

ON THE DUALITY OF INFORMATION TECHNOLOGY: UNDERSTANDING THE CONNECTION BETWEEN 'AUTOMATE' AND 'INFORMATE'

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Abstract

This paper examines the duality of information technology as expressed in Zuboff's (1988) concepts of automating and 'informating'. It pays particular attention in analysing the relationship between the concepts. Contrary to the notion in IT and organizations research it is argued that these concepts are interrelated. While the first concept has gained much attention by both practitioners as well as researchers scant attention has been paid to the latter. Given the fact that knowledge has been argued to be the single most important resource and asset of today's organizations the 'informating' concept deserves serious attention as it relates to effectiveness and as such to the acquisition and creation of knowledge. Since knowledge is most often derived through interacting with external actors of the organization it is argued that analysing the relationship between these concepts necessitates the use of an inter-organizational setting. An in-depth case study is presented of a pharmaceutical firm's development and use of a web-based information system. The purpose of that system is to function as a virtual community facilitating knowledge exchange relationships and thus bringing about new knowledge to the firm, its customers and end-consumers. Analysing the case study from an organizational perspective it is argued that in order to get 'informed' a firm has to both automate and 'informate' its counterparts. Automating counterparts is a pre-requisite for getting 'informed'. However, information brought about through automation has to be distilled into new knowledge — by exercising judgement through drawing distinctions (Reyes and Zarama, 1998; Tsoukas and Vladimirou, 2001) — and re-applied by modifying the system in order to receive more useful information. As such, getting 'informed' requires the firm to apply a long-term perspective by getting engaged in a cyclical process of continuous learning through exploration and exploitation (March, 1991). The results are often neither explicitly visible nor immediate making it less attractive as an option to organizations. Simple automation on the other hand is a process that relies more on technology than on knowledge and analytical skills of the organization.

Keywords: IT, duality, automate, informate, knowledge creation, communities of practice.

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An in-depth case study is presented of a pharmaceutical firm's development and use of a web-based information system. The purpose of that system is to function as a virtual community facilitating knowledge exchange relationships and thus bringing about new knowledge to the firm, its customers and end-consumers.

Analysing the case study from an organizational perspective it is argued that in order to get ‘informed’ a firm has to both automate and ‘informate’ its counterparts. Automating counterparts is a pre-requisite for getting ‘informed’. However, information brought about through automation has to be distilled into new knowledge — by exercising judgement through drawing distinctions (Reyes and Zarama, 1998; Tsoukas and Vladimirou, 2001) — and re-applied by modifying the system in order to receive more useful information. As such, getting ‘informed’ requires the firm to apply a long-term perspective by getting engaged in a cyclical process of continuous learning through exploration and exploitation (March, 1991). The results are often neither explicitly visible nor immediate making it less attractive as an option to organizations. Simple automation on the other hand is a process that relies more on technology than on knowledge and analytical skills of the organization. It is thus far easier to achieve and provides more immediate and visible results than ‘informating’ does hence a more attractive option to organizations.

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1. Introduction

According to Zuboff (1988) automating and 'informating' are two primary effects and analytical concepts respectively that implementation of information technology brings about in organizations. Opposite to what has been the notion within IT and organizational literature, automating and 'informating' are in this paper argued to be interrelated outcomes as they are derived from the same process of computerization. However, these effects among practitioners and the concepts among IT and organizational researchers have been given different degrees of attention.

The implementation of information technology (IT) in organizations is most often based on decisions to increase productivity. This relates to the automation of for instance routines and processes or to the integration of multiple existing systems and information environments within and between organizations. In all such cases a primary objective is to increase efficiency through rationalisation. Automation as a process is thus closely connected to issues of productivity, rationalisation and efficiency activities in organizations. These subjects have occupied much of the attention of practitioners and technology researchers respectively (see e.g. Brynjolfsson and Hitt, 1995; Davenport, 1992; 1997; Freeman, 1999; Hammer and Champy, 1993; Womack et al., 1991; Triplett, 1998).

Less attention, however, has been devoted to the 'informating' effect relating to matters of effectiveness (see e.g. Davenport, 1997). Harvesting new information brought about by computerization and the distilling of that information into new knowledge has been given a second order priority in organizations, if any at all. This is, however, not surprising as raising effectiveness through the acquisition and creation of new knowledge is a far more complex, intertwined and thus difficult a process to achieve than that of increasing efficiency through automation. Moreover, since effectiveness-enhancing ventures entail learning processes their results in terms of return on investment are neither immediate nor easily captured in monetary terms something that makes them less attractive on the IT-agendas of organizations.

The purpose of this paper is to analyse the duality of information technology as expressed by Zuboff's (1988) concepts of automating and 'informating'. How are the concepts in practice brought about? How do they relate to each other? We argue that these concepts are interrelated and to rightfully investigate their relationship one needs to examine them in an inter-organizational setting. We thus illustrate our arguments by an extensive case study on a pharmaceutical firms' engagement in developing and using a web-based information system. This system is designed as a virtual community of practice

which is aimed at bringing about new knowledge to the firm, its customers and end-consumers through enabling long-term knowledge exchange relationships between the parties.

