FRAGMENTATION OF WORKING TIME AND SMARTER IS-SOLUTIONS

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Abstract

It has been commonly stated how complex it is to measure the impact of Information Technology on managers' productivity. We propose to go beyond the concept of productivity in order to understand causes of low productivity: one factor which we have identified is called Fragmentation of Working Time (FWT), characterized as the effects of interruptions on productivity at work. In particular, we are interested in researching the contribution of IS solutions to solve this problem. For this purpose, we adopted Action Research (AR) as a research paradigm: AR enables us to study FWT and to learn from it by taking actions on social reality, that is by bringing effective remedies to our problem area in cooperation with 6 companies involved in a research project. This paper will present the various aspects of FWT and findings from the SMARTER research project.

1. Introduction

The twentieth century has seen the rise of scientific management methods - Taylorism in particular - which have been put in action in order to increase workers' productivity. In a recently published article, Peter Drucker [15] assesses that manual workers' productivity has seen a fifty-fold increase, as knowledge workers' productivity remains a challenge to be solved for the coming years. Also, there has been a large stream of literature on the impacts and the payoffs of Information Technology (IT) and Information Systems (IS) which are used by knowledge workers: at first, there were many studies mentioning the *productivity paradox* in the 1980s (more computing power, but no increase in productivity among white-collar workers, as in [31]), but on the contrary, there appeared many reports in the 1990s breaking this paradox and suggesting that we should use other measures than traditional productivity measurements ([29], [4] and [5]). Thus, we are making two statements: (i) we have built computer tools, which are very efficient in terms of computing power; but we partially lack tools to measure

their impact on productivity, (ii) although we have these tools available, we are still waiting for the promised major changes in the productivity of knowledge workers and persons involved in managerial activities.

The concern of our study is to go beyond productivity and to understand why managers are not as productive as we would expect them to be in the 1990s: we suppose that part of the productivity gains remain to be achieved because of fragmentation of working time (FWT) occuring in organizations. FWT, defined as the effect of unpredictable interruptions of many sorts on managerial and organizational performance, has been studied through various research aspects - in Psychology [20], Management [27], Time Management [13] and Computer Supported Cooperative Work [32] - but there is no study putting these together and bringing remedies. Also, most of the studies have been conducted under laboratory conditions [12] and not in normal work settings. Thus, we decided to use Action Research (AR) to conduct a research project aiming at tackling FWT. Action research offers the possibility to act on a real-world problem area and make findings which can be used as a basis for further studies and eventual generalizations. The work that we present here is based on a research project called SMARTER: this project involves 6 high-technology small and medium-sized companies, based in South-West Finland, and it has as a primary goal to find remedies to FWT, essentially with IS solutions. At the time of the writing of this paper, we have been looking at the problem with these companies for about 18 months, and we have now enough material to present the problematic of FWT and what actions we have taken to handle FWT, to provide some findings and also to generate a discussion on these findings.

This paper will present the AR approach and its application to solve FWT. We will look at the frameworks and methodology which are relevant for taking actions in our problem area. We will also expose and discuss the taken actions and early findings of our research.

2. The Research Approach

In the following sections, we will shortly present AR and justify why the AR approach is suitable, regarding to our research project and our field of studies (Information Systems research), we will also describe the AR approach that we use in the context of our problem area.

2.1 Action Research as an approach to Information Systems Research

Many authors trace back the origins of action research to Lewin (1946). AR came up as an approach which could cope with the limitations of positivist approaches, especially in research dealing with social reality. The split between positivist and action research arose from the way we understand social reality: on the one hand, for positivist researchers, social reality follows the principles of the regularities of the universe and constantly repeats itself, on the other hand, for action researchers, social reality is constantly constructed and reconstructed through dialogue, discourse and sensemaking [43] between human beings [9]. Since its emergence, AR has been a controversial subject, heavily criticised by positivist researchers who view experimental and survey research as the only valid modes of scientific inquiry, and therefore leading to the creation of two apparently contradictory research movements. In IS sciences, AR has been strongly marginalized, accounting for only 1% of article publications in IS research [28]. However, many authors have recently started to bridge the gap between both approaches with the following arguments:

- AR is a form of positivist research where control of the environment is *low* by nature [10]
- AR as a research approach should imply that the researcher intends to produce rigorous and generalisable results from research findings [19] and a re-iteration of the AR process [22].

