

Research in Convergence: A Literature Analysis

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Convergence is a complex phenomenon which involves multiple economic layers of regulatory bodies, industries, firms and users, and poses both challenges and opportunities for all of them. Although research on convergence has recently grown, there is little research which reviews the studies of convergence in the past and present, and critically discusses the development of convergence research. To fill this gap, this paper examines the current status of convergence research by use of a library meta-search engine. The analysis of the articles retrieved offers a series of snapshots regarding present studies on digital convergence in terms of the type of convergence dealt with, the level of analysis, and so on. The analysis also shows that most research by now is theoretically oriented at the macro level (i.e. regulatory and industrial), and suggests that more empirical research from the micro perspective (i.e. firms and users) is required.

Keywords: research, convergence, literature analysis, library meta-search engine

ACM Classification: K.1

1. INTRODUCTION

Advances in Information and Communications Technology (ICT) have revolutionized almost every domain of industry and society and have ushered in a new era of convergence. This apparent trend towards convergence is a result of the development of digital technology and rollout of digital infrastructure.

Convergence is a complex phenomenon and is defined in various ways in literature. For instance, digital convergence often refers to the convergence of different networks due to increasing interconnection and interoperability, the convergence of services and markets, the convergence of firms and industries, and the convergence of regulatory institutions (Ovum, 1999). The concept of digital convergence implies offering new services, infrastructures, or features (ITU, 1996) as well as integrating various consumer interfaces (EU, 1997). As such, convergence involves both

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technological development and a socio-economic process. Convergence leads to the breakup of old value chains by enabling firms to directly approach end users, often eliminating intermediaries in the value chain (Yang *et al*, 2004).

Many new services in telecommunications and media, which are often touted as breakthrough or killer applications in the stalled value chain for the sector concerned, relate to the concept of convergence. Digital multimedia broadcasting (DMB) is an example of convergence between telecommunications and broadcasting; 'one-phone' service is from convergence between fixed and mobile networks; telematics from convergence between telecommunications and the automotive industry, to name a few.

Although convergence was discussed as early as the late 1980s or early 1990s (Baldwin *et al*, 1996), it was discussed only as a possibility. As of now, however, convergence has become a reality, and those services mentioned above are already available in many parts of the world. As such, convergence poses both challenges and opportunities for firms and affects individuals as users/consumers of convergence services. Due to its huge implications and significance for the economy, research on convergence has grown, particularly in recent years. Despite this growth, there is no review article which examines the studies of convergence in the past and present, and critically discusses the development of convergence research. To fill this gap, this paper presents the current status of convergence research with a view to identifying knowledge gaps in the convergence literature. By so doing, we aim to offer a direction for further research.

The rest of the paper is organized as follows. Section two discusses how convergence has emerged by addressing key drivers. Section three describes the method used for data collection and analysis. The findings are presented in Section four where the papers reviewed are classified by the type of convergence, the methodology used, the level of analysis (research perspective), the country of author affiliation, and the country on which each study is based. A discussion about the implications of the findings follows in Section five, which is followed by concluding remarks.

2. DRIVERS FOR CONVERGENCE

Key drivers that enable convergence can be categorized into four areas: technological evolution, business and market concerns, users' demand, and regulatory policies.

In the first place, digitization of all types of signals facilitates duplication, transmission, and manipulation of any type of information and hence makes convergence possible. Thanks to digitization, any type of terminal can access any type of data, which in turn can be transmitted through any kind of pipe (Bore's *et al*, 2003). This implies that businesses and users may have access to a considerable amount of information in an interactive way using any type of terminal. Information that is transmitted is platform-independent, which means that there are several alternatives (traditional copper wire, wireless, cable or television antennae) to transmit the information and content.

Recently, the emergence of various new technologies has increased convergence rapidly. In particular, developments in wireless and Internet technologies have led the trend. For example, in access technology, the 2.4 GHz and 5 GHz broadband versions of wireless LAN (WLAN) have been commercialized, and Bluetooth and code-division multiple access (CDMA) 1xEV-DO (Evolution Data Only) have been developed with corresponding converged terminal devices (Yang *et al*, 2004). Technologies involved in the Next Generation Network (NGN), artificial intelligence, sensors, and web-related technologies also contribute to the trend of digital convergence.

