Toward an Understanding of the Service-Based Command System

Per-Arne Persson
Swedish Joint Headquarters
OPIL, LedsystM*
SE-107 86 STOCKHOLM, SWEDEN
Tel 46 8 56282284, 46 70 3415243

per-arne.persson@hkv.mil.se

Abstract

The Swedish Armed Forces have entered a transition phase, departing from a traditional late 20th century national defence structure to another, adaptable to situated demands, implying more efficient use of resources. The transformation blueprint is the Network-Based Defence (NBD) vision. Several crucial functions and capacities have to be verified as proof of concept. The transition includes the development of experiment test-beds, "demonstrators", for the verification and validation of concepts, command method design and technical solutions. The NBD vision relies on situated or situation-oriented activity systems (SitSysts), an abstraction for mission-specific tailoring of capacities and organizations. Prerequisite for such systems, in accordance with the general development in society, are physical and immaterial "Mission Related Services" (MRS), being the interfaces between clients (operators, unit commanders) and suppliers (other operators, units, agencies) that will promote flexible combinations of resources.

An analysis of the NBD concept has led to a command system and MRS design method, an adaptation of the Rational Unified Process (RUP™) method (framework), also incorporating current Swedish experiences. A possible further step is to embed the method in future new planning and control tools or services. The article describes the transition principles, the theory behind the method design, the analytic process, and the MRS methodology.

1. Introduction

1.1 Our Universe of Discourse

Even without the MRS concept, modern organizing presupposes a re-assessment of traditions. Communication and information technologies (CIT) will be crucial for the coordination of work and networked operations 'over the horizon', balancing automated procedures and traditional command work. The NBD-environment will differ from what we design and experience today: These technologies replace and substitute for social relations but issues such as trust, responsibility and accountability, will remain central in the usually taken for granted CIT-dense environments. Conventions about good and bad C2 system design promote method and technology design of a certain kind, following the systems-theoretical perspective on information systems design (Nurminen, 1988). For long, consequently, most systems development and command methods are deployed along the belief that command and control means 'transmission of facts' (in the form of "information"), effectively supported by faster processors, better

* The Swedish Armed Forces and the National Defence College have provided opportunities to study the force transformation program, develop theory and to participate in the 2004 ICCRTS.

interfaces and screen designs. Moreover, by default, what come from computers are objective facts ("ground truth") about the real world.

This article is about the "M"-project or -process (M for Methods), responsible for the development of command methods including doctrine, command and staff work methods and the definition of technical requirements specifications for several net-services and information systems. Other efforts are directed at the organizational and the human factors aspects of the NBD (the "P-process", dealing with the competence requirements for the new command structure). The Defence Material Administration (FMV) is responsible for the so-called *T-project* (design and technical support, procurement, the interface to industry. The Swedish Defence Research Agency (FOI) and the National Defence College (FHS) contribute and support through evaluation and research. Doctrine, methodology, personnel and technology are considered cornerstones of command systems, continuously interacting. Their development has to be integrated.

What will be desirable, even necessary, in the future operations, and what consequences are there? The MRS-idea may, because of its technical character, neglect the need for responsible interpretation, coherence and interpersonal trust. Checkland and Holwell (1998) underline that in an organization people inter-subjectively attribute meaning to their world and form a view of what is relevant information, using it to perform purposeful activities. The meaning of an event is constructed and not inherent in the sensor data or the message announcing it. Consequently there is no straightforward cause-effect relationship between what is labelled "information" (or technology) and its value for purposeful action. Our design methods should counter the risk of unpleasant surprises. The first important method design step is to articulate the perspective underpinning the image of ourselves and the 'command culture' (what we do, say and use) when commanding. Then the MRS design has to be theoretically informed in order to work from a consistent platform across the collaborating agencies and industries.

1.2 Perspectives on the Universe of Discourse

As regards the MRS concept, a common view is that they exist in the network and can be achieved via some kind of web portal, many of them being information contributing to the Common Operational Picture (COP). It is a short step to conclude that services *are* out there, ready to use, just grab them! But presumably the actual value of a certain service will be hard to establish before its use. Even if "information/facts" are communicated, intentions and uncertainty accompany person- and situation-dependent interpretations. In fact, much command communication is *not* fact-related. We are familiar with concepts such as *goals*, *intentions*, and *will*, and easily realize that both negotiations and "chat" belong to the communication flows. How can the MRS idea make such issues manifest? How do we know that onlookers (MRS and COP 'spectators') interpret what they experience similarly, having and amplifying shared situation awareness? The assumed objective content is integrated with social interaction when the state of the world is inferred, even enforced through the chain of command.