Recently, it has been agreed that qualitative approaches in IS research have gained acceptance and are now equal in value compared to quantitative approaches [2]. However, in order to keep standards of good qualitative research, the researcher should keep in mind to follow, describe and apply *rigorously* their research aim, theory, frameworks and methodology, or else their work could be hardly assimilated to consulting. Many articles in leading journals provide now guidance to conduct this kind of research [21].

2.2 The Action Research approach in SMARTER

2.2.1 The SMARTER project. In the project, each company chooses to look at the problem of FWT in the context of one particular business process: various business processes have been chosen (for example, Internal Logictics, Project Management, Strategic Planning, Production Management). We work closely with each company for a period of 2 years, looking for solutions for specific management problems.

Collection of material and evidence is made through 6 case studies. These case studies are written on the basis of IS developement work done within the SMARTER research project, which is coordinated by the IAMSR. We also collect research material through questionnaires and interviews with persons closely involved in the processes in each company, and through follow-up studies of the solutions brought in each case company (including measures). The third phase of the research project is devoted to generalisation of results and theory building.

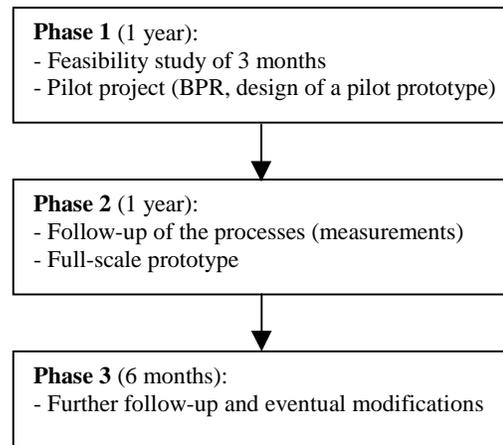Figure 1 illustrates the structure of the SMARTER project.

Phase 1 (1 year):
- Feasibility study of 3 months
- Pilot project (BPR, design of a pilot prototype)

Phase 2 (1 year):
- Follow-up of the processes (measurements)
- Full-scale prototype

Phase 3 (6 months):
- Further follow-up and eventual modifications

Figure 1. Structure of the research programme

2.2.2 Action Research in Action. Our research approach can be summarised as follows (adapted from [9] and [19]):
1. Researcher (R) and practitioner (P) investigates the problem situation
2. R and P declare frameworks and methodology
3. R and P take part in the change process through actions, this process involves implementation of IS tools.
4. R and P reflect and learn from experience, frameworks and methodology (in steps 1,2,3), in order to make findings, which can be scientifically generalizable.

This approach is cyclic, as the social system evolves and learning promotes the emergence of new frameworks and ideas, therefore it can happen and it is even sometimes recommended to iterate many times through the research cycle. It is also important to mention that AR studies are characterized by *positive* intervention in the organisation where we have located the problem area [22].

Our intervention and research orientation are guided by the concept of *actionable theory* [1]. An actionable theory provides explanation and understanding of the research object, which will serve action. In order to serve action,

our understanding and explanation should contain causal models which can be put into action (under the circumstances predefined in the research framework) and produce the desired effect. For this to happen, (i) the understanding and explanation should apply at both the general level and the individual case, (ii) the model should be valid and actionable. The implications for our work are that we do not only explain the phenomenon of FWT, but we do also provide a theory for *creating productive work environments*. The ultimate validation of our theory (the explanation and understanding) is achieved through the creation (not only the prediction) of our research object under defined circumstances. In our particular case, this is done through the development and implementation of an action programme.

In our research process, we go through a diagnosis phase: the purpose of this activity is (i) to understand the problem area through a literature review and collection of empirical data and (ii) to build a preliminary framework which would guide our actions. Our problem area is closely related to managerial work, we expose some interesting aspects on the nature of managerial work (see 3.1). We also reach a good understanding of interruptions and build a model of interruption handling which is used to gather data about the nature and the effects of interruptions (see 3.2). This enables us to start defining more precisely our problem area: fragmentation of working time, the data collected in 3.2 is used to build a taxonomy of FWT (see 3.3).

