Information Technology Artefacts and Services They Provide

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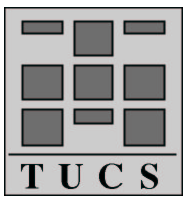

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Abstract

This research paper aims at an understanding of services based on information and communication technology that is sharper in its conceptual analysis than is usually presented. As the point of departure we take two basic frameworks and outline some relevant issues on the research on service marketing and on the information technology artefact. Next, the role of this artefact as a constituent of information technology (IT) services is derived. We use an example of historical development of information technology in order to outline its ascending influence on banking services. Further, based on our banking example, three different categories of services are identified. Finally, potential avenues for further research are proposed.

Keywords: information technology, information technology services, information systems, artefacts, self-services

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1. Introduction

In this paper, we discuss information (and communication) technology (I(C)T)-based services. There is by no means complete agreement in the literature on complicated and such pervasive phenomena known as IT services. The word can appear in quite different contexts starting from IS consulting and system delivery stretching to e-commerce and information search in the world wide web (WWW). Such a broad use of the term IT service is, on the one hand, well justified, because IT artefacts - earlier often called information systems (IS), are not usually purchased as material products. This observation opens the challenge to regard them as services. The main purpose of this paper is to explore in more detail what can or should be put in the service dimension of IT artefacts, i.e. in the concept IT service. One interesting issue is, to what extent and in which aspects IT services differ from services in general. Our analysis also aims at identifying different types of IT services, which leads to a tentative taxonomy of IT services.

This objective also contributes to the recent discussion on the identity of information systems research (ISR). Orlikowski and Iacono (2001) challenged the ISR community to reconceptualise the IT artefact. This is not, however, trivial, because it often seems that the context of the IT artefact is more important than the artefact itself. If any benefit or value is created by the use of the artefact, it goes to the human activity of the user(s). "The work of the user is not to use the system" (Sinkkonen, 1998). Some reconceptualisations have taken the radical step by locating the focus outside the technical artefact. Alter (1999) argues that "the work system is not just a useful focal point, but is actually more useful than traditional focal points including information technology, the information system itself, the organisation, or the firm". A parallel phenomenon has happened in theoretical and methodological sides of ISR. A rich collection of reference disciplines has been so frequently used, that it may, indeed, seem that the own theoretical framework of ISR is invisible or even nonexistent. A bagel metaphor describes this caricature: different reference disciplines can be seen as the sectors of the bagel, but the core – is empty. All scholars are not so pessimistic. For example, Baskerville and Myers (2002) argue that the IS discipline has fully emerged as a discipline in its own right and can in the future be used as a reference discipline by other disciplines.

In their recent paper Mathiassen and Sørensen (2002) have presented their response to the challenge given by Orlikowski and Iacono (2001). They "consider the artefact situated in a situation of use where it supports the performance of tasks". Then they develop a taxonomy of information by using the classification of tasks given by Mintzberg (1983) and another classification of services by Gutek (1995). The service dichotomy between encounter services (short-term) and relationship (long-term) services coincides with the first dichotomy of tasks, that of low or high complexity. The second task dichotomy is based on low versus high uncertainty, and this is reflected as a division between information processing and information generation services. The information services are thus divided in four classes: computational, networking, adaptive, and collaborative services.

While the work by Mathiassen and Sørensen (2002) has rather similar objectives than this paper, there are also differences. In our work, we want focus more to the structure and functioning of the IT artefact in the IT service. We therefore have to zoom deeper in to the service concept. We also want to avoid explanations that give the computer or the IT artefact the role of acting subject. Therefore we want to be able to identify the supplier and customer of the IT services as well as the value that the customer receives during the service (see, for example, Lapierre, 1997 on discussions of the existing literature on value).

In order to reach the objectives, we start by discussing the related theories of services and continue to discuss the concepts of IT and ICT and concretise them by means of the notion of IT artefact. Based on these concepts, we derive a rather detailed view of the peculiar way in which the IT artefact is embedded in IT services, and illustrate this by comparing different phases of the historical development of banking services. The core concept of self-service turns out to be the central component of IT services. It can be supplemented with two other categories: peripheral IT services and context-related exploitive services. Finally, we present a discussion and directions for future research.

2. Services and Information Technology

2.1 The Service Concept

Before entering a discussion on IT artefacts and IT services, we need to present some concepts related to services; we have found them from the service marketing literature. Marketing developed originally for selling concrete, physical products. At a later time services were considered as marketing objects too. The first step usually is to distinguish the services from the products or according to Levitt (1981), to distinguish 'intangibles' from 'tangibles' - with special characteristics. This is of course an apparent distinction to make. Services are attributed with characteristics such as intangibility, inseparability, heterogeneity, and perishability, that are compared with physical goods (see e.g. Wolak et al., 1998 a study of four characteristics of services; Shostack, 1977 for discussion of the concept of intangibility). In addition, lack of ownership is often included among these characteristics (Kotler et al., 1996):

(1) Intangibility is one of the key characteristics of services because there are no tangible evidence in services;
(2) Inseparability deals with the simultaneous delivery and consumption of services. Service cannot be separated from their providers, whether the providers are people or machines;
(3) Heterogeneity reflects the potential for variability in service delivery, which can be a particular problem for services with a high labour content; and
(4) Perishability means that services cannot be stored and carried forward (sold or used) to a future time period.
(5) Lack of ownership means that products can be owned but services (or service products) lack that quality of ownership.

