

# Mobile ICT-supported Work as a Driver for Organisational Change

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**Abstract:** Mobile information and communication technology (ICT) increasingly pervades work and processes supporting work within organisations both within the individual and organisational dimension. If an organisation tries to make this transition simply by ‘mobilising’ its employees by distributing mobile ICT devices, both the working individual and the organisation may be faced with problems in various domains. In this contribution, the concept of mobile ICT-supported work is defined and its specific characteristics and problems in contrast to non-mobile work with ICT are described. An overview is given of internal and external impulses for an organisation and its employees to transferring to mobile ICT-supported work. Based on empirical findings possible primary and resulting secondary problems of this transition are explored, and suggestions for organisational and individual changes are discussed. The concept of invariants is explained and given as a basis for an organisations’ individual way through change to mobile ICT-supported work.

## 1. Introduction

Work in the future’s information society, with an increasing tendency, will more and more be supported by mobile information and communication technology (ICT) (see e.g. [1], [2]). In particular, work on the individual level is released from traditional chains of work space and time, like e.g. office places, fixed hours of office work, weekends or, looking at the technological dimension, of immobile desktop computers and cable-bounded telephones. On the organisational level, work processes and even business processes are more and more pervaded by utilising mobile ICT and the demands for supporting mobile work of individual employees.

Solutions to this are neither simple nor ad-hoc. A systematic and holistic approach to the transition to mobile ICT-supported work, in order to avoid or at least minimise such problems, should be build upon the general question, which mechanisms could provoke the transition and what are the consequences of this transition for the organisation and the individual which have to be considered ? In particular, answers to the following questions have to be found: i) Which reasons for an organisation are there for changing to mobile ICT-supported work, and which reasons for the individual for accepting it? ii) Does the transition to mobile ICT-supported work induce further secondary changes within the organisation? iii) How can problems and changes invoked by the transition to mobile ICT-supported work be coped with by both the organisation and the individual? Answers to these questions comprise the three dimensions individuals, organisation, and technology. In the following discussion, the focus shall lay upon the first two dimensions, especially upon individual needs and requirements, organisational changes, but less upon the technological dimension.

## 2. Mobile ICT-Supported Work as a New Paradigm

More and more areas of work face an increasing pervasion by mobile computing. Traditional areas of work are evolving to mobile computing-based processes; new areas of work are emerging due to the potential of mobile computing and communication. Together, the development of both mobile computing and communication technologies (ICT) has led to a new paradigm of work: mobile ICT-supported work. So far, there has been no generally established definition for this term. Though there is a well known definition of mobile telework as “work for at least 10 hours per week away from home and from main place of work using online computer connection” ([2], p.10), this definition is too restrictive to address all aspects of mobile ICT-supported work in general. For example, storage capabilities of mobile devices, today, are large enough to carry all data needed on the mobile devices itself, without any need of online data communication. And even mobile work for only 4 hours per week may face some problems. Thus, instead of using this definition, in the following the term ‘mobile ICT-supported work’ shall refer to any kind of mobile work which is supported by mobile information and communication technology, independent of the degree of this support.

The reasons why organisations and individual employees transfer to mobile ICT-supported work are manifold and within different dimensions, as empirical studies reveal. Preliminary results from a research project on occupational safety and health aspects of mobile ICT-supported work which is currently conducted by us ([6]) show that for individual employees most of their drivers and reasons for using mobile ICT are within the domains communication and flexibility: mobile communication via email when out of office, exchange of data and documents with others, access to enterprise applications, flexibility in place and time of work, and the possibility of quick responses to customers demands are the most commonly items mentioned. On the other hand, our interviewees reported about repeated and partially critical problems with regard to technology. Reasons for these problems mainly are bad or intransparent service process and insufficient or none-at-all training on technology and applications. An empirical study by the IDC Group ([4]) shows that for organisations most of the impulses for introducing mobile ICT work are within the domains competitive advantages and business processes optimisation: development of new market areas, competitive advantages, improved quality, and accelerated business processes are the items regarded as most important. Other impulses may be due to current organisational trends, like e.g. reducing office infrastructure by ‘mobilising’ employees, outsourcing of tasks to part-time workers and freelancers, work intensification by utilising employees’ recreational time etc.