Our theory is a perspective on the services as a kind of information systems, specifically meaning *informing systems*, one quality of which is the capability to promote a basic understanding and assessment of the operationalized MRS system itself. Another issue is an *action orientation* instead of the traditional 'spectator view', which makes command work a kind of 'image-studying activity'. This new viewpoint originates in a business and operations oriented service classification system that deviates from the technical taxonomies where transportation and

processing of information is central. An intermediary tool is a life-cycle model for the MRS design and use method.

The service approach has consequences. We can say that operators should not just have more information, but instead achieve desired capabilities, informing resources or other kinds. In addition, the traditional meaning of and emphasis on information management may be outdated: the production and timely provision of MRS may depend on remote service providers, not only internal database management systems (DBMS). It may be neither technically feasible nor desirable from an administrative point of view, to intervene and try to overtake a technical infrastructure. It remains a challenge to develop methods for the acquisition of MRS that satisfies urgent needs, and to establish, through training, the necessary conditions for skills and trust that can support the NBD.

2. The NBD Vision and Transition Process, an Overview

The Swedish NBD process is designed as a joint effort within the armed forces. Our development strategy is evolutionary however in lock-step phases in order to allow choices for continued experimental development, as well as the use of satisfactory results by those outside the NBD development and test track. Figure 1 briefly illustrates the scheduled process.

NBD is the means to achieve a highly flexible force and command structure with an augmented total capability. Resources shall be possible to combine flexibly according to mission-specific conditions. The vision presupposes well-defined unit and component interfaces allowing cooperation and secure transfer of data and messages through standardization and a technical communication infrastructure. Decision-makers, information systems and weapon systems form a network (or network*ed*) organization allowing concentration of effects thanks to outstanding communications, command procedures and systems. The vision thus relies on principles from modern production, logistics and e-business, being more than pure technology. Technology enables new ways of organizing, but there is no straight line between a concept, its value, and its implementation. The vision comprises method, basic organizing principles, including a new mind-set, which shall allow flexible design of mission or situation oriented “effects packages”. There is a short step to see an outsourcing strategy behind the vision.

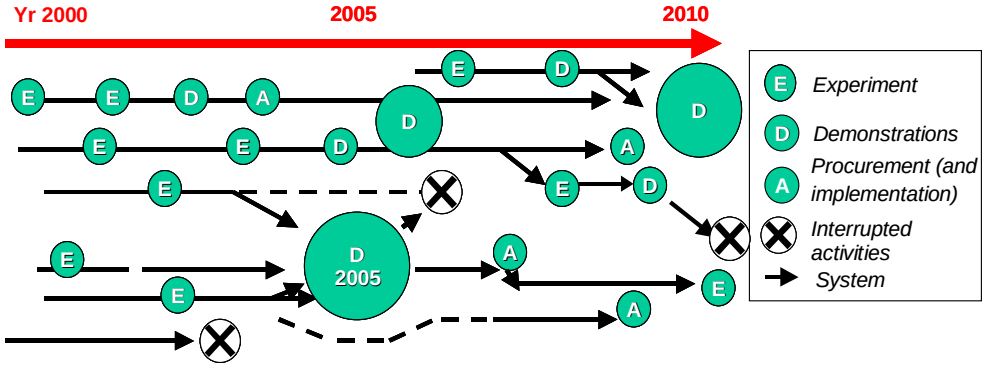

Figure 1. Development strategy and main process. The general methodology presupposes that demonstrations and ordinary operations are ongoing in parallel (Source: HQ NBD briefing material).

The first development period ends in 2006. The "Systems" in the figure are development areas or functions chosen because considered representative or crucial for the NBD, for example because they deal with interservice cooperation (joint/combined) and/or key technologies (network management, data fusion, security). The transition process integrates the development of experiment test-beds, *demonstrators*, for the evaluation, verification, and as far as possible validation of concepts, visions, technical solutions and methods for the transition as such, and for the MRS design and use.

The vision has a certain abstract 'metaphor overload', a variety of qualities and attractive concepts (*networked, situation awareness, dominant battlefield awareness, information superiority, selfsynchronization*), adding to the urge forward. But we do not *get* the NBD, we have to *create it* as a cooperative effort, making sense of the metaphors too. The hypotheses about the beneficial *information richness and reach*, the relations between more technology and self-synchronization, situation awareness, sensemaking and efficiency (Alberts et al., 2001) have yet to be confirmed, modified, or rejected. Research within social science and information systems has produced enough evidence to pay attention to Anthony Giddens' words that *"…science depends, not on the inductive accumulation of proofs, but on the methodological principle of doubt"* (1991, p. 21). The wise commander probably agrees.

