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Bundling, Differentiation, Alliances and Mergers: Convergence Strategies in U.S. Communication Markets (*)

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Abstract: Convergence is a multi-facetted phenomenon affecting the technological basis of information and communication industries, the boundaries of existing and new markets, and the organization of service providers. Convergence in substitutes will tend to increase the intensity of competition but convergence in complements may have the opposite effect. Given the economics of advanced communication industries, convergence necessitates strategies to overcome the risk of commodification at the level of networks, applications, and services. The paper examines bundling, differentiation, alliances, and merger strategies adopted by North American service providers in response to convergence. Service providers' opportunities and risks in the emerging environment differ considerably, with cable and telephone service providers presently in stronger positions than wireless service providers, broadcasters, and satellite service providers. New entrants such as Vonage, Skype, Google, and Yahoo have high disruptive potential but remain disadvantaged without their own access networks.
Key words: convergence, bundling, differentiation, alliances, mergers

Throughout history, rapid technological change has captivated people's imagination, often at the expense of a more detached analysis of the forces at work and their effects. Pundits have erred both by underestimating and overestimating the impact of technical and economic change: the market potential of mobile phones was grossly underrated, while expectations of integrated broadband communication have fallen short of actual adoption and use since the 1970s. The convergence debate is no exception. Whereas the term is widely used, its exact meaning is poorly defined and its consequences are rarely explored in-depth. Yet it continues to serve as a powerful shared vision, framing debates on the future of the communications industries and influencing management and policy

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decisions. This is not to say that the notion of convergence is futile: instances of convergence abound and are one important factor in the reorganization and transformation of the communication industries. However, other forces are at work as well and convergence unfolds in ways that are more complicated and with effects that are more multilayered than commonly recognized.

One of the core claims of this paper is that convergence is a reality, but that it has limitations as an overarching concept with which to grasp current transformations in the communication industries. Firstly, the term convergence suggests that existing phenomena blend into each other and become more alike. It conceptualizes the future in terms of the past organization of industry and thus has an inherently backward orientation. It consequently distracts from the fact that digitization enables entirely new services, which may embed components of previous services but are typically more than a recombination of them. Secondly, it emphasizes the centripetal forces leading toward a more integrated communication sector, but tends to ignore the centrifugal forces that contribute to divergence and differentiation within the sector. Thirdly, much of the literature on convergence seems to tacitly assume that technical convergence implies an integration of markets and firms (and subsequently necessitates a convergence of law and policy). Whereas some forces work in that direction, these effects are far from inevitable. Fourthly, with few exceptions (GREENSTEIN & KHANNA, 1997, for example), the literature fails to embed convergence in a broader economic theory of networks and service provision. Such a closer look would reveal that one of the main conclusions of much of the convergence literature – that convergence intensifies competition – only holds under certain conditions and that there are some forms of convergence and corporate responses that weaken it. Lastly, convergence is often seen as an external, technically driven phenomenon to which firms can only adapt. In practice, it is the outcome of a co-evolution of technical change, active business strategies to shape markets, user choices and policy decisions.

This short paper cannot do justice to all these issues. Rather, it has to focus on a few select questions. The next section develops a typology of convergence processes. The third section of the paper discusses the economics of convergence and divergence and their implications for competitive strategy. Prototypes of responses to convergence are reviewed in the fourth, fifth and sixth sections, which are followed by some conclusions and perspectives for the future.

■ The anatomy of convergence

In communications, the term convergence was apparently first used in the late 1970s and early 1980s. From a technological perspective, Nicholas Negroponte at MIT and John Scully at Apple Computers envisioned a more integrated future for computing, telecommunications and the services based on these technologies [1]. The term was popularized by Ithiel de Sola Pool, who predicted a: "convergence of modes" in his 1983 *book Technologies of Freedom* that would integrate all communications into one grand system (POOL, 1983). His concern was predominantly the danger that forms of government control established for over-the-air broadcasting (and not the free press model) would gradually be expanded to cover these emerging technologies and limit their inherent ability to support free speech. Despite these different approaches, these early pundits share the key observation that digital technology enables the representation of different types of information (voice, data, audio and video) in a more unified way. Combined with the increased processing power of microchips, the rapidly expanding transmission capacity of fiber optic networks and more sophisticated forms of compression, progressive integration in a multimedia industry seemed all but inevitable. At the same time, the number of service providers was to multiply and intensify competition throughout the sector.

This view became widely accepted and was further elaborated during the 1990s. BALDWIN, McVOY & STEINFELD (1996) remains the most comprehensive overview of the many facets of convergence. Convergence is explored in its technological, business and policy aspects. Despite many caveats and critical distance to possible future scenarios, the authors anticipate the emergence of integrated broadband networks and eventually full-service networks, accompanied by acceleration in competition among the main players. LATZER (1997, especially pp. 60-84) differentiates between two phases of convergence. Beginning in the 1960s, telecommunications and data communications started to converge, a development for which NORA & MINC (1980) coined the term "telematics." Since the 1980s, a second phase of convergence between mass media with the telematics sector is identified, a phenomenon labelled by LATZER

[1] The term has a longer track record in mathematics (as referring to the convergence of mathematical series, for instance) and in development economics (as referring to the convergence of economic performance data) (GORDON, 2003). More recently, the term was used to refer to the narrowing of performance gaps between industrialized nations (KOSKI & MAJUMDAR, 2000).