The second driving factor for convergence is business concerns for market growth and firms' strategic positions. Faced with market saturation and the prospect of stagnation, the telecommuni-

communications industry is now seeking new opportunities through convergence. With the growth of mobile communications, fixed-line operators have experienced a continuous decrease in their revenue as traffic moves from fixed to mobile networks (Horvath and Maldoom, 2002 for call substitution; Gruber and Verboven, 2001 for subscriber substitution). Thus, many fixed-line operators are conducting trials of convergence services in an attempt to maintain their market share and increase revenue per subscriber. One example of such services is one-phone service, in which customers are provided with a single mobile phone both for home use on fixed-network tariffs and for road use at mobile rates. The one-phone service provider attempts to gain a commercial advantage by leveraging its competency across both fixed-line and mobile connections, although at present problems with data communication are preventing one-phone service from delivering the anticipated benefits (Studer, 2001). For mobile service providers, the prospect of fixed-mobile convergence (FMC) offers service enhancement as well as cost savings in areas such as network infrastructure, sales channels, and customer support. Telecommunication firms are also involved in inter-industry convergence. A representative example is telecommunication-broadcasting convergence, the motivation for which is firms' desire to achieve economies of scale and scope, and eventually to maximize profit through the creation of new revenue streams (Chan-Olmsted and Kang, 2003; Yoffie, 1997). Inter-industry convergence distinctly requires at least two different providers of entirely different origin (in the case of mobile payment or mobile banking, for example, typically a communications provider and a conventional retail bank). These partners collaborate in the knowledge that they may eventually become competitors in the same marketplace (see Oh *et al* in this issue for example). Inter-industry convergence creates for telecommunication players the problem of dealing with a new set of customers (and customer requirements).

Users' needs related to mobility, portability, and high speed also contribute to the progress of convergence. Users are accustomed not only to the high speed of fixed lines, but also to portable devices like laptop computers and personal digital assistants (PDAs). Therefore, fixed-mobile convergence is in strong demand. The DMB system has been designed to complement mobile networks by offering so-called 'take-out TV' on mobile devices. In Internet Protocol TV (IPTV) various data services based on interactive two-way communication are available, which allows, for instance, users to watch films while searching for information in the background or executing other tasks such as home shopping.

The regulatory aspect (in fact, deregulation) is another important driver for convergence. In the area of fixed-mobile convergence, for example, the Canadian government allowed telecommunications providers to offer any type of fixed and mobile convergence service in 1998. The FCC in the United States also allowed incumbent local exchange carriers (ILECs) to sell convergence services (Yang *et al*, 2004). The convergence between voice and data communications was prompted by the Computer Inquiries (in particular, Computer II in 1981 and Computer III in 1986) and was facilitated by the 1996 Telecommunications Act of the U.S.A. (Cannon, 2001). The convergence between telecommunications and broadcasting is heavily dependent on regulatory arrangements, especially on the degree to which broadcasting and telecoms are regulated by a single body. Although Great Britain has such a system, Ofcom, in place, it has not yet been established in most countries (Blackman, 1998; Wu, 2004; Zhang, 2002). One of the reasons for the slow take-up of DMB in Korea is a regulatory dispute between the telecommunication regulator and the broadcasting one. For inter-industry convergence, such as mobile banking, telecommunications providers must understand not only the regulations for the telecommunications sector but also those of the banking industry.

3. DATA COLLECTION

We have focused on journal articles and excluded book chapters and conference papers. Although conference papers may include papers with up-to-date information and research, it is likely that they are part of research in progress. In addition, as a practical matter, there is no database with comprehensive coverage of conferences.

