TELECOMMUNICATIONS BECOMES UNIFIED COMMUNICATIONS – CHANGE PROCESSES IN THE COMMUNICATIONS MARKET FOR ENTERPRISES

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ABSTRACT

The ongoing improvement of performance in standardized Information technology, together with the extensive networking by internet technologies, makes it more and more possible to integrate formerly individual applications and specialized hardware in the standardized data infrastructure and applications landscape in the data center of enterprises. This helps enterprises to achieve cost savings and improvements in efficiency.

Because of this development, especially the branch of telecommunication for enterprises is in a state of change, away from singular private telephone networks and proprietary communications systems to complete integration of voice communications as one more software application in the data center. Beginning with the description of the role of information and communication in the economical functions of the enterprise this paper starts with the examination of the telecommunications market, especially in Germany. After the definition of the relevant market as a part of the overall ITK market, an outline of the last years show how stable this market was despite of all technology changes until now. The upcoming innovation Unified Communications, with it's potential business advantages for enterprises, is explained. The results of first users are compared with the promises of vendors, leading to an outlook of further changes in the market.

1. Telecommunications for Enterprises: Examination of the market

1.1 Telecommunications as business function

Information and communications in enterprises

Communications is the exchange of information, telecommunications is this exchange over distances. [64] The meaning of "information" is related to the context of usage:

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- In the sense of common language as knowledge over facts and processes (Stahlknecht 1995)
- In the sense of signaling theory: a signal (or information) stands for each message, for example by speech, tones, signs, figures, scripts, pictures as well as for tactile, audio, visual stimuli. (Fritzsche 1987)
- In Business Economics and Business Informatics "Information is purpose oriented knowledge, that is used to achieve goals and objectives" (Gutenberg 1975)

The value of telecommunications in enterprises is caused by the importance of information in the processes of companies. Figure 1 shows the companies process in the sense of Gutenberg as a transformation process of production factors. This transformation process can be seen ".. as a combination of working factors and production machinery with the goal of "creating products and services". [65] Information can be a port of the production factors, but Information and Communications are always an essential part of the planning factor as base of all decision processes.

Beside the central role as planning factor in the decision processes and the optional role as resources or material, information can also be an object factor and become part of the produced products and services. Information as a productions factor means always, that information has the restriction of a rare material and has to be used efficiently[66].

Becker deducts out of this the decisive roles of Information and Information distribution: "So führt insbesondere eine asymmetrische Informationsverteilung zwischen Martktteilnehmern zu Wettbewerbsvorteilen." Macharzina summarizes the Importance of Information and Communications for companies very well: „Unternehmertum und unternehmerischer Erfolg oder Misserfolg beruhen letztendlich auf der ungleichen Verteilung von Informationen in Unternehmen und Gesellschaft" and „Die Informations- und Kommunikationstechnik stiftet Wettbewerbsvorteile"[67]

Models of communications

The communication in companies is based on the direct communication from men to men. In former timers – and also today in very small enterprises e.g. handicraft enterprises the "direct touch communication" often is the only form of communication, as shown in Figure 1.

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[64] Compare (Carr & Snyder 1997, Page 6) : "Telecommunications is the transmission of data, or information, over a distance"

[65] In (Gutenberg 1975), Page 27, original: "Elementarfaktoren" and "dispositer Faktor"

[66] Compare Becker, Informationsmanagement 1999 (Becker 1999) S.548/549, translated: especially the asymetric distribution of informations between the market participants leads to competition advantages"

[67] Compare (Macharzina, 1999), page 649, translated: "Entrepeneurship and entrepeneurial success or failure finally result out of the inhomogenous distribution of information in enterprises" and "the Information and Communication technology causes competitive advantages"

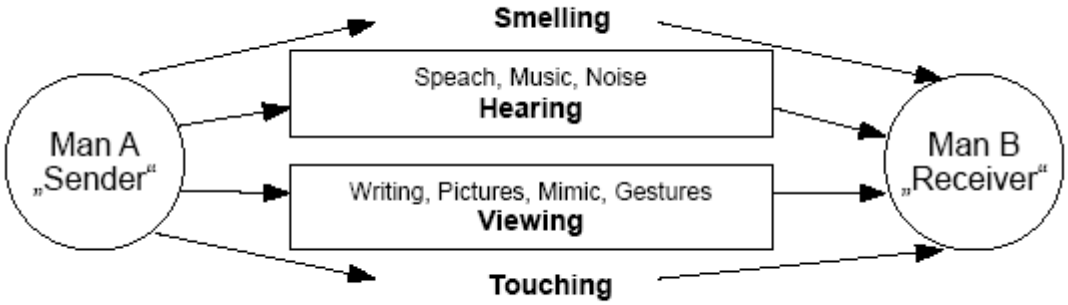

Figure 1: Communication from man to man

The communication by the senses of smell and touch is to neglect in the business environment, so that the senses of "viewing" and "Hearing" with the communication forms of Speech, written text,

pictures, mimic, gestures and body language are dominant.

The singular communication only from one man to the other is only a special case. In reality we see the communication from men to men bidirectional 1:1 as often as 1:N or as communication in groups N:N-1 as well one- as bidirectional. If the communicating people are separate by space or time a medium is necessary to deliver the message. In a classical case this can be the postman, who delivers a letter, maybe over several Massagers from sender to receiver. But normally a technical transmission channel is needed.

