Value Chain Dynamics in the Communication Industry

A white paper prepared by the Value Chain Dynamics Working Group (VCDWG)
MIT Communications Futures Program (CFP)
Cambridge University Communications Research Network

Participating CFP Companies

BT	**Deutsche Telekom/T-Mobile**	**Motorola**
Cisco	**France Telecom**	**Nokia**
Comcast	**Intel**	**Nortel**

The overnight success of Skype shook the telecommunication industry to its bones. With very little investment, a small company somewhere in Europe nullified most voice revenue forecasts for the future telecommunication market, leading to a spiral of fast declining voice revenue. This type of "sudden strike" innovation on technology and business level is becoming increasingly common in the communication industry, disrupting and transforming established industry structures. An understanding of the dynamics that leads to such successful innovations is crucial for survival in the future communication industry.

In the past, the structure of the communication industry was based on the tight integration of critical communication functionality. Services were provided by a very limited set of players, with the core of the network supplying this tightly integrated set of features, and the edge, i.e., the users, consuming them. With this, control over the core warranted success for the incumbents owning it. However, today's packet-based Internet increasingly decouples, through its design, service and delivery functionality. Accordingly, the topological notions of *core* and *edge* are no longer meaningful in the possible success of innovations and business models of the future. Instead, alternative forms of evaluation are needed.

The mission of the former Core-Edge (renamed Value Chain Dynamics in November 2005) Working Group is to develop such alternatives. To accomplish this, case studies but also taxonomy and methodology work have been undertaken since the group's formation in 2004. While the results of this work are captured in separate documents, this white paper attempts to build an overarching story for this research. This story will evolve as we refine our findings and results in future deliverables.

Executive Summary

Innovation in the communications industry today can happen virtually anywhere at anytime by anybody. The resulting increased innovation speed comes by virtue of changes in the technology, business and regulatory space. Previously scarce resources, such as servers and networks, have become easily and widely available, reducing the barrier of entry for new players. However, the most important question for any investor, in particular for new business propositions, still concerns the likelihood for success of a particular business model, its sustainability over time and its strategic positioning within the likely changes of the industry.

The issue of control is key for evaluating the success of innovation. The "sudden strike" type of innovation became possible through being able to flexibly place control points throughout the communication infrastructure. Consequently, methods for evaluating the future value chain need to take this flexibility into account. With this, it seems obvious that topological constructs like *core* and *edge* within the communication networks no longer suffice to lay out the possible future industry value chain. For instance, ownership of the core network machinery established the current industry incumbent and their success. Today however, topological placement of components (i.e., within the core or edge of the network) is increasingly decoupled from the importance of this functionality as business critical control points. This makes it increasingly difficult to reliably position a business proposition today based on the topological placement of the components implementing the particular solution.

Hence, new methodologies and tools are required to properly evaluate possible success of business propositions. As argued above, these new methodologies should not depend on topological constructs. Rather, they should incorporate the functional components and their high level implementations in the evaluation process. This led to the introduction of the *coreness* concept, which analyzes control points in terms of the *properties* that were once the exclusive domain of core functions. With this in mind, coreness is defined as a function of scarcity, i.e., the number of possible players in the market, and the demand for a particular business model. The notion of triggers allows an evaluation of the business sustainability over time. With this, we eventually intend to provide a set of tools that allows for devising strategies for product placements and overall value chain positioning.

The intent of this white paper is to introduce our findings around these new tools and methods. It provides insights into the first phase of the VCDWG research, but also relates it to the concepts of other work performed within CFP and presents the future research agenda of the working group. With this, we intend to provide some form of tangible output to our sponsors that can be handed to interested parties within the companies to facilitate discussions and feedback.

Core-Edge Dynamics and the VCDWG Approach

The communications industry is undergoing major changes in its overall structure, changing traditional sources for revenue generation and innovation with a potentially tremendous effect on the business, technology and regulatory landscape. Current incumbents are threatened by new entrants, not only from the communication sector itself (like through alternative access technologies) but also through cross-industry entrants such as Apple with its iTunes/iPod offering [5].

A variety of dynamics, in the areas of regulation, business strategy but also technology, are causing these changes. The effect of these dynamics is illustrated, in a high-level manner, with the double helix [6], shown in Figure 1 as a version adapted to the communication industry.