In typical literature reviews (Gonzalez *et al*, 2006), a set of representative journals in the discipline concerned is chosen and, after a basic search through keywords, browsed manually to find relevant papers for the topic studied. In this review, we decided to use a database search due to the nature of the topic. As seen above in the key drivers, convergence is multi-dimensional and can be approached from a variety of perspectives. As such it requires a multidisciplinary approach, and in fact it is dealt with in various disciplines such as law, economics, strategy, marketing, telecommunications, policy and media, to name a few. It is not feasible to manually search through all related journals in all related disciplines. Therefore, in an initial attempt to study convergence where a previous literature review has not been executed, we conducted a database search.

By using a library meta-search engine including six databases such as ScienceDirect, JSTOR, Emerald, John Wiley Interscience, IEEE Xplore and SCOPUS, we searched for articles published during the last decade from January 1997 to April 2007. We chose the year 1997 as the starting point because the Telecommunications Act of the USA, which is of considerable significance to the telecommunication sector, was enacted in 1996. For the search, we used the main keyword *convergence*. In order to focus on digital convergence, we combined it with one of the nine following prefixes: telecom, broadcast, media, device, digital, service, fixed and mobile (or FMC), ICT, and regulation. The nine prefixes were selected because they could represent multidimensional characteristics of digital convergence.

We obtained fifty-eight articles, excluding engineering-oriented papers. Engineering-oriented papers are excluded from analysis because they address mainly technological aspects of convergence, and because the purpose of this review is to examine managerial, business and industrial aspects of digital convergence. The articles retrieved are classified according to the key word (Table 1). Regulation is the most heavily researched topic in relation to convergence, which is understandable since the implementation of new convergence services is limited by regulations and requires changes to regulations. The keywords service, telecom and media follow.

While much of the analysis is quantitative in nature (i.e. counting frequencies and identifying the year of publication and author affiliation), some is qualitative in that it requires a judgment about the nature of each paper (i.e. the level of analysis, the type of convergence and the methodology used). For the latter, we first established a set of criteria based on discussions among us (for the level of analysis and the convergence type) and on previous literature reviews (for the methodology). Then each of us classified the fifty-eight articles using the criteria given. Because the nature of the classification task was relatively straightforward, though still requiring judgment, we found that there were only a few differences, which were easily sorted out after discussion.

4. LITERATURE REVIEW RESULTS

Findings from the analysis are presented in order of journal, year of publication, author affiliation, country basis, methodology, type of convergence, and level of analysis.

4.1 Publication Journals and Years

Table 2 shows the list of journals where the articles retrieved are published. The fifty-eight articles are in thirty-one international journals from January 1997 to April 2007. Although engineering-

Key words (Convergence + ...)	Number of articles	Authors and years
Regulation	15	Clements (1998), Tadayoni and Skouby (1999), Heesvelde (2000), Studer (2001), Zhang (2002), Bore's <i>et al</i> (2003), Islam (2003), Rangone and Turconi (2003), Parker (2004), Ballon (2004), Menon (2004), Joseph (2005), Garcia-Murillo (2005), Weber (2007)
Service	9	Andersson and Molleryd (1997), Chan-Olmsted (1998), Yan and Pitt (1999), Ciancetta <i>et al</i> (1999), Trigila <i>et al</i> (2002), Shin (2004), Muñoz and Rubio (2004), Wu (2004), Girma and Kneller (2005)
Telecom	8	Perrucci and Cimatoribus (1997), Larouche (1998), Rao (1999), Hills and Michalis (2000), Koski and Majumdar (2000), Tuttlebee <i>et al</i> (2003), Yang <i>et al</i> (2004), Wu <i>et al</i> (2004)
Media	8	Uyttendaele (1997), Blackman (1998), Snider (1999), Winseck (1999), Wirtz (2001), Buchner and Zimmer (2001), Shin (2005), Shin (2006)
ICT	4	Jussawalla (1999), Simpson (1999), Henten <i>et al</i> (2003), Palmberg and Martikainen (2006)
Broadcast	4	Weare and Rapheal (2001), Horn <i>et al</i> (1999), Keller <i>et al</i> (2001a), Keller <i>et al</i> (2001b)
FMC	4	Harrison and Hearnden (1999), Webb (2000), Curwen (2006), Kubota <i>et al</i> (2006)
Digital	3	Collins (1998), Cowie and Marsden (1999), Iosifidis (2002)
Device	3	Kim <i>et al</i> (2005), Yoo and Yoon (2006), Dauer and Lane (2006)
Total	58	