3. Belief Systems Within Military Command and Control and a Position Statement

A consequence of the common control thinking and CIT-dense environments especially in the NBD vision, is that work is transformed into what has been called "information work", meaning a universe of symbols (Nurminen, 1988). In it, the social world and its creators become symbolic and invisible unless re-presented. An operator has to be capable of scanning the particular symbols by which he/she is informed about the world, interpreting, understanding and connecting them to the external world which is to be managed. They need to manage and manipulate symbolic and formal relationships, rapidly connecting them to real world situations (Kallinikos, 1996). Actually there are three tasks: management of symbols, their relations to what they represent, and finally the real world. Abstractions and symbolic constructs (e.g. "information") often become *reified*, first achieving a physical character, then taken for granted although resting on assumptions and values, many of which are uncritically accepted (Nurminen, 1988). Examples are "information", "service", and "method", but what do they imply?

A special case is when rule-based automated actions control automated processes are designed. In such situations the correspondence between what is managed in the world and the symbols managed in the control process is even non-existent, and the processes are too fast for human operators to react on, as for example in modern aircraft.

Symbols have meaning only in relation to the entity in the real world they symbolize. Now, in the NBD vision, we are supposed to manage action–in–the–world through *services*, constituting points of contact with it and relying on symbols representing resources and possible effects. This situation calls for great attention to the relations between the supposed real world, how activities are described as "services" and represented. Our methods for service use and management must counter the tendency for reification and blurred responsibilities.

According to a cognitive science-inspired cybernetic model (Alberts et al., 2001, Figure 2) for the theoretical development of command practices, three domains have to be connected: the *physical*,

the information domain and the cognitive domain. There are two kinds of sensing, what an observer experiences directly and what is mediated as "information".

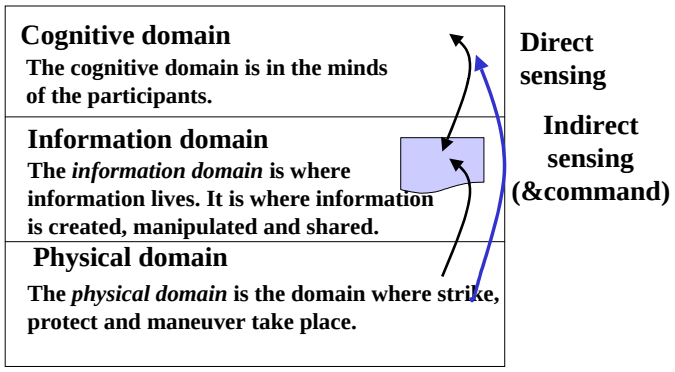

Figure 2. The three-layered model including the sensing of the physical for cognitive action

The linkage and effect hypothesis (better technology – shared situation awareness – higher effect) evolves from the supposed benefits of *information richness and reach*, an aggregate measure of the quality of information and of the degree that information is shared (Alberts et al., 2001). "Having the right information", "sharing" it, then getting what is called "situation awareness" are (hopefully) straight-forward linear effects of the supposed higher information quality originating in better technologies. In other words, 'hard wiring' the physical domain (i.e. the social world), the information domain (symbols) and the cognitive domain (knowledge) is possible and efficient. But we have to investigate what "share " means, its preconditions, the roles of the services and the necessary methods involved.

The theories behind this model have to be analyzed because such hypotheses are questioned by researchers using terms as the *descriptive fallacy* (language is used only for descriptions) (Goldkuhl, 1995; Melin, 2002), and the *resemblance fallacy* (look-alike graphical, external representations promote cognition and internal representation) (Scaife and Rogers, 1995). Yet another is the *fallacy of misplaced information*, the view that all information is in the content of a message (Barwise, 1988). Clearly, a simplistic technical perspective on command (and control) leads to troubles. Whether something makes sense is *context-dependent*. Social contexts are re-created continuously. Given such uncertainties, we probably need a more solid perspective on command practices and work, and on technology's roles within human interactions, cognition and communication.

To start with, because we want systems (teams, organized action, technologies), *relations* are crucial components, especially in war. A relation implies some kind of *communication* and might have to reinforce the latter. Then there might be a superimposed control interest promoting both relations and communication. Even an enemy has to be controlled which presupposes relations.