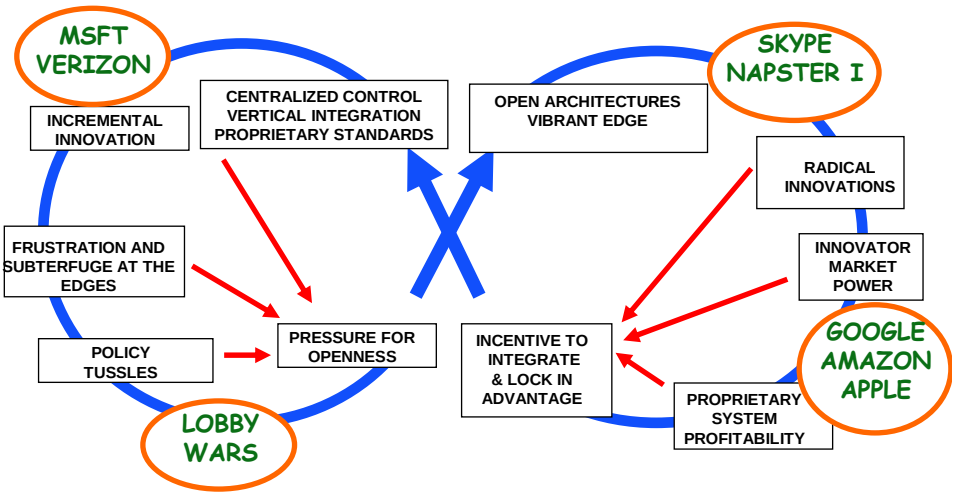


Figure 1 Double Helix of Innovation

The integration and disintegration of market players, following the mantra of the "temporary advantage" [8], is described as following a cycle that is steered by an underlying model of dynamics, leading to a well-defined movement of the industry around this double helix.

One aspect in this movement along the double helix is the particular dynamics that keep the helix spinning. These dynamics, referred to as *core-edge dynamics* in the remainder of the document, seem to be largely affected by the placement of functionality and therefore the establishment of control points along the communication industry value chain. In the past, such placement of functionality was largely based on some notion of *core-edge spectrum*, determining traditional communication value chains by largely

aligning them with topological definitions of **core** and **edge** within a communication network.

However, there is more and more evidence appearing that such topological notion does not suffice anymore to predict the future communication value chain due to the overall effect of the increased possibility to establish control points irrespective of the topological placement in the network. Within our work, we intend to determine the effect of such topology-independent control, generally questioning the traditional notion of the "core-edge spectrum" itself, i.e., the notion that innovation and revenue generation is following some form of topological constructs similar to the topology of communication networks.

Our Objectives

The objectives of our work are to develop a set of methodologies and tools that enables our sponsor companies to

- **understand** the dynamics of the value chain, ranging from business model level questions to dynamics of the entire value chain
- **react** to current dynamics, targeting to devise shorter term strategies such as for particular product placements
- **predict** possible dynamics, targeting to devise longer-term strategies for the overall positioning in the value chain

Our Scope

In order to fulfill the outlined objectives, it is important to properly define the scope of the problem space that the working group intends to tackle. For this, one needs to break down the high level goal "of understanding the effects of core-edge dynamics". This is attempted with our *tier model*, illustrated in Figure 2. It shows the working group operating from the level of business models over their dynamics to entire value chain dynamics, aligned with the charter of the working group [1].

The *dimension* boxes illustrate the scope of the questions asked within the different levels.

The *value dimension* is mainly concerned with the competitiveness and sustainability of particular business models. In this, value creation and development over time is crucial. This dimension is the focus of our current discussions and work within the group.

The *strategy dimension* targets to devise strategies regarding certain business models but also devising strategies that affect entire value chains beyond a particular product only. For instance, strategies for product subsidies enabling other product offerings could be the target of this dimension of our work. We intend to implement this part through our work around dynamic modeling of the success likelihood of particular business models over time, i.e., our work around the coreness concept (see below). With this, we believe

to enable devising strategies to steer towards a desirable goal along a specific path of business models.