Table 1: Articles retrieved

oriented papers are excluded from the analysis, there are still some engineering journals included in the list (e.g. *Bell Labs Technical Journal*, *Electronics & Communication Engineering Journal* and IEEE journals). This inclusion reflects the fact that convergence is interdisciplinary by nature, and even researchers with an engineering background need to understand the multidimensional aspects of convergence.

According to Table 2, 'info' is the journal which has published the largest number of convergence articles (eleven), followed by 'Telecommunications Policy' (nine articles) and 'Telematics and Informatics' (six articles). These three journals, which are ICT-specific journals, represent 44.8% of the articles. Four journals, such as 'The Public' and 'IEEE Wireless Communications', have published two articles each, and the other twenty-four journals have published only one article each.

Journal	Number of articles	%
Info	11	19.0
Telecommunications Policy	9	15.5
Telematics and Informatics	6	10.3
The Public	2	3.4
EBU Technical Review	2	3.4
IEEE Personal Communications	2	3.4
IEEE Wireless Communications	2	3.4
Technovation	1	1.7
Journal of Economic Surveys	1	1.7
Management Decision	1	1.7
Strategy & Leadership	1	1.7
Government Information Quarterly	1	1.7
Bell Labs Technical Journal	1	1.7
Wireless Personal Communications	1	1.7
Applied Economics	1	1.7
Interacting with Computers	1	1.7
Technology and Disability	1	1.7
Electronics & Communication Engineering Journal	1	1.7
International Journal of Communication Systems	1	1.7
Fujitsu Scientific and Technical Journal	1	1.7
Computer Law & Security Report	1	1.7
International Journal of Service Industry Management	1	1.7
Journal of Media Economics	1	1.7
Scottish Journal of Political Economy	1	1.7
Managerial Auditing Journal	1	1.7
Computer Communications	1	1.7
Review of International Political Economy	1	1.7
Information Economics and Policy	1	1.7
The Harvard International Journal of Press/Politics	1	1.7
Social Science Computer Review	1	1.7
Long Range Planning	1	1.7
Total	58	100.0

Table 2: Number of articles on convergence in each journal

Table 3 shows that articles on convergence have been published evenly across the years from 1997 to 2007 with an exception of 1999 when the largest number of articles (twelve) was published. We can infer that the 1996 Telecommunications Act of the USA created momentum for research on convergence and publication efforts from 1996 were often not completed until 1999. This distribution suggests that convergence has been an on-going process during the last decade.

Year	Number of articles
1997	3
1998	5
1999	12
2000	4
2001	6
2002	3
2003	5
2004	8
2005	5
2006	6
2007	1
Total	58

Table 3: Number of articles in each year

Country	Frequency
USA	30
UK	20
Germany	15
Korea	9
Italy	6
Sweden	6
Denmark	4
Japan	4
Belgium	3
Finland	2
Netherlands	2
Spain	2
Canada	1
Hong Kong	1
Mexico	1
Sri Lanka	1
Switzerland	1
Total	108*

* Due to co-authorship, the total frequency (108) exceeds the number of the articles (58).

Table 4: Author affiliation by country

Country	Number of articles dealing with the country
General	22
USA	7
EU	7
UK	7
Korea	6
India	2
Sweden	2
Asia	1
Belgium	1
Canada	1
Denmark	1
Finnish	1
Germany	1
Italy	1
Japan	1
Malaysia	1
Netherlands	1
OECD	1
South Africa	1
Total	65*

* If an article refers to multiple countries, all the referred countries are counted.