The unifying link between the physical world and concepts is the human as constructor and user-mediator/interpreter of concepts. The proof of interpretation and concept validity is whether people can make sense of a situation through action, or adversely, can initiate organized action in order to find out what makes sense. Between humans, issues such as trust and relations remain important because in war action often means dangers. Technologies support any kind of human

communication and action but are utilized also for their destruction. The MRS idea depends on technology. Moreover, it presupposes an Enterprise & Business Architecture allowing the design and use of standardized components as building bocks in order to achieve a desired flexibility.

With such principles in mind, recalling the three fallacies it is necessary to carefully scrutinize, as a basic step in the design methodology, implicit perspectives and their connection to all stakeholders, concepts, and metaphors. In summary, taken for granted technologies may cause fatal results and depend on superhuman capacities, never achievable. We have to try to remain honest when we model ourselves (however painful this may be!). This policy does not interfere with the necessity to find new and therefore appropriate balances between automation and humans' decision making, keeping issues of responsibility and authority at the centre of attention.

4. Development Methods and Command Method Design, an Overview

We have identified the need for a *three level methodology* having incorporated best practice from enterprise modelling, service and information systems design, and test and experimentation (Figure 3). The upper level is project and process management, the intermediary is the systems and services design level, and at base we have the operational level where services, supporting command teams and creating action are designed.

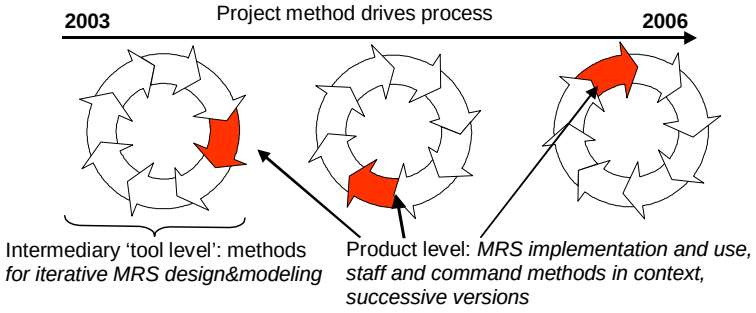

Figure 3. The three level method system.

The development of command methods requires its own technical design and test environment. Thus, an infrastructure for evaluation and exercises including training simulators is under construction. Its purpose is to link distributed development teams, providing opportunities for joint exercises and the production of empirical data for support of further design and recurrent tests. The method design includes the organizing and co-ordination of Integrated Project Teams (IPT) including military practitioners and people from industry, the design and development of command procedures, doctrines and control systems/services from the lowest level and upwards through the chain of command.

The command method and MRS design is scenario-based and includes the modelling of missions through the command levels. Figure 4 is a generic and basic model of a method.

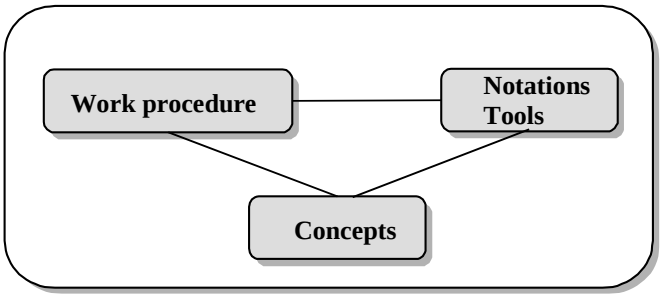

Figure 4. A generic method model, notations being descriptions and products

Given a doctrinal influence along the chain of command, the design of methods and practices probably have to be a bottom-up effort. On each level in the methodology a close integration is needed between work and technology: Project management, systems development with design tools, and command practices and services where CIT is used. The outputs of the method development will consist of

- Requirement specifications and business models
- Prototypes and functional models, the 'MRS matter', "grounding" software applications
- Method instructions, manuals, foundations for doctrines,
- Action and exercises, testing ideas and technologies.