(1997) as "mediamatics." According to Latzer, the transition to mediamatics affects the networks, functions and corporate organization of communications. van DIJK (1999, p. 9) also distinguishes these two waves of convergence, but identifies five layers at which integration takes place: infrastructure, transportation, management, services and types of data. Similarly, NOAM (2000) draws a distinction between convergence of delivery technologies, business convergence, regulatory convergence and convergence between telecommunications and the internet.

Building on these predecessors and on BAUER, WEIJNEN, TURK & HERDER (2003), this paper distinguishes between technological, market and organizational convergence (regulatory convergence will not be discussed in detail). Although there is no universally agreed definition of the term "convergence," it is most frequently used to refer to a blurring of the boundaries and/or a reduction of the differences between firms or industries. This blurring can occur in varying degrees, ranging from a partial overlap to a full elimination of differences and thus a fusion of formerly separate sectors. GERADIN (2001) refers to the former as "loose convergence" and to the latter as "deep convergence." An example of partial convergence is powerline communications, in which electricity wires are used to configure a platform for communications. Should powerline communications succeed, electric utilities would overlap with communications service providers in part of their operations, but the two sectors would not fully integrate. An example of deep convergence (or fusion) would be the emergence of fully integrated multimedia service providers, supplying their customers via integrated broadband communications platforms. Furthermore, convergence may be symmetric (two or more formerly separate industries penetrate each other's domain) or asymmetric (one industry expanding into the domain of the other, but not vice versa, as in the case of powerline communications).

Technological convergence refers to developments affecting the technological basis of communications at the level of networks, applications and services. The three most important trends are digitization, increased processor speed and the migration to higher transmission capacity. At the level of networks, migration to a general-purpose platform may unfold in two prototypical ways (as well as hybrids): network upgrades and new deployments. Examples of the first approach are enhancements of one-way cable delivery networks to two-way interactive capability; narrowband voice network to DSL platforms; 2G and 2.5G mobile to 3G networks; and electric distribution wires to powerline communications. Examples of the second approach are the deployment of fiber networks or of broadband wireless networks. Which path will be pursued depends on the revenue opportunities

generated by new platforms and the relative costs of upgrades as compared to the costs of new deployments. Despite digitization and a migration to higher bandwidths, important differences with regard important functional characteristics (such as mobility, reliability and security) remain between technologies. Moreover, given the high costs of new network deployments, limits on the ability to upgrade the existing infrastructure [2], and the different cost structures of platforms, a hybrid path will be pursued by most service providers. For example, SBC deploys fiber to the premises (FTTP) in greenfield developments, but fiber to the neighbourhood (FTTN) combined with VDSL in established service areas. Similarly, Bell South extends the reach of its DSL network with WiMax. Currently, these heterogeneous components are partially integrated by a logical architecture, most importantly the ubiquitous TCP/IP protocol. However, embedded are a variety of proprietary network architectures such as the cable systems' reliance on DOCSIS protocol.

In addition to these technological aspects, economic forces, such as the need to price discriminate to recover the high fixed costs of network investment (discussed in greater detail in the following section) will work towards more differentiated network platforms. Moreover, as more competitors become involved in the development of applications and services, the technological basis at the higher layers of the network stack becomes more differentiated. There is already a broad sense among applications and service providers that a higher degree of standardization would be desirable. With the gradual emergence of the next generation of internet protocols, one can expect a lengthy transition period in which both IPv4 and IPv6 will coexist. It consequently seems likely that the future network infrastructure will be even more heterogeneous and differentiated. Whereas these platforms will provide a broad range of similar functionalities, each will also provide specialized functions not available from any other platform. Areas of differentiation will include the degree of mobility supported by a platform (full mobility, nomadic, stationary); network security; throughput; resilience; quality of service and price. From a technological perspective, forces of convergence are thus counteracted by important opposite forces that are most likely to result in a differentiated technical infrastructure.

[2] Verizon estimates that only 80% of its access lines can be economically upgraded to DSL capability.

The emergence of general purpose technologies affects the boundaries of existing markets and industries, possibly leading to market convergence. It will also enable the creation of entirely new markets and perhaps industries. GREENSTEIN & KHANNA (1997) recognized that convergence may affect the substitutability or the complementarity relations between products and services. The degree of substitutability between products spans a continuum from zero (independent products) to strong (close substitutes). "Convergence in substitutes" implies that products or services become more interchangeable from a user perspective (GREENSTEIN & KHANNA, 1997). For example, news delivered via the internet may become a closer substitute for news delivered via radio, television or newspapers. Wireless telephone services may become a stronger substitute for fixed telephone service. Other things equal, convergence in substitutes expands the choice options of users and therefore tends to increase the intensity of competition. Convergence in substitutes may create incentives for firms to adopt defensive strategies, such as the bundling of services or even mergers to reduce its competition-enhancing effects.

"Convergence in complements" occurs if two or more products or services work better together than they used to (GREENSTEIN & KHANNA, 1997). It occurs if firms develop products or subsystems within a standard bundle of features that can work together to form a larger system. For example, to be a successful provider of multimedia services, it may be necessary to combine networking, computer and design expertise. As such diverse expertise may be spread across several organizations, convergence in complements may create strong incentives for collaboration in alliances, joint ventures or even mergers. Other things equal, the intensity of competition within the cluster of complementary products may consequently be reduced. Convergence in complements may therefore require balancing the benefits from collaboration with the potential losses from reduced competition.