Payne (1992), for example, defines service as follows: "A service is an activity which has some element of intangibility associated with it, which involves some interaction with customers or with property in their possession, and does not result in a transfer of ownership. A change in condition may occur and production of the service may or may

not be associated with a physical product." In the same vein, Grönroos (2000, p. 47) lists characteristics that are identified for most services:

- services are processes consisting of activities or a series of activities rather than things;
- services are at least to some extent produced and consumed simultaneously; and
- the customer participates in the service production process at least to some extent.

Services are sometimes clustered to groups or packages of smaller services, accentuating the process nature of services. The core of any service is tied to the benefit it offers to the buyer (Halinen, 1994, p. 42). The customer may have to use some services in order to use the particularly desired service. For example, he may make a ticket reservation and take a bus in order to come to the concert, that is the core service of this chain; it gives the core need fulfilment. The other services are often called peripheral services (see Lehtinen, 1983; 1986: Grönroos, 2000 refers the dichotomy also as the main service and auxiliary services, which are further divided into facilitating services and supporting services). The basic service package is extended into the Augmented Service Offering (see for example, Grönroos, 2000) but in this paper we are more interested on the basic package of IT service. In the end, it is the customer who decides whether to buy or not the whole package – despite of what the are the characteristics and whether the item contains intangibles, tangibles, or a mix of both qualities. More important is the total value for the customer. Chronologically this kind service package can be structured in three phases: *joining phase*, *intensive phase*, and *detachment phase* (cf. Figure 1). Grönroos (1990, pp. 244-245) names these phases as connection, intensive, and disconnection, respectively.

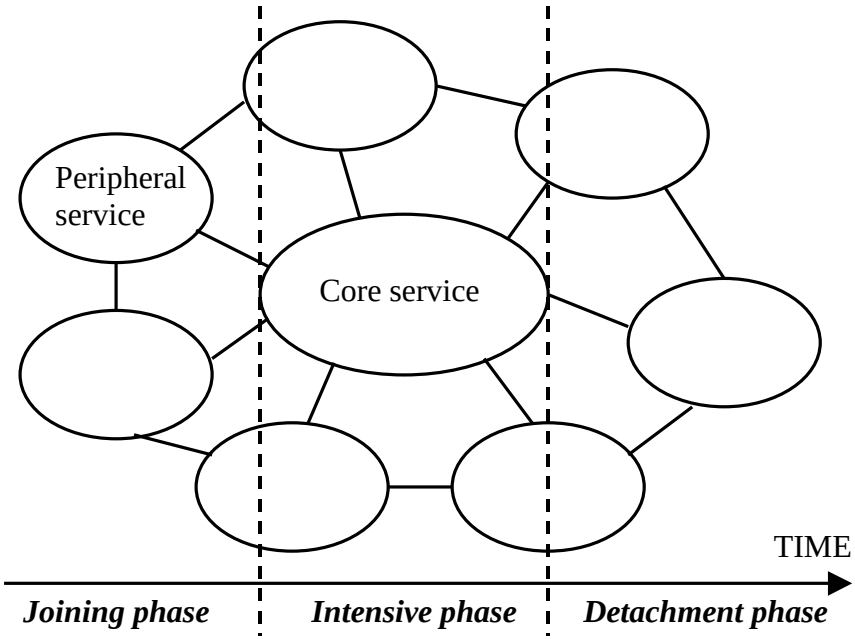

Figure 1. A dynamic view of the service package (Lehtinen, 1983; 1986).

2.2 The IT Artefact Concept

IT artefact can be seen as a modern term replacing and reconceptualising the traditional phrase 'information system' (see a pathbreaking source for discussion the meaning of computers as an IT artefact from Dahlbom and Mathiassen, 1993). IS was by many scholars experienced as too closed, static and factory-oriented (an input transformed into an output). IT artefact adapts itself more flexibly to multiple metaphors, such as tool, shared information space, and media. These metaphors are also conveniently associated with the three basic functions of IT: processing, data storages (data bases), and communication (networking). This list explains why we do not understand the relevance of the new acronym ICT, because the communication aspect already is an inherent and important aspect of IT: there is very little to be communicated when all information has been communicated. ICT sounds redundant in the same way than term "road and car traffic". Road traffic includes trucks, (motor) bicycles, many other vehicles – and, of course, cars.

The three basic functions can then be aggregated and concatenated in myriads of ways. Such larger compositions constitute practical services that lend themselves to be classified in the similar way than what Mathiassen and Sørensen (2002) gave a good example. For our purposes it is important to realize that we regard all such aggregates of any size (even the smallest ones) as IT artefacts. We remind, however, that we have a preference for theories and interpretations that do not qualify the IT artefact as a genuine supplier or a customer of services, even if it sometimes looks like this could be the case; e.g., in the case of the ATM (automatic teller machine).