In each case such a technical channel is characterized by several restrictions and influences, which are not possible to avoid. Figure 2 shows a communications model over a digital communication channel.

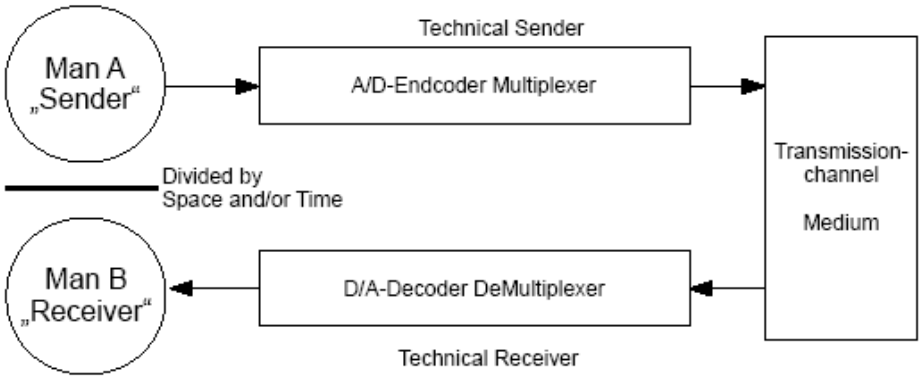

Figure 2: Communications model over digital channel

This model is valid by already established communication, as a part of all the communication forms from 1:1 to N:N-1. But the establishing of a communication is also a characteristic part of a communication media. Already between two communications partners, addressing the other partner is usually a very complex process, done by the switching layer. This layer is also used in an established connection for the change of the communication form, e.g. from 1:1 to 1:N by adding further communications partners.

The so called "Mass communications medias" are characterized by the missing switching layer: her everybody can participate. Examples are radio or television broadcasting.

Behind each of the steps in the communication model is technology and infrastructure, related as well to costs as to restrictions in Quality, e.g. by restrictions of bandwidth, noise or delays. Therefore in reality all forms of telecommunications are compromises in the sum of their criteria. The Dimension of these criteria are:

- which part of the spectrum of senses is transmitted. (Speech, text, picture, movie)
- number of communications partners and direction, that means 1:1, 1:N, N:N-1, as well as the way of building up the connection and the mobility of sender and receiver
- Quality restrictions compared to the original of real direct communication, e.g. by restrictions of bandwidth, noise or delays.
- Possible reproduction and documentation of the information.
- Costs

By this criteria we can see, that the economic principle is really valid: if one communications media in all criteria is worse then an alternative, this communication media will be obsolete and vanish over the time. Examples are the replacement of the telegram by Email or the vanishing of telephone cells because of the mobile phones. But still there are lots of combinations differentiating each other and therefore coexisting.

Definition of the scope of analysis as a part of the market for telecommunications infrastructure

The umbrella organization of some thousand German IT- and Communications companies structures the ITC market in German – overall a market over 143 billion EURO revenue and employing some 800.000 people – in five segments:[68]

- Consumer Electronics
- IT Hardware
- Software and IT Services

[68] Compare (Bitkom 2007b)

- Telecommunications Hardware
- Telecommunications Services

The part, which is analyzed for "communications systems for enterprises" contains, historically coming from the segment Telecommunications Hardware, by innovative substitution of specific hardware by Software Applications, more and more parts of the segment "Software and IT Services".

This part, having a volume of billion EUROS, which represents 5% of the German ITC market, is exciting because of the relatively small number of market members on the selling side. This allows a good presentation of the change processes by Innovations.

Gerpott structures the supplier in the telecommunications market in TC infrastructure suppliers, Service Operators, Value-added Service suppliers and TC Service suppliers[69]. Figure 3 shows this structure graphically.

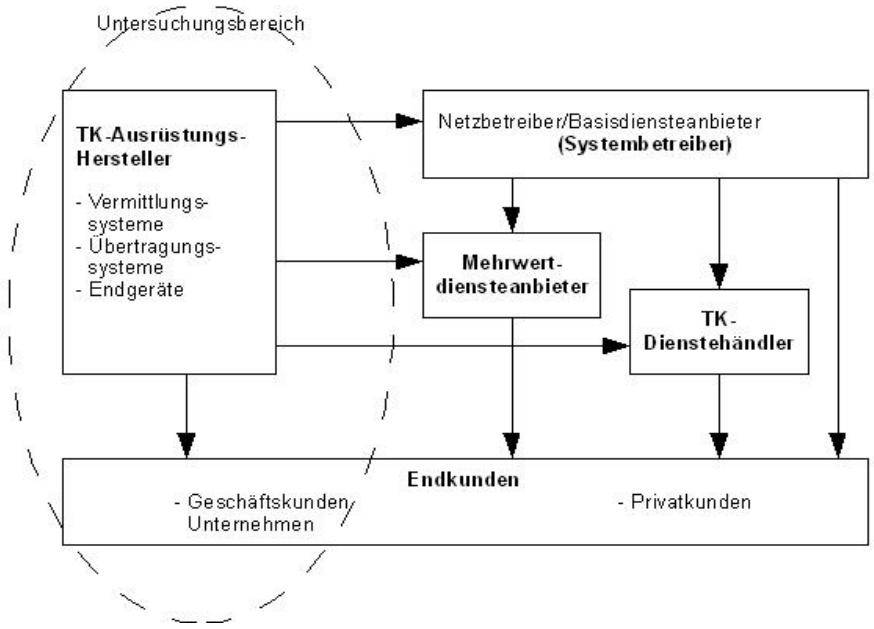

Figure 3: Field of examination in telecommunications market

69 Compare (Gerpott 1998)

1.2 History of communications systems

Analog technology

Beginning with the patent for the telephone in 1876 by Graham Bell the transmission of speech as a media of communications over unlimited distances spread quickly. 1899 there were only 50.000 telephone lines in Berlin, in 1914 already 150.000 and in 1930 more then 400.000[70].

