Proceedings

Trends in Information Systems

How IT will challenge existing organizational forms and create Ambient organizations

Niels Bjørn-Andersen
Copenhagen Business School
Department of IT Management
Howitzvej 60, 2000 Frederiksberg Denmark
+45 38 15 44 44 wireless
nba@cbs.dk

ABSTRACT

IT[1] is likely to be as important to the way companies will organize in the future as electricity was to the industrial revolution. IT will revolutionize entire industries and markets. IT will create new types of organizations that will surpass and outsmart traditional organizations. This has been predicted for more than a decade. But now it is happening especially in the music, newspaper and publishing industries, and shall see it even more pronounced in these sectors in the future. But it will not be limited to these industries; it will influence all types of industry and government organizations.

Already today, we see many examples of innovative organizational designs, enhancing organizational effectiveness and competitiveness.

The paper will briefly discuss the potential of future IT developments, and will proceed to give a short theoretical background for why we see a growth in IT-facilitated new organizational forms. A couple of interesting organizational design will be mentioned, before we proceed to making the argument that any business process in principle may be reengineered, centralized or outsourced in one way or other. Interesting examples will be presented.

We suggest that future IT will have such a profound impact on organizational structure going far beyond the traditional 'virtual organization' that it calls for a new organizational concept, which we have chosen to label the "Ambient Organization'.

Categories and Subject Descriptors

K.4.3 Organizational Impacts, dealing especially with impact of IT on organizational structures.

General Terms

Management

Keywords

Impact, business processes, industry structure, organization, IT, transaction costs,

[1] IT is defined broadly as covering all types of IT and telecommunication technologies including application software.

1. INTRODUCTION

Since the early introduction of IT into organizations, practitioners and researchers have been intrigued by the issues about the impact of IT on individuals and organizations [14, 23, 26]. The tremendous and on most dimensions accelerating advances in the technology over the last 50 years has not decreased this interest in how this technology is contributing to changes in individuals roles, organizational structures/processes, and industry structures.

The more extensive discussions of the impact of IT continued over the years [3, 18, 25]. A significant contribution was made by [7], when they proposed nine IT capabilities as shown in table 1s, which they believed would have significant impact.

Table 1 IT Capabilities and their organizational impact (Davenport & Short, 1990)

Capability	Organizational impact/Benefit
Transactional	IT can transform unstructured processes into routinized transactions
Geographical	IT can transfer information across distances making processes independent of geography
Automational	IT can replace or reduce human labor
Analytical	IT can bring to bear complex and analytical methods on a process
Informational	IT can bring vast amounts of detailed information into a process
Sequential	IT can enable ….. multiple tasks to be carried out simultaneously
Knowledge Management	IT allows the capture and dissemination of knowledge ... to improve the process
Tracking	IT allows the detailed tracking of task status, inputs and outputs
Dissemination	IT can directly connect two parties that would otherwise communicate through an intermediary

Although the language seems dated today, it is clear that we have experienced all of the above, and more is likely to come.

In the early 90s, we saw the emergence of a substantial body of research suggesting that IT would lead to new organizational forms, and concepts like, 'Shamrock' [13], 'Boundary-less organization' (General Electric), and 'Spaghetti organization' [5] were proposed.

But in the mid 90'ies, the concept of "virtual organizations" gained a substantial rallying and became the most used concept [9, 13, 20, 21, 27], and many organizations as well as researchers followed the line of outsourcing of those company functions, which were not core. The main theoretical reason is that since transaction costs involved in outsourcing have dropped and will continue to drop, it will become much more advantageous to concentrate on core and source everything else from organizations offering "best-of-breed" at competitive conditions.

In order to analyze this, we shall first briefly discuss the main theoretical background why we see the substantial and growing trend towards different types of sourcing and outsourcing arrangements, in other words the Transaction costs economics. Following that, we shall briefly remind ourselves about the significant developments within IT that we have experienced over the last decade, and have a look at what is in stall for the next decade. We will mention the basic technologies and move on to some of those specialized companies now providing (software and organizational) platforms for the future growth in sourcing and outsourcing arrangements. Following that, we shall a more detailed analysis of company functions using a well-known framework of value chain [24]. In this analysis we shall show that all traditional company functions including innovation, which one might argue is not part of the Value Chain, can be outsourced, and that this is very likely to happen due to the substantial drop in transaction costs related to having (part of) the business processes carried out by somebody else. In transaction cost terms, we are likely to see a much more widespread development towards sourcing from the market rather than from own hierarchy. We shall conclude with a section on the new organizational form called an 'Ambient organization', which is likely to emerge, when a much more substantial part of the traditional business processes are sourced from somebody else.