The combination of both studies (Table 1) gives an answer to the *first question* of section one, i.e. the question for drivers for transferring to mobile ICT-work, on an empirical basis. Since these drivers are internally or externally invoked by other domains than the technology itself, we shall denote them as primary drivers.

Table 1: Drivers towards mobile ICT-supported work

Driver	Dimension
enlarge accessibility to employees	individual
flexibility in place and time of work	individual
opportunity of working part time	individual
enlarged self-responsibility at work	individual
develop new market areas	organisation
gain competitive advantages	organisation
improve quality of service	organisation
possibility of quick responses to customers demands	organisation
accelerate business processes	organisation
improve information exchange	organisation
improve quality of data	technology
mobile communication via email when out of office	technology
exchange of data and documents with others	technology
mobile access to enterprise applications	technology
optimisation of office infrastructure	technology

### 3. Mobile ICT-Supported Work as a Complex Problem Space

The transition to mobile ICT-supported work is invoked by external or internal primary drivers. If this transition is tried to be made simply by introducing new mobile ICT to individual work and organisational work processes, both the working individual and the organisation may be faced with serious problems in various domains, like e.g. business process design, technology management, or health and well-being of the working individuals. Table 2 illustrates this by two scenarios.

In these two scenarios the questions are not what amount of additional work-load the mobile service technicians has to cope with caused by wrong data, and what the amount of mental stress the mobile project workers suffers from by the repeated interruptions is. Instead, the crucial question is how to avoid these two factors at all. For that would have a positive impact on both the performance of business processes of the organisation and on the well-being and workability of the individual employee. Solutions for the mobile service technician scenario may comprise organisational aspects, like e.g. establishing enterprise configuration management and product data management systems, and technical aspects, like e.g. an automatic remote-updating of all local data during the login procedure ([3]). Solutions for the mobile project worker scenario may comprise enterprise cultural aspects, like e.g. codes for email communication, and individual aspects, like e.g. trainings on personal coping strategies ([5]).

Table 2a: Problem scenario at mobile ICT-supported work: Mobile service technician

<b>Scenario 1: Mobile Service Technician</b>	
situation	The service technician visits customer's site for maintenance of complex fabrication devices. He uses his laptop for remotely accessing engineering data, service documents, and configuration items of customer's devices.
incident	The configuration items are expired or wrong due to failures within the configuration management process. Thus the technician installs wrong components to customer's device.
effect	The installation procedure fails. The service technician faces unexpected additional work for repair.

Table 2b: Problem scenario at mobile ICT-supported work: Mobile project worker

<b>Scenario 2: Mobile Project Worker</b>	
situation	The project worker receives many emails concerning his task and work within the project in general. New emails are indicated by an alarm icon on the desktop. Immediate response to emails is expected within the organisation.
incident	Each new email is being processed immediately. Thus the project workers flow of work is repeatedly interrupted.
effect	The project task cannot be completed in time, which leads to increasing work load and time pressure. The project worker receives additional negative psychic strains due to repeated interruptions at work.

Problems and solutions that may arise or have to be found, respectively, if mobile ICT-supported work is introduced by concerning the technological domain, only, are spread over a variety of non-technical domains. That makes mobile ICT-supported work a complex problem space. Therefore, the transition to mobile ICT-supported work has to be in conjunction with other technical, organisational and individual secondary changes. That gives an answer to the *second question* of section one, i.e. whether or not the introduction of mobile ICT-supported work induces further changes. The problems that may arise from the technological-centred introduction of mobile ICT work act as drivers for these further changes. Table 3 shows a non-complete selection of these problems. Thus, we shall denote them as secondary drivers.

Table 3: Problems related to mobile ICT-supported work

<b>Problem</b>	<b>Dimension</b>
repeated interruption	individual
loss of contact to organisation	individual
information overload	individual
increased work / time pressure	individual
uncertain privacy	individual
permanent reachability / accessibility	individual
email surveillance	individual
little access to knowledge of mobile workers	organisation
difficult controlling of work process and results	organisation
need for occupational safety and health	organisation
unclear employee loyalty / staff retention	organisation
IT service management	technology
actuality of mobile data	technology
security of remote-login	technology

#### 4. The Role of Invariants

The difference between mobile ICT work and ‘normal’, i.e. stationary work with ICT seems, at the first glance, trivial: the first is mobile, the latter isn’t. But in fact, the difference between these two types of work is based upon the fact that both underlie different invariants. The term ‘invariant’ refers to factors of work which remain constant under different viewpoints to work ([3],[7]). A simple example of an invariant for stationary ICT work is the place of work itself, e.g. the office, since it remains constant during work. This invariant becomes variable under mobile ICT-supported work. Invariants and variables exist in all of the three dimensions mentioned above. Table 4 shows further examples.