Communication systems for enterprise existed since 1900 in form of completely mechanically working switchboards, addressing the need of employees to communicate between them selves and with external persons per speech. The costs for the otherwise necessary telephone line for each employee were drastically reduced by the use of these switchboards. Free of charge internal phone calls and inexpensive calls between subsidiaries with own lines let the usage of communication systems for enterprises grow to more then 90% for companies with more then 20 employees [71].

The initially used technology of line switching based on the physical connection of users. The connection was switched direct per plug or later by motor driven switches or relays, transmitting the information analogue from phone to phone. The telephone number as a singular address of each user made the worldwide connection and communication possible, in the beginning per manual switching, after the 2nd World War with automatic switching.

Digital technology

Already in 1924 Nyquist described the theoretically fundamentals for the digital transmission of analogue signals, 1948 completed by the theory of Shannon[72]. By the transmission of at least two samples per period of the signal, each signal with a given bandwidth can be reconstructed, as shown in Figure 4.

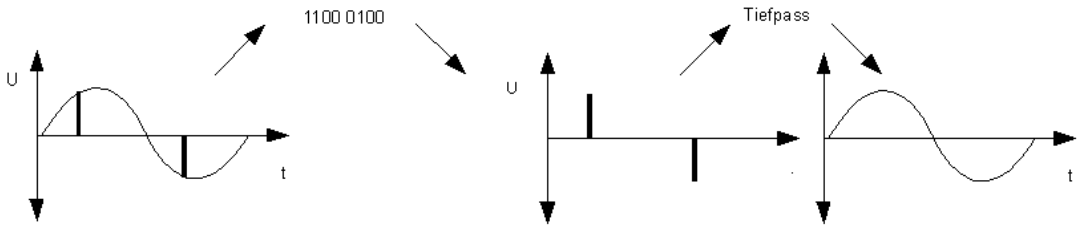

Figure 4: Coding, Transmission and Decoding

[70] From (Fernmeldemuseum Aachen 2009)
[71] Compare (computerwoche 2005)
[72] See (Shannon 1948)

But only with the availability of the first integrated circuits, beginning in the middle of the 80th, the speech is transmitted not more analogue, but coded in binary digital signals. Still there has to be a connection between the users, but in opposite to the analogue transmission not during the complete transmission but in periodically short time slots, even sufficient for the transmission of the digital signal. The receiver has to decode the binary signal and reconstruct the analogue speech. The quality is dependent of the number of digital steps and the range of bandwidth, determinated by the sampling frequency – e.g. for ISDN this is 256 steps and 8 kHz of Bandwidth, giving a good quality of speech.

Beside of the quality of the transmitted signal the voice communication needs a nearly not sensible delay from sender to receiver. The time for coding, transmission and decoding in the voice network should be less then 150ms for the perception of a good quality, less then 400 ms for just acceptable quality.

The Time Division Multiplex (TDM) procedure makes it possible to transmit several voice communications over one line, for example 30 connections over a S2M-Standard Line. This leads to further concentration and miniaturization with growing transmission rates. With the beginning use of micro processors in the mid of the 80th for switching of digital signals several new features for the management of the connections were available, which made communication easier and helped people to be more productive. The implementation of the digital network standard ISDN in the public network brought in the 90th the next step of features, available also between public switched connections. In opposite to other regions, the ISDN technology spread in Germany widely.

The necessary invest for the development of this digital switching technology brought a first consolidation of the market of communication infrastructure suppliers in the 80th from 27 to only 6 worldwide suppliers, who had an impact over some regions beside of their strong home market: Alcatel, AT&T, Ericsson, NEC, Northern Telecom (Nortel) and Siemens.[73] The most important competitors in the German market were in 1985 Siemens and T&N[74]. The next important competitors with shares in the range of only 10% were IBM and Nixdorf, both bought by Siemens in 1989 and 1990, therefore dominating the German market up to now.

History of Internet

Based on the work of Baran[75] in 1964, describing a network of nods, still able to work despite of the failure of singular nods, in 1968 the ARPANET was implemented by the American military, also used for the connection of research institutes.

Other then the hierarchical structured technology of the TDM-network and its similar administrations authorities, this was a flexible network based on the Internet Protocol IP and the

[73] Compare Computerwoche 49/1991
[74] Compare Computerwoche 16/1985
[75] Compare (Baran 1964)

Transport Protocols TCP and UDP. Here the individual network nods decides for each data packet of the transmission the optimal path to the receiving nod, who puts them together to reconstruct the message. The modular structure of the model of layers makes it possible to use this Internet Protocols for several applications.

Like the flexible structure of the decentralized IP network also the organizational structure for the internet is decentralized and flexible, also promoting innovative and user friendly applications.