Table 5: Country basis of each article

4.2 Author Affiliation by Country and Country Basis of Each Article

We examined author affiliation by country and the country basis of each article. Author affiliation by country refers to the country of the university or organization for which the author was working when the article was published. More than half the authors come from the USA, UK, and Germany (Table 4).

The “country basis” of an article refers to the country which is under study in each paper. For example, regulatory reform of a particular country is discussed; a survey is conducted on users in a particular country’s market; a case study is conducted for a convergence service that is available in a particular country. According to our analysis (Table 5), about one third of the articles in our review (twenty-two articles) do not refer to any particular country, which means they deal with convergence mainly at the conceptual level. As with author affiliation, the USA, UK and EU are the most frequently examined countries. It is understandable that the USA and UK are the countries that have led discussions regarding convergence and first implemented new legal and regulatory structures for convergence. Accordingly, many papers of which country basis is the USA and UK deal with regulatory aspects of convergence (Perrucci and Cimatoribus, 1997; Simpson, 1999; Zhang, 2002; Shin, 2004; Garcia-Murillo, 2005; Joseph, 2005).

It is worth noting that Korea is highly ranked in both author affiliation (nine) and country basis (six). Korea has the most advanced broadband infrastructure in the world (Lee *et al*, 2003), which is developing into ubiquitous networks. Using these advanced networks, Korean telecom and media firms in collaboration with firms in other industries are offering novel convergence services such as DMB. Some of them have begun to be integrated into the lives of the Korean population. Therefore, studies on convergence, particularly those based on real examples, are growing in Korea with the help of researchers who have taken advantage of this opportunity. For example, recent papers examining convergence in Korea focus on DMB and FMC cases (Shin, 2006; Yang *et al*, 2004).

4.3 Research Methodology

Based on the recent work of Gonzalez *et al* (2006), we classified the articles into theoretical studies and empirical studies. Theoretical studies can be divided into conceptual, illustrative, and applied-concept ones. Conceptual studies focus on ‘why,’ while illustrative studies focus on ‘what’ and ‘how’ in order to explain a phenomenon under study. Applied-concept studies are a mixture of the two. Although theoretical articles can contain some empirical data, those data play secondary support roles; the emphasis is on ideas rather than on data (Gonzalez *et al*, 2006). Empirical studies include case studies, surveys, field studies, and experiments.

As seen in Table 6, theoretical studies take a high proportion (67 %) of convergence research. To identify a trend, if any, of publication by methodology, we divided the period from 1997 to 2007 into three different stages: until 2000, from 2001 to 2004, and since 2005. We have found that the majority of the articles are theoretical studies until 2004. However, empirical studies have become the main methodology since 2005. It is noteworthy that illustrative studies and case studies were dominant until 2000, but this dominance has disappeared since 2001.

Among the theoretical studies, illustrative studies are the most frequent, followed by conceptual and applied concept studies. This means that a number of studies have attempted to guide convergence practice and to offer recommendations for action. As convergence becomes increasingly available as a service for consumers, empirical studies on a variety of convergence services have increased. The case study is the most commonly used method among the empirical methodologies.

4.4 Types of convergence

Convergence domains can be conveniently categorized into three different types: 1) convergence within the telecommunications sector; 2) convergence between the telecommunications and the

Period	Theoretical (conceptual : illustrative : applied)		Empirical (case : survey : field : experiment)
Stage 1 (Until 2000)	17 (2 : 15 : 0)	>	7 (4 : 2 : 1 : 0)
Stage 2 (2001–2004)	18 (9 : 9 : 0)	>	4 (1 : 3 : 0 : 0)
Stage 3 (Since 2005)	4 (1 : 2 : 1)	<	8 (4 : 3 : 0 : 1)
Total	39 (12 : 26 : 1) (67%)		19 (9 : 8 : 1 : 1) (33%)

Table 6: Research methodologies in convergence research

broadcasting sectors; and 3) convergence between telecommunications and different industries such as banking, automobiles, education, among others.