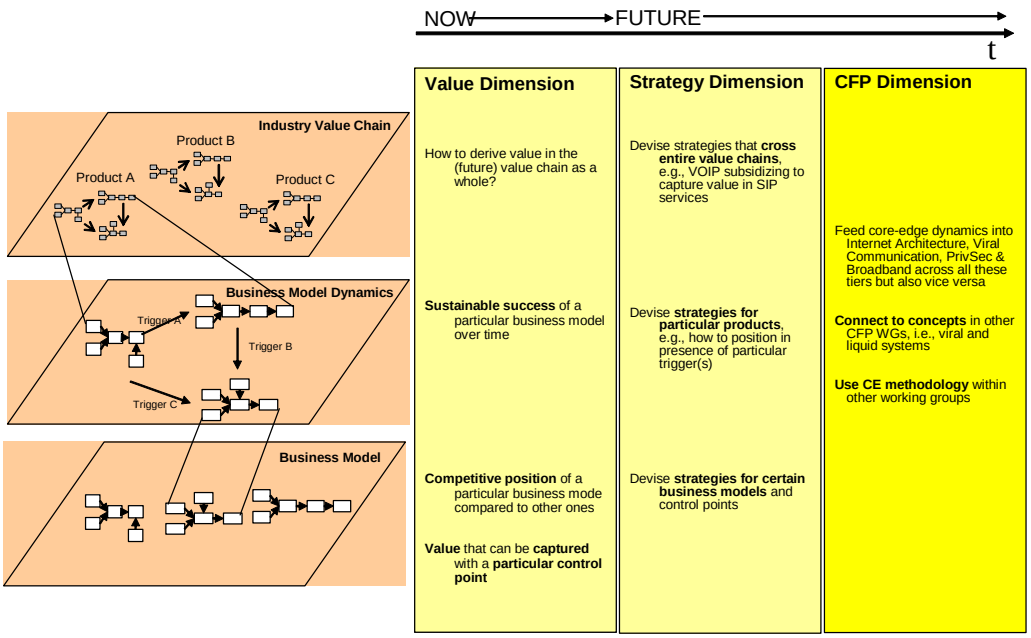


Figure 2 Scope of the Working Group

The third dimension, i.e., the *CFP dimension*, aims at connecting the working group's concepts to those that are investigated in other CFP working groups, such as the Liquid Protocols [9] or Viral Systems approach [10]. In this, the application of our methodology to these concepts is crucial to explore, including the implications of the investigated dynamics on the overall Internet Architecture and other technology work within CFP.

Our Approach

The approach chosen for our research is based on a cycle of *validation* and *generalization*, as defined in the charter of the working group [1].

Case studies are a key vehicle in this approach, validating our findings in observable, real-life cases and offerings. The main criteria for selecting case studies are formulated in [7]. In short, a case study should exhibit some presence of core-edge dynamics through innovation and disruption in an observable field of the communication market. A certain level of technology and market maturity is desired, although more predictive studies can be conducted on rather immature technologies and markets.

By generalizing our findings, we are able to develop tools for the CFP industry partners to examine core-edge dynamics and possible outcomes in their own areas of interest. The tools and instruments are constantly evolved, verified and refined through grounding in new case studies. Examples of these tools and concepts will be given

throughout the remainder of the whitepaper, such as our taxonomy and the *coreness* concept.

Summary of our Case Studies

As outlined in our approach, the case studies within our working group were essential for deriving the general concepts but also constantly verifying their viability. In the following, a summary is given for each of the case studies.

Voice Over IP

Background The commercial use of voice over Internet protocol (VoIP) began with VocalTec's VocalChat software in March of 1995. Ever since, VoIP is perceived to have the potential to disrupt the existing value chains in the communications industry. In the late 1990s, this threat of disruption mobilized much investment from voice and data networking suppliers towards standards and product development and deployment. As the dot-com bubble busted, VoIP-related activities slowed down temporarily, only to attract even greater interest in the past two years. Having placed their bets on VoIP, however, the suppliers continue to wonder about the ultimate form of voice communication that will be most attractive to the user, as they exploit VoIP's ability to converge voice, video and data.

Regulators around the world have begun to address the question of VoIP regulation in the past two years. Most industrialized nations have decided to apply only the social regulation to VoIP, sparing it of economic regulation traditionally imposed on the telephone service. The rationale for not imposing the economic regulation is the highly competitive telecommunications sector. Regulators, however, fear whether the industry structure, resulting from the technology suppliers' response to regulation, will continue to remain highly innovative and competitive, and at the same time deliver the desired societal robustness.

Major Business Models Four different classes of business models have emerged in the public (not the enterprise) use of VoIP. These are: VoIP in the backbone, facility-based VoIP, VoIP over broadband and peer-to-peer VoIP. Emergence of these business models can be attributed to the corporate strategies of incumbents that protect their technological legacy and interest, or those of the new entrants that create new market opportunities.

VoIP in the backbone uses circuit-switching to the end-point (i.e. phone), and packet-switching in the core network. Most local exchange carriers (LEC), such as Verizon, Qwest, and inter-exchange carriers (IXC), such as MCI, Sprint, use this business model to offer long-distance calling. This model is vertically integrated and delivers features, reliability and regulatory compliance of the public switched telephone networks (PSTN).

Facility-based VoIP uses packet-switching for end-to-end communication. Providers of voice over cable (VoCable), voice over digital subscriber line (VoDSL) and voice over wireless use this business model. This model too is vertically integrated, but the voice service here can be offered as a bundled good with data (i.e. Internet service) or video (i.e. Television programming).

VoIP over broadband is a model where voice service is offered to consumers who already have broadband access. Here, the Internet Service Provider (ISP) and the VoIP service provider are different entities. A typical example is Vonage or 8x8 service over an existing broadband connection. This model is *not* vertically integrated. The success of such a model comes from the ability to control call signaling (used for call setup and termination) and the actual voice packets separately. VoIP over broadband enables Phone-to-Phone, PC-to-Phone or Phone-to-PC communication. It offers a few other functionalities such as multiple virtual phone numbers over the traditional PSTN, currently trading off the regulatory compliance.

Peer-to-peer VoIP is available to anyone with any form of Internet connectivity by downloading a free voice-enabled application. MSN Messenger, AOL Instant Messenger (IM) and Yahoo Messenger were the early providers of this mode of voice communication. Recently, Skype has emerged as a popular P2P VoIP provider. This model is *not* vertically integrated. The P2P VoIP provider only provides the end application and the directory service. The service is usually free. P2P VoIP provides PC-to-PC connectivity. Today, customers use peer-to-peer VoIP only for recreation or for substituting a small percentage of international calls. The providers have not yet found a way to charge for the service, unless they offer PSTN interconnection. All said; this class of VoIP is the one that has a very different look-and-feel from traditional telephony. It remains to be seen if what form it will develop into and how disruptive it will be.