But the decisive step from the technical network of computers to the comprehensive media for information exchange and storage was initiated by Berners-Lee with the concept of the World Wide Web[76]. The abstraction layer to translate the technical IP-addresses by simple user friendly Web adresses in the Hypertext protocol (HTTP) and the Email addresses derived from this, became beside the data exchange via File Transfer Protocol, the most important applications of the Internet[77].

This was the base for a tremendous growth, shown in Figure Fehler: Referenz nicht gefunden, the network growing from 20 Hosts in 1980 to more then 1000 Hosts in 1990, and up to now to 550 million Hosts[78]. Parallel the number of Websites grew from the first site of Berners-Lee in 1991 to more then 100 million Web sites in the World Wide Web today.

Changes caused by Voice over Internet Protocol (VoIP)

As shown in Figure 3, the voice information can be transmitted over the Internet. But the described requirements for voice communications are a special challenge over the Internet: because of the for each data packet individual path through the network, the delays for each packet can be very different and related to the available bandwidth. This requires a significant storage of received packets, again rising the delay from end to end.

Already in the 90th there were the first tries of voice communications over the Internet, but the quality was not sufficient for the broad usage.

Only with the availability of more and more Bandwidth and high performing micro processors and components in the Internet together with the implementations of prioritizing methods for time critical data packets the requirements of voice communications could be fulfilled beginning around 2000. After this changes the Internet was more and more also used for voice communications[79].

[76] Compare (Berners-Lee 1989)
[77] Compare "Nutzung des Internets" in CT 20/2008 S92 ,(Bleich 2008)
[78] Out of (ISC 2008)
[79] From (Telegeography Research 2008)

In the beginning the enterprises used the new technology because of restrictions in features and quality more by connecting smaller subsidiaries and home workers, less in their central locations, which longtime were the strongholds of large traditional TDM communications systems.

Today the flexible, modular structure of the Internet Protocols even makes it possible, if enough bandwidth is available; to get better quality than in TDM based ISDN networks. If two IP telephones can use the high quality coding algorithm the quality is almost in the range of "HighFidelity".

VoIP as a disruptive innovation

Already 1997 the journal "Funkschau" asked "stirbt die TK-Anlage", the 5-year prognosis of some well known analysts[80] forecasts a disruptive change driven by the innovation VoIP.

A model for the explanation of disruptive market changes driven by innovations is given by Christensen[81].

He describes disruptive innovations, often developed by the market leaders, as simple, cheap and less feature rich. The most profitable customers of this market leaders can't or won't use these disruptive innovations, which therefore will grow in some niche markets, often not served by the market leaders but by small and new suppliers.

Because of this, the established suppliers neglect the disruptive innovations; meanwhile the new suppliers finalize their development, so that at the traditional technology is no more competitive. In this case such a disruptive innovation may be a driver for fundamental changes in a supplier market.

The technology VoIP fulfills the criteria of such a disruptive Innovation. It was the leading Data Network supplier Cicso, who in 1998 by buying the small supplier of VoIP software "Selsius" started in the voice communication market. Cisco defined this segment as one of seven key segments for growth[82] and invested heavily in the development of this market. In fact the established suppliers entered the VoIP market too late , so that Cisco could establish a leading place in the telecommunications market.

After 2005 the established suppliers also mastered the VoIP technology and integrated it in their communication systems. So – beside of the market entry of Cisco – the fundamental change

[80] Compare Computerwoche 17/2002: "Für das Jahr 2002 haben namhafte Marktforschungsunternehmen wie beispielsweise International Date Corp. (IDC) oder Frost & Sullivan in der Zeit von 1996 bis 1999 ein weltweites Marktvolumen zwischen fünf und 80 Milliarden Dollar prognostiziert - eine Zahl, die aus heutiger Sicht utopisch anmutet "

[81] Compare (Christensen 2000), disruptive Innovations in opposite to sustaining innovations

[82] Compare (Moore 2005 beginning with page 100 "Cisco Innovating in Growth Markets"

of the market didn't happen – in opposite to the model of Christensen[83], who in 2004 doubted this ability of the existing suppliers.

History of the supplier market

The profit of 14%, which was possible to gain in the communications market in the 90th[84], shrank because of heavy competition with continuing reduction of market prices.

Examining the dominating in the beginning of digitalization, we can see the impact of this market pressure by a lot of mergers & acquisitions. NEC established together with the Netherlands Philips enterprise for it's EMEA Business the NEC-Philips. Alcatel merges with the carrier part of Lucent to Alcatel-Lucent in 2006.

AT&T made in 1996 an own company named LUCENT from it's infrastructure business, which divided in 2000, naming it's enterprise business AVAYA. AVAYA took over the German Tenovis in 2004. Tenovis was one of the German telecommunications supplier with the longest tradition as Telenorma and later T&N. In 2007 Avaya was bought by the investors Silver Lake and TPG Capitel. Erickson was integrated in Aastra in 2008. Aastra had previously taken over some small suppliers as Ascom in 2003 and DeTeWe in 2005. Siemens took over the telecommunications business department "Rolm" from IBM in 1989 and 1990 the German Computer and telecommunications company Nixdorf AG. 1997 Siemens took over the GPT, which was a strong supplier in the UK space. 2006 Siemens divided it's telecommunications business for enterprises in the Siemens Enterprise Communications and sold 51% of this SEN to the Gores Investors Group in 2008. One of the unchanging exceptions seem to be the Canadian Nortel, despite of being in financial trouble since 2001 – but with applying for chapter 11 in January 2009 decisive changes of Nortel are to expect too.