5. The Methodology for Developing the NBD

Our design methodology and process are supported by established theory, scientific results and practices. As a joint project between the T and the M programs, method engineering has led to an expanded version of the RUP™ method/framework. Basically, RUP has been designed for software intensive systems (Kruchten, 2000). We defined some basic capacities of the desired design method. It should provide support for a new kind of environment, the NBD operations, of which we do not know much. Because of the command method focus, business modelling with the help of UML-charts and diagrams for augmented visibility of work and actions is imperative. Then, because we have to cooperate closely with industry in IPTs, the method must be a communication medium and support the production of design artefacts across the organizations involved. The analysis has led to this methodology for the development of the NBD activities, and the service-method combinations, where the first four steps/iterative activities lay the foundation for the business models and what can be seen as the *command and control architecture* :

- *Outline context and the 'design space', identify goals and stakeholders.* Define/outline business processes and operations; Analysis of objectives, subsystems; Action-not information orientation. List prerequisites and consequences;
- *Relations and communication.* Define relations between activity subsystems, and communication requirements. Result is input for early technical simulation.
- *E*stablish *rules* for interaction and control.
- *Allocate responsibilities and authority*; design control system and services *architecture*, man-man-machine responsibilities, strategy (automation or not?)
- Specify, design and develop the MRS as "hosts" for command methods (rules, algorithms, operations, and of Sitsysts). Implies business&control system models and transactions.

- Tests, simulation, exercises and experiments for the integration of services and methods.

Commercial systems development methods often focus at step five, producing *software intensive systems.* The NBD objectives and operations are, however, not possible to define in detail. Neither methods nor services can be designed and stored before actual needs and purposes can be defined, 'fine tuning' being normal. Our methodology presupposes several rounds before detailed design. The choice and use of supporting tool-sets for modelling, simulation, and requirements management have to acknowledge the basic principles, not alienating people and their experiences. Pedagogically, we believe the approach will support the "discovery of the NBD-vision", giving opportunities to face difficulties early.

Except from the NBD discovery-aspects, the initial iteration following the method and the first year process (figure 3) have a double purpose. It aims at the design and early stages in the build-up of an environment for tests and integrating exercises, distributed over a national network of development sites. These activities have to be planned and conducted in close cooperation with the Defence Material Administration (FMV) and the Defence Research Agency (FOI). Training of project teams, the establishment of horizontal collaboration between technical staff (validation, simulation) and operators in IPTs are main and immediate concerns. Let us take a closer look at the service concept.

6. "Service Orientation", a Trend in Organizing, its Theory and its Application

6.1 Theory

A common view is that the society dominated by industrial production of goods has been succeeded by another kind of economy, the *service economy*, sometimes used synonymously with information society (Webster, 1995). Typical issues are *customer orientation and satisfaction* (Echeverri and Edvardsson, 2002). Underpinning the concept is a 'brew' of branding, competition, advantages, marketing, quality ideals and arguments. Figure 5 illustrates the 'service idea' with the *service concept*, illustrating its role as a link between customers' needs and resources at the top of a production pyramid.

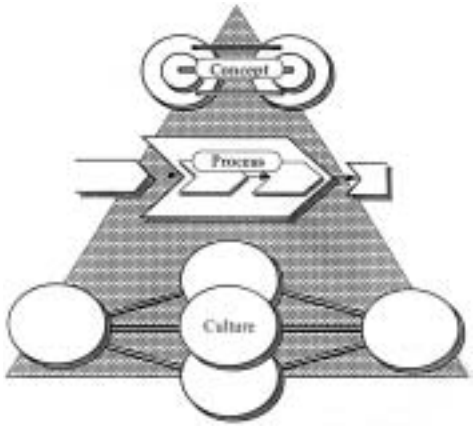

Figure 5. The service pyramid, the service concept, business processes, cultural support (ibid.)

"The service view" means to study something as a service, and as service production (Professor Bo Edvardsson, Karlstad University, June 2003 workshop). The definition used by Edvardsson is that a

> " is an activity or series of activities of more or less intangible nature that normally, but not necessarily, take place in interactions between the customer and service employees and/or physical

> resources or goods and/or systems of the service provider, which are provided as solutions to customer problems. (ibid.)

"The service logic" is at the core of value creation, a certain perspective, socially constructed. By making resources available they can be used economically without extra overhead. This logic have different components. Services can be free, charged for, imply certain procedures, have push or pull capacities. Independently of which, certain methods are involved and should guide the MRS acquisition and use according to a certain business logic or transaction thinking. Ideologically, consumers/operators do not have to know all about the producers. The latter, being responsible for service availability, quality and performance, deliver the service independently of who is the customer.

Customers react on services based on what they experience. The concept of *visibility line* denotes the visible part of a service (ibid.) which is also its *interactive part*, including technology, organization and physical products. The customer may meet and interact with a 'front person'. Behind the front are support staff and resources.

Ideally, few relations are needed between producer – consumer other than what the MRS requires, technically. However, according to the "service view", *customer involvement is crucial.* Especially in military operations, there must be no uncertainty as regards quality assurance, the allocation of rights on command roles for the ordering of services, and responsibilities if case of failures.