In the US, facility-based VoIP and VoIP over broadband are expected to comply with social regulation such as 911 and wiretapping laws, while the peer-to-peer VoIP is not.

Possible Future Scenarios Looking at the current trends, three possible scenarios can be anticipated. The scenario that most suppliers fear is where the voice becomes a commodity. The scenario that most suppliers would favor is growth of VoIP-enabled voice communications such as gaming, Internet TV, distance education that are beyond telephony. The third scenario is combination of the two, where traditional voice becomes a commodity and then there will be premium voice services that consumers would be willing to pay extra.

Online Music

Background Digital music services grew out of the unauthorized file-sharing phenomenon of the late 1990s. As edge-based peer-to-peer networks gained popularity, a digital music value chain emerged comprised of file sharing software, personal computers, jukebox software, portable MP3 players, and a community of users providing content. These components were loosely coupled -- interchangeable -- and DRM-free music files were not tied to specific components.

Legal action from the RIAA led to innovation in two opposing directions. On the one hand, unauthorized file-sharing networks got better at circumventing authority. On the other, the authorized digital music market was born, distributing DRM-protected content online.

Major Business Models DRM has been used as a key strategic mechanism for tying content to different components, introducing pockets of scarcity in the value chain. Two key business models emerged from the first wave of authorized digital music services – device centric and software centric. The former is the near-exclusive domain of Apple's iTunes Music Store and the latter comprises online stores selling music supported by the Windows Media Player format.

More recently, mobile carrier services have added a third category of business model; network centric, where content is tied to the actual delivery channel (the carrier's network), as well as the handset. This latter trend not only increases instances of scarcity, it also represents a shift in certain aspects of control back to traditional "core" components of the value chain and the network operators.

The Apple's iTunes Music Store (iTMS) dominates the authorized digital marketplace with 70% market share in 2004. As a device manufacturer, the company's business model was predicated on the success of the iPod. Apple leveraged the icon status reached by the iPod, and made it a major control point in the iTMS value chain by providing a highly streamlined channel that tied content to the portable player through its proprietary DRM technology, FairPlay. Thus, while the iPod was initially marketed as an open MP3 player supporting the unauthorized digital music value chain, it is now sold as the exclusive device for iTunes.

Possible Future Scenarios Several key trends threaten the iTMS model including customer preference for subscription services, growth of the MS-based player market, and finally, the music phone as the portable playback device. As mobile networks improve, music phones may complement or even replace the personal computer as the primary *sourcing* device, thereby challenging *online* music models in general and capturing value from traffic that up until now by-passed mobile networks.

Location-Based Services

Background Location-based services (LBS) have been hyped as the upcoming new service area for several years. Mobile technology, but also the growing availability of positioning technology like GPS, has raised expectations for exploiting individuals' location with new services. During the past two to three years, LBS has finally picked up pace, less through core- but through edge-based developments, where powerful single-purpose devices equipped with onboard memory enable tracking and way finding type of scenarios. Lately, mobile phones, through their open development environment, increasingly enable the integration of location functionality into these everyday devices. Also, regulations like E911 spurred LBS activity in the mobile phone world, although mobile phone operators still seem to struggle about how to differentiate themselves from their fixed counterparts.

Major Business Models Location determination and software distribution were found to be the major control points in LBS around which all business models seem to revolve. Two major business models emerge from stand-alone positioning techniques such as GPS, namely positioning applications executed in single or multiple purpose devices. The former is the world of the Garmins and the like, while the latter is dominated by

mobile phones with GPS attachments and eventually with full integration into the phone (accelerated through E911-like regulations).

The carrier-based model has recently gained momentum, largely driven by limitations of GPS in dense and indoor environments. More accurate technologies like A-GPS (assisted GPS) move this control point back to the mobile operators through the operator-based assistance in the location determination. But also the inclusion of cellular positioning information (e.g., the cell identifier) raises hope for operators to re-capture this control point (cell information is largely available directly on the mobile devices, however without direct relation to the actual location). In addition, the software distribution to mobile phones is tightly controlled in many operator networks.

Recent edge-based developments however, such as so-called "war driver logs", threaten to undermine the incumbents' position by creating databases for the location of various wireless beacons, e.g., cell identifiers, WLAN beacons etc. With this, control of location determination is driven entirely to edge devices. These models commoditize location determination while focusing on the software distribution as the main business driver.

Possible Future Scenarios The trend of edge-driven location databases clearly threatens the operator-based model of LBS for the future. The rapid growth of these databases together with the slow pace of deploying real operator-based LBS with attractive pricing models is likely to reduce this opportunity for operators.

In this light, operators might turn towards software distribution as a major control point to enforce associated LBS applications. However, the current model of quasi-open environments could prevent too drastic measures. More likely seems to be the branding of "operator-friendly" LBS applications through subsidized vendor devices, a strategy already implemented in some markets.