Organizational convergence can be defined as the integration of functions formerly accomplished in separate firms into one enterprise. It can take many forms. For example, the emergence of multi-media companies through vertical and horizontal expansion into adjacent markets could be considered one form of organizational convergence. Alliances, network firms as well as mergers and acquisitions, are other forms of organizational convergence. COASE (1937), WILLIAMSON (1975) and others in the tradition of transaction cost economics have shown that the boundaries of a firm are strongly influenced by the relative cost of conducting transactions via a market, as opposed to internalizing an activity within the firm.

Organizational convergence could thus also be defined as an integration of functions due to cost changes in the production processes employed by the industry and individual firms. The ongoing technological and economic change in information and communication industries affects their economies of scale, economies of scope, and economics of aggregation (BAKOS & BRYNJOLFSSON, 2000). From an efficiency perspective, one would expect organizational convergence in areas where such economies are strong and transaction costs of contracting in open markets are high. In contrast to such "active" organizational convergence, it may also be motivated as a strategy to defend existing market positions, in which case the efficiency impact may be limited or even negative.

■ The economics of convergence

As the discussion in the previous section illustrated, convergence is only one trajectory of the evolution of advanced communication systems. It is accompanied by parallel processes of differentiation and divergence. Moreover, entirely new platforms, applications and services emerge, such as peer-to-peer networking, wireless *ad hoc* networks or blogs that are enabled by advanced networks, but are not necessarily a "convergence phenomenon." Although multiple technological, corporate-strategic and political forces are at work and the outcomes are difficult to predict, it is possible to identify the important economic principles that shape them. From an economic vantage point, technological convergence can be seen as the emergence of a general-purpose technology (BRESNAHAN & TRAJTENBERG, 1995). Market and organizational convergence are influenced by these changes in the technological basis. An understanding of strategies in response to convergence therefore has to begin with the economics of convergence.

Digital network platforms, applications and services share the common characteristic of high upfront (possibly sunk) costs and relatively low, and, in extreme cases, even zero, incremental costs. However, their cost structures, particularly the magnitude and relative importance of fixed and variable cost, differ. For example, wireless broadband networks require lower initial capital outlays, but typically have higher variable operations and maintenance costs. Upgrades of analog cable networks to digital interactive platforms or upgrades of narrowband voice networks to DSL capability require more modest investments per home than the deployment of fiber-to-the-

neighbourhood (FTTN), fiber-to-the-curb (FTTC) or fiber-to-the-premises (FTTP), the most expensive solution. In metropolitan areas, upgrades of existing networks may be carried out at an investment expense of USD 250-500 per home, while greenfield fiber solutions may cost up to USD 2,500 per home [3]. It is helpful to conceptualize network rollout as a two-stage decision: during the first stage service providers determine the coverage and capacity of the network; during the second stage, once the investment is sunk, they will compete for customers using price and non-price instruments. As the total capital outlay and installation costs are dependent, among other factors, on the number of homes connected, network deployment costs are a combination of fixed and variable components. However, once the network is in place, with regard to the provision of services using the platform, the costs of the network are fixed (and largely sunk). The different cost structures of alternative network platforms will place limits on the degree of technical convergence. It is therefore likely that the future network will remain heterogeneous with large areas that are seamlessly integrated, but others that are not.

At the level of content production, costs are likewise characterized by high upfront and sunk cost. A motion picture, a television show, a news internet site or a database all require sinking funds before the product or service can be sold. Once created, the incremental costs of copying and distribution – via CD, DVD, broadcasting, cable, or the internet – are typically low. However, the cost structure also depends on the vertical organization of the industry. The above scenario directly applies for a vertically integrated company with a presence in production and distribution. Companies operating only at the distribution stage have to acquire content. If content is bought at a fixed price, the sunk cost scenario applies. However, in some forms of distribution, for example, internet streaming, royalties, which constitute a major portion of the expenses, are based on the number of streams and hence are a variable cost of production. In the first case, the sunken nature of the cost creates strong economic pressures to maximize sales and/or audience sizes; in the latter cases, the economic pressure to be big and take advantage of economies of scale is lower.

As the capacity of the networks in place expands and an increasing number of platforms are principally able to provide digital services, large

[3] Corning, a major fiber manufacturer, has published figures stating that, due to technical innovations and price declines for components, new fiber networks could be deployed for as low as USD 1,200 per home connected. See USTA "FTTH: Market Drivers, Economics, and Technologies and Deployments", July 12, 2005, p. 19.

segments of the market for information transportation may start to resemble commodity markets with low profit margins. It has become a widely shared view that higher value-added, and hence profit opportunities, will be associated with applications and services (or in general activities at higher levels of the network stack). Whereas this may be true in some market segments, in others similar tendencies towards commodification may apply. For example, access-independent VoIP service, such as Skype or Google Talk, will not only create enormous pressure on the existing telephony business model that charges by the minute, but may also undermine other VoIP service providers such as Vonage. In areas where profit margins will be eroded quickly, a mismatch between the cost structure and profit opportunities of the industry is created. Combinations of high sunk costs and low profit opportunities are not stable and will necessitate adjustments by the service providers [4]. Two principal strategies are available: (1) a differentiation of the network, application and service layers to avoid commodification, or (2) partial or full vertical integration between network and content layers (or at least the formation of alliances between firms at these levels).