The resulting research framework is then used to design an action programme for handling fragmentation of working time (see 4.1). This action progamme implies lateral action streams (which are sometimes independent from each other), as we do not aim at handling FWT with one single method but rather with a set of interrelated methods. As each of the companies is focusing on one business process, it appears that Business Process Reengineering (BPR) and Information Technology are proposed as possible solutions - our foundation is that redesigning better processes with smoother information flows will help to reduce fragmentation of working time (see 4.2). Time management is also an important feature of the action programme (see 4.3). The results of the action programmes are evaluated through case studies.

3. The Research Framework

3.1 On the Nature of Managerial Work

3.1.1 Various descriptions of managerial work. There has been many studies done about the nature of managerial work ([6], [17], [23], [26], [33] and [35]), and these studies are still relevant in the actual world ("managerial work does not really change over time", Mintzberg, in [6]). Panko [30] refers to more than 50 studies of the "use of time" of lower, middle, top managers, professionals and

knowledge workers using various techniques (agendas, observations, estimates, …) and methodologies for the last 50 years. However, we should at that point mention the "Failure of Description" issue - [27] - which warns that no single description of managerial work is applicable to all types of managers, and that it is important to keep in mind that managers have different profiles inherent to their position [30]. What is striking about the field of study is that we have now a broad understanding of what managers do (leading authors have identified several categories of managerial activities), but no theory. On the contrary, we identify various schools of thought about management.

The predominant school of thought is the classical school, introduced by Fayol in 1916 [16], also known as **POSDCORB** (**P**lanning, **O**rganising, **S**taffing, **D**irecting, **Co**ordinating, **R**eporting, **B**udgeting). POSDCORB has been the starting point for many studies trying to classify managers' activities in different categories. This school has been heavily criticised, in the sense that its framework has helped us to understand what managers do (through the categorisation of managers' activities) but not what they achieve. In particular, Mintzberg (1991) affirms that we have been mesmerized by POSDCORB, and that it has hindered our progress to define managerial work. It is true to say that the POSDCORB framework is powerful to provide a general description of managerial behaviour.

Mintzberg (1974) introduced a new perspective in the field by identifying 10 managerial roles (interpersonal, informational and decisional roles), but still little effort has been done in this research direction [24]. Kotter made a study of *effective* general managers and came to the conclusion that none of the managers studied were using formal management methods in their work. On the contrary, managers who were communicating extensively ("wasting" time) were the most successful. These conclusions leave us with 2 streams of thinking about managerial work: 1) the dominant stream of formal, organised and reflective management as a profession which is taught in our business education programs (inherited from the POSDCORB school), 2) the stream of ad hoc management characterized by the recognition of interruptions, extensive communication, contact network buildings and "on the feet" planning as inherent features of managerial work. In the present state of research, it seems that the POSDCORB framework provides the most solid theoretical fondations for conceptual studies and design of Information Systems, whereas the second stream provides a good description, recognised by practitioners, but has been lacking solid theoretical models to implement IS.

3.1.2 A definition of managerial work. All the authors that we have mentioned in this section refer to managerial work as a stream of disjointed, fragmented activities occurring at an unrelenting pace. Despite changes in the business environment, it seems that managerial work does not change over time (Mintzberg, 1991). Mintzberg

identifies 6 characteristics of managerial work: (i) quantity and pace of work, (ii) pattern in activities, (iii) relationship between action and reflection, (iv) use of different media, (v) relationship to a variety of contacts, (vi) interplay between rights and duties.

Also interesting is that fragmentation has always existed and remains a fundamental characteristic of managerial work (little is done to reduce it, whatsoever). An unusual phenomenon is that fragmentation has been expanding to traditionally non-managerial professions, because of organisational pressures (reduction of middle-management, streamlining of processes) which have moved managerial responsibilities to other organisational layers (more on Fragmentation of Working Time in 3.3). It is also important to notice that the development of mobile communications has enabled a shift in the place where managers typically work (Panko underlines that managers spend 50% of their time in their own office; this may not be true anymore).