Originally, Oxford English Dictionary defines a concept of 'artefact' as: "Anything made by human art and workmanship; an artificial product". Our interest in regarding the notion of IT artefact as a service receives credibility when we now have a look at the general characteristics of services. While made by a human being, the IT artefact is a physical thing, but its essence is in its functions rather than in its material properties. These functions typically cannot be performed separately of the artefact; furthermore, one or more persons in their respective roles must be identified and (in the first interpretation that will be generalized later) must be present. Grönroos (2000) notes that there does seem to be an increasing awareness among researchers and practitioners, that it is even unnecessary to continue to debate service definitions - mostly because there were a lot of debate on definitions of services in the 1960s, 70s, and 80s. But still, we argue for kind of a fundamental service discussion, which has to be emerged in terms of IT. We see that IT services have similarity but also additional features compared with the traditional characteristics of services (cf. also Viardot, 2000; Brännback and Puhakainen, 1998; Kaitovaara and Puhakainen, 2002 on their notions on digitisation of services). First, there are intangibility in person intensive high-expertise services on IT. On the other hand, there are also tangible evidence presence in those cases where IT hardware act as a vehicle in IT service consumption. Second, simultaneous delivery and consumption occur in person intensive high-expertise IT services. In self-services such as user processing text with computer, the word processor application is delivered and installed to the user's computer. Afterwards the consumption of IT service takes place whenever the user wants. However, even this kind of service cannot be separated from its provider i.e., computer. Third, there are heterogeneity in such IT services that have high person content. Especially this is the case when IT services are not delivered with a professional and controlled manner based on detailed job procedures and processes. IT

services that exist in electronic and full digitized form (such as CD-ROMs) are homogenous to deliver. Fourth, IT services can be perishable in person intensive high-expertise areas. IT services that exist in electronic and fully digitized form can be stored and carried forward (sold or used) to a future time period. Fifth and finally, IT hardware can be simply owned but then again IT consulting services may lack that quality of ownership. Lack of ownership is not so evident in IT services provided through the digital networks: the customer owns the right to use and utilize the application. The customer also owns the information that is processed - although, it can be physically stored in the servers located in the IT service provider's premises.

The service character of IT artefact has been observed also by other scholars. For example, Shapiro and Varian (1999, p. 8) emphasise the service aspect in their statement: "the technology is the packaging that allows the information to be delivered to end consumers". Information Technology Interaction Model introduced by Silver et al. (1995) attempts to give a reasonable definition of IT. Their model rests on the premise that the consequences of IS in organisations derive from the interaction of the technology with the organisation as well as its environment.

Basically, information systems development (ISD) approaches can be divided into build or pay (Silver et al. 1995), or as Sawyer (2001) states, to made-to-order (custom) or packaged (commercial), both of which are (implicitly) understood as means to provide services. In addition, Nambisan (2001) refers "software services" to services provided to customers on a project basis including custom-software-development services. By "software products" he refers to packaged solutions. All this confirms our preliminary understanding that IT artefacts are services rather than material products.

Hence, the concept of the IT artefact is defined as follows: *The IT artefact is a service constructed on software (a program) or hardware (an electronic/a digital component), or often a combination of both – that is, the minimum requirements for platform of IS.*

3. The IT Artefact as a Part of Service

Above we concluded that IT and software are not material products in the first place, rather, it could be fruitful to regard them as services. This is by no means a new invention, quite the contrary; it is more or less a commonplace to talk about software systems under the general label "services". It does not, however, happen so often that the notion of service is given a more concrete meaning. In this paper we try to reach a deeper or at least more analytic understanding of the issue "What do we mean when we say that software systems are services?". We do this by studying two aspects of services:

- Identify the supplier and customer of the service; and
- Determine the contents of the service by identifying the added value to the customer.

This is often seen more clearly when comparing the new service to the earlier way to do the corresponding things. Viardot (2000, p. 454-455) notes that "IT-based services" are "a subtle mix of information, knowledge, and technology". Further, Viardot (2000) lists IT services for business: consulting services, systems engineering services, systems integration services, support services, outsourcing services, network services, and e-business solutions. Also a framework by Wells (1998, Chapter 1) that lists various IT

services cannot reach the essence of IT services. These discussions on the concept of IT services do not just reveal the pervasive effect and relationship that IT has to the field of services.

3.1 IT Services in Retrospect

We shall use the history of bank services to illustrate different forms or classes of services that can be provided by means of IT. We focus in the service of payment of an invoice. In the first step the bank offered such a manual payment service. This was based on the fact that both the payer and the payee had an account in the same bank. The payer was liberated from physically moving to the payee's location and could perform multiple transactions during a single visit. The first computer-supported information systems (as were their ancestors in Hollerith punched card systems) were operated in batch processing. This improved the efficiency of the bank processes, but it also created the idea of the nation-wide IS of the bank with a parallel increase of the payment network between the bank's customers. On-line real-time systems further speeded up the performance of the transaction – at least among one bank's customers. Progress in data transmission and its protection soon led to ATM for customers that allowed them to operate the entire transaction without assistance of bank personnel. Networked home computers moved these services from the banks' vestibules to the customers' homes. These phases are summarised in the following Table 1.

Table 1. Taxonomy of banking services and their introduction to market.