A differentiation strategy may be implemented in many ways. Network service providers may offer different qualities of service at different prices. For example, at the retail level, broadband access providers offer higher access speeds at higher prices. They often also limit the amount of data that may be downloaded per month in any given price bracket. At the wholesale level, different service level agreements at varying prices are available as well. Fiber network operators like Verizon offer open wholesale and retail platforms in addition to closed platforms. For example, consumers may buy bundled video, internet, and voice service from Verizon, which will be provided via a closed platform. They may elect to only buy a broadband access platform and contract for IPTV service independently. Moreover, technical convergence does not imply that advanced networks will have clearly defined horizontal layers. Service providers like Akamai invest in overlay networks that defy the supposed horizontal layered structure of the internet (CLARK, 2005). A vertical integration strategy attempts to reduce the risk of commodification by creating a presence in supposedly high value-added application and service layers. However, it is not straightforward and network service providers many not have all the core competencies required to pursue a successful vertical integration strategy. Both strategies, as well

[4] This is different from the past, where high costs at the network and applications level were typically matched by high added-value at that level.

as hybrids combining both approaches, are being pursued by U.S. companies, as discussed in more detail in the next section.

Convergence also affects market entry barriers, although the net effects are difficult to anticipate. It is useful to distinguish between its effect on exogenous and endogenous entry barriers. Exogenous entry barriers are beyond the control of firms in the market. Convergence may increase some exogenous barriers, but reduce others. For example, if technical convergence results in increased economies of scale and scope, it will, other things equal, increase entry barriers, as fewer facilities-based access providers may be able to survive in the market. However, if the extent of such economies relative to the market remains limited, convergence may reduce market entry barriers, especially for applications and service providers who may be able to choose from competing network platforms. In a fully digital environment, network service providers have many opportunities and incentives to differentiate their services to create endogenous market entry barriers, especially if they are not subject to any non-discrimination requirements as is the case for broadband in the U.S. At the same time, network operators have incentives to make their platform available to third parties to internalize some of the complementary externalities created by applications and service providers (FARRELL & WEISER, 2003). The incentives of platform owners to grant access to third parties may be further enhanced once the initial costs are sunk. The net effect of these contrary forces is not fully understood in practice and it will remain to be seen whether the self-interest of network owners and antitrust will be effective in preventing abuse of such strategies.

All these developments suggest that the economics of advanced networks are much more complicated than anticipated in early models that predicted convergence to full-service networks. The relative ability of existing and new service providers to take advantage of the new opportunities enabled by convergence varies greatly. For example, cable companies enjoy an advantage in bundling services over telephone companies, who eventually will have to upgrade to some form of fiber optic network infrastructure to effectively deliver video entertainment services, for which ADSL is not fast enough. Similarly, whereas wireless service providers will enjoy competitive advantages due to their mobility, they will face major difficulties in delivering high-quality entertainment services, unless big breakthroughs occur. Terrestrial broadcasters and satellite service providers have large and relatively stable audiences, but face enormous hurdles in upgrading their analog infrastructure. Even with an all-digital infrastructure, their ability to offer a broad range of services is more limited than that of

other facilities-based service providers. Overall, it is likely that all these technological and economic factors will generate a heterogeneous network infrastructure with associated differentiated applications and services. The next sections look at corporate strategies in response to convergence and to actively shape the emerging market environment.

■ Bundling

The bundling of services allows service providers to reduce variability in the willingness to pay for individual services and at the same time increase their revenues (SHAPIRO & VARIAN, 1999). For example, assume that consumer A is willing to pay USD 60 per month for cable TV and USD 30 for voice services. Furthermore, suppose that consumer B is willing to pay USD 80 for cable TV, but only USD 5 for voice service (perhaps because he/she is using VoIP). If the service provider charged USD 85 it could sell cable TV and voice service to both consumers, for total revenues of USD 170. Other pricing strategies would yield lower total revenues [5]. If consumers have more complicated preference structures, as is likely, more differentiated mixed bundling strategies can be adopted with similar effects. For consumers, bundling may reduce the overall outlay for services compared to stand-along purchases, but the one-stop shopping model may also create benefits due to reduced transaction costs (such as one bill for one service provider). Ideally, bundling has beneficial effects for suppliers and users. In the economic environment described in the previous sections, the bundling of services fulfils important additional strategic functions. It allows service providers to shield themselves, at least to a certain degree, against market entry by nimble competitors in one market segment, such as access-independent VoIP service providers. In a broadband environment, companies like Vonage or Skype could enter the market with relatively modest customer acquisition costs and only minimal facility investment. However, if an incumbent is able to bundle voice services with services – such as entertainment or internet access – that the potential entrant in a single segment cannot supply, it may be able to offer the contested service at a low, perhaps even zero, price within the bundle [6]. This will drastically

[5] For example a price for cable TV of USD 60 and for phone services of USD 30 would yield USD 150; a price for cable of USD 80 and for voice of USD 10 would yield USD 90.

[6] Firms offering components of a bundle at low prices will have to avoid antitrust action. There are no clear rules with regard to bundling. Courts seem to have considered discounts in excess

reduce the market entry opportunities of potential new entrants that only compete in one market segment. More generally, bundling of services will create entry barriers for companies that are present in fewer market segment than the incumbent (NALEBUFF, 2004) and will thus, other things equal, reduce the intensity of competition.