6.2 Applications

Theoretically, the service concept is a logical step within management control development. A century ago organizers learnt how to *separate the controlled system from the controlling system*, gaining precision, flexibility and economy. The service thinking is about the *separation of resource and effect*, making the latter widely available *and* controllable through standarized interfaces and methods. Subsequently, the standardization gives way to more combinations of component resources and flexibility in execution.

Thus, the MRS concept may be seen as an answer to control crises in modern society, reducing the need for central control promoting 'market-place thinking'. Large, global, integrated economies and (military) organizations can no longer be controlled by proven bureaucratic methods and means, basically distributing power and authority, relying on systematic, repeatable division-of-labour procedures. More IT, itself thought of and often designed as *The* Control Technology, is no remedy. IT means bureaucracy. Service thinking hopefully allows simpler coordination and organizing (*Sitsysts*), but probably involves more actors and agencies.

As we have seen, machine and communicative capability (*'richness and reach'*) promise to make resources usable in new modes. We talk about 'globalized' capabilities such as precision engagement and focussed logistics. Here-and-now effects can be replaced by *anytime-anywhere* actions. Applying the service thinking, we have to engage operators and listen to them as expert customers (what do *you* want to know, to do?), making the MRS concept more than another confusing technology. Other core issues are the visibility line: how does the service provider describe and communicate the service, how to make the acquisition explicit, and how to certify producers worldwide when it comes to support for military action? Who to trust and why?

7. Theoretical Guidance for The command Method and service Design

Several researchers have investigated the modern organization and its control technologies. Zuboff (1988) describes a data interface as a symbolic medium through which effects are produced on the basis of interpretations of "what is happening". Symbols are abstractions; they are experiences as remote from the rich sensory reality to which people are accustomed (*"In a symbolic medium, meaning is not a given value; rather, it must be constructed"*, p 76). Zuboff means that in a new medium there is an initial disjuncture between symbol and experience. The MRS concept is a new medium but has to be understood in its own right. In order to find references, we have approached it from information systems theory.

While recognizing that IT means unique contributions, Groth (1999) rejects

> claims that have been made over the last few years about the impact of information technology - that networking is the main impact of information technology, that hierarchy is being supplanted by networked teams, that classic automation is outdated and that the large firms of today are doomed in the competition with the agile, virtual organizations of tomorrow. (ibid., p. 14)

He means that such assertions are based on "superficial analyses and a lack of understanding both of the basics of organization, of human cognition and of the distinctive properties of information technology" (ibid.)

Typical for the modern organizations, says Groth, is the *model-driven organizing* building on conceptual models. These models rely on quite formal and precise descriptions of the main objects and events in the organization. Once this kind of description is achieved, coordination will be mediated by the systems, and by the model (=abstract systems). The main constituting parts of the organization will be the integrated computer-based systems, their *"programmed patterns of action"* and the conceptual model these are based on. In summary, the organization will be model-driven. Now we can enter into information systems.

An *information system* is commonly interpreted as a machine producing information. The dominant view of information systems states that they contain a model, an image or simulation of reality (Ågerfalk, 1999). According to this view, people *look at the system's* information instead of observing the world directly. Then, we can assume, processing and decision making occur in the cognitive domain before output (information) is produced. But humans do not just look at and process information about it. We do things, act and communicate directly in the social world, constantly recreating it as a cycle of interpreting – conceptualising and influencing it. Because of the contradictory theories involved and the fallacies mentioned above, other theories are required. The *language action perspective* (LAP) on information systems is better as a basic theoretical position. Winograd (1987) means that the LAP deals with meanings and relevance, not with assumed information processing in machines or in the brain where it is invisible. *"Conversation for action"* is central in this perspective. In brief, it says that all action is communication and all communication is action.

An information system thus has a dual *action character* as (1) an instrument (tool) for users to perform action and (2) perform action independently of its users but still according to its rules and program, called *actability* (Ågerfalk, 1999). One major problem with many existing information systems is probably that their action character is not visible for its users, instead it is implicit. *Actability*, the most important quality, means to *"perform actions and to permit, promote and facilitate users to perform their actions both through the systems and based on*

messages from the system, in some business context" (ibid., p. 147). The action enhancement is called *pragmatization of information systems*. Systems/vehicles for communication constitute a combination of an action potential (a repertoire of actions and a vocabulary), a memory of earlier actions and prerequisites, and of actions performed interactively by the user and the system and/or automatically by the system (ibid.). From this position the step is short to seeing services as information systems, thereby establishing some kind of quality criteria.