Dominating period of banking services	**Customer/Client**	**Bank as Service provider**	**IT service value creation**	
			Customer/Client	**Bank**
Cash	Cash invoice payments directly to the payees at their physical locations	Loan and account services (transferring funds) in a conventional bank branch	[No IT] Value achieved by saving into own account, loan possibilities	[No IT] Manual operations: business value gained with interest margin
Simple payment service	Invoice payments via bank employees as indirect debit	Account transfers between bank's customers and invoice processing in a single physical location	[No IT] A visit in single branch of bank is enough for several invoice payments	[No IT] Mechanical accounting machines as tools for effective transactions
Batch processing	Faster invoice payments services via bank employees as indirect debit	Efficient banking services: however, the role of bank employee important due to the location-dependent face-to-face operations	Branches with united account management, services can be used for invoice payments between different bank companies, account information	Batched IT-based IS rationalize banking services, increasing speed and control of transactions (Computer-oriented staff is required for internal services: the first computer in Finland in year 1958 was used for book-keeping purposes)
Real time system	Real-time invoice payments via bank employees as direct debit (e.g., in Finland in the 1970s)	More reliable, real time banking services with scale advantages, a possibility to offer more services	IT-based IS increasing service offering, such as advanced account information	Scale advantages: bank employee processes all the episodes of invoice payments with IT-based IS in a real time
Automatic teller machines (ATMs) and payment machines	Substituting cash i.e., cards for transactions, invoice payments and other banking services in-branch and off-branch	Introducing new devices – that is, alternative banking services for face-to-face operations	IT-based IS supporting different card services, automata services available despite of banking hours	Integration of automata in bank's IT-based IS, shortening queues, cost savings on staff expenses
Internet banking with various devices e.g., personal computer (PC): fixed line banking, and mobile banking services	Invoice payments and other banking services through range of terminals and devices (Finnish bank introduces the Internet bank in 1996 – first in Europe)	Most of the bank services in an electronic and digital form, a possibility for managing several banking services	Location-independent, IT-based services accessible 24 hours a day with own PCs and mobile devices	Decreasing both staff and premise expenses with more IT capacity for processing transactions

As indicated in the Table 1, we have been able to identify the customer and the service provider of the service. This important requirement is fulfilled also in the internal services that the computing service provided. Different steps, on the other hand, can be interpreted as manifestations of new ways to create added value through new technological or organisational innovation. In what follows, we shall focus on the role of the IT artefact in the services.

3.2 Functions in IT Services

This historical analysis gives a good overview over many essential characteristics of IT services. Before a more detailed analysis of them, we start our analysis by returning back to Charles Babbage and his design of machines, particularly the Difference Machine in 1820's (Hyman, 1982). It is obvious that Babbage understood the purpose of his construct as a calculator (or computer) that could produce mathematical tables to be used for example in the service of navigation or artillery - or banks. The supplier was the owner-programmer of the machine and the customer came e.g., from the banks. Such tables were material things, but their justification was not in their material properties, but rather in the usefulness of the information they included. The value added was constituted by the lower price or greater accuracy (less errors, more significant digits) than earlier.

The first computers in the 1940's were, indeed, regarded as computers, i.e. devices for performing calculations. As in the case of Babbage, the delivery took place in batches that were produced with a significant degree of automation created by programming. The batch-orientation was a pure necessity, just imagine yourself at a marketplace trying to sell single additions or multiplications to the customers. The power of the programmed computer comes into existence through long and difficult sequences of calculations or through repetition of simpler calculations for a large number of cases i.e., for a batch of data.

The data was organised in large files stored on punched cards or magnetic tapes, that were processed in the mode of batch processing. The bank typically had its own computing centre, even if many other industries had externalised their data processing to specialised service bureaus. The computing centre had one record for each account to be updated daily – or rather typically over night.

The computing centre provided the bank offices with two types of services. It collected all transactions (deposits, withdrawals, transfers) of the day from each office and delivered updated account lists of the accounts in the return. Behind this visible service there was, however, another service: that of data management. The computing centre stored and maintained the standing files of all customers and all their accounts. Of course, also these were subject of change, but typically the collection of accounts was more permanent than the running transactions. Certain fields in the standing files, or master files, as they soon were called, could be used for summarising the transactions e.g., for purposes of customer relationship management. Processing and storing of data were the two functions of IT services, soon to be followed by the third one: data transmission.

3.3 System Services and Business Context Services

It is important to be aware of the different nature of the two services based on our banking example. The computing centre provided the branch offices with data processing and data management services, whereas the branch offices continued to offer ordinary bank services to their customers. In the first type of service the customer received value added in the form of improved efficiency; manual back office activities could be done with less effort and probably more reliably. Unified work practices were easier to control, which raised the threshold of embezzlement, for example. In the customer service the customer still had his bankbook as a document, but the first steps towards the development to the primacy of the bank's account-keeping was now taken. The customer was still bound to keep contact with his home branch office.