The Starting Point of Our Concept: A Taxonomy for the Communication Industry

The first step towards evaluating value chain dynamics involves defining a proper taxonomy. This taxonomy is used for deriving possible business models for particular products and services.

Two main aspects can be identified as crucial for our taxonomy, namely the identification of *control points* and their particular *implementation* (rooted in a communication infrastructure for delivery, service provisioning and management). As a consequence, the taxonomy, as described in more detail in [2], includes the following notions:

- *Service transactions*, *providers* & *consumers*: Identifies potential control points of a business proposition as well as the parties holding the control points.
- C*ontrol structure*, used for implementing the service transactions. This control structure identifies the chosen means of implementation for these control points through the parties holding the control. It is grounded in infrastructure aspects

for *delivery*, *service provisioning* and *management*. As implementation choices, *centralized* vs. *distributed* means are considered.

With these constructs of the taxonomy, possible business models can be built through assembling constellations of control points in which the structure of the constellations is defined through the implementation of the control points (by particular parties and through particular methods).

Note well that in order to accommodate the "innovation anywhere/anytime/anybody" phenomenon of today's communication industry, the resulting taxonomy is not based on topological constructs of *core*, *access*, or *edge* due to the perceived irrelevance for the likely value chain dynamics of the industry. As a result, there is no definition for these constructs in our taxonomy.

The Key Question Remains: How to Evaluate Success of Future Business Models?

Identifying and classifying service transactions and their implementation helps us construct potential business models for products and services, but the key question remains, namely which of these business models are likely to succeed.

The Problem with the old "Core" Concept

In the past, the success of a business model was largely dependent on whether functionality resided in the "core" or "edge" of the underlying communication network (possibly with some notion of "access" and other refined definitions of the network topology), where a "core" service or functionality was more likely to succeed or dominate. For instance, the AT&T dominance in the 80s (eventually leading to its break-up) was based on the provisioning of the core network up to the end consumer. This is very different from today's offerings in this space, as shown within our VOIP case study [4], where value is created regardless of the ownership of some "core" function. Also, offerings such as online music services [5] have no "core"-based precedence similar to AT&T at all (leaving out the CD sales channels model of the industry) but were right from the beginning based on "edge"-based propositions.

Hence, it can be observed that innovation nowadays (and therefore the likelihood for a successful business) is not tied anymore with these topological constructs, which is the main reason for not finding definition of these terms in our taxonomy. As a consequence, different (non-topological) concepts are required that express whether or not a certain business proposition is likely to be successful and sustainable over time. In the following, we will introduce our methodology (described in more detail in [3]) to address the definition of one possible concept, which we called "coreness". In this, keep in mind that there is no topological but a conceptual relation to the term "core", given the above described usage of "core" to evaluate business propositions.

From Business Models…

In order to enter the first level of our tier scope (see Figure 2), the enumeration of possible business models is crucial. For this, the taxonomy is applied to identify the

possible control points, the parties holding control over these, and their particular implementation with respect to delivery, service provisioning and management. This leads to a list, similar to the one in the music case study [5] (Figure 3).

With such list, constellations of control points, rooted in the possibilities for implementing control over these, can be constructed. These constellations constitute possible business models, each of them exploiting the implemented control structure within a particular business case. Figure 4 shows an example illustration of such control point constellation for the music case study.

With this, a set of possible business models is constructed based on an evaluation of control points and their implementation within a given product offering. These constellations need refinement towards *value networks* in the sense that the constellations are annotated with a particular value that is associated with each control point.

It is suggested in [11] that the value of a particular control point is to be determined through its margin (i.e., revenue minus costs associated with this control point) multiplied by the demand that this control point is able to capture, this demand dependent on the interchangeability of the control point (i.e., the ability for competitors to implement the very same control point). The annotation of control points with some notion of value will return as a crucial piece when evaluating the success of business models (see below). However, the annotation has not been verified yet within the case studies, remaining therefore a topic of investigation in our future work.