2. Theoretical background

Transaction costs economics [6] are one of the important theoretical reasons for why we are going to see new ways of organizing. The original idea is simple. The acquisition of a product or a service can be said to consist of two elements, production costs and transaction cost, and for the sake of simplicity, let's just consider two ideal types of sourcing forms, either sourcing from the hierarchy (make yourself) or sourcing from the market (buy). Typical transaction costs are

- searching cost to find who can deliver
- transportation costs to where it is to be used
- inventory holding costs in case of fluctuations in supply
- communication costs
- coordination costs between two independent companies
- quality assurance costs
- costs of writing contracts with somebody in market
- costs of enforcing contracts with somebody in market

If we consider these cost types, it is clear that over time, all of these (perhaps with the exception of the two latter ones) have decreased both in the hierarchy and in the market, but they have decreased much more dramatically in market forms or organization. Today and even more in the coming decade, the transaction costs for procuring from the market are going to approach the costs of procuring from own hierarchy. And since the production costs by definition are going to be lower in the market (choosing the most effective supplier) than in one's own organization, we are going to see a strong tendency towards outsourcing or other sorts of arrangements, where one is not producing in a traditional hierarchy. As Ronald Coase puts it [6], "Costs of a formal contract/hierarchy are lower for frequent transaction than in the market. That is why firms exist". But to phrase it differently, if transaction costs of frequent transactions in the market drop substantially, firms will not exist according to Coase. In other words, we will see the emergence of new organizational forms that we have chosen to call "Ambient Organizations".

Since the analyses related to virtual organizations in the early 90s, we have seen a very substantial development in IT with the invention and use of Internet, World Wide Web, social media and the different types of ambient intelligence technologies. This is not just more of the same; it is a qualitatively different type of technology, which justifies the use of another concept than "virtual organization". In the words of one of pioneers within Web 1.0 and Web 2.0: The Internet (and other knowledge mobilization technologies) offers an alternative to hierarchy and market: open collaboration with no or minimal investment costs for the relation [2].

The idea of outsourcing started in the late 80s, but today we see how new types of sourcing are taking place from creation of shared service centers over outsourcing to cloud sourcing and even crowdsourcing of everything from sourcing of a product/service to the much more complex phenomenon of "Business Process Outsourcing BPO". Analyzing the phenomenon of moving away from the traditional hierarchy, we find the following types of buying arrangements for products/services/business processes:

- Shared service center as cost center between SBU's but owned by organization
- Profit center, still owned by mother company
- Outsourcing on-shore, near-shore or off-shore
- Cloud computing where location of process is not knows to outsourcer
- Crowdsourcing, where sourcing is done from an initially unknown provider, who is typically rewarded on delivery

In coming to an end of this short theoretical section, we shall in passing point out that there are obvious constraints on the extent which one can procure from outside. These can be explained among others with reference to Agency Theory [11]. The lower transaction costs associated with procuring from others has to be balanced against the agency costs of having others than the principal carry out the business process. However, using their model, we are in no doubt that the overall picture is one-directional: We shall see a strong increase in outsourcing types.

3. Future IT development

There is little doubt that we have seen tremendous growth in IT since [7] made their predictions. Most significantly, the advances in processor speed, in storage density and in telecommunication speed, which have resulted in an avalanche of different applications, especially within the area of Internet, World Wide Web, e-commerce and e-business. It seems a fair prediction that within a decade we as individuals shall have for our discretionary use

1. Unlimited processing capacity on our desktop or wireless device
2. Unlimited storage for whatever we would like to store
3. Unlimited communication possibility for video broadcasting in high resolution or 3D

This does not mean that organizations will not perceive IT bottlenecks, but for the individual pursuing his/her individual tasks, the technology will be available anywhere in whatever form and shape one might wish.

In 2000, the EU-commission published a study on the impact of future IT, as part of the Information Society Technology research program (6th research framework program 2002 – 2006) of the EU. In this program the extensive miniaturization, proliferation and distribution of IT was named "Ambient intelligence". Xerox first named this development as "Ubiquitous computing", while IBM decided to name it "Pervasive computing". An issue of CACM was devoted to discuss these two concepts [19].