Until recently, incumbent service providers in the U.S. were typically constrained from bundling monopolistic with competitive services due to concerns about predatory behaviour. For example, after the U.S. Telecommunications Act of 1996 ("Act"), the Regional Bell Operating Companies (RBOCs) could not offer integrated bundles of local and long distance services in their own service territories until they met the conditions established in the 14-point checklist of section 271 of the Act. Likewise, although all of them had wireless subsidiaries, RBOCs could not offer bundles of wireline and wireless services until recently. It took until December 2003 for the RBOCs to receive approval to offer long distance services within their own service territories [7]. However, interexchange carriers and cable companies were freed by the Act to compete in local markets. AT&T's "One Rate" plan and MCI's "Neighborhood" plan were first examples of bundled local and long distance service. By 2002, bundled local and long distance service was the most popular integrated offering. As their restrictions were eliminated, RBOCs started to offer integrated local and long distance service packages as well. In July 2002, Bell South introduced bundles (branded "Answers") that included local and long-distance telephone service, internet access and wireless services (via the joint SBC-Bell South subsidiary Cingular). In August of the same year, Verizon introduced a similar offer, branded "Veriations All". Both services included one integrated bill and discounts from the unbundled price (BRIER & GAGE, 2002). Cable companies such as TCI had experimentally offered telephone services as early as 1994 and internet access shortly thereafter. Cable modem access started to grow more rapidly in the late 1990s, but cable telephone service offerings grew only slowly. With the broader appeal of VoIP, cable voice services are now growing faster. As of December 31st, 2004, 3.7 million access lines were served by cable companies, equalling 44% of all lines provided by facilities-based carriers (but only 2% of all local access lines, FCC 2005, p. 3). The introduction of national calling plans by

of 10% of the variable cost as anticompetitive (BIANCO, 2004). However, given the low incremental cost of voice services provided on broadband networks, network owners could probably defend a low price.

[7] See: http://www.fcc.gov/Bureaus/Common_Carrier/in-region_applications/[October 15, 2005].

wireless service providers (also led by AT&T's move to introduce "buckets" of minutes with its "Digital One Rate" plan in 1998) and the pricing plans by VoIP service providers also reflect the integration of local and long distance service pricing.

Within a short time, triple-play (fixed voice, video and internet access) and quadruple-play (fixed voice, wireless, video and internet access) offerings have emerged as the consensual vision for the future of the industry. Interestingly, the early pioneers in this area were rural local exchange carriers (RLECs). Some pundits estimate that several hundred RLECs are presently offering bundled services. RLECs are small companies, often with fewer than 5,000 customers, but many of them can take advantage of their close customer relations, familiarity with local conditions, and a trusted brand name. For example, Paul Bunyan Rural Telephone Cooperative in Bemidji, Minnesota offers six service packages that combine in different bundles local phone service (long-distance is offered separately at flat rates), internet access, and digital television service, at discounts ranging from USD 2.95 to USD 26.13 [8]. Another small rural telephone company, Ringgold Telephone Co. in Ringgold, Georgia, introduced a television service in 2001. It does not offer bundled packages at discounted prices, but provides the full range of voice, data and video services [9]. One challenge for small RLECs is the licensing of programming. Their business association, the National Telecommunications Cooperative Association (NCTA) serves as an intermediary to license programs.

During the past two years, the leading cable and telephone companies in the U.S. and Canada have moved aggressively to introduce various bundled packages. The starting positions of the two main players (cable and telephone companies) are not equal. With a broadband distribution networks in place and fewer regulatory constraints, cable companies have an advantage in the market for bundled entertainment services. Their main revenue drivers are entertainment and broadband internet access. Voice service is often added at a discounted price to enhance the incentives to buy bundled packages. However, cable companies face disadvantages in offering mobile services. As of October 2005, only Rogers Communications in Canada has expanded into mobile service offerings. (There are also rumours that Comcast might acquire T-Mobile in the U.S. and/or form an MVNO agreement with Sprint Nextel.) Incumbent telephone companies

8 See http://www.paulbunyan.net/index.html (last visited October 16th, 2005).

9 See http://www.rtctel.com/ (last visited October 16th, 2005).

(ILECs) were not able to offer video services without significant network upgrades. In the USA, Verizon Communications elected to invest in FTTP, although this implies a higher investment cost and probably a slower rollout process than the hybrid strategies (FTTN, FTTC) pursued by other incumbents SBC ("Project LightSpeed") and Bell South. Verizon has introduced FiOS, a higher-speed internet access service, providing download speeds of 5, 15, or 30 Mbps in selected communities (such as Keller, Texas).

Table 1 summarizes selected features of triple-play and quadruple-play plans. Prices, service offerings and promotional discounts vary by location and rollout of services is heterogeneous. Certain services, say cable telephony or Verizon's FiOS service, are only available in specific locations. Service providers typically require that a potential consumer identifies a location before pricing information is revealed. This strategy substantially reduces market transparency and makes it nearly impossible to systematically compare prices across locations. Some general patterns are visible from table 1. Comcast, Time Warner Cable, and Cox Communications, the three largest cable multiple system operators (MSOs), do not (yet) offer mobile services and thus are at best competing in the market for triple play bundles. None of these companies has deployed voice services throughout their service territories. Thus, in many areas they effectively compete only in the video and internet bundle market. The RBOCs SBC and Verizon have a strong presence in local and long distance voice markets as well as wireless (SBC co-owns Cingular and Verizon partnered with Vodafone to form Verizon Wireless). On the other hand, with the exception of Verizon's fiber optic FiOS service, which is available only in a few locations, their networks are not yet capable of delivering high-quality video. Thus, each company has (temporarily) teamed up with a satellite service provider (SBC with DISH network, Verizon with DirecTV) and sells DBS service, but not as part of an integrated bundle.

Given the many choice options in basic service options, bundled prices typically give a discount on the total price of the individual services, contingent upon the purchase of certain services. For example, Comcast grants a discount of USD 10.00-15.00 on its digital voice service, depending on whether a customer has signed up for either cable or internet, or both services. SBC customers are only eligible for discounts ranging from USD 2-USD 11 if they buy local and long distance voice services from the company.