Examining the market in 2005 the picture is despite of all technology and economical changes well known. Infonetics Research[85] named as leading suppliers worldwide: Nortel, Avaya, Siemens, Alcatel and Cisco with NEC as number one in its core market Asia-Pacific.

The market in Europe is similar with Siemens and Alcatel in the range of 16%, Aastra, Avaya, Nortel and Ericsson around 10%, Cisco with 5% and Philips-NEC with 3% market share[86].

In Germany still Siemens dominates with 35% market share. We can see that the traditional suppliers have assimilated the technology VoIP and beside of the changes by Mergers&Aquisitions and by the market entry of Cisco.

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[83] Compare (Christensen u. a. 2004)
[84] Out of (McKinsey & Co 1994), page 3, example from the enterprise Communication Division of Siemens
[85] Market share globaly in 2005 from (Infonetics Research 2006)
[86] Out of (Frost&Sullivan 2006)

1.3 Upcoming Innovation: „Unified Communications“

Changes in communications behavior

30 years ago the ways of communications in enterprises were quite limited. Beside the fixed office phone as the only real time media the asynchronous media of letters and teletype messages were used. Later in the 1980s telefax substituted teletype messages and parts of letter correspondence.

Starting with 20 hosts in 1980 the Internet, as a communications network for the exchange of data between computers, grew to 550 million hosts[87]. Based on this network the World-Wide-Web, as a system for creating, organizing and linking of documents, grew from the first web site in 1991 to more than 100 million web sites today.

The distribution of personal computers in the 1990s and the growth of the Internet established Email as a communications medium that substituted a big part of letter correspondence and fax: almost 50% of all employees in Germany have an email address in their working environment[88]. The new forms of digital communications such as Web Collaboration, Text- and Video Chat and Instant Messaging are finding the way from private usage into the office environment.

In parallel the usage of mobile devices increased exponentially with the launch of digital mobile networks. Starting 1992 in Germany from 180 thousand mobile GSM phones it grew to 86 Million GSM and UMTS contracts in 2006 – that is more than one for each German resident[89]. As part of this growth mobile data communication reached a share of almost 20% in the GSM and UMTS mobile networks in 2006.

Beside of the advances in technology there are also other drivers for the growing usage of telecommunications. Companies are given the option of a wider sales market, but also more competition is in place because of buyers that compare globally. The resulting global competition causes high pressure on prices and forces enterprises to differentiate and/or to reduce costs. Differentiation and cost reduction could be done by outsourcing parts of value chains or by implementing cost-saving concepts like “Just-In-Time Production”. The fight for customers requires much quicker reactions to customer- and market request. Offers have to be produced quicker, product life cycles have to be shortened significantly. Marketing has to be intensified and customer service has to be optimized. This requirements cause changes in the way companies and their employees work and communicate.

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87 See (ISC 2008)

88 Compare (DSL-Magazin 2008)

89 With 700 thousand analog C-Net users until then, the D-Net started 1992, compare (Teletarif 2007) and (Bitkom 2007a)

Stable hierarchical structures move to matrix organisations with dynamic project based collaborations. Stable work teams working face-to-face are shifted to virtual distributed teams, even distributed over different companies between customers and suppliers. Invariant office opening times are not only changed by mobile workers and distributed teams over different time zones, but also by flexible working times and disappearing borders between working hours and time off. Long formalized coordination processes, for instance as "circulation letters" are replaced by time-sensitive business processes requiring reactions in real time. Complex business processes are mostly supported by business applications for Enterprise Resource Planning (ERP), Supply Chain Management (SCM) and Customer Relationship Management (CRM).

Because of the advances in communications technology and the business needs of the global market, users are experiencing a complex and fragmented communications environment with multiple devices and media, as office phone, mobile phone, blackberry, video room system, home phone, email, etc.[90]

Challenges for Enterprises in communications

New communication media and devices create new challenges. A permanent availability is expected – externally for organisations regarding customers and partners and internally for employees in key positions. For each trial to reach someone, multiple connections are made and multiple messages could be left. This increases the efforts for sender and recipient of the message as well as the discontinuity of media brings additional efforts.

A study of Insignia Research for Siemens Enterprise Communications names the top three pain points for business users: waiting for information, unwanted communications and inefficient team coordination, each valid for at least 80% of the participants (SEN 2007). 94% find themselves waiting for information from others before they can move forward on a task. This includes leaving multiple messages on the same subject and costs more then 5h per week. 35% see a extremely or very significant impact in this issue, 38% are extremely or very frustrated with this. 91% of respondents spent an average of 3.5 hours per week on interruptions and unwanted and unscheduled communications that distracted them and therefore negatively (for 22% very or extremely) impacted their productivity. Of these, 34% are very or extremely frustrated.

80% see inefficient team coordination, involving 3.5 hours per week with coordination obstacles that (in 24% extremely or very significantly) impact their team's ability to move toward it's goals, make deadlines, and deliver high quality work. For 30% this is very or extremely frustrating.

[90] See (Yankee Group & Kerrvala 2007)

The Survey was responded by 517 participants in the US, Canada and Europe. 62% of the respondents were in customer-facing sales and services roles, of mixed ages and coming from companies of all sizes. Table 1 shows the results of the top pain points in overview.