In the 6th Research framework program of the EU it was suggested not to use any of these two US terms, but to use the concept of ambient intelligence for the phenomenon that the computational power is available everywhere. In the report ISTAG Scenarios for Ambient Intelligence 2010 (ISTAG 2001), the concept of Ambient Intelligence is discussed, and scenarios for how this might provide "greater user-friendliness, more efficient services support, user-empowerment, and support for human interactions" are developed. These scenarios describe a future "where people are surrounded by intelligent intuitive interfaces that are embedded in all kind of objects and an environment that is capable of recognizing and responding to the presence of different individuals in a seamless, unobtrusive and often invisible way".

A more extensive definition of ambient intelligence is found in Wikipedia stating that Ambient Intelligence becomes a reality when we have:

- Unobtrusive hardware (miniaturization, nanotechnology, smart devices, sensors etc.)
- A seamless mobile/fixed web-based communication infrastructure (interoperability, wired and wireless networks etc.)
- Dynamic and massively distributed device networks
- Natural feeling human interfaces (intelligent agents, multi-modal interfaces, models of context awareness etc.)
- Dependability and security (self-testing and self-repairing software, privacy ensuring technology etc.)

Even though in 2011 this is only a reality for a very small elite group or for limited purposes, we shall argue that it will surely be available to 'all of us' in 2020. This means that individuals will be surrounded by ambient technologies providing ambient intelligence. This development will allow us 'endless' possibilities for searching, storing, analyzing, structuring, reproducing and disseminating information in form of figures, text, graphs, sound, and video to anybody anywhere. More important, it will allow us to collaborate with others in new ways, which are likely to be much more effective

The ISTAG committee falls short of discussing any implications above the level of the individual level and the individual in society. Specifically it does not discuss implications for organizations and industry structures, a shortcoming that we shall address here, because we believe that this will have enormous implications, since all (business) processes will potentially be impacted and radically change the way organizations and industry structures will evolve.

Accordingly, in the following we shall attempt to develop scenarios for what visions for future IT will mean for the way in which companies will chose to organize in the future. We shall define this future organizational model as an "Ambient Organization" indicating that the organization is present 'everywhere' and sourcing its resources/capabilities in the shape and form of skills, processes and technologies from 'everywhere', notably from other organizations, which are not owned or controlled by them.

4. Organizational platform providers

The new organizational forms that we shall discuss below are to a very large extent enabled by different types of intermediaries providing IT-based organizational platforms that bring down transaction costs for anybody, who would like to source from 3rd party.

These intermediaries are the traditional information technology platform providers (Intel, Cisco, Microsoft etc.), but we are also witnessing new entrants like Amazon, who is providing cloud computing in competition with traditional facilities management companies like Microsoft, IBM, Cap Gemini and CSC.

In the early days of the dot.com age in the late 90's we saw a steep growth in so-called marketplaces. Gartner Group even predicted in 2000 that the number would exceed 10.000 by the end of the decade. An overwhelming part of these originally marketplaces, however, have disappeared, because the liquidity simply was not there and did not come. Sellers could not figure out how to avoid a perfect price competition eroding profits for everybody, and the seller often won the contract with a loss giving deal. Buyers were skeptical about quality and reliability of supplied goods/services, and the marketplace itself had a hard time in figuring out a business model that would make buyers and sellers come back, and not trade outside the marketplace.

Today the much fewer market places have matured. For example in the Nordic countries, the company "Gatetrade" (www.Gatetrade.com) was one of the first marketplaces established on the Oracle platform in 2000. After some very turbulent years and several financial reconstructions, the company is now providing procurement solutions to a wide range of public and private companies.

However, this success is dwarfed by the Chinese B2B marketplace Alibaba.com. Started in 2003, the now 12.000 employee large company is boosting that at any point in time

24/7, they have about 6 million transactions between buyers and sellers taking place simultaneously. For an annual fee of $ 300 for Chinese companies and $ 4000 for non-Chinese companies, one might trade as often and as many as one pleases. One might say that Alibaba is to a very high degree enabling China becoming the manufacturing center of the world. But Alibaba is not just connecting buyers and sellers, they are also like Gaterade providing or organizing a number of services facilitating trade like credit rating, logistics and procurement. They do charge for their services, but the amounts are typically trivial for the acquirer of the service, but if there are millions of buyers of a service, the investment and the level of automation of the service can be extremely high and still yield very attractive rents to Alibaba.