We put forward the understanding that in order for an organization to get 'informed', i.e. in the end gain new knowledge, it requires that the organization itself both automates and 'informs' its counterparts. Here, by automating we refer to the process of increasing efficiency through computerizing transactional work, processes and procedures. By 'informing', respectively, we refer to the process of increasing effectiveness through the acquisition of information by the use of information technology and — through critical reflection — the distilling of that information into new knowledge. Although our attention is not specifically on the latter, i.e. how the process of critical reflection brings about new knowledge, we parallel the notion of knowledge as put forward by Tsoukas and Vladimirou (2001).

Including this introduction, this paper is structured into five parts. In the second part we examine the concepts from a theoretical point of view. Here we focus firstly on framing, describing and defining the concepts according to Zuboff (1988). Secondly, by using the terms of exploration and exploitation (March, 1991) we draw distinctions in our quest to examine the internal logic of the concepts. Thirdly, we focus on the concept which has received least attention as we discuss the growing importance of the 'informate' concept in light of the current debate on knowledge. In the third part of this paper we briefly present the method employed for the empirical data gathered. Continuing, in the fourth part the case study is presented and analysed. Finally, we close this paper by a concluding discussion.

2. The Concepts of Automate and Informate

In her socio-technical study Zuboff (1988) described and analysed the effects brought about on organizations and workers by IT-infusion. The author provided an insight to the alteration of both the nature and experience of work. She argued that work in the pre-computerization era was much a sensory experience that had become replaced by symbolic electronic information. Her study reflected both negative as well as positive current and possible future outcomes of IT-infusion. Workers, for instance, expressed their anxiety over the loss of touch with their tasks and the feeling of being subjects to increased control exercised by managers. On the other hand the technology, for instance, provided less room for error and subsequently possibilities for new and innovative ways to

increase knowledge sharing within the organization. Zuboff (1988) coined the terms automate and 'informate' by which she expressed, on an analytical level, the duality of information technology. These terms related to the increased abstraction of work and the increased visibility, respectively, of processes, events and objects allowing this information to be known and shared.

The broader notion of automating subscribes to refinement and rationalisation; the substitution of manual work, often of transactional character, by computerized information technology. As such it relates to efficiency, i.e. achieving better performance by conducting current work practices the best possible way – doing things right. Its relation to the productivity issue is obvious. In its core productivity is a simple ratio between produced outputs and input units or as Brynjolfsson and Hitt (1998) put it: “[p]roductivity growth comes from working smarter”. The notion of 'informate' on the other hand relates to new knowledge gained through alternative representations of the subjects automated by the implemented information technology. Thus, 'informate' is closely related to effectiveness, i.e. in this sense, through learning develop new and improved work practices – doing right things. However, in research, these analytical concepts have mostly been treated as separate outcomes of IT infusion although some remarks have been made about a possible liaison between these two (see e.g. Earl, 1996).

2.1 The Internal Logic of the Concepts

One way of enhancing our understanding of the internal logic of the two analytical concepts is by using organizational learning terms of exploration and exploitation (March, 1991). As automation is performed in order to increase productivity and thus raise efficiency it entails exploiting an already visible map of a set of rather fixed possible explicit choices to an organization. These choices relate to ways by which to accomplish a process, a procedure or, for that matter, a practice in general. To this, new technological solutions are applied that will support or enable these choices. In this respect, both means and ends are known to the organization. Knowledge of the causality between input and output may be internally held or easily acquired from external sources and as such it can easily be applied when required. This leaves organizations engaged in such enterprises with a low level of uncertainty. Moreover, this knowledge of the causality is static in nature since means and ends are rather fixed. Thus in comparison, automation as a process does not require knowledge and analytical skills for the handling of fluctuating dynamic means and ends. Hence, for automation to be performed it can be argued that it requires only a rather moderate level of analytic capacity by the organization.

By contrast, 'informating'¹, defined as the process of increasing effectiveness through the acquisition of information and the distilling of that into new knowledge, is harder to perform. This, since it entails the organization to engage in both exploration and exploitation. Here, exploration can be described as partially "walking in the dark" and gradually through *critical reflection* on information gained revealing a map of possibly exploitative new choices. Partially, since there are always some basic and initial knowledge requirements driving what, where, how and when to explore. As much as these requirements can be described as mechanisms for driving the search behaviour of the firm they are also mentioned as mechanisms affecting the firm's reception of new knowledge (Cohen and Levinthal, 1990). Moreover, the firm has to possess knowledge basic to the new knowledge (Lane and Lubatkin, 1998). Not having such knowledge makes the firm a hostage to ignorance against discoveries of exploitative new choices. As information is acquired concerning these choices it has to become distilled into new knowledge. In this admittedly simplified description, the information on these choices thus becomes subject of exploitation which in order provides feedback enabling the organization to continue exploring and thus to maintain this cyclical activity in progress. In this sense, 'informating' as defined above is a continuous, iterative and experimental process of trial and error where means and ends are dynamic and thus fluctuating. The reason for this is simply because as Tsoukas (1996:22) has pointed out: "Firms are faced with *radical uncertainty*: they do not, they cannot, know what they need to know." (*Emphasis in original*). Accordingly, the level of uncertainty is higher than in the case of automating and as such it makes greater demands on knowledge and analytical skills on the organization. Hence, for 'informating' to be performed it requires a high level of analytic capacity by the organization.