Table 1: PAIN POINTS OF COMPANIES

Pain Points	Incidence/ %	Time Involved/h	Extremely/ very Significant Impact /%	Extremely/ very Frustrating /%	Priority to reduce extremely/very high /%
Waiting for Information	94	5,3	35	38	38
Unwanted Communication	91	3,5	22	34	29
Inefficient Team Coordination	80	3,5	24	30	31

This challenge promises Unified Communications to solve by optimized integration of communication features into business processes.

Definition and Elements of Unified Communications

This pain points of communications are promised to solve by the integration of multiple communications devices and media in the communication processes of people, teams and finally in the business processes of enterprises.

Since the middle of the 1990 the concept of integrating the different asynchronous media Email, Fax and Voice Messages „Unified Messaging“ is used in enterprise communications. Based on this the concept of „Unified Communications“ (UC) is described since the beginning of 2000[91].

A single, consistent definition of UC doesn't exist, there is a number of definitions coming from the telecommunications suppliers, software developers and consulting enterprises. Some important representants of the telecommunications suppliers are Alcatel-Lucent, Avaya, Cisco, Nortel, SEN, of the most important software suppliers there are IBM and Microsoft and from Consulting Berlecon, Gartner, IEC, UC-Strategy andWaynhouse Research[92].

[91] Compare US patent to Unified Communications: (Besprosvan, 2001)

[92] Compare the definitions and descriptions from (Alcatel-Lucent, 2009), (Cisco, 2007), (Nortel, 2009b),(SEN, 2009), Microsoft in (Schurman, 2009), (IBM, 2009),(Gartner, 2008),(IEC, 2009), UC Strategies in (Pleasant, 2008), (wainhouse research, 2009)

Summing up the different points of view, you can see that the definitions describe on one hand the functional targets of UC, on the other hand the elements and components.

The common functions are:

- the optimization of communication and collaboration of people by integrating synchronous and asynchronous media,
- the creation of an homogenous and ubiquitous user experience,
- free choice of devices, by extensive control and management,
- the provision of presence information,
- the integration of functions of communications in groupware and business applications.

The common elements and components are:

- Real-time communications: telephony, video, instant messaging (chat),
- web-, video- and voice conferencing,
- web collaboration,
- asynchronous messaging by email, voicemail and fax,
- mobility with „Access by any device“
- desktop integration.
- Business process integration (CEBP = Communications Enabled Business Processes)

This UC functions and elements are described in more details:

Presence: the current status of peoples availability for different communications media is shown to potential communication partners or provided to applications for the intelligent choice of device and media. In ideal implementations the user can either set this presence status manually by simple switching on his current device or automatically by logical user defined combination of available information, as calendaring status (e.g. “in a conference”) and device status (e.g. telephone: busy or notebook: logged in IP-Net of location A). The so called “Federation” even enables sharing this presence information over different UC-applications, for example with customers and suppliers. The “Tag” function starts communication events when the presence status of UC-Users changes.

Unified Messaging: The integration of voice- or email messages and optional also telefax or Short Message Service (SMS).

Mobility**:** one number service lets people been reached alternatively on their office phone, mobile phone or home phone by a single number – and shows the same number to their communications partner when actively calling,

Integration in applications**:** By „Click-to-Service“ communications actions, e.g. like telephony, speech-, video or web conferences can be started directly inside of business- and office

applications. Occurring communications events (e.g. external call) can automatically open business applications and enrich them by information from data bases to the communications partner. When integrated in the personal working tools of employees (e.g. Office applications) UC increases personal productivity and especially the productivity of teams. The integration in the business processes of a company is the next level – and should lead to even significantly higher impacts on enterprise effectiveness.

The realization of Unified Communications requires the interaction of some in most cases already existing elements and some new elements and applications:

- Telephony: IP-Telephony as well as integration of mobile phones.
- Data network for IP communications, capable for real-time data. IT-applications:
- Groupware for Email, Web Collaboration and Calendaring, Office-Applications and Workflow systems, other Client applications.
- UC Middleware for the integration of all communications functions and the aggregation and provision of presence information
- Video communications: room systems and webcams over IP, also legacy ISDN room systems

Business advantages by Unified Communications

UC integrates elements of the voice and data segment. Not one of the existing suppliers covers all of the components of UC, but all are involved in the integration. That's why, beside of open interfaces of all components, the skills of the system integrator are one key to the success. Another is the alignment of the departments involved in this integration: the responsibilities for voice- and data infrastructure as well as applications and organization are often separated and difficult to synchronize.

The promises of the UC-vendors are high, often supported by theoretical business models of potential savings and Return-of-Invest calculations. Microsoft claims (Microsoft 2008a)verall potential saving of 20 % of current communication costs. This should be done by

- Replacing internal and customer/partner meetings and in-person trainings by Web Collaboration with savings of 20-40% of current travel and training expenses.
- Reducing real estate & facility costs by reducing the office space per employee and improving space utilization with telework and remote working with savings from 30-40% of current costs
- Replacing long distance calls and charged audio conferences, with savings of 10-40%
- Reducing IT infrastructure and administration cost by consolidating with savings of 20-60%.

In another study of Microsoft (Forrester Consulting 2007a), a detailed model for a hypothetical international marketing company with 4.000 employees is given and a business value of 39 Million $ over 3 years calculated for implementing and using UC.