While the two examples above supports "all" aspects of trading, we have also seen a growth in platforms for supporting innovation to be outsourced to third party using cloud sourcing and crowdsourcing.

On the research front, Albert Angern and his group at INSEAD has developed and is offering the Inno Tube platform with more than twenty tools for supporting the sourcing of innovation from others.

More mainstream is the so-called "Mechanical Turk" provided by Amazon since 2005. The Mechanical Turk is designed to enable crowdsourcing by providing a marketplace for exchange of ideas and as one of its web-services on EC2. The Requester place a Human Intelligence Task (HIT) on the site with the use of an API. Workers can browse the HIT's to find interesting tasks worthy of their energy and solve the tasks. It is even possible for the Requester to demand particular qualifications of workers. Payment will typically accrue as gift certificates for buying on Amazon or workers can receive money via Paypal. This can be used for many purposes.

A third example of support of innovation is "Innocentive", a platform supporting open innovation. Here companies or organizations can crowd source ideas helpful in their innovation process. InnoCentive Challenges gives users access to a Web community of 200,000 experts, which might help companies achieve innovative business results. It also provides the ONRAMP (Open iNnovation Rapid Adoption Methods and Practices), which is a suite of training and implementation services designed to help companies adopt open innovation rapidly and successfully within their organizations.

What we have tried to show here is that the foundational provision of net IT of "unlimited" processing, storing and communication capacities, enabling support of any type of sourcing arrangement, from down to earth simple services to the complex innovation services.

We shall now proceed to give a few examples of companies using this opportunities to develop new organizational forms that we have chosen to name "Ambient organizations".

5. Key examples of sourcing from others

In order to investigate the feasibility and proliferation of sourcing from others, we have chosen the probably most well-known model for organizational functions, the Value chain model by Michel Porter [24]. The Value Chain model does not require further introduction, but it is a rather "complete" description of activities of an organization and accordingly, suitable for our purpose. The Value Chair is for reference provided below in figure 1.

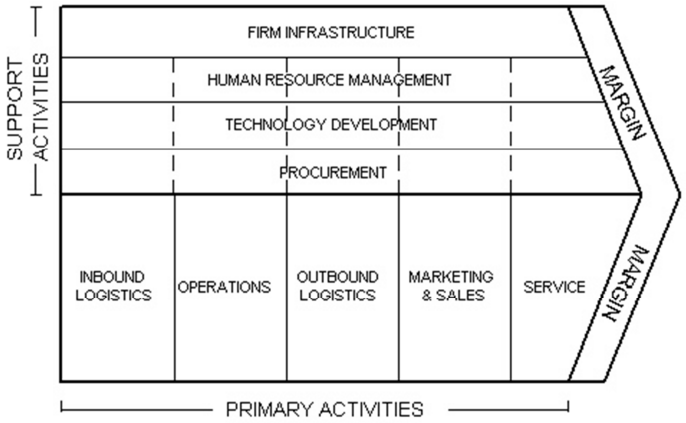

Figure 1. The Generic Value Chain, Porter (1995)

We acknowledge the fact that most observers and practitioners today do not think in terms of company functions but business processes. However, we believe that the underlying arguments apply both to functions and to processes, and we find it is easier to explain using the very widely acknowledged model from Porter.

In this section we shall discuss and present examples of how primary activities, support activities and innovation activities can all be procured from the market. One might even argue that Porter has not included innovation in his Value Chain, or given it a fairly small place as one of the support activities, but the importance of innovation today, we have decided to include it in our analysis on the same level as the primary and support activities.

Our intention is to document that all of these activities to an increasing degree are being sourced from the market. We shall structure this discussion based on table 1. In this table we have shown the five main types of sourcing arrangements in the first column and the three types of activities cross the three following columns. For each of the activities, we shall provide examples of

Table 1. Examples of sourcing from the market

Functions Type of sourcing	Primary activity, e.g. Produce, sell and service	Support activity e.g. Procurement, accounting, HR and IT	Innovation activity e.g. Basic and applied research
Own shared (service) center	Standard practice	Carlsberg	Standard practice
Own profit center	Standard practice	Proctor & Gamble	Xerox Park
Outsource/ Off-shore	Bestseller or VW auto	Unilever	Bang & Olufsen
Cloud sourcing	Diagnose scans/x-ray in Second Life	IT services to India eConomic	Lego
Crowdsourcing	Salesforce.com	Prediction markets Intelligence Agency	Andiamo

how large companies are 'deconstructing' the traditional organizational hierarchy and is sourcing hitherto typical in-house activities (functions or business processes) from third party specialists within these areas. We do that in the following three sub-sections, but will refrain from commenting on the cells in the table called 'Standard practices', which we have named like that to indicate that this type of centralization of functions from SBU's or Lines of Business (LoB) is now so common place that there is no need to point to any specific companies.