3.2 Interruptions at work

There is a large body of theory on interruptions and their effects in the field of cognitive psychology; however most of these works refer to studies on cognitive aspects of interruptions rather than to their applied consequences on management and workers' performance. The literature on distraction theory has defined an interruption as an "*externally-generated, randomly occurring, discrete event that breaks continuity of cognitive focus on a primary task*" [12]. In some cases, an interruption will require from the worker a recovery period of up to 15 minutes (time needed to re-concentrate on the task) before the interrupted task is continued. Cognitive studies on interruptions have showed that an interruption requires immediate attention and action, and that the timing of an interruption is often out of control. Actually, a human being is constantly interrupted when focusing on a primary task, as he/she is continually scanning for signals in his/her environment. What makes the difference is our ability to sort out "important" interruptions from others. Also, we are gaining an understanding of effects of interruptions: these effects depend on task complexity and the nature and content of the interruption (as illustrated in [34]). A complex task implies parallel processing of multiple information: therefore, if the interrupted primary task is complex, it is likely that the interruption will have a greater effect, because the interruption will generate parallel cognitive processes which could interfere with the primary tasks' processes. The contents of the interruptions are also significant: some interruptions may contribute to the primary task from a content point of view. These effects, largely investigated in the Distraction/Conflict Theory [3], include a decrease in decision performance.

In today's organizations, interruptions are commonplace: many studies have identified interruptions as time wasters

(drop-in visitors, telephone interruptions, e-mail automatic notification). In this respect, many observations are interesting to point out:

- (i) people allow (and encourage) interruptions to take place (e.g. leaving a mobile phone "on", e-mail automatic notification) and to precede other tasks,
- (ii) people respond quickly to these interruptions, often disorganizing their work priorities (it gives them the feeling of "busyness" and urgency and that they have to take care of many matters in parallel),
- (iii) executives of small firms who use IT are more likely to be victims of interruptions,
- (iv) technology offers ways to be reachable anywhere and at anytime.

These factors are contributing to create interrupted work environments with significant effects on personal and organizational performance (for example, Van Solingen [42] shows how constant interruptions in software development projects can lead to reduction of developers' efficiency and project delays).

In the context of our research project, we have elaborated a model of how interruptions occur and take place (Figure 2). This model was the base for collecting information about the nature of interruptions and their impacts on productivity through a survey method.
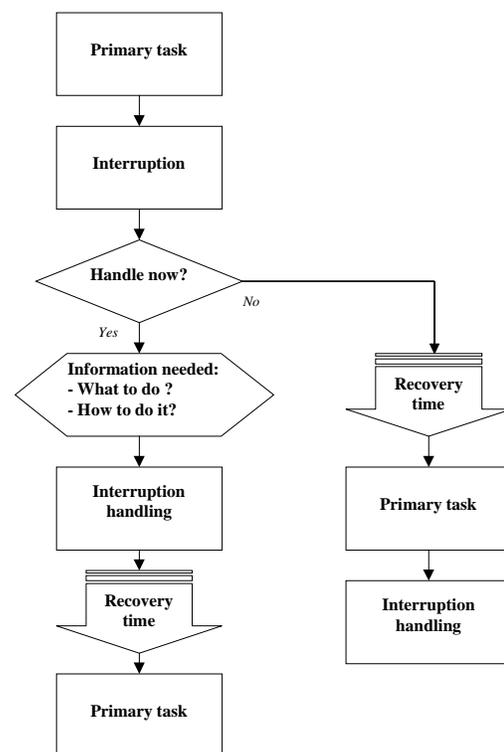

Figure 2. Dealing with interruptions: a model

The results of this survey - which was distributed to 20 managers - have shown that interruptions can have dramatic positive and negative effects [40]. Among the negative effects, we have observed that the recovery time needed after interruptions tended to increase according to the length of interruptions, and also that interruptions have more negative (disturbed concentration - delayed work) than positive impacts (promotes learning - promotes social interaction). The study also showed that (i) personal interruptions generated more workload (interruption length) than phone interruptions, (ii) the reason of the interruption affects the workload of the interruption (we handle documentation issues much faster than issues where knowledge sharing is involved).