Even if the two service types here are visible, they cannot be sharply separated. The business services are affected by the introduction of IT. New forms of work and some restrictions often accompany such introduction, but perhaps more often the IT has an enabling function: new ways of doing things become possible. Whereas business activity – or in other terms, simply work - is affected in multiple ways by the IT, there is no free-standing, independent IT in the organisation. The introduction and continued existence of the IT artefact has to be justified in terms of its contribution to the business activity. This implies that the "pure" IT services always have to be regarded as an inherent constituent of business context activity. Thus the two service types are inseparable, even if the separation may be temporarily done for analytic purposes – if the analyst does not forget to connect the parts again.

This principle of inseparability is justified also semantically: the operations and transactions performed by means of the computer belong to the work domain of the users' business activity. The updating of bank accounts must not give different results, if it is performed by using IT instead of earlier manual performance. The program thus repeats the steps of the worker.

The work is thus organised so that first the tasks are outsourced from the bank's back office to the computing centre. But in the computing centre no worker performs the calculations, but rather the operator makes the computer program to do the processes. These two steps of delegation seem to interrupt the fluent work processes. Later technological development gives however good opportunities to bridge such gaps.

Three major innovations were needed to radically change the organisation of work. Direct access memories allowed updating of single transactions instead of large batches, which soon led to real-time data management. Data transmission enabled the on-line connection to the databases. Cathode ray tube (CRT) screens gave the opportunity to display the updated data in real-time as well. Together these new features changed the work situation of the bank clerk essentially: she could display the customer data immediately when he had come to the counter and identified himself. The most relevant information was naturally the state of the relevant accounts owned by the customer. She could key in all details of the desired transaction, whether it was a withdrawal, deposit, or transfer to another account, for example as a payment of an invoice. The transaction could be completed, if all parties were customers of the same bank.

This completion was made possible by centralised data management and the consequent opportunity to access all accounts of all customers almost simultaneously. If one transaction needed transfer between two or more banks, it still had to wait batch processing of clearing transactions. The customer could get the same service in all offices of his bank, independently of his home office.

IT developments enable firms to create services more easily. In general, new IT often makes it easier to maintain relationships with customers, as well as new ways of doing so. (Grönroos, 2000) This is the case also in our example of banking services, where IT has been played a remarkable role in their development.

3.4. Work Roles behind the Curtain

After these changes, the bank transaction was very much the same as before. The independence of the local office and the speed of the service made the greatest difference. But the "computing service" was subject to a radical change. For the bank clerk this change appears as if the people who had delivered this service had almost entirely disappeared. The clerk in fact performed most of the tasks that the operators in the computing centre earlier had done, if they had not become obsolete along with new technical solutions.

Such disappearance was not, however, total. The computing centre people still were there, even if their work was not all the time visible, they were in a way behind the curtain. But as soon as a breakdown took place either in the performing of the transactions or in the availability of the necessary infrastructure, these persons had to be found and they had to straighten the problems. The network had to be recovered after a breakdown and the origin of a possible error in the databases had to be identified and corrected. There was little tolerance of long delays in fixing error situations, because a waiting customer is often willing to walk out end enter a competitor's office.

This was not the first time when specialist workers hided themselves behind a curtain. In the IT this had happened already when the developers of ISs (designers and programmers) had finished their job and left the artefact to be used in the production runs. Even if most developers often left the scene entirely, some of them stayed behind the curtain and continued the maintenance work by correcting errors (also these hidden roles had to become visible at failure situations) and developing the artefact further.

These two games of hide and seek are not, however, quite identical. The tasks in the computing centre's part of the work-flow were based on the properties of the technology of its time. New inventions made many of such tasks obsolete, and it was but natural to streamline these processes. The role of designers and programmers was, however, more fundamental, because the semantics of system's functions and of the work of the users had to coincide with each other. This requirement was necessary, if the users wanted to get their work done. Nurminen et al. (1994) has interpreted this semantic coincidence with the term "sleeping labour". This notion should be placed between the concepts "living labour" (actual workers), and "dead labour" (of earlier workers) that is embedded in infrastructure and even in other artefacts prepared by them. Sleeping labour is not only an enabling artefact, it is also a description of work processes (represented in system descriptions and program code), that can be evoked by the user in the purpose to repeat the performance of the predefined work steps whenever

this is needed. In this way the user becomes the real actor of the system functions. The use situation of the clerk now can be seen as a self-service of this kind of sleeping labour, i.e. of the functions and services (seemingly) provided by the IT artefact.

The immediate and easy access to the system services had also another, probably unintended consequence: one bank clerk was able to perform several types of transactions. The shift from one transaction type to another could be done by pushing two or three buttons. Also the customer got benefit from this because he could get all issues treated by one clerk when he earlier had to stand in line behind several counters. Unfortunately, in many banks the education was organised more in terms of system functions than of bank services. Therefore the (unexpected) enlargement of the jobs did not always entail job enrichment, because the competence in the substance of banking was too superficial. This restriction did not, however, create too much harm when the clerks performed well-defined routine transactions. As usually, exceptions and breakdowns brought these problems to the surface.

The emphasis of routine transactions implied at least partial ignorance of tasks that demanded high competence. This inconvenience was to a great extent caused by the good availability of and easy access to IT artefacts. The inconvenience was, however, soon turned into a great convenience to the customer. In the third wave, the bank clerks started moving out of the scene – if not entirely, at least many of them were behind the curtain. This change occurred, when ATMs for withdrawals and devices for payment of bills were raised at the entrances of bank offices. Provided with well-protected keywords and passwords the customers were given access to their own accounts that they could manipulate. This opportunity was naturally restricted to the most standardised transactions.