5.1 Primary activities

Looking at the five primary activities, there are plenty of examples of how organizations source their inbound logistics. The Danish company '*Bestseller* 'is in the clothing fashion business. Design is done in the head office in Denmark, and all production is taking place in China. What is more interesting is that all inbound logistics is outsourced to a logistic provider called PrimeCargo, who is taking care of all logistics from manufactures in China to their own warehouse in Denmark, from where they distribute the finished goods to retailers around in Europe. Although PrimeCargo will also supply e-commerce sales of Bestseller goods, the actual web-shop is outsourced to a company called Bootz located in Sweden.

Operations or manufacturing is also being outsourced left, right and center to relatively low labor cost regions especially in Asia, and China is becoming the manufacturing engine of the world. But BPO can also take place inside a fully owned manufacturing plant. In a spectacular deal, VW has chosen DHL for its internal supply chain handling of in-plant logistics in Bratislava, Slovakia. No less than 800 DHL employees are now managing 50% of all production material including inbound receiving, put away and storage, picking and kitting, sequencing as well as line-side deliveries directly to the Volkswagen production lines. "Logistics are essential in vehicle manufacturing. DHL has convinced us due to its innovative concepts they can provide a supply chain solution tailored exactly to our needs," Juraj Janá, Head of Logistics with Volkswagen in Bratislava.

Other interesting examples of sourcing of primary activities are the cloud sourcing of the examination of different types of scanned pictures in hospitals. Hospitals especially in the US have found that it is much more advantageous to source highly skilled doctors from Second Life than to attempt to hire the same doctors from 'wherever' in the world they might live (e.g. India) and bring them on-shore.

Finally among the primary activities, we might mention that "Salesforce.com" is offering a state off the art CRM-system off the shelf as a SaaS solution. But it is also interesting that Salesforce.com themselves are crowdsourcing service help as well as ideas for further development of their successful CRM package from "anybody" who signs up of their web-site. In this way they can source help, service and info about new requirements in a much more efficient way than traditional competitors. Furthermore, they can rely on a large community of users to assist each-other in solving problems.

5.2 Support activities

There are many examples of large companies going through major transformations of their support activities. The Carlsberg beer group with production and sales in more than one country around the world has decided to centralize their accounting in Poland. This may seem like a small step, but considering that the group consist of more than 50 previously independent breweries with each their brand, production, local market and own administration, this was hardly easy to do, but has had a huge potential scale advantage.

Along a similar vein, Proctor & Gamble has established a global shared service unit taking care finance, accounting, HR and IT in order to reap the economics of scale and achieve higher effectiveness.

But both these two re-organizational efforts are taking place within the same multinational organization. Unilever has taken the reorganization to a higher level, and has outsourced its HR function with all its business processes to Accenture. In a spectacular "throw it over the fence" or "lift and shift" approach, all of HR has been contracted to Accenture "due to mega cultural and technical barriers involved in handling it themselves".

When it comes to cloud sourcing, this is of course a very well-known phenomenon within IT, and we are so far just at the beginning of cloud sourcing, getting services like operations centers, infrastructure, network an applications in ASP solutions and SaaS. Traditional IT vendors like Microsoft are offering cloud sourcing of IT services on their Azure platform, and new players like Amazon is entering what looks like an almost blue ocean market. An interesting example of a very successful is the Danish company eConomic, who is offering accounting services and basic support of business processes like any ERP-system for SME's would do. eConomic now approximately 40.000 customers paying from € 25/month, and it is noteworthy that the start-up costs are typically a fraction of the implementation costs of acquiring and implementing a small ERP-package. Almost everybody from Microsoft to Gartner and IDC agrees that there is a huge market in the provision of cloud sourcing IT services, and indeed Microsoft Dynamics, which is now the third largest provider of ERP-services is driving the provision of cloud services very hard.