The service concept functions as an information system. A service must inform people about action repertoires, previous actions and allow the necessary interaction with the social world. Services need an informing capacity, "telling" *how* to get them, *when* they are executed or delivering, *status and quality* aspects, and how to interrupt them. They have to, using Checkland's and Holwell's words (1998), serve, help or support people in their work, providing informational support to purposeful action.

We need a deeper insight about methods and how to make them concrete enough to produce visible results in real (however fictitious) operations. The foundation includes a *theoretical understanding of the NBD*, of *technology in organizations*, the *relations between human actions and technology*, about the *concept of information* and about *information systems*, and the central MRS-concept. We have to thrive on professional experience and thus learn how to reinterpret and reuse knowledge and skills in the new context.

The spoken word seemingly will be required also in the NBD. It represents a medium that human beings have developed to convey experience; preserving a close relationship between the word and bodily presence. Spoken words emit from and are shaped by the body's immediate interior condition (for example, breathlessness, fright, grief, joy). Their communicative power previously was bounded by the presence of both speaker and listener. Nurminen (1988) means that the historical progression to the written word plainly shows the crisis of meaning that emerged as language took on a life of its own at a distance from experience and independent of speakers and listeners.

Trust and trust-building processes play a critical role in facilitating information-sharing and complex problem-solving in network organizations. We are confronted by a thorough transformation of social relations into abstract systems with the help of which we are supposed to survive and can not easily replace. It is a short step to treating the spoken word from machines and people as 'informing, listening and emotive services'.

8. Towards a Command Method and Service Design Process

As we have seen (figure 4), methods can be modelled as consisting of concepts, artefacts (descriptions, tools and products) and a certain working procedure to be executed. Given a certain purpose, methods are not aimed at being objective. Methods link processes through their output in the form of artefacts, having to be visible if humans are involved, in order to be controllable. Artefacts become communication media, designed for informing purposes or as initiators of action. Thus, the most important role of artefacts is that they are the outcome of methods: The need for a certain visible artefact drives the need for a certain method. Artefacts thus may be used to make manifest many relations in the information system and in the social world (for example represented in control charts and tables). Figure 6 illustrates how processes and services are related in a command process.

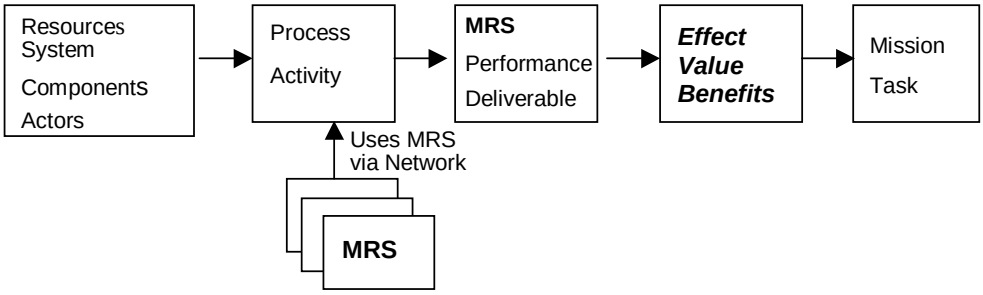

Figure 6. Processes, services and effects necessary for missions (Source: T-project Phase 1 report, December 2002)

The relations between process, MRS and the deliverables, artefacts, are not only technical but also social because a process may be distributed among many persons.

Because we design and work with systems, social and technical networks, *relations have a central role*, have to be analysed, and consciously crafted and supported. Melin (2002) distinguishes between different kinds of relations. *Actor relations* influence mutual recognition and form the identity related to the other, evolving through interaction and are possible (but maybe demanding) to analyse. *Resource dependencies* (technology, materials, knowledge) are defined through critical-resource analysis. Ownership (for example) and means for resource control are clarified.

War is about relations: *the establishment, control and support of desired, purposeful social relations*. Various substantial relations, even to an enemy, are vital in order to organize, control and synchronize actions and operations. In the temporary network (or network*ed*) organization, few relations can be taken for granted, for the achievement of effect, for commitment and discipline. We see several challenges such as vulnerability for social and cognitive breakdowns, and confusion when sensemaking fails, caused by interrupted communication. Relations and the technology must be protected, maybe more than what has been considered necessary in an organization where people know each other, can tolerate disturbances, and do not rely on real-time data transmission.

If we believe that it is possible to objectively represent and describe the world, and that people rationally obey orders, then few problems exist. But when we consider the possibility that what we call “the world” is a social construction based on mutual agreements about the state of things, we face another situation.