Another methodology is used in a study on behalf of Cisco (Forrester Consulting 2007b) where 329 managers from the banking, manufacturing and educational sector were asked, how it would help their business to overcome several communications challenges, for example: "If ..managers could see other key team members availability, how would this affect productivity?". The positive answers are transferred to the usage of Unified Communications: "UC provides organizations value that can be quantified..."

But it is not given, that the implementation of the technical solution Unified Communications, really solves the communications challenges. Only if the users accept and value the UC functions and change their behaviour UC has an impact. An example is the central function of presence: only if all users in a virtual team set or adjust their presence status, the team can experience the full profit of this function.

The real situation of the implementation UC, despite of all the marketing hype, shows a current study from Quarter 4 2008 of the ECC (E-Commerce-Center Handel 2008). The ECC has done an online survey with more then 300 participants in Germany, thereof more then 60% managers of small (42% with 1-9 employees) to big (10% more then 1000 employees) enterprises. The result, given in figure 5, shows that only 12% of all participants use UC, with a clear difference related to the size of the company: while 25% of companies with more then 250 employees use UC, it's less then 10% of the small companies. Additionally only 10% currently plan to implement UC, almost 50% even have never heard of Unified communications.

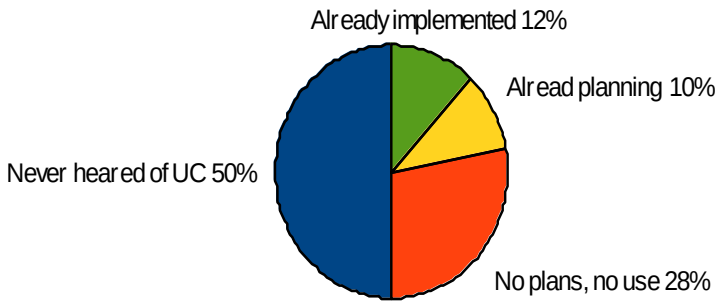

Figure 5: Status of UC in German companies

A survey on 200 enterprises already using IP-Telephony, published by Cisco, shows in figure 6 in more details the availability of different UC functions. The interviews of IT/TK managers of

these companies were initially done 2005 and repeated 2008, so that also positive trends are shown. Considering that companies using IP-Telephony still are "early adaptors" of modern communication technology, this result confirms the ECC survey and shows the currently small but growing implemented Base of UC.

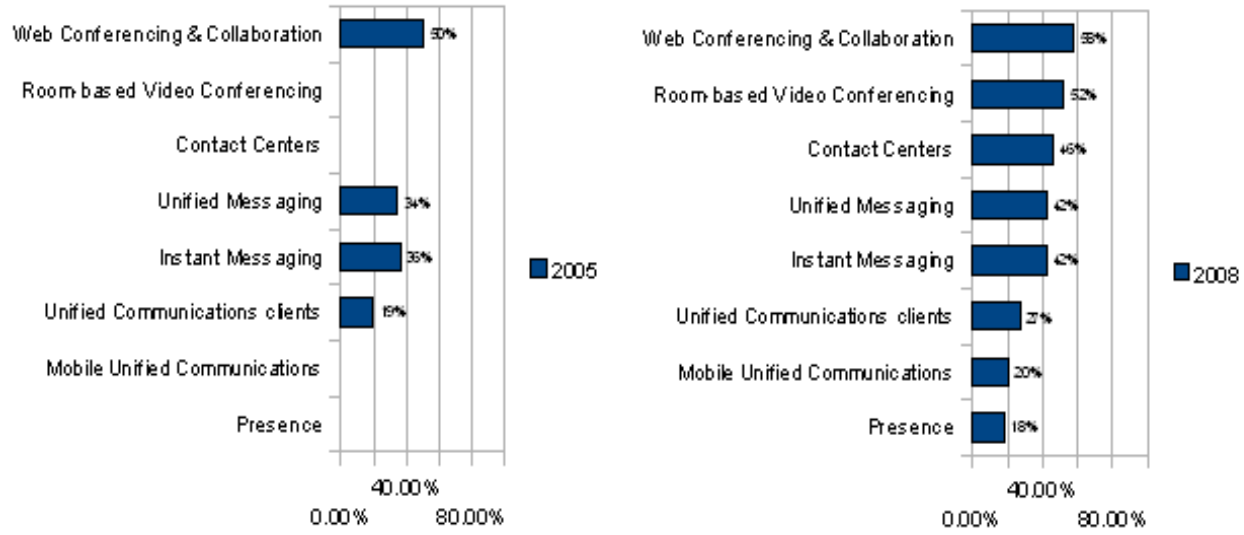

Figure 6: Available UC functions in companies using IP-Telephony

Experiences of users

Compared to the number of studies regarding „communications pain points" and showing more or less theoretical models of the value to overcome this communications challenges, there are only few „real world" examples for the results of using UC.

In a case study on the implementation of the Microsoft and Nortel UC Solution for 200 users (Microsoft 2008b) the experiences of Swisscom users are described with "the solution's presence, messaging and conferencing capabilities are helping each employee save up to 20 minutes a day. Virtual teams have cut the time needed to create customer proposals by up to 20 percent".