We are already familiar with this kind of curtaining from its first (developers) and second (operators) wave. Again it seems that the clerks have disappeared, but any significant breakdown will make that role visible again. And again this curtaining has the characteristics of its own. The key issue is in the fact that the collaboration between the clerk and the customer belongs to the bank's key services. The transaction must have two parties by definition. Because the clerk role is hiding behind the curtain, the customer must perform her tasks himself. These tasks include the identification of the customer and the transaction type followed with entering the details of each transaction. The value to the customer was in better availability of services, he could perform transactions even outside the opening hours of banks. The lines were typically shorter and the distance to the service point was often shorter. Also the price of the services was typically lower.

The next step to home banking by using PC was not very radical. Compared to the ATM, the customer received added value in not having to move from home to the terminal and in 24 hours availability of services. Furthermore, additional services could be integrated with the very routinised basic transactions offered by the ATM.

There has been researches on the trend towards self-service (see Toffler, 1980; Naisbitt, 1982). As Normann (2000) notes: "We have an increasing amount of discretionary time which we can use to service ourselves". We are often both consumers and producers of the service. It means that the consumers are the service provider company's workforce.

4. IT Services and Their Dimensions

It is a tautology that IT services must be related to IT. This has been often interpreted so that information technology is used (typically by the supplier/service provider) as a vehicle in the production of services. This formulation leaves the IT component as a black box: it gives no explanation to the questions how (and why!) the IT functions as a part of services. Our analysis in the previous chapter indicates that the use of the IT artefact itself can also be interpreted as a service. Furthermore, the actions performed directly by means of the IT artefact (that were called as 'system services' above) are constituent factors to all IT services. In other words, it does not make sense to talk about IT services unless there are these system services are available and operational. Therefore we call them as *core IT services.*

In what follows, we first elaborate the idea of core IT services. It will turn out that other IT services are needed for enabling and enhancing the core services, even if the value created through IT artefacts comes from the successful performance of core services.

4.1 Core IT Services

The core IT services are services that are directly provided by means of IT artefacts. Information technology lends itself for processing, storing, and transmission of data, as already was stated above. Traditional information systems were often complicated aggregations of these main functions. Early number-crunching machines were gradually shifted to data management systems, whereas the current emphasis on communication is based on advanced data transmission. This is further strengthened by integrated structures of the ISs: multiple users of one integrated system are in fact communicating with each other.

One particular characteristic for the core IT services is, that they almost exclusively are self-services. The user of the system is also the operator. The steps of the executed program therefore become steps of the user's work processes, even if the supplier of there programmed task chains is not present. The user is thus seen as the customer of the services provided. A similar interpretation can be given to the data maintained and the messages sent: all of them belong to the work domain of the actual user.

The concept of self-service is sometimes useful also for bracketing the customer. The user of an IT artefact can also hide himself behind the curtain. For example, this is what happens when he constructs an "intelligent" agent for searching information in the WWW. The agent program may continue its execution long after the user has gone to the bed. Another example can be found in the electronic market places, where the user of the IT artefact (the supplier of the product/service) is not present when his IT artefact is running and giving interactive service to the customer.

This peculiar property of self-service is one of the key features of the IT artefacts, that has enabled many individual and collective actors to construct complex and networked activity networks.

4.2. Peripheral IT Services

The value of IT services is created through the repeated performance of core-services, often in the form of self-service. The supply of the core services cannot, however, be initiated from the scratch. The adequate equipment, different layers of software, and

network connections must be there, as well as the operating and development personnel even if these tend to hide themselves behind the curtain at the moment of self-service. Characteristic of the enabling services is the formulation and implementation of the 'sleeping labour'. The work processes are described and turned into software code. The resulting IT artefact is a multi-layered package of sleeping work. Not only the steps of the user's work processes are canned. A complicated network of operating systems, compilers, data base management systems, data communication protocols, drivers of devices and many others are functional substitutes of human work that are necessary for the core IT services. These activities can be called system development in the broad meaning of the term. The traditional systems development lifecycle (SDLC) known as the classical waterfall model, divides the ISD process into distinct functions to be performed by different persons or in separate time intervals (Dahlbom and Mathiassen, 1993, p. 87). Without these peripheral, enabling IT services during its lifecycle – including phases such as feasibility study, requirements analysis, implementation and deployment, the IT artefact cannot be operated nor utilized successfully as a self-service. They may be partly or entirely outsourced, but in any case they are services rather than material products. These necessary prerequisites to the core IT services are called *enabling IT services.*

Enabling services are often provided by IT vendors, one or more of them. The relationship between the vendor and the customer is often rather long over the period of whole life cycle of the IT artefact, starting from pre-study, problem analysis, and requirement determination to the final implementation. Sometimes business process innovation (reengineering) is combined with system development. The service relationship can be extended to continue during the core IT processes; this is called maintenance since the word guarantee is seldom used for IT artefacts. Sometimes the intensive phase of peripheral IT services are congruent with core IT service, since typical maintenance operations such as giving user rights are performed by the IT personnel simultaneously while the IT artefact is in use.