A typical example of convergence within telecommunications is FMC. Traditionally, fixed and mobile communications have operated separately. Recently, however, fixed and mobile communications have begun to substitute for, and compete with, each other, with the expectation that the two formats will eventually integrate into personal numbering services, unified messaging services, single billing services and unified portals (Horvath and Maldoom, 2002). One-phone service is a representative service. Another example of convergence within the telecommunications sector is voice-data convergence. Recent developments in voice-data convergence are Voice over Internet Protocol (VoIP) and Wireless Application Protocol (WAP)-based services (Shin, 2004). According to Table 7, almost half of the articles in our review deal with convergence within telecommunications (47.9%). This indicates that convergence within telecommunications is still a main phenomenon.

Recent years have also seen a growing trend towards the convergence of telecommunications (including the Internet) and broadcasting media. Multimedia images are now transmitted through telecommunications networks, as in IPTV, and internet services are provided via cable TV networks, as in Triple Play Services (TPS) (OECD, 2004). Typical examples of convergence between telecommunications and broadcasting are DMB services and IPTV, which distribute televisual content over a broadband connection enabling a more customized and interactive service. IPTV differs from Internet-based TV in sending data over a dedicated bandwidth allocation rather than the public Internet. DMB is a mobile television service with additional audio and data services viewable on portable terminals such as DMB cell phones, portable DMB receivers, or vehicular DMB. Table 7 shows that this type of convergence between telecommunications and broadcasting has been frequently studied and represents 35.6% of the articles in our review. Although it is a relatively recent trend, the convergence of telecommunications and broadcasting has become a reality and stands out as a common research topic.

The third kind of convergence is convergence between telecommunications and other previously distinct, non-competing industries (Kim *et al*, 2006). Typical examples of this type of convergence involve a wide variety of new services such as radio frequency identification (RFID) in supply chain

	1997 (%)	1998 (%)	1999 (%)	2000 (%)	2001 (%)	2002 (%)	2003 (%)	2004 (%)	2005 (%)	2006 (%)	2007 (%)	Total (%)
Within telecom (Voice and data, FMC, computer and communications)	3	5	5	3	2	3	1	5	3	4	1	35 (47.9)
Telecom and Broadcasting	2	4	5	1	4	0	2	5	1	2	0	26 (35.6)
Telecom and other industries	0	1	4	0	0	0	2	1	2	2	0	12 (16.4)
Total	5 (6.8)	10 (13.5)	14 (19.2)	4 (5.5)	6 (8.2)	3 (4.1)	5 (6.8)	11 (15.1)	6 (8.2)	8 (11.0)	1 (1.4)	73* (100.0)

* As some articles refer to multiple types of convergence, the total number of articles in the table above is greater than 58.

Table 7: Number of articles for each type of convergence

	User (%)	Firm (Management) (%)	Industry (Economics) (%)	Regulation (Policy) (%)	Total
Stage 1 (Until 2000)	0	5	6	14	25
Stage 2 (2001~2004)	1	6	8	9	24
Stage 3 (Since 2005)	2	6	2	3	13
Total	3 (4.8)	17 (27.4)	16 (25.8)	26 (42.0)	62*

* If an article holds multiple perspectives, each perspective is counted individually.

Table 8: Research perspective on convergence

management, home networking, telematics, mobile banking, e-government, e-health, e-learning, among others. Inter-industry convergence represents both an opportunity and a threat to telecommunications and conventional industry sectors because while both can expand their business domains, they may also have to compete with their partners in the domains which used to be considered their own territory. According to Table 7, this type of convergence has not been much addressed in convergence research, and thus it accounts for only 16.4% of the articles in our review. However, since convergence between telecommunications and other industries is emerging and growing fast, it is expected that there will be more research on this type of convergence in the near future.