A systematic approach is done in the survey of UC Strategies: In first quarter 2008 Nancy Jamison and Blair Pleasant interviewed about 50 end uses already experienced in using UC in North and South America, Europe and Africa (Pleasant & Jamison 2008). Figure 7 shows some of the results regarding the usage of the available UC functions and the functions where the participants feel the "most value" in using. Interesting is, that even though 100% of the participants use presence and instant messaging, the individual value strongly differentiates from Instant Messaging, Click to Call, Conferencing and Presence. But finally 100% of the asked UC Users answered the question "Do you feel that UC features have changed the way that you work" with "Yes".

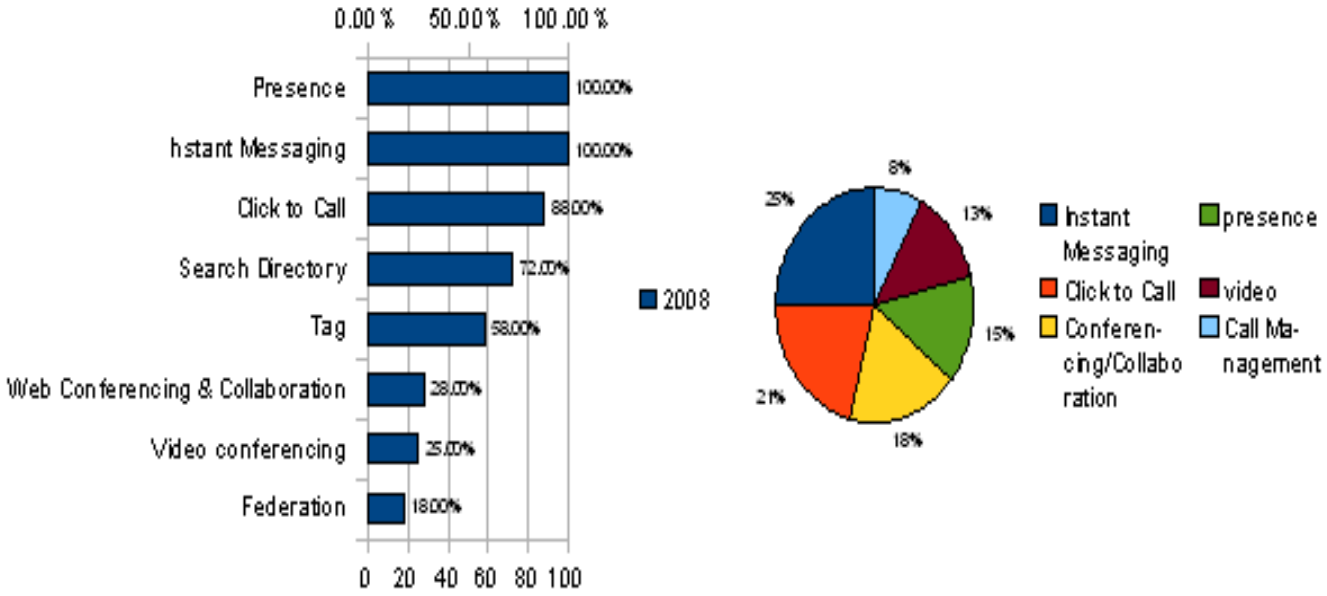

Figure 7: Usage of UC Functions and "Most Valued" Function

All in all we can see in a number of surveys that the challenges for enterprises in using modern communications technology are real. The vendors of Unified Communications solutions argue the overcome of these challenges and calculate the value for the enterprises based on theoretical models. Despite all the market efforts of the UC Vendors not many companies have already implemented the concept of Unified Communications. Therefore less precise information about the results of realization are available. But these results show that the early users of UC experience an impact on their daily work and benefit a value for their personal productivity. The potential of integrating communications in the business processes promises further improvement for the enterprises using UC. Implementing Unified Communications can be a differentiator for enterprises.

Impact of UC on the communications market

The change to Unified Communications with the opening in the direction of strong and established software houses will have a much bigger impact on the telecommunications market for enterprises then the integration of the Voice over IP technology. With Microsoft and IBM at least two of this software houses will establish leading positions in this market. The traditional suppliers, as well as Cisco as the only considerable new market player from the wave of VoIP-Innovation, are in progress to prepare themselves for the requirements of Unified Communications by major change processes, acquisitions and partnerships.

But only a few will be successful, so that a significant consolidation of the market can be expected. Beside of Microsoft, IBM and Cisco not more then 2-3 of the established suppliers will stay in the market.

2. Summary and outlook

This paper, as a summary of the first part of my dissertation thesis, provides firstly the examination and presentation of the meaning and function of telecommunications in companies and the development of the related market of the suppliers of telecommunications infrastructure during the technology change driven by Voice over IP. Secondly it analysis the innovation "Unified Communications" and the impact for the users as well as for the communications market. After an examination and classification of Unified Communications in the functions of enterprises the paper compares experiences of users with the theoretical concept and with the promises of the suppliers. A forecast for the coming development of the market is derived from this.

The next steps in the completion of the thesis will be to elaborate and analyze the drivers of this changes in the context of the whole development around the social and technological changes by digital media. Derived from this the base for the management of this changes will be presented. By the examination of the changes in other industries statements to coming change processes in this industries will be done, bringing a better understanding and allowing an optimized management not only of the market of telecommunications suppliers but also for other industries being driven by similar factors of change. The complete thesis will contribute to the understanding of change processes in enterprises, driven by the development of digital media.

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