Table 1 - Bundling options offered by major U.S. cable and telephone companies (price in USD as of October 1st 2005)

Service offering	*Voice*		*Video/entertainment*			*Internet*		*Mobile*	*Bundle*
	Local	*LD*	*Standard cable*	*Digital cable*	*DVR*	*With cable/ phone*	*No cable/ phone*		
Comcast Cable (Southfield, Michigan)									
Individual	54.95 (Comcast Digital Voice)		45.99	57.94-96.99	9.95	42.95	57.95		
Preferred	44.95			X					
Preferred	44.95					X			
Preferred	39.95			X		X			
Cablevision (New York, New Jersey)									
Individual	34.95			39.90		44.95	49.95		
Double play (introductory)	29.95			39.90		29.95			
Double play (regular)	34.94			39.90		44.95			
Triple play (introductory)	29.95			29.95		29.95			
Triple play (regular)	34.95			39.90		44.95			$20 discount
SBC Communications (Michigan)									
Individual	27.95-39.95	15.00 (flat)	29.99-86.99 (depending on channel line-up, in partnership with DISH satellite network)			14.95-24.99 (various dial-up and DSL plans with Yahoo)		39.99-69.99 (Cingular)	
SBC Total Connections	X	X	Sold separately			X		X	Save up to 11.00
SBC Connections	X	X	Sold separately					X	Save up to 5.00
SBC Connections	X	X	Sold separately			X			Save up to 3.00
All Distance Select	X	X	Sold separately						Save up to 2.96
Verizon Communications (Michigan)									
Individual	34.95 (Voice Wing)		41.99 and up			DSL: 14.95 (768 kbps) – 37.95 (3 Mbps); FiOS: 34.95 (3 Mbps)-199.95 (30 Mbps)		39.99 (450 minutes)-199.99 (6000 minutes)	
Verizon Freedom	64.95 (local and long distance plus features)		41.99 and up			14.95 and up			Up to $6 triple play discount

Sources: Comcast: http://www.comcast.com/; Cablevision: http://www.optimum.com/; SBC: http://www.sbc.com/; Verizon: http://www22.verizon.com

Similarly, Verizon customers are eligible for discounts of up to USD 6 per month if they combine its local and long distance bundle ("Verizon Freedom") with internet access and DirecTV. Market transparency is further reduced by the widespread reliance on introductory special pricing offers and additional discounts for multi-year contracts. For example, in many areas Comcast offers high-speed internet access to new customers who are also Comcast cable subscribers for USD 19.99 per month, in contrast to USD 42.95 per month for undiscounted service to existing customers. Cablevision, a cable system in New York and New Jersey, offers aggressively priced double- and triple-play introductory bundles, under its "Optimum" brand. Each product in the bundles is priced at USD 29.95 for the first year with prices going up to the market rate thereafter (triple play customers will receive a USD 20 discount from the market price after year one). Although the introductory offer does not state what these prices might be, a large number of customers sign up per day. Cablevision is also running a trial providing a TiVo digital video recorder (DVR) with a wireless router, integrating a broadband backchannel into the bundle. In many of the bundled service agreements, penalties apply for premature cancellations in multi-year contracts, even if a customer only wants to drop one component of a bundle. All these observations support the theoretical conclusions that converged markets will be characterized by substantial price and service differentiation.

■ Differentiation and diversification

Not all incumbent and potential new service providers have the resource base or the skills to offer fully bundled services. Terrestrial mobile service providers, satellite service providers and terrestrial broadcasters all are limited by the technical capabilities of the embedded network infrastructure and/or by financial constraints. Although digital technology and increased network capacity will relieve some of the exiting constraints, these companies will more likely be participants in triple- and quadruple-play strategies rather than orchestrators. Software developers, portals, equipment manufacturers and system integrators are likely to be in a similar position. At least for the foreseeable future these companies will either be integrated in the bundling strategies of incumbent fixed network providers or they will have to pursue more limited differentiation and diversification approaches. Despite their more limited scope, they can be effective

competitors and will exert significant competitive pressure in certain market segments.

Terrestrial mobile service providers currently do not have the bandwidth deployed to offer a range of services comparable to those offered by fixed network service providers. However, as mobile networks are upgraded to 2.5G and 3G capability and augmented with hotspots and perhaps WiMax a broader range of services may be offered. The United States does not have an explicit "3G strategy." Spectrum earmarked for 3G services will have to be cleared from present users and will not be auctioned until June 2006. However, mobile service providers may use their existing licenses to deploy 3G services. Compared to Europe, the U.S. mobile industry pursued a more gradual transition to advanced mobile services. However, even if most of the network were upgraded, it is questionable whether mobile service providers could become the organizers of effective triple or quadruple play offers. The largest U.S. wireless service providers, Cingular and Verizon, are affiliated with RBOCs and folded into their bundling strategies. At present, their services are both marketed on a stand-alone basis and as part of a bundle. In any case, they will have to pursue strategies to reduce the decline in average revenues per user (ARPU). Similar developments are to be expected from the other national mobile service providers (Sprint/Nextel, and T-Mobile) and perhaps from the over 100 regional and local mobile voice service providers in the USA [10].