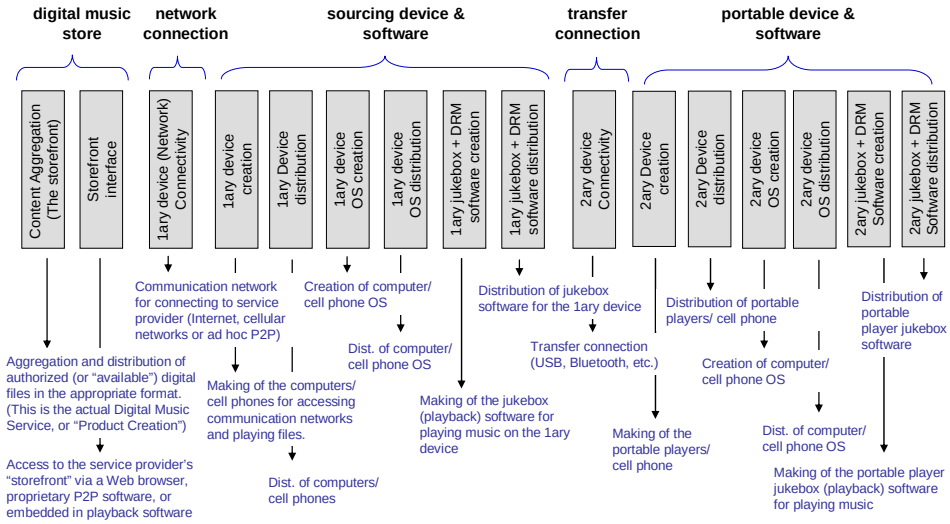
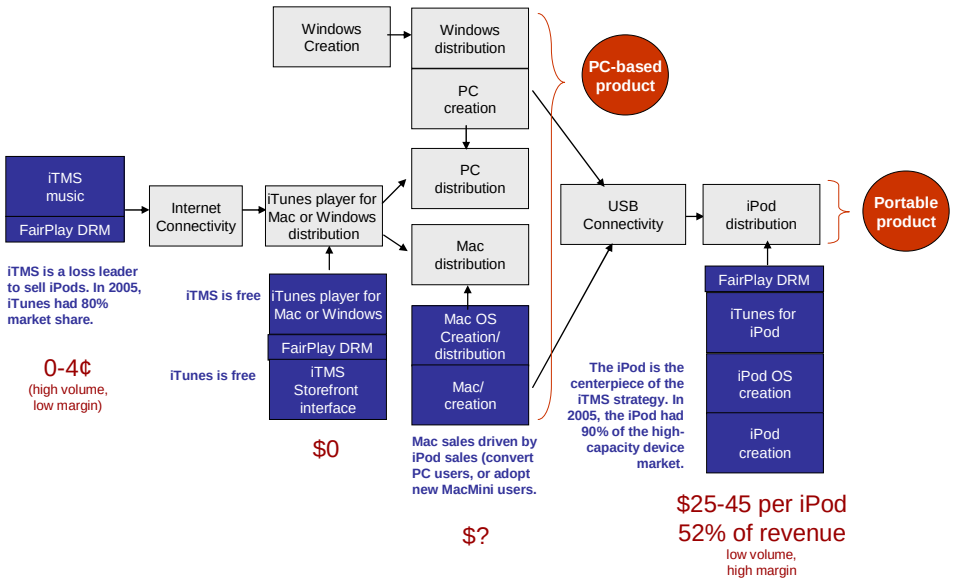


Figure 3 Applying the Taxonomy: Control Points of the Music Case Study



The iTunes Music Store control point constellation

Figure 4 Applying the Taxonomy: Control Point Constellation for iTunes Case

…over Triggers…

Triggers, rooted in the domains of technology, business, regulation and society, cause changes in business models on the micro level and changes in the industry value chain on the macro level (i.e., the problem rises vertically along the tier scope of Figure 2). In other words, identifying triggers and the dynamics they cause is crucial to raise the scope of the possible answers from the level of individual business models onto dynamics among business models or even entire value chains.

Figure 5 left shows how triggers are evaluated, using the VOIP case study as an example. Triggers are categorized according to Fine's *Gearteeth model* [3], introducing technology, business cycle, industry structure, regulatory policy, customer preference, capital market and corporate strategy triggers. It can be seen that the number of possible triggers can easily reach some dozens. Typical examples of triggers are increase or decrease in, e.g., number of developers, available features, "challenger" technologies (e.g., WLAN) etc.

Triggers however do not only result in dynamic changes of business models. They also bear dynamics of their own. In other words, certain triggers can cause other triggers to be executed which can in turn impact other triggers again. For instance, certain technology triggers can generate regulatory triggers as an effect (e.g., introduction of VOIP technology triggers regulatory action). This is captured in our evaluation of the *trigger dynamics* (Figure 4 right), as done in the VOIP case study [4].

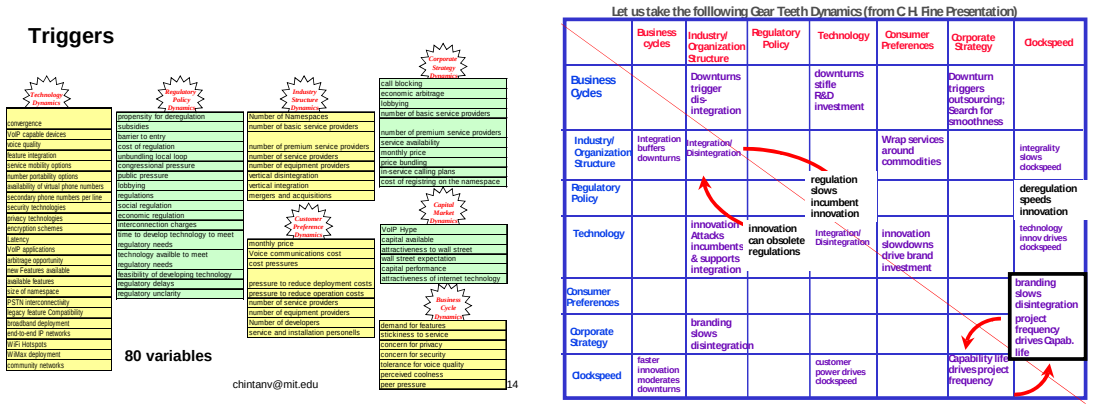


Figure 5 Triggers and the Dynamics They Cause: The VOIP Example

With these two aspects, we evaluate cause and effect of changes in the environments in which the set of possible business models resides.