3.3 Fragmentation of Working Time

Fragmentation of working time can be explained as a result of a paradox: for years, workers' efficiency (front-line workers, managers and even top management) has been limited by lack of information (quality and up-to-date information); then, thanks to IT developments, information barriers have been removed and organisation's information flows have grown: nowadays, we are in such a position that we receive more information than we can actually process (this has been referred to as information overload). Especially, key people are getting involved in so many activities that they are not able to focus long enough on any task. *We have built tools for improving productivity but we are becoming less productive.*

Several reasons and negative effects for FWT to occur can be identified. They can be classified depending on their level of application, whether at the collective or individual level. Let us first expose collective reasons:

1. The network organisation: Small and medium-sized firms are subject to strong competitive pressures which lead them to look for cost-effectiveness and trim their organisation. Combined with the emergence of new organisational models (network and lean organisations), it has the effect of involving people in too many activities and therefore to involve these persons in administration activities. Also, management of one's own time depends on other people. Especially the working time of key people of the organisation is consumed by daily routines, and they hardly find the necessary time to focus on their core activities, at which they are good, and to use their skills at their full potential. Involving people in many teams (which is good, in a sense, since it promotes teamwork) has the vicious effect to increase the need for information and knowledge, as people feel the need to be always informed about what is going on in the projects where they are involved [8].

2. Information Technology: The use of IT is increasing at a tremendous rate in any organisation. On a collective level, it often occurs that IT solutions are mixed or outdated. As a consequence, it is difficult to transfer information, it slows down the workflow (both within and outside the organisation) and affects one's and other people's work schedule. An other aspect worth to be mentioned is the opportunity that IT offers to reach other people and to be reached in a much easier way: for example, it is not rare nowadays that managers receive about 50 electronic messages per day whose content is not so crucial for running the business *("nice to know"* but not *"important to know"* information). Mobile phones and e-mail allow immediate access to people "anywhere and anytime": these technologies have the effect to unconsciously and unintentionally increase the workload in organisations, also they generate more work because one has often to start searching for supporting information to accomplish the new tasks.

3. Open organisation: It is frequent to see organisations that have cut internal, functional boundaries in order to promote free information flows and knowledge-sharing. The commonly observed effect is that people have little time reserved for uninterrupted work ([11]; [18]).

4. The changing nature of work: Work has changed from divided, specialized and monitored work to integrated, multifunctional and self-coordinated work. These new properties of work indicate that it is becoming more knowledge-intensive in the sense that the worker needs to understand the business across functional areas of the organisation. This has been commonly called knowledge work: product development, project management and system development are some examples [14]. Knowledge work activities are primarily subject to the problem of FWT that we are talking about, because the nature of knowledge work is such that it requires some flexibility to be performed in optimal conditions, this flexibility can be a trap leading to fragmented working time.

On an individual level, we identify the following reasons:

1. Inadequate information technology: On an indvidual level, the introduction of new technology often translates into periods of adjustments: any new application has to be assimilated before it can be used at its full potential. The use of different applications and their increasing complexity also causes frustration for the workers, and delays the accomplishment of the work to be done.

2. Personal attitude: People easily accept work overload, without defining their priorities, or organising their tasks. This leads to delays, badly finished (or unfinished) tasks. People are members in too many teams.

As we see from the previous list of reasons and effects, we face a problem with multiple facets (as illustrated in Figure 3). Basically, we have learned that four factors influence FWT, these are People, Technology, Organization, Environment.
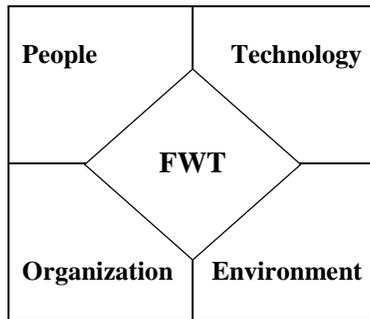
Figure 3. Factors which generate fragmentation of working time

There are obviously some undesired effects which can be solved with simple rules and guidelines, as long as they are followed on a regular basis, but our concern here is to see how we can bring improvements in the daily activities of key people with IS solutions. This attempt is reinforced by the fact that the latest technology developments permit us to develop smart solutions. Therefore, a BPR approach is suggested as a solution for minimising FWT, as it will free up managers from time-consuming routines and let them focus on their core business.