Both mobile service providers affiliated with fixed networks and independent wireless operators pursue strategies of diversification, enabled by digitization and convergence. Some of these diversification efforts are organized as alliances and joint ventures. For example, between 2003-2005 Sprint Nextel PCS expanded its mobile voice and data offerings with a spectrum of multimedia services. Customers of its Vision Multimedia Service have access to several radio services, TV, comic strips and games. Radio service includes several options, including 20 channels provided by satellite radio operator SIRIUS (SIRIUS Music), on-demand access to radio services such as public radio, and premium services. Television services include CNN, Fox Sports, The Weather Channel, and GoTV (delivering news from Reuters and AP, film reviews from *Variety*, etc.). Most recently, Sprint Nextel announced a partnership with Real Networks, whose Rhapsody Radio

[10] According to FCC reports, by December 31st, 2004, 76 mobile service providers had over 10,000 subscribers. Many smaller firms offered wireless service on a local and regional scale. See FCC (2005b, p. 3).

service will be available in streaming format for USD 6.95 per month. Verizon Wireless has introduced VCast in 60 metropolitan areas, streaming news, entertainment, sports and weather clips. At the time of writing, VCast offered a much narrower range of services than Sprint Vision Multimedia. Cingular also offers games for downloading and a (relatively narrow) range of news, financial information, weather, etc. via its MEdia Net.

Digitization and convergence also offers market entry opportunities for new players, including portals like Yahoo or MSNBC; search engines like Google and software developers like Microsoft. Skype, developed by Sharman Networks, the designers of KaZaA, used its experience in peer-to-peer software and networking to launch an internet-based voice service. Free between users running the Skype software on their computers or mobile devices, SkypeOut and SkypeIn offer services to the general user population. Following Skype's lead, Yahoo has introduced its Messenger service, offering free PC-to-PC calls. Similarly, Google offers Google Talk, as well combining calling and messaging services. These services pose considerable challenges for incumbent voice service providers, especially among young user groups. Some of these players are also deploying mobile access networks. For example, Google has announced that it would invest in free wireless broadband network covering San Francisco and Nintendo has announced that it will offer free wireless broadband access in McDonald's restaurants. Rapid innovation is also affecting home and business environments. One development is fixed-mobile integration. In enterprises, VoIP is used increasingly for internal communications. In the USA and Canada, fixed-mobile convergence for residential users is developing only slowly. However, interesting experiments are underway in home networking. For example, e-music retailer Napster also sells wireless hotspots to stream media content from a PC to a TV set [11].

■ Mergers and alliances

For many advanced applications and services the value chain (or value network) has become much more complicated, not only involving more players (and thus more challenging coordination tasks), but also requiring a high degree of synchronicity to successfully launch an innovation. For example, mobile banking requires, among others, the collaboration of

[11] See http://www.napster.com/using_napster/napster_in_your_living_room.html.

financial institutions, mobile service providers, equipment manufacturers, applications developers and perhaps portals. No individual company is likely to have the core skills necessary to solve all issues in-house. The requirement to coordinate the activities of several firms and their interdependencies raises complicated collective action problems, especially if a market is characterized by high uncertainty and financial risk. For example, network service providers may be reluctant to introduce new functionality before equipment manufacturers supply the necessary devices. However, equipment manufacturers may not be willing to produce devices until they see what the network can support. These problems can, at least to a certain degree, be overcome if firms collaborate in alliances and joint ventures. For example, NTT in Japan and SK Telecom in Korea played a leading role in the development of i-mode and Nate − the only two examples of successful mobile portals − coordinating the activities of equipment manufacturers, applications providers, and content providers to ascertain interoperability of the services. Mergers may also help overcome coordination issues. Both alliances and mergers may be pursued as active or defensive strategies.

A full treatment of mergers in the U.S. communications markets would far exceed the scope of this paper. A few remarks in the light of the economics of convergence nonetheless seem appropriate. It was argued that convergence in complements may be a strong incentive to merge and enhance requisite skills and resources. Convergence in substitutes, which will tend to increase the intensity of competition, will create incentives to seek defensive vertical and horizontal mergers. NOAM (2003) has studied the degree of concentration in U.S. communications markets in great detail. On the whole, concentration in the industry declined until about 2000 and then started to increase again. The completed and pending mergers of the past few years have accelerated this general trend. In a series of mergers, four of the seven RBOCs were integrated into only two (SBC, and Verizon). AT&T and MCI, the two independent long distance service providers, are in the process of being absorbed by SBC and Verizon respectively.

National wireless service providers are also consolidating: AT&T Wireless was taken over by Cingular, Sprint PCS is in the process of merging with Nextel, and the seventh and eight largest providers (Alltel and Western Wireless) are also merging. Once the pending mergers are consummated, nearly 75% of wireless subscribers will be served by a subsidiary of a wireline company, casting doubt on the much-touted vision that wireless will become a strong competitor to wireline service. It is more likely that service providers will emphasize the complementarities between

mobile and fixed services and pursue strategies of fixed-mobile integration. Presently a large number of wireless broadband service providers is entering the market (estimates range from 2,800 to 6,000 start-ups). Many of these experiments will fail and some of the successful service providers are likely to be taken over by the existing, larger conglomerates. NOAM's (2003) expectation that 2½ facilities providers will emerge in most markets is somewhat supported by these observations. An unresolved question is whether such a highly integrated industry will develop effective competition or patterns of manipulated competition. Given the high sunk and low incremental cost, the latter scenario is not a foregone conclusion, but if materializes, it will be at odds with the widely anticipated highly competitive convergence future.