4.5 Research Perspective on Convergence

We classify the research perspectives on convergence into four different categories. By research perspective, we mean the level of analysis, that is, whether users are the subject of investigation or whether it is a case study of a firm. We have four perspectives: 1) user perspective; 2) firm perspective, 3) industry perspective; and 4) regulation perspective. According to Table 8, the majority of the articles (42%) in our review belong to the regulation perspective category. In particular, the studies from the regulation perspective were dominant in stage 1 (until 2000) but have significantly decreased in stage 3 (since 2005). It can be seen that the studies of convergence from the firm perspective¹ and the industry perspective constitute a substantial proportion each (27.4% and 25.8% respectively). The studies in the former have been published almost evenly across stage 1, stage 2 and stage 3. In the meantime, it is worth mentioning the increase in the number of articles with the user perspective in stage 3, which indicates that convergence services have become available in the markets of some countries.

5. DISCUSSION

We have completed an analysis of articles on convergence that were retrieved using a library meta-search engine. This analysis enables us to see a series of snapshots regarding the past and current research on convergence. From the analysis we draw a framework through which we can present an integrated profile of research in the area and reflect on its implications.

¹ For example, Yoffie (1997) deals with strategic issues regarding digital convergence for firms. Success in the digital convergence environment requires not only the installation of a set of novel technologies, but also the adoption of an innovative strategy.

In order to build the framework, we employ the two criteria used in the preceding section: research methodology and research perspective. For the former, it is evident that we have two types of articles: theoretical and empirical. For the latter, we group the four research perspectives into two groups, macro and micro perspectives. The macro includes the industry and regulation perspectives; the micro includes the user and firm perspectives. By intersecting the two criteria, we get a matrix with four cells. Then we place each article into one of the cells based on our analysis in the preceding section (Figure 1).

Figure 1 clearly shows that more than half of the articles (53.4%) are theoretical at the macro level. That is, they discuss convergence mainly from the regulatory perspective. The theoretical studies with the micro perspective come next (19%). About three quarters of the studies are theoretical. The large number of theoretical studies is attributed to the fact that convergence has