…to Coreness

We mentioned before that the placement of control points within a topological notion was not seen as appropriate anymore for evaluating the likelihood of success for particular business models. Hence, the main focus was placed throughout the investigations within the working group to identify parameters that influence the success of particular business models. Throughout these investigations, the following four parameters crystallized as being crucial:

- *Interchangeability*: Expresses the possibility of implementing particular control points or entire product offerings. Hence, it answers the question as to how easily can other players in the market provide this control point or the entire product? The used measure here is the number of potential other players. Within our presentations, interchangeability is often replaced by *scarcity* (as the reciprocal measure) of the control point, in particular when addressing a more business-oriented audience. We will use scarcity in the following.

- *Demand*: Expresses the market share that a particular control point or product offering is able to capture. This can be measured in sales units, subscribers or other information.

- *Value*: Denotes the value that this control point or product can capture. This is probably the most difficult parameter to determine since its determination depends on a variety of factors, most notably interchangeability and demand.

- *Time*: All three parameters above change over time, this change caused by applying triggers which were identified throughout the course of the investigation.

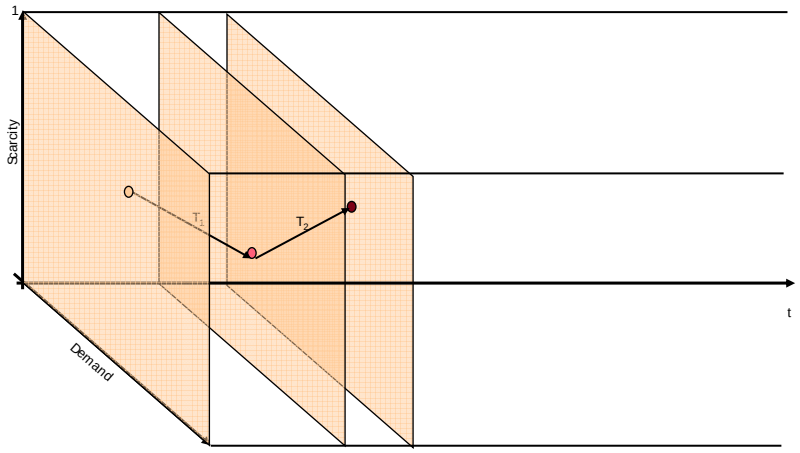
With these parameters, one could formulate business models of likely success, e.g., when

implementing control points of high value and little interchangeability (i.e., little competition) with a strategy of increasing demand over time.

However, the question of how to connect these parameters within a single concept still remains. For this, we introduce a concept we call "coreness" [3] (illustrated in Figure 6). We believe that this concept will facilitate the evaluation of new business models.

For this, scarcity and demand for each control point (or products) are plotted along the X and Y axis, each point in this resulting plane annotated by the value of the control point or constellation (illustrated with varying color in Figure 6). Such placement in the two-dimensional plane is varied over time, adding a time-dependent dynamic aspect to the evaluation. This dynamic aspect leads to the *coreness tunnel*, as outlined in Figure 6. It is appreciated that the proposed concept is independent from the particularly chosen method to describe the dynamic aspects, i.e., the trigger dynamics and the effect on the business models. Methodologies for studying and analyzing the dynamics of the core-edge phenomena (or coreness tunnel) include System Dynamics [12] and game theory.

With this proposed coreness concept, a conceptual framework is defined that encompasses all four parameters of importance when evaluating the likelihood of success for particular business models.



- Encompasses all four parameters of importance, i.e., demand, scarcity, value and time
- Allows for defining *regions* for devising strategies
- Concept independent from the particular method used for simulating the four parameters (could be SD or other techniques)

Figure 6 The Coreness Path: Evaluating Business Model Success

It also allows for defining regions within the three-dimensional tunnel that expresses strategies, which can be reached through different alternative *coreness paths*, i.e., applying different triggers sequences to the same starting point, the trigger sequences identified in our trigger dynamics investigations. It is subject to further studies how to

formulate these strategies and translate them into region information within the coreness tunnel. But it is a first step towards the strategy dimension of our working group scope.

Conclusions

The working group set out in 2004 to explore new ways to evaluate the dynamics of the future communication value chain. This quest became necessary after the topological notions of "core" and "edge" were not found useful anymore to serve this purpose in a world of "innovation anywhere at anytime by anybody".