Another interesting example of cloud computing was reported by a research team from HP utilizing the Mechanical Turk from Amazon. They collected tweets about 24 films in the week prior to the film opening on a Friday night. Based on this, they developed a prediction model. This was later tested on two films. For these two films they collected 15.000 tweets from Twitter. They had a Sentiment analysis of the tweets done using Mechanical Turk. They got 3000 workers to classify the tweets into positive, neutral or negative about the film, and had each tweet analyzed by three workers, eliminating assessments by workers which were not consistent or who were clearly outliers. The amazing result was that they were able to predict with 5% accuracy the number of tickets sold in the box office in the first week after opening. When one takes into account that the tweets were all from the week prior to the opening and that very few of the people sending the tweets had read any reviews in traditional media, this is going a long way towards documenting the "wisdom of the crowd" as opposed to experts (filmmakers, reviewers, journalists), who would not be able to get anywhere near such accuracy in the prediction.

Another more sinister example could be Intelligence agencies, which have difficulties identifying individuals in protesting crowds putting up photographs of the protesters and source suggestions from the crowd as to the identity of the protesters.

5.3 Innovation activities

There seems little doubt that innovation is one of the most important business activities, and something that most companies find absolutely critical for long term survival. And many might raise the question whether it is possible or advisable to outsource something so close to core business like outsourcing. We shall provide a couple of examples of how that is happening.

Many different models have been tried out in practice, and having own R&D departments is of course a common practice. Some companies like Xerox have established a separate research center like Xerox Park, but it is probably fair to say that they have not been too successful in transferring inventions from Xerox Park into innovations in the main company.

The up-scale Hi Fi producer Bang & Olufsen has for many years been a leader in design of Hi Fi equipment based on what is Scandinavian Design. And for many years, the head designer was the Dane Jacob Jensen. However, in recent years, the very exclusive Scandinavian design is actually done by a designer in Palo Alto in California. Bang & Olufsen has outsourced the key core business of Scandinavian design to a US designer.

Another example is the large pharmaceutical company Lilly, which is using Innocentive actively to achieve crowd sourcing of ideas for innovation.

Finally, when it comes to cloud sourcing of ideas, the toy manufacturer Lego originally launched its Mindstorms product in 1998, which is basically a programmable robot. Uses are encouraged to build their own robots and program them to carry out particular tasks. What Lego found in the late 90's was that users were breaking the code to achieve new functionalities. After the initial dismay, Lego has now embraced users having such wishes, and over the last 12 years, Lego is drawing in subsets of users in developing new robots and toys e.g. in the web-product "Design by me". In particular Lego has been successful in Japan, where they get a large amount of submissions for new Lego-sets using the new Lego CUUSOO platform. They then do competitions, and if a set gets more than 1000 votes, it goes almost directly into production.

6. Ambient Organization

Over the last almost 200 years we have seen the emergence of large hierarchical organizations, mainly based upon the fact that it was an advantage to make one self in the hierarchy rather than buy in the marketplace. The tools and capabilities for coordinating and managing were far superior inside the organization than trying to coordinate and manage with many partners and suppliers in the market.

However, the IT developments within almost all areas of business are creating a large number of opportunities for different ways of organizing. We have shown that in a matter of very few years, we shall have unlimited processing capacity, unlimited storage and unlimited communication capabilities available at our fingertips or even available for oral commands. This will dramatically reduce transaction costs of sourcing from the market rather than from one's own hierarchy, which as Coase [6] originally pointed out, will always be producing at higher costs than the best in the market. In other words, it will be an advantage to source from the "best" in market rather than produce oneself.

We have then taken one of the most popular models of organizations, that of the value chain of [24], and we have attempted to illustrate that there are today a large number of organizations, who are already sourcing key and some would even say core business processes from outside. This is happening due to the dramatic fall in transaction costs when sourcing from the outside.

We have developed a short classification of different types of outsourcing arrangements, from shared service centers to crowdsourcing, and we suggest that in principle it is possible to outsource or source practically all types of business processes whether it is production, marketing or innovation from the outside

If this is the case, we are just at the beginning of the emergence of a new type of organizations that we have proposed to call Ambient Organizations.

We have chosen the concept "Ambient" to illustrate that any modern organization needs to be present everywhere, whether it needs procuring of the best raw material, recruiting of the best employees, manufacturing in the most optimal place, marketing via social networks, selling in a range of different markets, servicing for a wide variety of customers, and last but certainly not least innovating with customers and different partners.