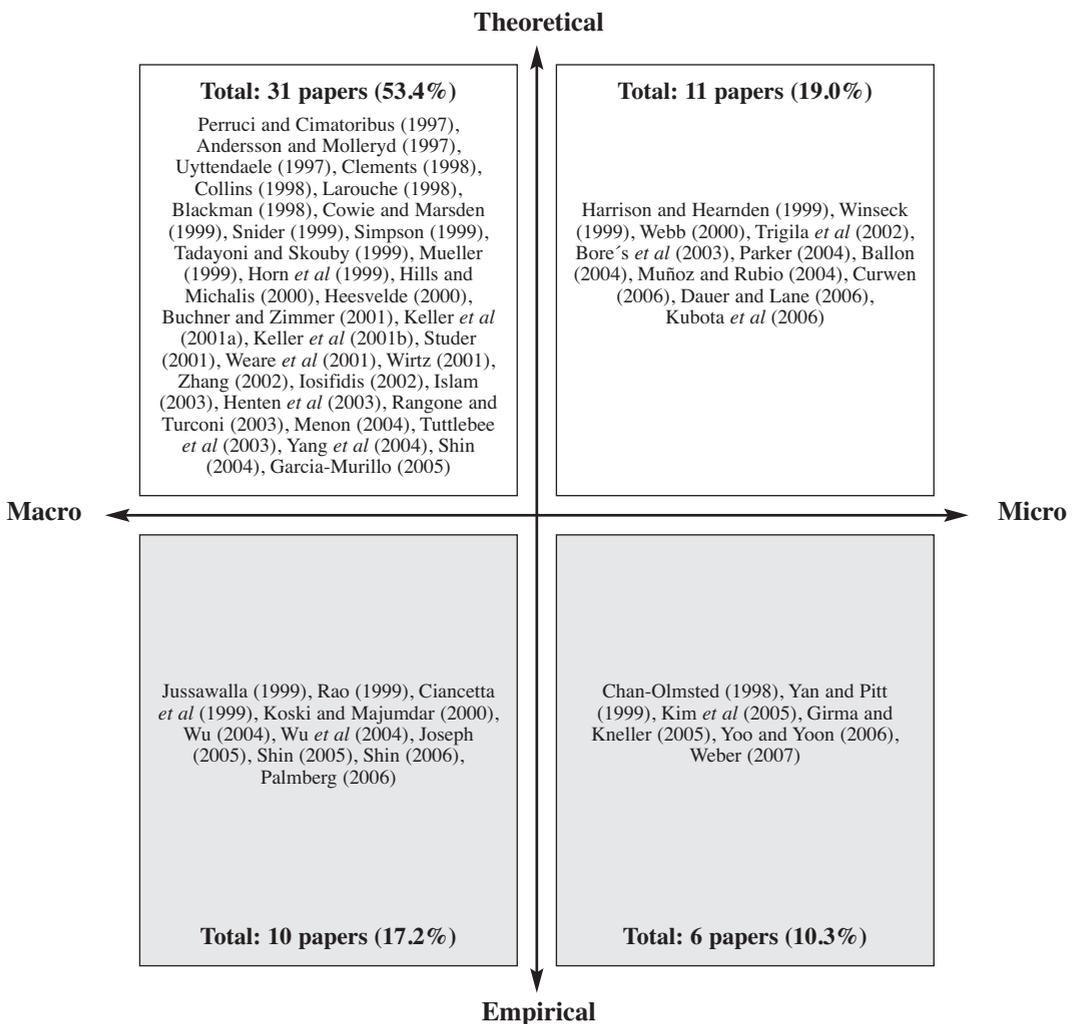


Figure 1: Research map in convergence

long been examined only as a possible service and only recently convergence services have become available in various markets.

Although the number of empirical studies is increasing, it is still limited. Emerging convergence services pose both challenges and opportunities for businesses and affect individuals as users/consumers of those services. However, our literature review shows that two-thirds of the articles hold the macro perspective (industry and regulation perspective). Only a few studies exist with the user perspective (Kim *et al.*, 2005; Yoo and Yoon, 2006).

We expect that there will still be a need for theoretical articles at the macro level because new types of convergence between telecommunications and other industries continue to emerge and new rules for these new types of convergence market will develop as well. However, given that more convergence services will be available, more empirical studies with the micro perspective will be required to understand firms' strategic behaviours in the convergence markets and users' responses to those convergence services. In other words, only technology and regulation among four drivers for convergence have been relatively well examined so far; the other two drivers, business concerns and users, will probably become the focus of future convergence research.

In summary, as shown in Figure 1, there is little research which helps to elucidate the micro aspect of convergence and empirically examines the opportunities and potential threats for firms and users created by convergence. We suggest that future research should contribute to filling this knowledge gap in convergence.

6. CONCLUSION

This paper reviews research in convergence. Convergence has long been discussed and has finally arrived in the markets of many economies in different forms, mainly as convergence within the telecommunications sector, convergence between the telecommunications and the broadcasting sectors, and convergence between telecommunications and different industries. It also involves multiple economic layers, including regulatory bodies, industries, firms and users, as seen in the research perspective. As such it requires multiple approaches involving policy, economics, management, and consumer behaviour. Due to difficulties from this multi-layered and multi-disciplinary nature of understanding convergence, there has been no literature review on convergence; this study is the first attempt for reviewing studies in convergence.

This paper contributes to the body of knowledge by attempting to critically review studies on convergence scattered in different disciplines. In so doing we identify the current status of convergence research and suggest a direction for further research. Since convergence services are increasing, more empirical research from the micro perspective is required to understand consumers' responses to convergence, and thereby to help businesses develop strategies in the age of convergence.

Limitations of this paper include the possibility of missing some publications. Due to the nature of convergence (multi-layered, multidisciplinary), it is dealt with in a variety of disciplines, and it is virtually impossible to browse all the related journals in all the related disciplines. Therefore, we used a meta-database search engine. Although we tried to be comprehensive in our literature search, the database search might miss articles with keywords that did not match the keywords used but were semantically identical. However, we believe this review can serve as a point of departure for future research by offering a map of current and future research.

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