A factor which is invariant both for mobile and stationary ICT work may not necessarily remain constant during the transition. An obvious example for this is the factor hardware / software, since mobile hardware is different from stationary hardware, but invariant in each case. Other factors, like e.g. IT service management may be less obviously subject to change, others may indeed remain unchanged as well.

The important aspect of invariants is that many areas of design and management of work need invariants as basic fundament. For example, occupational safety and health, basic ergonomics, and IT support depend on the invariance of the place of work. As a consequence, either these areas have to be reorganised for the mobile form of work, where this invariant becomes variable, or new invariants have to be found - or probably both.

A conjecture indicated by table 4 is that most of the factors that are invariant under mobility are organisational factors. This, of course, is due to the fact, that both the individual and probably the technology become mobile, but not the organisation. Consequently, on the one hand, primarily organisational factors have to be strengthened or even newly created during

the transition to mobile ICT work in order to gain these new invariants. On the other hand, organisational factors bear the highest potential for supplying efficient, effective (from the organisational view), and healthy (from the individual view) working conditions for mobile ICT-supported work. These two aspects represent the basis for an answer to the *third question* of section one.

Table 4: Examples of variables and invariants of mobile ICT-supported work

Dimension	Factors	Mobile Work	Stationary Work
individual	working individual	invariant	invariant
	co-workers	variable	invariant
	recreation time and family	variable	invariant
	personal perspective of life	variable	variable
	place and time of work	variable	invariant
organisation	interfaces	variable	invariant
	corporate governance	invariant	invariant
	change management	invariant	invariant
	information	invariant	invariant
technology/ infrastructure	hardware / software	invariant	invariant
	IT service management	invariant	invariant
	tools	invariant	invariant
	communication	variable	invariant

## 5. Conclusion

Mobile ICT-supported work as a new paradigm for work could be triggered by external and internal impulses. But also, mobile ICT-supported work itself by means of the problems that may arise during the introduction process can be a driver for further changes inside the organisation. Drivers to change and changes itself may lie within the three dimensions individual, organisation, and technology. Unfortunately, there are little monocausal relations between drivers, problems, and solutions. Thus, necessary changes are neither straightforward nor generally valid. They depend on technological aspects and conditions, on the strategy and culture of the organisation, and on the individuals working for the organisation. General guidelines for the transition to mobile ICT-supported work could only be given on the basis of invariants for this new form of work. But the individual way of change and its implementation, i.e. the *final answer* to the *third question* has to be found by each organisation on its own.

## References

- [1] eWork 2002 – Status Report on New Ways to Work in the Knowledge Society. European Commission, Information Society Directorate-General (<ftp://ftp.cordis.lu/pub/ist/docs/ka2/ework2002en.pdf>) (last access Apr. 08)
- [2] Benchmarking Progress of new Ways of Working and New Forms of Business across Europe – EcaTT Final Report. empirica, Aug. 2000 (<http://www.ecatt.com/freport/ECaTT-Final-Report.pdf>) (last access Apr 08)
- [3] Kohn, M 2006. Business Process Oriented Safety and Health at Mobile IT-supported Work. 28. International Congress on Occupational Health. 11-16 June 2006, Milano
- [4] IDC 2005: Mobile Enterprise Study, IDC Mobile Enterprise (in German)
- [5] Kohn, M. 2007 Work with email – Challenges for a human-centred design of in: Toomingas A, Lants A, Berns T (Eds). Work With Computing Systems 2007 - Book of Abstracts. Stockholm: Royal Institute of Technology; 2007
- [6] Hupke, M., Kohn, M., Stamm, R., Paridon, H. 2008. Effects of the increasing Use of Mobile Information and Communication Technology at Work. 4th Int. Conf WorkingOnSafety.net, Crete, Greece 2008 (accepted, to be published)
- [7] Kohn, M. 2008 On new Invariants for Occupational Safety and Health for Mobile IT Work. 4th Int. Conf. WorkingOnSafety.net, Crete, Greece 2008 (accepted, to be published)