However, as processes of exploration and exploitation, automating and 'informating' compete for scarce resources. In relation to 'informating', automating as a process is about explicit choices with moderate requirements on analytic capacity by the firm since means and ends are rather fixed and known. The results, prior to the performance of such a process, are thus easily presentable, more immediate and visible making automating a more preferred choice to organizations than 'informating'.

¹ The term 'informating' may easily be misinterpreted as just a by-product of computerisation, a second order effect given the developments within the IT area at the time of its introduction by Zuboff (1988). Although technically correct it is fundamentally wrong if one considers the wider context of knowledge management and its inherited understanding of current levels of IT sophistication. Our understanding is based on the latter meaning that 'informating' is a first order effect, i.e. organizations decisively use IT to facilitate, support or enable knowledge generating, sharing and exchanging processes.

2.2 The growing importance of getting 'informed'

Subsequently, as pointed out by many scholars, organizations of today compete more on knowledge than on any other 'asset' (Baumard, 1999; Boisot, 1998; Burton-Jones, 2001; Prusak, 1997; Teece, 2000). As such it constitutes the most valuable resource of an organization and it is manifested for instance internally in the routines and processes (Blackler, 1995) as well as externally in the organization's products (Leonard-Barton, 1995). The acquisition of information and creation of new knowledge is thus vital to the organization and can be brought about for instance through the interaction with customers and end-consumers (Davenport and Prusak, 1998; Nonaka, 1994; Nonaka and Takeuchi, 1995). Establishing relationships with these actors becomes important as it provides organizations an increased ability to meet customers' needs through for instance increased innovativeness (von Hippel, 1994). But knowledge about the customers is just one aspect. Organizations are in need of deeper knowledge which also entails knowledge about the customer's knowledge (Kaiserlidis, 2001). This because organizations engaging in knowledge exchanging relationships with external actors need not only to acquire knowledge but to provide knowledge as well. In other words, using the terms of automating and 'informating' we argue that getting 'informed' in the sense of, at the end, gaining knowledge from external actors requires not only the focal organization to automate customers' and end-consumers' processes and procedures but to 'informate' these actors as well. One prerequisite for efficiently 'informating' or providing knowledge and thus increasing the value of such relationships is to hold knowledge about what these external actors know.

The concept of communities of practice is fundamental in understanding the genesis of knowledge. As a term, coined by Lave and Wenger (1991), communities of practice refers to an organizational form consisting of groups of individuals that are informally bound together by the sharing of a common interest or passion for a specific enterprise (Wenger, 2000; Wenger and Snyder, 2000). By working together they exchange experience and knowledge. Such activities nurture common thinking, purpose development and increase understanding of what needs to be accomplished, how and why. The very effect, product or outcome for that matter of such communities is knowledge (Gherardi, 2001; Wenger, 2000; Wenger and Snyder, 2000). The process however is continuous thus knowledge in this sense cannot be regarded as a static outcome or to use Orlikowski's (2002:252-253) words: "[k]nowledge is an ongoing social accomplishment, constituted and reconstituted in everyday practice. As such, knowing cannot be understood as stable or enduring. Because it is enacted in the moment, its existence is virtual, its status provisional".

Virtual communities apply to the same notion but relate specifically to communities which are functioning based on an IT infrastructure such as the Internet (Hagel and Armstrong, 1997). The latter, a manifestation of information technology, has altered the trade off between information richness and reach (Evans and Wurster, 2000), enabled new levels and forms of connectivity leading to the emergence of new communication patterns (Sproull and Kiesler, 1992; Markus, 1994). Internet-technology thus provides organizations, their customers and end-consumers respectively a feasible foundation and infrastructure for knowledge exchanging activities. Based on the above discussion, we argue that there is a growing importance to organizations of getting 'informed'. Since knowledge in today's economy is the most vital resource or 'asset' of a firm there is a need to develop and nurture processes by which advantages deriving from organizations' knowledge can be sustained and increased. Next, before continuing by presenting and analysing the case study of Alpha Pharmaceuticals we pay attention to the methodological considerations of our empirical data gathered.

3. Method

The purpose of this paper is to analyse the duality of information technology as expressed by the concepts of automating and 'informing'. The fundamental questions driving our investigation are two. How are the concepts in practice brought about? How do they relate to each other? The empirical material of this paper is based on an in-depth case study conducted during the period between November 2001 and April 2003. The study focused on Alpha Pharmaceutical's development and use of a scaleable information system platform encompassing two virtual communities aimed for knowledge exchanging activities with its primary targets of customers (medical professionals) and end-consumers (patients). Ten in-depth interviews were conducted with personnel at the external system developers firm responsible for the development and modification of the system. The interviews, which were semi-structured in nature, recorded and transcribed, lasted approximately between one and a half and two hours. They were conducted with and directed to the client management, project management, technical development management and information design management. The interviews are spread across the time period mentioned above.