Business success is all about control, which is why the focus of the initial investigations was on the identification of control points and their implementation within a particular communication architecture. This helps in constructing possible business models that can then be evaluated regarding their viability and sustainability. Triggers are identified, rooted in different domains ranging from technology over industry structure to regulation, that can potentially lead to changes in the business models, e.g., in the implementation of particular control points. These triggers underlie dynamics of their own, which are identified within an exercise of its own.

With these tools in hand, a concept can be formulated for evaluating sustainable business success and eventually for formulating strategies to position offerings within the value chain, namely the coreness concept. This concept unifies the main four success parameters that were identified in the case studies, i.e., scarcity, demand, value and time, in a conceptual framework. It is this conceptual framework and its expected viability for the question at hand, which constitutes the basis for our future investigations:

- **Dynamics Modeling of Coreness Evolution:** As pointed out in our introduction to the coreness concept, there is no particular dynamics model that is assumed to be the foundation for this concept. Hence, it is intended to investigate the viability of different dynamic modeling approaches for this concept. The first candidate for this is *system dynamics* [12]. The challenge here is to use the modeling approach to specifically address a particular case study (for verification purposes) but also derive general lessons or even models that can be applied for any other case study. The identified problem for the model is to describe the evolution of *coreness*, i.e., the behavior of scarcity and demand over time. At the time of writing, first results have been achieved through a round of interviews in relation to the Voice over IP case study. The intention is to have more concrete results for the next plenary meeting in January 2006. As a result of this work, a whitepaper and potentially some form of "flight simulator" is desired that shows the viability of this modeling technique but also describes potential shortcomings.

- **New Case Studies**: In order to refresh the input for our investigations, the working group intends to ramp up new case studies in identified areas, while closing out older cases. First input for potential areas was solicited throughout 2005. Apart from the product- and service-oriented case studies of the past, there were several

suggestions made to include more concept-oriented case studies in the future pool of cases.

- **VCDWG in the Context of CFP**: The Value Chain Dynamics WG is, like other working groups within CFP, embedded in the larger context of possible futures of the communication industry. For that, particular concepts are under development within the different working groups, each of these allowing different views onto the industry. For instance, the Viral Communication WG is currently exploring the concept of *Liquid Systems*, while the VCDWG is manifesting the coreness concept, as discussed in this paper. Figure 7 shows a first attempt of connecting these different pieces together, based on some very early discussions. Within the future research agenda, a deeper investigation is intended as to how these different concepts connect to each other. The hope is that through this investigation, a strong message can be formulated towards the unique angle and approach of CFP.

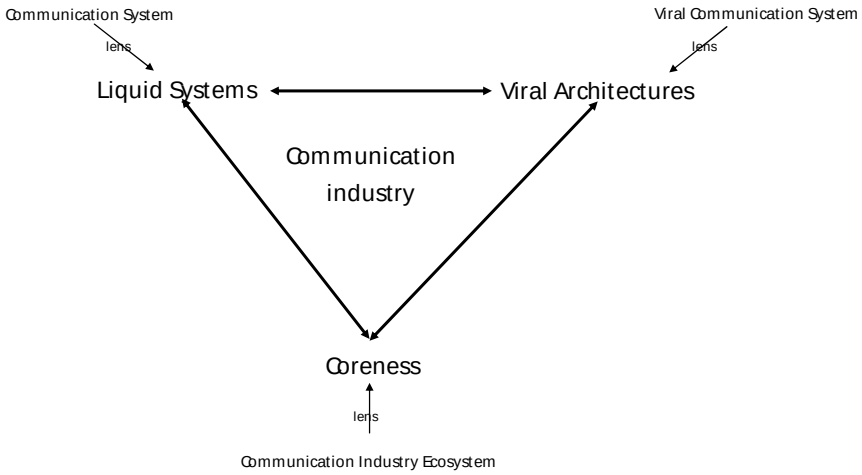


Figure 7 Connecting to Current CFP Concepts

The work presented in this whitepaper constitutes a first step in the direction of answering crucial questions for the future communication value chain in regards of the viability of certain propositions and the positioning along the possible value chains there are. But there is more work to be done, filling the currently developed concepts with more results to finally lead to a strong package that can help the industry sponsors of CFP help understand their future.

Acknowledgements

Many of the ideas and concepts in this paper reflect the numerous discussions among participants in the Value Chain Dynamics Working Group of the Communications

Futures Program at MIT but also the dedicated work by the students involved in the case studies. Thanks needs to be given to the individuals involved in these discussions, in particular Charles Fine (MIT), Dirk Trossen (Nokia), John Watlington (France Telecom), Sylvie Bokshorn (France Telecom), Dana Pavel (Nokia), Sharon Eisner (MIT), Natalie Klym (MIT), Gabriel Weinberg (MIT), Chintan Vaishnav (MIT), Mark Hardie (Nokia), Kai Miao (Intel). It is to be made clear that opinions expressed in this paper and in the contributions leading up to this paper are drawn from the contributions of these individuals and do not represent official views or policies of CFP's sponsoring companies or universities.

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