Our position regarding FWT, as it is defined in this paper, is that reducing fragmentation of working time is not an objective per se, and may not even be desirable. We try to provide support to people who work in highly interrupted work environments, in respect with FWT; however, this objtive should not be put in contradiction with the nature of the work assignments and modern management principles which encourage information and knowledge sharing, networking, rapid response time and customer orientation. Our final aim is to see if we do increase managers' and knowledge workers' productivity, both in quality and quantity, through the implementation of an action programme tackling FWT with IS-solutions.

4. An Action Programme for Handling Fragmentation of Working Time.

4.1 An Action Programme

The results of the suvey presented in 3.2 and our taxonomy of FWT provide us a better understanding of the research phenomenon: this background is used to build an action programme for handling FWT.

We propose the combination of proactive and reactive methods which would bring remedies in order to reduce FWT and its related effects. These methods are taken into use in the context of the companies activities.

Proactive method: With this method, we try to reduce the number of interruptions and to prevent undesired interruptions to take place. This can be done with: (1) *collective and individual management*: we encourage people to avoid unnecesssary interruptions, to choose appropriate communication channels, we set up rules to sort out undesired interruptions, (2) *training*: we train managers to use IS tools more effectively (office management software, e-mail programs …), time management training to learn how to handle interruptions effectively, (3) *better design of IS tools*: avoid e-mail notification features (and better control of this feature), better control of mobile phone (user groups, ...), better system interfaces for the users, (4) *workflow analysis*: look for interruptions which are caused by an inappropriate workflow and attempts to redesign the workflow according to our objectives.

Reactive method: when we are not able to prevent interruptions to take place, we try to reduce the negative effects of interruptions (disturbances, long recovery time). In order to accomplish that, we can (1) *provide workers with tools to cope efficiently with interruptions*: this category expresses the need for a Support Information System (Decision Support Systems, Knowledge-based Systems.), which provide information needed to handle the interruption, (2) *design work environments to help reducing negative effects*: improve the design of system interfaces.

4.2 Modern Information Technology for Management and Business Process Reengineering

In an increasingly complex world, managers and knowledge workers must use computers to support decision-making and collect information necessary to perform their work. They must learn how to use new tools and techniques which are developed in the field of management [41]. These tools and techniques include applications designed for problem analysis and decision support.

Modern Information Technology has also been expanding for several reasons: speed of computation, processing and storage capacity, cost effectiveness, quality support. This technology has evolved towards many forms: Decision Support Systems (DSS), Executive Information Systems (EIS), Expert Systems (ES). Recent developments in technology are expected to provide better support to managerial activities. These technologies are: Intelligent Agents, Neural Networks, Fuzzy Logic, Data Mining and Data Warehousing [7].

A question that has been addressed in the IS community is: how can we design useful management information systems (MIS) for managers? The design of MIS requires knowledge of what constitutes the manager's work. In fact, many of the tools which have been designed for managers (DSS, EIS, MIS) follow the principles of the POSDCORB approach: these systems - developed according to conventional approaches to computing - apply a formal approach to management and require a high level of "number crunching". On the other hand, it is interesting to

see how soft computing approaches and intelligent techniques could be applied to design IS according to what we have learned about managerial work in Mintzberg and Kotter.

Business Process Reengineering has been extensively used to redesign administrative and operational work processes, but it has remained difficult to redesign knowledge work processes [14]. Knowledge work processes require autonomy and resist structured approaches. We think that the characteristics of Support and Intelligent Systems technology apply to the nature of the processes which we have chosen with the companies (project management, strategic planning, product development).