Besides these formal interviews the premises of the system developers were visited on numerous occasions in order to participate in presentations, informal meetings and to hold unstructured discussions with the previously mentioned personnel. During these occasions notes were taken in order to support further enquiries. The reason for these

visits was to increase the overall understanding of the complex and extensive, in terms of people involved, project of system development and continuous modification. This process then of gaining understanding was iterative in nature as it has moved us back and forth between data and the creation of our theoretical reasoning.

Interviews and visits constitute the sources to data of one part of the empirical material in this paper. Another part is constituted of extensive documental material collected and analysed providing a better understanding of the system, the system developers point of view, Alpha Pharmaceutical's as well as their customers' and end-consumers' point of view. This material includes classified documents such as general purpose statement of the project, internally and externally conducted market analyses, customers' procedures analyses, brand analyses, system construction blueprints and project members' communication, memos and reports.

4. The Case of Alpha Pharmaceutical

In this fourth part of the paper we present and analyse our case study on a major international organization, Alpha Pharmaceutical (*henceforth*, Alpha). The case describes Alpha's development and use of a scaleable information system platform called InfoMedical. Using this platform Alpha created in order two web-based virtual communities, AsthmaMedical, which is currently operational, and HeartMedical, a "sister" community of AsthmaMedical, which became operational three years after AsthmaMedical. These communities are to be understood as nothing more than two different manifestations of InfoMedical. Our case study focuses on AsthmaMedical. Both communities, however, share the same purpose of functioning as an arena for knowledge exchange between Alpha, its customers and end-consumers. By customers it is here meant health care professionals: general practitioners, nurses and specialists. By end-consumers it is here meant asthma patients and to some extent careers of these such as parents of children suffering from this chronic disease. The terms customers and end-consumers respectively will be used in cases to denote all encompassing members of each group.

The case study is comprised of three parts. We begin our presentation and subsequent analysis by providing a background to the InfoMedical project. Here we focus on the underlying reasons and incentives for Alpha and subsequent purpose with the InfoMedical platform and the virtual communities built upon it. In the second part we focus on the pre-developing phase where Alpha commenced a number of investigations in order to gain

knowledge of what procedures looked like at customers and end-consumers respectively. These investigations also focused on finding out about what could be done to support and if possible, by fulfilling identified needs, to bring about new and better procedures through the use of information technology. The results of this latter part and consequently the system developed and used will be dealt with in the third and final part of this case study.

4.1. Background, incentives and purpose

Consolidation, downsizing and reorganization, mergers and acquisitions marked the pharmaceutical industry around the turn of the century. Firms in this highly regulated and conservative oligopoly, which traditionally made major investments in research and development (R & D), were forced to adapt to a changing business environment. New regulations, for instance, carrying demands on increased product documentation and drug safety extended development time and increased costs. Subsequently, decreasing product lifecycles, due to, for instance, the emergence of generic drugs and austere governmental regulations on the prescriptions of and the price on drugs put pressure on profitability (Cordella and Simon, 2000). Adapting to changes in the business environment had previously often meant implementing new technology leading to increased automation and integration of the core functions of pre-clinical research, clinical testing, production and marketing. While efficacious before, these measures have become obsolete as large firms in today's industry tend towards engaging in close collaboration with small research firms and on specialised drugs. Gaining new knowledge through collaborative efforts has thus become vital and two unexplored until now sources of knowledge are health care professionals and patients. Subsequently, the advent of information technology and the increased Internet penetration has been followed with great interest as it provides a feasible foundation for new solutions.

Alpha is no exception. As one of the largest multinational firms with local presence through its marketing companies in more than forty countries and a vast history in the industry Alpha began to investigate new possibilities to establish relationships with these counterparts. Finding new ways by which to connect with and receive valuable information about its customers and end-consumers was one necessary step to take in the process of adapting to the demands posed by the new business conditions. Accessing and utilising the knowledge of their customers and end-consumers would provide the firm a stronger position in its marketing and value creation effort of its large and multifaceted R & D programme. The idea and the driving forces behind the InfoMedical project came from two influential departments within the firm. These were the marketing and the R & D

departments respectively. Both departments and several other local marketing companies had been working on ideas of how to take advantage of IT in their activities. The R&D department, for instance, had already begun developing tools for acquiring information on test results of their studies through the use of the Internet. It is not difficult to justify the reasons for this action. The last phases of product development are clinical trial execution-intensive and thus related with high costs. Given the fact of decreasing product life-cycles, the more time spent by a firm waiting for test results before product launch the more revenues are lost. Subsequently, the marketing department had become aware of the fierce competition in the market through its sales representatives. The complains from these employees about general practitioners (doctors) not having enough time to discuss when visited at their practises had increased. Or, as put by the client manager at the system developers:

The time spending on talking with sales representatives from the pharmaceutical industry is limited for a doctor. And this time is constantly decreasing. In an environment of fierce competition with more and more pharmaceutical firms trying to get a share of the doctor's time and with more and more new drugs on the market by which you have to compete with, you really need something more to offer. You have to add more value. They (Alpha) needed to come up with a solution that enabled the attraction of the doctors' attention, something far more than just a plain and simple can of pills.