When system development leads to the implementation of a new IT artefact, the resulting core IT services rather often are successful only to a partial extent. The value created through the core processes can often be improved by many ways: processes can be further streamlined, users can get more education, or organisation of the work can be improved in many ways, to name a few possibilities. Many analyses on IS development failures, for example Sauer (1993) indicate that many failures are due to the insufficient attention to organisational implementation. This observation may be interpreted so that enabling services may be satisfactory, but the organisational, social, and human aspects yet may lead to serious problems unless they are deliberately and professionally treated. Most of such measures of improvement can outsourced if desired. The outsourcing opportunity, however, leads us to regard also these activities as services related to IT. We call them *enhancing IT services.*

The enhancing IT services are more consulting than design and construction of IT artefacts. Such services may be provided by the system vendors, but they may also be supplied by independent organisations. The need for enhancing services in the context of IT services is probably higher than for other services. This is probably due to the fact that self-service and the absence of service providers imply greater cognitive requirements than in traditional services. It is not trivial to distribute the potential

sleeping labour to the right persons' workstations and make the collection of such processes a part of the user's fluent work performance.

Whereas the enabling services convert human work processes into sleeping pieces of software, the enhancing services can be seen as a reverse conversion, in which the software is embedded in the users' division of labour and work processes. Therefore it is important to regard them also together, even if the analytic distinction made above turned out to be fruitful. This is what has happened particularly in many approaches of participatory design. Users have been involved in the change process from the very beginning; this inherently merges the enabling and enhancing services.

4.3 Exploitive Services

In the value creation process the enabling and enhancing services carry cost that hopefully will be covered through continuous application of the core services at the user's work situation. The core service is, however, not able to cover any cost alone. It is sufficient here to remind about the Sinkkonen's statement: "The work of the user is not to use the system". The use of an IT artefact alone does not create added value. There has to be processes and/or services that collect the benefit. We refer them as *exploitive context-related services.*

The core IT service fortunately has an activity (context) surrounding it. This activity proper is the expected beneficiary of the core service. The activity may belong to industrial production as well as to the service sector. In any case the core services support the exploitive activity in improving productivity and efficiency. Our analysis already gives a reasonable interpretation to the core and peripheral processes that can be applied also for material production. In this paper we are interested in IT services and therefore we focus on the services that are based on the use of IT artefacts. Different versions of the invoice payment service offered by the bank were a good example of such services.

There is still space needed behind the curtain. The supplier or customer may disappear and leave the interface of the service to the computer interface. Of course, this is possible only if the service is standardised to a high degree. At the same time it happens that the core IT service and the service proper melt together. In the banking example the customer performs the core IT service and the payment service entirely alone without synchronous assistance by any bank clerk.

Another interesting characteristic of exploitive services is that they can be embedded in practically any type of services. The service just has to be sufficiently standardised; then a part of it may be supported by an IT artefact. The complicated service structures do not disappear. Tickets can be reserved with the support of IT and mailed to the customer, even if the main service is the desired performance at a theatre. It seems, that IT further increases the potential of constructing new and larger service aggregates.

5. Discussion and Further Research

In this paper we have analysed the role of IT artefacts in IT services. We found out that the use of such an artefact itself is a service, during which the user himself operates the artefact and wakes up the embedded, "sleeping" work processes. This immediate service, either existing or planned, is a necessary constituent of all services that qualify

as IT services. Interesting is the automation aspect, that, indeed, gives the opportunity to turn genuine services into self-services run by the user. This view is, however, too narrow to be useful, because there are many other types of services that with good reason can be called IT services. As Johns (1999) concluded that the service concept should always be accompanied by a qualifying word to clarify the sense in which it is being used, and that the context should be carefully explained. Thus, we have distinguished two major groups, peripheral IT services and exploitive context-related services. These two together with the core IT services constitute our suggestion to the (tentative) taxonomy of IT services.

Peripheral IT services were divided in two subgroups, enabling and enhancing IT services. As the names indicate, enabling IT services include all necessary services that are needed in order to make the core IT services operable. The supply of the artefact itself and the necessary infrastructure belong to this category. Often the delivery chain is described by means of the life cycle of the artefact. Enhancing IT services, on the other hand, criticise the unnecessarily low level of exploitation of the IT artefact in the core IT service and suggest various ways to improve it. User education or reorganisation of work may be services that belong to this group. Exploitive context-related services are those services that turn the benefit of the core IT services to fulfil the mission or business idea of the organisation. These are the proper genuine services in which the core IT services are embedded. The concept of core IT services gives a credible explanation how this embedment can be understood and what are its prerequisites in the form of peripheral IT services. Exploitive context-related services are not classified further, because they spread out to any imaginable area of application. The work by Mathiassen and Sørensen (2002) fits well in here as a good candidate.

The relationship between the main categories is described in Figure 2. The horizontal dimension may be interpreted as a crude view of the life cycle with the delivery of the IT artefact (enabling) on the left side, the implementation and use (core) in the middle, and the maintenance and improvement (enhancing) on the right hand side. Since the enhancing efforts often lead to changes also in the IT artefact itself, the left and right hand ends meet each other. Just bend the life cycle ends and glue them together to form a cycle.