The Ambient Organization is proposed as a metaphor for organizations utilizing emerging Ambient Intelligence Technologies, and is exploiting virtual resources on a business process level as well as on an individual level. It will in this way redefines/reinvents its organizational structures and its business models through building strongly on contractual and even non-contractual short term relationships (outsourcing, crowdsourcing) in order to deliver enhanced customer value for meeting increasingly complex and ever more competitive and dynamic environments.

For us as managers and/or researchers, the Ambient Organization will require a totally new set of skills and capabilities in managing and leading growth in the 21st century. This is our challenge.

7. References

[1] Airaghi, Angelo, Schuurmans, Martin: ISTAG Scenarios for Ambient Intelligence in 2010, European Commission Community Research 2001

[2] Benkler, Y. (2006). The Wealth of Networks. Yale University Press

[3] Bjørn-Andersen, N, Hedberg, B., Mercer, D., Munford, E. & Solé, A.: The Impact of Systems Change in Organisations, Sijthoff & Noordhoff, Alphen aan den Rijn, The Netherlands, 1979

[4] Bjørn-Andersen, N., Eason, K., and Robey, D. *Managing Computer Impact: An International Study of Management and Organizations*. Norwood, NJ: Ablex Publishing Corp., 1986.

[5] Bjørn-Andersen & Turner J.: The Metamorphosis of Oticon, in Galliers. B. & Baets W. (eds.): Information Technology and Organizational Transformation, 1998

[6] Coase, R.: 'The Nature of the Firm' (1937) 4(16) Economica 386–405

[7] Davenport, and Short "The New Industrial Engineering: Information Technology and Business Process Re-design," Sloan Management Review), 1990,

[8] De Witt, B., Meyer, R.: ”Strategy, Process, Content, Context – An International Perspective”, Thomson, 3rd Edition, 2004 p. 375-401

[9] Dubinskas, F. A.: Virtual organizations: Computer Conferencing and Organizational Design, Journal of Organizational Computing & Electronic Commerce, vol. 3, issue 4, 1993

[10] Elliot, S.: Technology enabled innovation, industry transformation and the emergence of ambient organizations, working paper, University of Sydney, 2005

[11] Gurbaxani, V. and Whang, S. The impact of information systems on organizations and markets. Commications of the ACM 34, 1 (1991), 59–73.

[12] Gore, B.: One Pioneer, 1985, see http://www.context.org /ICLIB/IC11/WholePer.htm

[13] Handy, C: The Age of Unreason, Drake International, 1989

[14] Hoos, Ida: Automation in the office, Washington D.C. Public Affairs Press, 1961

[15] Häcki, R. & Lighton, J.: “The future of the networked company”, McKinsey, Quarterly no. 3, 2001, p. 20-39

[16] Hagel J. & Singer. : Unbundling the organization, 1998

[17] ISTAG: Scenarios for Ambient Intelligence, IST program, www.cordis.lu/ist/istag.htm, 2001

[18] Kling, R. (1980). Social analyses of computing: Theoretical perspectives in recent empirical research. Computing Surveys, 12(1), 61-110.

[19] Lyytinen, K. & Yoo, Y.: Issues and challenges in ubiquitous computing, CAM, vol 45, no 12, pp 63-65

[20] Malone, T. & Laubacher R.J.: The Dawn of the E-lance Economy, HBR, September-October, 1998, p 145 - 156

[21] Mandy, C.: Trust and the Virtual Organization, HBR, May-June 1995, product number 4363

[22] Markus, Lynne. M. & Robey, D.: “Information Technology and Organizational Change: Causal Structure in Theory and Research” Management Science, Vol. 34, No. 5. May 1988, pp. 583-598

[23] Mumford, E & Banks, O.: The Computer and the Clerk, Routledge and Kegan Paul, 1967

[24] Porter, M. Competitive Advantage: Creating and Sustaining Superior Performance (1985)

[25] Robey, D. "Computers and Management Structure: Some Empirical Findings Re-examined," *Human Relations*, 30 (11), November 1977, 963-976.

[26] Whisler, T.L: The Impact of Computers in Organizations, Praeger, 1970

[27] Voss, Hans Werner: Virtual Organizations: The future is now, Strategy and Leadership, July August 1996