(Parenthesis added)

Being buyers and 'recommenders' of products general practitioners were important knowledge holders. The knowledge possessed about a pharmaceutical product's performance in practice and about its interaction with patients was highly valuable. Moreover, to patients a doctor is somewhat of an authority and as such a person to whom one has confidence. Exploiting this relationship in a positive manner would perhaps yield favourable results to Alpha. In the beginning of 2000 the head of business development of the marketing department came up with the following simple yet very vivid idea. To gather the doctors' attention, Alpha would have to offer a solution comprised of two parts. Firstly, the solution had to provide benefits enough to the doctors for them to re-direct their attention from alternative activities to Alpha. And, since it had been reported by the sales

representatives that doctors were constantly occupied at their practices Alpha had to provide a solution which could decrease the amount of transactional and repetitive work. By doing that, it would, at least theoretically, provide room for more analytic work to be performed. But accomplishing this entailed a second phase. Transactional and repetitive tasks most often stem from filling out forms, analysing data, writing prescriptions, answering recurrent questions, etc. All these activities were related directly or indirectly to patients. Thus, the second part of the solution was that in order for the first part to work Alpha had to consider the patients' situation as well. Not surprisingly this yielded positive response from the R & D department. Their attention was not as much on doctors as it was on patients whom they needed in the clinical trial phase. This idea initiated the InfoMedical project. However, as good as it may have been, it could neither be implemented on all types of doctors nor to patients suffering from various diseases. For the project to become successful selectivity had to be employed. Alpha was working on more than six therapeutic areas within which several sub-areas each dealing with specific products were to be found. However, it went without saying. An almost immediate candidate came to light: asthma, a major group within the respiratory therapeutic area. If anything was to be backed by this project it had to be an area of potential growth. And this was true for the asthma case as the European respiratory market was growing annually with 7-8 per cent according to Alpha's own estimations. As the asthma area could fulfil the economic growth requirements it could also fulfil technical and relational (linking patients and doctors together) requirements and thus it was an excellent candidate from all standpoints. Once again the client manager:

There was some new thinking on treatment of asthmatics. Treat your disease and medication based on how you feel right now and not how you felt last month. Traditionally patients were provided with a recommendation they were asked to follow; a certain level of medication during one, two or maybe a three-months time period. Then they paid a visit to the doctor and the doctor asks "so, how have you been during this time" and the patient could answer "not that good actually" and the doctor's response would be "OK, let's increase the dose of cortisone" and it went on like that. With this new method it's more like "OK, I have a difficulty in breathing now!" and you get instantly a recommendation on how to medicate yourself, what drug and how much.

Alpha's product on asthma treatment was just about to be launched in the market thus the creation of the InfoMedical platform and the AsthmaMedical community would in fact support the launch. However, there is some more to that. This product provided a more customized asthma treatment offering patients the possibility to adjust the numbers of inhalations to better fit their fluctuation in disease severity. In fact, it could be argued that the product was made to be supported by the system. The explanation to this lies in the following reasoning. Asthmatics use a peak flow meter, a device by which to get the PEF (peak expiratory flow) rate, the fastest speed an asthmatic can blow air out of her lungs. The purpose is to find the optimal rate, a 'personal best' peak flow, to which all other rates later are compared with providing the basis for the medication. The new product is a bit different than more traditional products since it enables a better match between current health status and treatment. It does so simply by providing the doses in different quantities and qualities. But as choices increase, knowledge to support choosing is needed. Thus, the AsthmaMedical community provides patients the possibility to self-manage their asthma. By communicating the peak flow values to the system, the system through its algorithms calculates for the patient a highly customized recommendation to follow. If the system would not exist using the new product would mean that the patient would constantly be required to be in touch with her doctor in order to get recommendations.

4.2 The pre-developing phase

However, at this point Alpha does not know how exactly, in practice, to automate transactional procedures at the doctors' as well as that of the patients. Neither do they know of how to 'informate' these counterparts, although some clues were provided in this first part of the case study. What Alpha does know however is that they want to establish relationships with the doctors, learn from them as well as to educate them. This would strengthen their marketing capabilities. They also know that they want to establish relationships with the patients and educate them as well; to learn from them either directly, by letting them take part in clinical trials, or, indirectly, by observing them in "action" when dealing with their disease. While the ends are rather apparent the means are yet unknown. The hidden map of possibly exploitable choices had to be further explored and subsequently this meant sharpening the driving mechanisms of the firm's search behaviour. In doing so they turned both to internal and external sources for knowledge. Two different types of investigations were conducted. The first type of investigations related to the sharpening of Alpha's search behaviour through deeper knowledge about the counterparts. Here, internal and external consultants investigated (1) the nature of