The vertical dimension is added, because the power of the concept core IT services can applied also for material production. Another lesson to be learned from this dimension is that the exploitive services and peripheral IT services are connected only indirectly; they are mediated by the core IT services. For example, the purchase of an enterprise resource planning (ERP) system (enabling peripheral IT service) and the related consulting for streamlining of business processes (exploitive service) are a probable candidate for failure, unless a sufficient attention is paid also to the core IT services. The organisation has to find and implement a solution for the core services. This observation justifies the name core IT service.

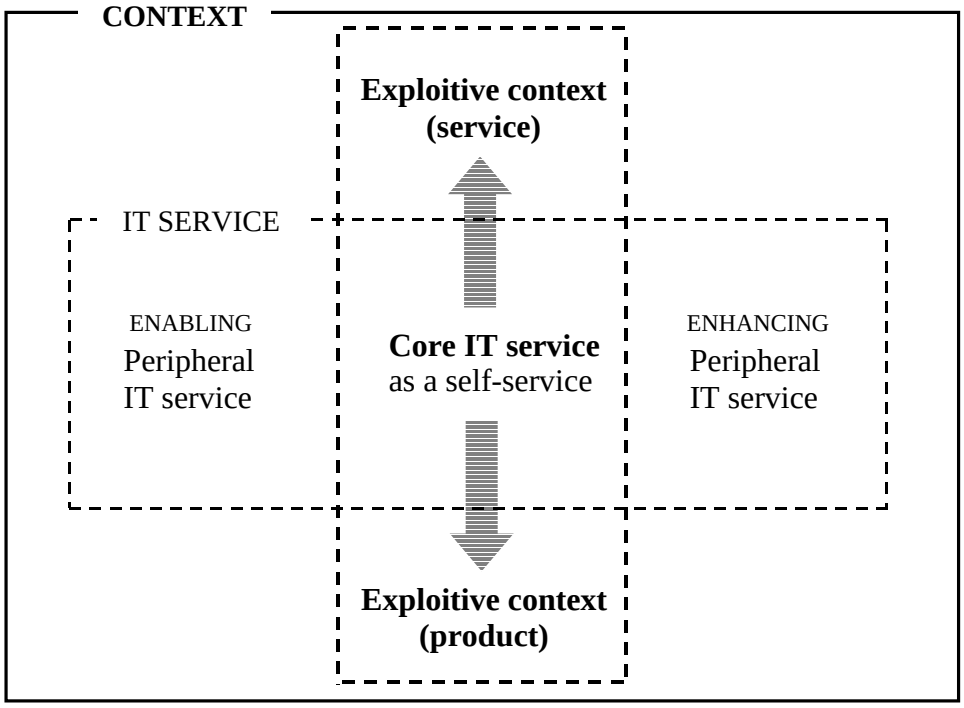

Figure 2. The relationship of core IT service and exploitive context.

There is also a piece of hermeneutical thinking in our taxonomy. As we believe that the distinction improves our understanding of IT services by identifying different classes end their relationships, we simultaneously have an insight that all the categories together constitute a whole that makes sense as an undivided entity. If we take any IT service, we probably can find all three main categories operating simultaneously. Furthermore, we can regard these categories as perspectives and even suggest particular roles as the carriers of these perspectives. The perspective of core IT services belongs obviously to the user (customer) role, whereas there are several roles among the IT specialist who divide the perspective peripheral IT services. The perspective of exploitive services is in the interest of management, in the first place.

To sum up the main contributions of this paper, we recall three suggestions: the service character of IT, IT artefact as a vehicle of self-service, and the persistence of both customer and service provider even in the cases where one of them or both seemingly is absent. The recognition of IT as a service opens the discourse on similarities and dissimilarities between IT services and services in general. The notion of self-service brings one of the exclusive properties of the IT service to the surface. It gives at least a partial explanation to the mechanism of repeated exploitation of the potential stored in the IT artefact. The hidden roles give an access to the parties of the service network. This is important at the conceptual level and often helpful also in practice.

Even if the suggestions are tentative for the time being, they have two attractive properties. First, there is a good degree of consistency between them. And secondly, they are promising, since they have a reasonable amount of explanatory power and since they open new directions for relevant research.

Potential avenues for further research can be found at least in three directions. One problem area that needs more work is the value creation process. How do the three main categories of IT services create present or future value? How come does it sometimes happen that the value is lost rather than created? Another area of interest is to expand the notion of self-service further to various kinds of interactive applications (IT artefact-to-IT artefact). For example, how should the IT service provider-customer-relationship be understood in the case of “intellectual” agents. A third problem could be found in the packaging of IT services. In order to make IT services more efficient, they probably have to be formalised and packaged to a high degree to be operable at the moment of truth, especially those in the (core) self-service situation. Various enabling and enhancing IT services, human-to-human in particular, should be examined - although these type of IT services may set some limits to the packaging of IT services but which makes such attempts attractive. On the other hand, exploitive context-related services have the interface to the core IT services that must be formal and package-able, but to what extent does this requirement be valid to the other aspects of exploitive services.

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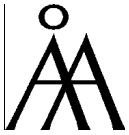

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