Table 2 - Selected recent alliances in the communications industries

Participants	*Purpose*
SBC-Yahoo; Verizon-Yahoo; Bell South-Yahoo	Co-branding of (broadband) internet access
SBC-EchoStar; Verizon-DirecTV	Sale of satellite broadcasting service as component of quad-play strategy
Comcast-TiVo	Digital Video Recorder service, interactive advertising
Comcast-T-Mobile	Marketing alliance to offer T-Mobile HotSpot Wi-Fi internet service to Comcast customers
Cingular-Dell; Sprint Nextel PCS-Palm	Integration of advanced wireless services and hardware
Comcast, Time Warner, Cox Communications, Advance/Newhouse-Sprint Nextel	Alliance between various cable companies and Sprint Nextel to offer TV on mobile phones beginning in 2006
SBC-Hewlett Packard; Cingular-Computer Associates; Bell South-Air2Web	Business and enterprise solutions
Sprint Nextel PCS-Real Networks; Sprint Nextel PCS-SIRIUS; Verizon-MSN	Mobile broadcasting and streaming content
Sun Microsystems-Google	Cross-distribution of software
Microsoft-Yahoo	Integration of instant messenger services

Mergers have also re-shaped other segments of the industry. Most prominently, the merger between AOL and Time Warner was seen as the logical response to convergence. Years later, it is evident that the merger, at least in its initial conception, failed to meet its expectations. Earlier attempts to create multimedia empires by Vivendi Universal also did not succeed, although for different reasons. Nevertheless, information technology companies have adopted strategies to expand into media and media companies to expand into the internet. For example, News Corporation recently acquired MySpace.com, giving it access to a social network of 33 million people online.

The last few years have seen a plethora of alliances and joint ventures. Table 2 summarizes a selection of recent partnerships and their main purpose. Keeping an accurate track of these activities is nearly impossible as the beginning of collaboration is usually announced widely whereas its demise is concealed. It is also difficult to assess the success of alliances in a systematic fashion. Compared to the size and likely impact of mergers, the above alliances look like more limited and narrowly targeted activities. Some, like the alliances between RBOCs and DBS service providers, are likely to be temporary and may be abandoned once the carriers have upgraded their own terrestrial networks. At that point in time, they may just contract for content directly. Several recent agreements, for example, between Verizon, Disney and Starz, all point in that direction. Contractual models are also likely to develop for short episodes to be viewed at mobile phones. Such mobisodes are developed by the MTV Networks division of Viacom, Disney, and Warner Brothers.

■ Summary and outlook

Convergence is a reality, but it has shortcomings as an organizing lens to strategize and theorize the present and future of communication industries. Early views of convergence anticipated an amalgamation of the formerly separate voice, data, audio and video segments into one industry. Such forecasts tacitly, but erroneously assumed that technological convergence propelled by digitization, higher processing power of computers and higher bandwidth, would inevitably lead to market and organizational convergence. Whereas such developments do occur, they unfold in more multi-faceted ways than commonly expected. Moreover, the effects of convergence on competition are not unanimously positive, as earlier analyses seemed to suggest. Other things equal, convergence in substitutes will intensify competition, but convergence in complements are likely to reduce it. As both processes unfold in parallel, it is difficult to predict the overall effect of convergence. Moreover, the economics of advanced communication networks and applications work against full convergence. Most importantly, firms facing high upfront and low incremental costs will have to differentiate their technology platforms, applications and services to be able to price discriminate and recover the initial investment.

As the empirical evidence presented in this paper illustrates, firms have adopted a broad range of responses – including bundling, differentiation,

mergers and the formation of alliances – with complicated effects on the organization of the communications industries. There is strong evidence that the market has undergone a bifurcation: on the one hand, convergence does integrate the technological basis and allows more integrated offerings; at the same time, the availability of service and pricing packages is highly fragmented and differentiated. The markets for advanced communications services, while they offer a high degree of flexibility, have at the same time lost transparency. This may be a temporary phenomenon and vanish once services will be deployed on a more ubiquitous basis, but this is by no means certain. The opportunities to benefit from convergence are asymmetrically distributed. Cable companies and telephone companies are presently best positioned and seem poised to take advantage of triple and quadruple play offerings. However, the network infrastructure of telephone companies needs major upgrades to be capable of delivering video on demand services. Cellular wireless service providers, broadcasters, and satellite service providers face even more significant hurdles before they may offer a broader range of services. Wireless broadband is presently a booming market, but the economics of this sector are more risky than often assumed. Nevertheless the sector seems to have an important role to play on the edges of the communications infrastructure (BAUER, DENG, LAI & JI, 2005). Powerline communications may add an additional platform; but are currently only available on a limited basis. Their main strategy is likely to emphasize diversification and differentiation.

Technological convergence has created many opportunities for new service providers to enter the market for communications services. Among them are numerous VoIP providers, such as Vonage or Skype, which are viable as long as they can get access to broadband platforms. Information technology companies like Google, Yahoo and Microsoft have also sought to enter the market for communications services and are winning a growing share of it. The telephone companies, at least in the long run, will face increasing price pressure in some traditional voice market segments (they will probably remain dominant suppliers in smaller local markets). Triple play strategies are thus a critical survival strategy. Cable service providers managed to overcome the problems of a mature and saturated market for entertainment services with broadband internet access. Multimedia services, such as interactive games could be seen as the next source of revenues once internet access prices, which have remained relatively high, start to decline. As a result of the economics of convergence, the emerging market environment will be differentiated and market transparency may be low, at least initially. While consumers will benefit from a broad range of choices,

they will also face certain costs of diversity, such as switching and search costs. Overall, convergence is transforming market boundaries and industry organization. It is also enabling new services and creates extraordinary opportunities for differentiation. Convergence has both competition-enhancing and competition-reducing effects. Its impacts unfold in ways that often deviate from early expectations, assuring an exciting and challenging future for the industry.

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