asthmatics, (2) their relationship to health care professionals, (3) the health care professionals' understanding of asthma and asthmatics and finally (4), their relationship with the patients. These reports were largely based on questionnaires, discussions in focus groups, in-depth interviews and product testing. As such they focused on capturing values, perceptions and needs implicitly or explicitly expressed by the respondents. The second type of investigations were to some extent² based on the results of the first type and as such they focused on finding the means that would fit the ends mentioned earlier. Internal and external consultants conducted, (1) market analyses, (2) brand analyses and (3) more technical analyses, concerning for instance information design, functionality design, and infrastructural respectively. The reason for the investigations being large in number and conducted by several internal and external units was based on InfoMedical project groups' position and vision. As this group was based at the headquarters of Alpha and international as far as to its member constellation, its authority was beyond that of the local marketing companies. A separate department with global authority had been created in Alpha dealing with electronic commerce and knowledge management issues. It was to this department that the InfoMedical project group had to answer to. Subsequently, the group's vision included an implicit intention for a larger role-out of the system and its communities than that of the few countries chosen as initial test markets. Next we focus our attention on the results of the first type of investigations. Since the third and final part of this case study considers the system per se, the second type of investigations will not be dealt with.

4.2.1 Sharpening search behaviour

The first type of investigations although conducted in different markets (countries) provided the complex picture of the world of asthmatics where clinical, social, psychological aspects proved to play vital roles. Asthmatics were not a homogeneous group although they shared some values and perceptions respectively. It was put forward in many reports that in order to understand and hence find suitable means to support aware and unaware of needs of the asthmatics' segmentation had to be made based on their clinical condition, psychological preferences and emotional needs.

² Some of the investigating teams produced hybrid reports, i.e. they both examined the subjects mentioned above and proposed means to reach the ends. All investigating teams though were informed about the project groups' aim and objectives, a factor most likely biasing some of the results in the first type of investigations conducted.

END-CONSUMERS: *Asthmatics and Careers*

The investigations revealed that to most asthmatics, living with asthma becomes eventually a habit. However habitual it becomes, it is a highly private matter and although felt as important to be known to the surrounding most patients do not wish to manage it in public. Surrounding the disease is a large number of unspoken negative values. For instance, each time patients take their medication they feel reminded of their limitations. This is one reason to why asthmatics reluctantly medicate themselves in public. Being dependent of the drugs used requires the patients to remind themselves and indirectly this negatively affects their perception of flexibility and movability. In the investigations, patients also expressed a certain degree of distrustfulness towards drug use per se. They were concerned with not using too much as they felt that the drugs might cause more damaging side effects than what is currently known and/or expressed to them. In another terms, patients were concerned with security. Addiction was one such example. In contrast to other types of diseases, asthma is chronic and the treatment is preventive meaning that medication must be taken in good as well as in poorer conditions. Beliefs were held that this could lead to addiction and that asthma medicines had the potential for tolerance. This is not true. Rather it is a sign of poor knowledge on the matter. In certain cases age can lead, but does not have to, to poorer conditions requiring stepping up the treatment in order to manage the asthmatic symptoms.

The management of asthma is not solely contingent upon medication and thus the cooperation between doctor and patient. Patients can affect their condition themselves by being precautionous and proactive. Precautionous in this case relates to for instance avoiding exposure to environments or habits that have a negative impact on lung capacity such as smoking. Proactive in this sense meaning for instance regular exercise that brings about better overall condition. Patients expressed their awareness of these measures, yet few of them in need of taking such measures did so.

Dependent on the patients' clinical condition, the intensity of the mentioned above values and perceptions varied but not their substance. Poorly managed patients for instance were often characterised by deniability. They had trouble in accepting the fact that the disease is chronic in nature. Medication was not taken on a regular basis but only at times when they felt their condition being very poor. In many cases this behaviour led to the suffering of some attacks. Well managed patients on the other hand were in control of their condition. Much of that can be explained by their understanding of the medication as preventive action. These patients had fully accepted their disease and thus did not feel

that asthma affected their daily life nor were they concerned with their asthmatic condition. Monitoring of the disease was a way of optimising the treatment.

Perhaps the best attention to and management of the demands put on by this disease was provided by parents to asthmatic children. To parents safety applies differently. As mortality issues are of great concern some parents perceive side effects to be far less important. Many parents expressed their inability to adequately explain for their children why they are different from other children and why that prevents them from doing things. Feeling restricted the child can get stressed and the asthma can get worse. To parents such situations raises emotions of inadequacy, they get the feeling of being “bad parents”. Another important finding related to management control. As children grow older they slowly gain more control over managing their asthma. The issue of who should be responsible for the management becomes important.

HEALTHCARE PROFESSIONALS: *General Practitioners, Nurses and Specialists*

Among the large number of patients with varying types of illnesses treated by general practitioners, asthmatics make up on average a relatively small group. What is surprising though is that in all investigations general practitioners had trouble in defining who could be regarded as an asthmatic or not. The reason was that they believed that many of their patients labelled themselves asthmatics because it sounded more sophisticated when in fact, according to the general practitioners, they suffered from chronic bronchitis. Some remarked that asthma was in deed a smaller problem than what media actually had portrayed it to be. Generally though, they believed that asthmatics received good and effective treatment and that the patients were good at treating themselves. By using schemas they kept track of their patients’ asthma development. However, due to differences in equipment they followed different procedures in diagnosing patients. According to the general practitioners, informing patients about their disease was a role better suited for nurses. They were believed to have more patience in dealing with asthmatics and subsequently it would save time which could be used for other tasks.