4.3 Time management

The organisational context created by competitive environments has been a fantastic opportunity for consultancy on time management, the literature of time management has been prolific during many years, many companies arrange management seminars including time management training for their personnel. The typical themes of this literature are: how to achieve more in less time? How to get organised at work, avoid interruptions and time-wasters and be successful in one's professional career? How to create time for oneself, in concordance with family objectives? Answers include several principles, good habits, paper- and IT-based tools. In this field, Stephen Covey's work has received wide acceptance (other remarkable works include [25] and [44]), Covey exposes 7 good habits for managers to follow, these are: (i) Be Proactive, (ii) Begin with the End in Mind, (iii) Put First Things First, (iv) Think Win/Win, (v) Seek First to Understand - Then to be Understood, (vi) Synergize, (vii) Sharpen the Saw.

In the context of SMARTER, we have used some elements of Time Management in order to convey our message and generate discussions about company internal policies and habits. Doing that, we have noticed that the people who are involved in the project actually start questioning the pertinence of the interruptions, which they generate or from which they suffer, and discussing their use of IT tools.

4.4 Cases of Fragmentation of Working Time - Findings

The action programme described in 4.1 is fully or partially implemented. In this section, we will make an account of 3 cases, which are mainly technology-oriented, we will also provide some elements of discussion which were raised during the many interviews and seminars which we organized in the research project and some preliminary results.

4.4.1 Case 1. Context: Company A is the development unit of a large Nordic company manufacturing household appliances. Company A employs about 60 persons, of which half a dozen is project managers. Its primary business activities are project-based, and it manages 300-400 projects per year (the typical project length is about 6 weeks). A project involves the project manager, designers, toolmakers and administration personnel. The nature of the work environment is such that ad hoc teams are constantly built within the organisation for a short period of time; many persons belong to many teams at the same time. Difficulties arise when we come to project management activities: at the start of the research project, each manager has a different understanding of the project management process. On the top of that, IT tools do not fit very well with each other (many systems used in parallel, problems to transfer information,…), or the information is not stored in any system. In this environment, project managers must make constant efforts to keep track of what is going on with their respective projects, and to reconcile various sources of information. These efforts cost many hours of work per week.

Actions: In the context of the research project, we decided to start looking thoroughly at the project management process, using the Business Process Reengineering method in order to redesign the process with more logical workflows and more appropriate IS solutions. The results are (i) a documentation of the project management process, (ii) some efforts to improve the use of office computer tools (through training courses), and (iii) the development of a Web Information System which helps managers to handle the documents which are related to the project management's workflow. Altogether, we expect these actions to impact positively on FWT and the productivity of managers.

Our solution includes: (i) harmonisation of the project management process (to elicit a clear understanding of the process and to reengineer it in order to eliminate incoherent procedures), (ii) integration of the various software in use in accordance with the process ([38] and [39]). These software programs include a Project Simulator, Intranet-based tools to track orders, quotations, dispatch notes and other management documents, resource scheduling application, and visualisation tools (to keep track of the status of any project).

4.4.2 Case 2. Context: Company B is designing and producing telephone systems. Its telephone systems, enabling simultaneous voice and data communications, are suited for small businesses and home offices. They also offer special communication systems for hospitals and schools. This company was incorporated at the beginning of 1996. In 1997, the company's turnover reached FIM 31 Million and they employ about 50 persons. The company is investing strongly in R&D. They are marketing their product line through a network of dealers all over Europe. As the company was becoming independent from its previous owner, the management team had decided to

engage in a thorough re-assessment process of the corporate strategy and of the strategic planning process, especially in order to decide on which range of products they would put most of their efforts. Therefore, the project would include assisstance in the strategy assessment and the reengineering of the strategic plannning process. This project (different from the case of company A) is challenging for many reasons: the strategy planning process is very disseminated, it is difficult to say who owns the process; also this process, although very formalized in some occasions (meetings, seminars, brainstorming sessions), often takes place in unformalized contexts (data collection and analysis "anytime, anywhere, anyhow").

