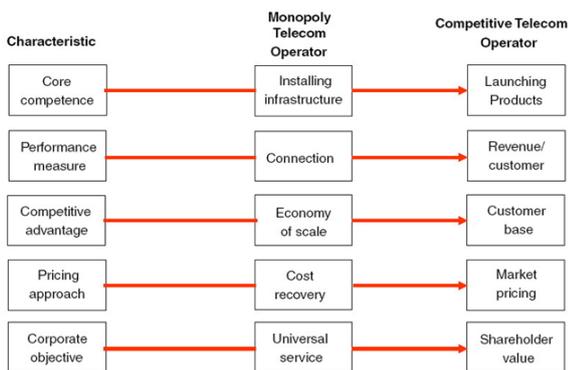
clear understanding of their place on the value chain throughout the process of creation and distribution of a product or service. Value Network Analysis, is more suited, as described by Peppard and Rylander (2006), to the New Economy where the supply and demand chains are highly digitized urging managers to rethink traditional methods of analyzing their place and role in the process of production and delivery of services. The companies and their functionalities have moved from being integrated into a chain to a network of networks where value is co-created by interrelated players. Hence, the new strategy needs to address this change in the new ecosystem of services and production in order to be able to efficiently contribute, but also to be able to make use of others' contributions to the co-created value.

The transitional changes presented in Figure 2 address an explicit need for telecommunications companies to restructure their core functionalities according to Treacy and Wiersema's (1993) three value dimensions of "Customer Intimacy", "Product/Service Innovation" and "Operational Excellence". This paper is trying to argue, that competitive mobile carriers, due to their technological centrality, are not capable to reach an effective transition in most of these characteristics on their own, as they are highly dependent on detailed customer insight that cannot be analyzed with existing approaches and techniques applied to churn management.

The current vertical integration of all technological, commercial, financial and marketing functions of competing mobile operators leaves little hope for survival in the future. Currently the mobile carriers are a part of a much larger network of application providers, handset manufacturers and content generators. To address this variety of independent players, the new model requires a great deal of separation of infrastructure operation from the product and relationship marketing function. Customer behaviour prediction along with innovation of products and services cannot rely only on customer data generated internally. It should also account for data and contextual information created in the larger network of players. Clear separation of functionalities will make the vertically integrated mobile carriers more compatible to the network of free players that directly impact the way mobile services are consumed. Many application developers that create products for smaller groups of customers dedicate more resources to understanding the real communication needs of their customers in a variety of contexts - something no major mobile provider can afford to get too deep into, because of the large scale of customers.

Preparing for a new, purely free market can be the best strategy for telecoms to choose in the short run.

Major players can make use of all their partners to find out more about their customers, and move towards the establishment of smaller, customer context oriented functionalities, totally separated from technological constraints. To address new market structures these functionalities need to act as separate firms, concentrating on specific needs of very specific groups. By knowing customers' business drivers, their sensitivity to the external world and how the values are created in a specific group, mobile operators will be able to better understand the needs in terms of mobile connection, products and services.



**Figure 2: Challenges facing traditional Mobile Operators as they enter Mobile Space (Peppard and Rylander 2006).**

## Conclusion

With the growing competition among mobile operators, customer churn management has become a pivotal concern and major element of achieving a competitive advantage. This paper proposed to take a fresh look at the current practices in customer churn management in the telecommunications industry. The critique focused on the technological centrality and functional integrity of mobile operators, inherent in the ways data is used to predict customers' propensity to churn. Against the backdrop of the directional conflict between science and innovation, one can argue that the context affecting customers' decision to churn is disregarded. Instead the easily answered question of "Who?" will churn guides the management strategy, rather than the more fundamental question "Why?" the customer may want to churn. By arguing that the telecommunications industry in its current structure provides very limited place for innovative ways to deal with customer retention and loyalty mechanisms, the paper further suggests the Value Network Analysis framework as a useful approach for the functional unbundling of mobile carriers in the future. Obviously future research and empirical evidence is needed to add soundness and feasibility to such a suggestion.

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