The investigations showed that general practitioners had problems in dealing with patients who do not comply. They believed that a patient stopped medicating herself as soon as she felt better. Prescribing more medicine to these patients tended to increase their feeling of being ill. Good compliance on the other hand was mostly shown by well educated and information-seeking patients.

Nurses on the other hand wished they had more time to spend with each patient. Their role often includes dealing with transactional parts of the diagnosis, offering advice related not only to instruments but to everyday life issues as well. They see non-compliance as the main problem and hold beliefs which closely resemble those of the general practitioners'.

While the above two groups meet asthmatics with different cases of asthma specialists only receive patients with moderate and severe cases of the disease. Patients come to specialists referred to either by general practitioners, emergency rooms or from other hospitals. Suspicion is most often though what triggers these transfers. In contrast to general practitioners, specialists can detect asthma very easily. They have both the experience and the necessary equipment. Their analysing and diagnosing procedures of patients relies not only on PEF meters but also more on in-depth interviewing techniques. They try to reach a rich understanding of the patient's daily life, course of illness, and comfortableness with different kinds of medicines in relation to the patient's life style, their response to and compliance with these medicines.

Also specialists describe non-compliance as the biggest problem in asthma management. Their understanding parallels that of the general practitioners when they identify the largest non-compliances in number among the lower status population. Less educated people are keener on ignoring advices. In an effort to understand why and to try changing this type of behaviour specialists try to emphasise on explaining the importance of medication and possible effects of non-compliance.

NEEDS IDENTIFIED

In ending this second part of the case study we focus on the needs and the reasons behind these needs – be it aware and unaware of. There are two general and interrelated categories of needs that can be identified stemming from different reasons: the need for increasing knowledge about the disease and related aspects to the disease and, the need for supporting and improving the management of the disease. Both categories, in different respects, apply to all mentioned above roles, customers as well as end-consumers.

Strangely enough though, the above two general needs seem to coincide with the notions of automating and 'informating'. Increasing knowledge strongly relates to 'informating', i.e. increasing effectiveness but here only by *exploring new possibly exploitable choices*. Supporting the management of the disease on the other hand strongly relates to automating, i.e. increasing efficiency. In this case, a new technological

solution is applied (IT in general and Internet-technology in particular) in order to enable choices, here relating to the ways or procedures by which asthma management is brought about. These procedures are already known and explicit: *analysis and diagnosis*.

4.3 AsthmaMedical

AsthmaMedical, the first manifestation of the InfoMedical platform, in its core a virtual community, is based on two parts, asthma management centre (AMC) and a knowledge centre (KC). In order to gain access to the management centre a patient has to sign up by providing his or hers personal data and choosing a login and password. Once logged into the system the patient can choose to customize large parts of the AMC by altering the preferences. The functions in the AMC are the main function of asthma diary, the asthma calendar, the asthma action plan, the asthma treatment records, the reminder function, the glossary, the doctor/nurse contacts, the lifestyle settings and the personal profile.

The heart of the AMC is the asthma diary. This is the patient's main data input channel consisting of questions related to the peak flow of the day, the current asthma situation of the day, the exposure to asthma triggers, unscheduled treatments of the day and even possibilities to ask questions to the patient's doctor or nurse. The asthma calendar a function to control time and hour of asthma reporting. The asthma action plan consisting of a four-graded colour scale of green, yellow, orange and red with instructions highly adapted to the patient's specific situation on his current asthma status and possible treatment recommendations. The asthma treatment records holding information on the current and previous medication of the patient. The reminder, a highly customised part to enable the patient alert functions on specific hours or time of the day to monitor his or hers asthma or even to alert the patient on appointment with doctors and nurses. Finally there are three databases containing information about the doctor and nurse contacts of the patient. Here, the patient can add and erase a doctor and thereby provide or deny access to his or hers files. Furthermore, the lifestyle database holding information on sporting activities, hobbies etc affecting and getting affected by the asthma disease and the personal profile database with addresses and name information.

The KC provides the patient an equal opportunity to customise the functions. Here the patient can choose to read articles of both professional (evidence based articles) and layman term nature (third party provided). She can search the article database or the entire knowledge centre. She can gain knowledge from the topic centres of allergy, asthma, alternative treatment methods, pregnancy, anatomy, children, delivery systems,

exercise, medicine, self-management, symptoms, treatments, triggers and more. The patient can ask questions to experts, participate in forum discussions and mailing lists, get invited to seminars and work shops, read the latest news on asthma and the latest reports on pollen and pollution rates holding a high geographical accuracy and detail.