Communication, therefore, is certainly more than quantitative data processing, MMI-design, automated reports, or machine-readable signals to and from sensors and databases. In order to make an organization, even a temporary one (a Sitsyst), conflicting interests have to be negotiated and neutralized, with the support of doctrine and training. We realize that the technical infrastructure has a key role for every kind of human effort but *people*, not systems, have to be motivated before action can be organized. An early, careful bottom-up analysis of relations, action, and responsibilities provides input for the detailed business and method design.

Figure 7 is a generic systems' life cycle model applicable on of the methods involved in command work, service design and use. The life-cycle is related to the kind of mission or task at hand. MRS design includes service production and service use. The *visibility line* is marked between use and production.

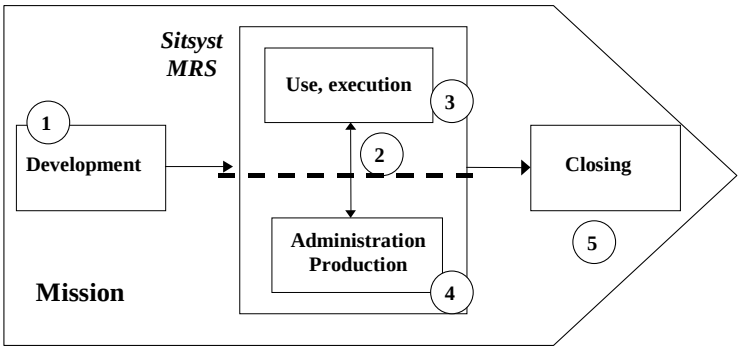

Figure 7. The service development and use model as a life cycle model superimposed on a business process

This model helps identify the different MRS-related method categories (numbered 1 – 5) that are required for the development, the implementation of the services and the MRS (use, administration, adaptation to situated demands as an interaction producer – consumer), and its dissolution/closing. The services are information systems in their own right, themselves constituting and presupposing methods when implemented and provided (figure 5, category 4 and 2 respectively).

The review of information systems theory, included the pragmatization perspective (Ågerfalk, 1999) and the language-action perspective. Based on this, we have defined three different action-oriented classes or MRS categories:
informing services (reporting, actual situation, sensing and surveillance),
action or *operations services* (combat oriented activities, transportation, logistics), and
structuring services (security, rules, control/coordination, and communication protocols).

In addition, each category requires an interface for the interaction between producer and consumer, which includes an *informing capacity* (what goes on, is the service active, capacity/quality, delivered, how to get it?). The business modelling within the RUP-framework thus will have to illuminate interaction and (as usual within RUP) "explore automation".

9. Uncertainties and Continued Research

The article describes a design and method development approach supported by theories. However, we do not know enough about the belief systems stimulating efforts such as the NBD-approach. One hypothesis, in Weber's words, is that the 'iron cages' of the large bureaucracies that form modern society's infrastructure have become unbearable (Mommsen, 1980) and new approaches are necessary. This means that what we witness and hear about (NBD, service-orientation) might be another turn in the ongoing struggle between charisma and routinization. In such a context, what kind of methods and services will satisfy military commanders, and what kind of relations and communication will suffice? It will be necessary to counter the tendency, promoted by technology and the NBD vision, that more and more human action becomes invisible work (Forsythe, 1999). Proper development methods, command methods and services should augment the visibility.

The NBD enterprise contains several high-risk but challenging elements, from concept ambiguity, to the match between new technologies and military experts. We certainly need to re-balance automation and human action, but not from a position that devalues experience. As regards research, we foresee a need for serious tests of the *richness and reach*-hypothesis and the design of research approaches for the modern *network* and network*ed organisation.* There is an urgent need for another theoretical foundation than just cybernetic/systems theory and cognitive science in order to fully understand the social character of technology, especially information technology and the MRS as concept, construct and product. The perspective on the human as responsible, active, creator of the world, should be brought forward and the design of services be launched from a consistent theoretical perspective.

We foresee that principles from the RUP-based design method will be implemented as planning and control tools that can exploit and further develop the MRS concept. In order to achieve the desired 'net-capacities', we will have to accept detailed design and a very structured work process. Whether this will exhaust creativity remains uncertain. Our ambitions include support of design teams with training and theory, within a distributed development and test environment. There, modelling and simulation, even detailed technical analysis of method-related actions and technical operations, will have prior roles as test methodologies for the detailed 'blueprints' and simulations, and for the design of the models that will be necessary and integrated parts of the new organization (Groth, 1999).

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