Actions: Concerning the research project in itself, it appeared that there was a need for a lot of information about the markets, the potential customers, the competitors. This information existed but it was unstructured and could lead to various interpretations depending on the persons involved in the planning process; meaning that judgements and opinions were interfering very much in the process of analysis. The ideal strategic planning process, which we strived for, called for a strategy grounded more on facts than opinions. Also, the time needed to acquire information and its quality were relevant as objectives. Hence, we have formulated the 4 following objectives:

- Develop company strategy grounded on more information (facts rather than opinions)
- Shorten time needed to acquire information
- Better information quality
- Adapt information to the user's needs

The work actually being done was a quick reengineering of the strategy planning process, some of the cornerstones for the new process to be designed were: (i) use of Information Systems, (ii) use of formal analysis methods (cognitive mapping, SWOT, market curves and matrices), (iii) exploitation of external data sources (use of datawarehouses). The information systems development part included the construction of a system which facilitated the building of financial projections with risk- and scenario- analysis, including reporting functions and easy visualisation of data for the strategic planning process.

4.4.3 Case 3. Context: Company C is a food-processing company. Its production is sold to large retail chains. Company C decided to engage in the automation of management reports routines. At the present state, sales reports to the top management are generated semi-automatically (data is extracted from a system, and fed into a spreadsheet application). The company receives large amounts of sales data through their EDI-system (which is linked to the retailers' systems).

Actions: The objectives of the project are to try to benefit from datawarehousing solutions, to select the necessary data for the reports and integrate an application that would build the report automatically, so that the user can have any report with a few mouse clicks and no data manipulation, therefore reducing the time needed to generate a report. The solution is developed, tested and the introduction process to the users is under way.

4.4.4 Other findings. With our case companies, we have observed immediate and unexpected effects: 1) one company decided to think thoroughly through the organisation of internal meetings - are some specific meetings necessary? Who should attend? How long should these meetings be? 2) In an other company, some courses have been organised to train the managers to use more effectively their office computing tools.

Many discussions have been introduced about the efficiency of IT:

1) E-mail is recognised as a powerful communication instrument but it is often misused in many respects: (i) e-mail programs include e-mail notification features which alert the user through blinking icons or sounds, this gives a false sense of urgency which often interrupts other work activities, (ii) there is no intelligent e-mail notification feature (scanning and notifying important messages only), (iii) e-mail communication is inadequate in some cases, either e-mail is not the appropriate communication support for the information, or part of the necessary information is missing which requires action to get more information.

2) Mobile communication is also a powerful communication instrument, but it generates some interruptions which are not desirable.

3) The design of some IT solutions can delay some tasks, because it is difficult to transfer or transform information. Some of the research program's efforts focus on the study of better IS designs.

We have also some results from 1 case presented in this paper. In Case 1, as the process has been strongly streamlined, project managers start to have a better command of facts for their respective projects, part of the IS-solutions have been implemented and extensively used. It seems in particular that the Web Information System (WIS) delivers its promises, when we speak about providing the user with right and timely information, and helping each project manger to handle management documents.

4.5 Discussion and conclusion

The objectives of this paper were to describe the problematic of Fragmentation of Working Time. to provide a taxonomy and a method which could help us to identify remedies to this research problem, and to present cases and preliminary results, from an Action Research perspective. This has been facilitated by the study on the nature of managerial work and interruptions presented in

this paper: it was shown that interruptions have dramatic effects. Although we have identified many means to reduce FWT, our main concern remains to see if we can increase productivity by tackling FWT, and how Information Systems contribute in this respect. The paper presents an action programme which has been designed for implementation in the research project. A part of this action programme includes the development of IS-solutions, which have been either implemented or are in the process of being implemented. These solutions include (i) workflow systems, (ii) datawarehousing and reporting solutions, (iii) Project data management, (iv) strategic management support system. We present some preliminary results and we are in the process of collecting more material. Our preliminary results include mainly initiatives taken by the companies in order to reduce FWT, and achievements of productivity gains. Especially for the latter, we are about to engage in a comprehensive evaluation and follow-up programme for each individual case company, and from which we expect enough information to validate our models, and see if we have reached our research objective: *to bring sustainable, IS-based solutions to Fragmentation of Working Time which would increase productivity, and to draw lessons for practitionners to follow when attempting to tackle similar problems.*

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