The asthma management centre (clinic) for doctors and nurses is to a high degree based on the same structure. The difference is that the information put into the system by the patient shows up at the doctor. In order for the doctor to open up a virtual clinic he or she must be registered as a practitioner or specialist and receive a licence from Alpha. Once this is accomplished all personnel at the doctors practice have access to the files. A doctor has the possibility for a quick overview of his or hers patients' asthma status or to go deep onto one patient's health status and read background information, treatment data etc. The doctor can choose to get alerted on severe asthma situation either by e-mail or by SMS. Furthermore, the doctor can choose to communicate with the patients through the system, send SMS, and answer to questions. If the doctor chooses to he may also download at any given time asthma reports into his PDA for further analysis. Finally, the doctor has the opportunity to use a wide range of instruments to analyse the data and present it to patients on a pedagogical way.

5. Discussion

Based on this inter-organizationally focusing case study it is easy to identify both the automate and the 'informate' effect of IT infusion as well as the relationship between these effects and concepts respectively. Beginning with the two general categories of needs held by Alpha's customers and end-consumers and fulfilled through AsthmaMedical, i.e. (1) increased knowledge and (2) support and improvement of asthma management the following can be said. Although at first glance it is easy to identify the automate effect with the latter need and the 'informate' effect with the former need, the processes of automating and 'informating' performed by Alpha are in fact intertwined. This reveals their relationship in practice. When Alpha automates their counterparts' processes, procedures or practices, in this case the support of asthma management, they actually provide their counterparts with a rather standardized³ and thus efficient way of communicating with Alpha. This provides the parties with incentives to increase their relational conducts.

³ Standardization in this case refers to the structure of communication in Asthma Management Centre, i.e. the way of communicating and not to the communication (the content) per se which is customized to each user. Patients for instance provide the requested daily information to the system. This information gets processed by the aid of the built-in algorithms, an emulation, and thus an approximation of a health care professional's analysis and diagnosis, leading to an immediate reply in the form of a recommendation (diagnosis).

When Alpha 'informatates' their counterparts by increasing their knowledge about the disease they pave the way for a shared understanding and thus an incentive for knowledge exchange. The more Alpha's counterparts use the system the more 'informed' Alpha gets. Thus Alpha's main objective to integrate their counterparts in order to gain new knowledge, i.e. to use IT for 'informating' purposes, rests upon Alpha automating and 'informating' their counterparts first. Distilling the information received by the counterparts into new knowledge provides Alpha an opportunity to improve the automating and 'informating' of their counterparts through improved asthma management and increased knowledge.

The direct and standardised communication with their counterparts enables Alpha an opportunity to automatically and on a systematic fashion collect and analyze information and later distil that into knowledge by critical reflection and through drawing distinctions. However, this iterative trial and error process requires Alpha to possess knowledge and analytical capabilities to handle the dynamic and thus fluctuating means and ends. Such a demanding process also requires constant adjustments to be made on the system through modifications. The effects of this 'informating' process are less visible and immediate beforehand than simple 'automating' processes.

Although deliberately left aside in this paper, the effects of this 'informating' process to Alpha have been of both first and second order respectively. A brief description may help increase our understanding of such IT use. The first order effects in the Alpha case have been the integration of counterparts and the generation of new knowledge. Alpha's marketing department in the studied market have managed to gain a better relationship with health care professionals through increased knowledge leading to a better promotion of asthma products. Alpha's R&D department on the other hand did at the time of this study not use AsthmaMedical as intended, i.e. to acquire information on test results in the clinical trial phase of the firm's asthma products. There is a simple explanation to that. At the time when AsthmaMedical became operational the R&D department had already conducted their tests and received all the results needed. The idea however was not abolished. When the R&D department reached the clinical trial phase of a heart treatment-related drug the sister community of AsthmaMedical, HeartMedical (also based on the InfoMedical platform) was successfully used to acquire information on test results. This shows that knowledge on specific IT use initially acquired from the first community was not lost and could be applied through modification on a second community.

6. Concluding Remarks

In this paper we have analysed the duality of information technology as expressed by the concepts of automating and 'informating'. We have argued for the use of an interorganizational setting in order to properly analyse how automating and 'informating' is brought about in reality and how these concepts relate to each other. An in-depth case study has been used to illustrate this. Against a background of increased competition, decreasing returns and altered collaborating structure, Alpha acknowledges the need for new knowledge and in particular identifies customers and end-consumers as potential knowledge exchanging partners. Driven by incentives found in the marketing and R & D departments Alpha initiates the InfoMedical project and chooses the sub-area of asthma, belonging to the group of respiratory research, as its initial focus. Besides asthma being a growing market segment of Alpha's, Alpha's own product for asthma treatment, at the time close to market launch, had many characteristics that made it well fit to both the technical and relational aspects of the InfoMedical project. Thus, together with the general incentives found in the marketing and R & D departments, Alpha's asthma treatment product constituted a third incentive. Finally, by using information technology to enable knowledge exchange between Alpha and the two groups comprised of customers and end-consumers Alpha's purpose with the project was to sustain and if possible increase Alpha's competitive advantage in the long run. For Alpha this meant that they had to automate and 'informate' their counterparts in order to get 'informed' themselves. The results of the project though were more immediate to the counterparts. By automating Alpha managed to support the management of asthma. By 'informating' Alpha managed to provide new information to both counterparts. By doing both however, both Alpha and its counterparts improved their knowledge respectively.

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