Information: a many-faceted and fascinating phenomenon

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1.   Introduction

In the last decade of the past century a number of developments took place which have converted our present-day society into an information society. Several authors use the word 'revolution' without any reserve when they discuss the influence of the developments in the field of information and communication technology [ICT] (Toffler & Toffler, 1993; Castells, 1998). With this characterization they not only point at the speed with which changes take place, but in particular at the more or less radical break with the past. The idea that the current technological revolution will cause a total unravelling of the structure of society and a redesigning of the existing social relations is widely proclaimed (Junggeburt, 2000).
Since the late eighties the use of ICT has grown enormously and the end of this phenomenon is not yet in sight. Probably, we are only on the brink of developments whose real meaning in terms of communication, transparency and permeability must still reveal itself. As to the possibilities of communication, they time and again offer wider perspectives and views and allow forms of collaboration across organizations which have hardly been conceivable. One of most important phenomena is the Internet, which gives access to real-time connective information processing. Consequently, the information processes and the social structure resulting from this phenomenon are connective and individual (De Kerckhove, 1996). But more important than these two qualities is an accelerated growth of intellectual production. The value of information has increased proportionally.
The importance of information within the information society is generally acknowledged. Some people think it is so extensive that they regard information as the fourth production factor. The value of information is determined by those who use it and place it within a certain context (Vuijst, 1998). The process of decision making in organizations forms an important element of this context (Choo, 1998). Information becomes more valuable to the extent to which it allows uncertainty in decision making to be reduced, allowing better decisions to be taken. At this moment, the determination of the value of information is affected especially by another vision on the concept of information, in which this concept itself is considered to be changing, both in meaning and goal (Jägers & Maes, 1995).

2.   The concept of information: a shifting panel

Information has several meanings
Information does not present itself in one guise only. Dependent on the view that is chosen or the combination that is made with other parts of information, the concept can have different meanings; in fact, it is a many-faceted phenomenon. The days of starting from a categorical approach of information, in which it was stored in stable categories in a database and was accessible in one way, are over. The implementation of information and multimedia technology allows the combination of other, different forms of information transfer, exponentially increasing the number of possible images of reality. This has enormous consequences for the manners in which we organize. New possibilities lie within reach to choose from and combine into new forms of representation, resulting in the loss of meaning of traditional restore and collection media.

Information is subjective

Information is not a neutral phenomenon; it has always been related to a person's perception of reality and it is fed from the selection mechanism that is used in the observation (Van Hoorn, 1987). On this basis the idea of an information system as an objectified representation of reality is no longer tenable. At best it is an expression of a human agreement about the use of terminology around a question.

Information is ubiquitous and pervasive

Information is available for everyone and accessible for an almost negligible price on the Internet. The user is no longer waiting at the end of the value chain for what will be delivered, but he actively asks for the information needed at that moment. Incidentally, this is becoming a great problem, because of the enormous growth of the number of websites. It is an increasingly difficult task to gather the required and right information from the web. At the same time we see that information is not only complementary to a product or service, but that 'information' itself is the product. This demands a lot of the ways in which we set up information systems, place information at someone's disposal and organize the information infrastructure.

Information crosses the boundaries of organizations

Information is intangible and therefore it cannot be related to specific people, groups or locations. The sharing of information – electronic, written or oral – often takes place in a fluid and informal way, obscuring sight on what exactly is happening with it. The idea that we can retain information within our formal organizational boundaries is outdated, although there may be some objections from a legal point of view. This awareness has considerable consequences for the ways in which we deal with information within organizations, on the one hand, and how we approach employees about their use of relevant and available information, on the other. The currently popular 'information leak', mostly within the administration, has once again brought this aspect to the attention of society and it has evoked important questions about ethics. The situation after the Srebrenica mission of the Dutch army is certainly not the only relevant one, but it contains many lessons learned with regard to this aspect.

These changed views on information urge us to approach organizations in a different way than we have done for a long time. To think in terms of connections, interdependencies and processes, also across the boundaries of the organization, is a necessary condition for approaching, describing and analyzing the organizational reality. We see that organizations increasingly concentrate on the creation of value. In this context they realize that they have to deal with the required information in a conscious way. Drucker mentions four kinds of information and he sees them as diagnostic instruments (1999):

- *foundation information*; it affords an organization the possibility to know if a problem needs to be identified and treated, because it is abnormal;
- *productivity information*; it gives data on total-factor productivity by measuring the value added over-all costs, including the cost of capital;
- *competence information*; it rests on core competencies that meld market or customer value with a special ability of the producer or supplier;
- *resource allocation information*; it indicates the allocation of scarce resources, capital and performing people, which convert into action all the information that a management has about its business, because they determine whether the enterprise will do well or poorly.

Drucker's classification shows that information is embedded in everything, in products, in processes and in people, and in this way it proves an important basis for creation of value. The flows of information – facilitated by ICT – settle into these elements and this constitutes an integrated unit of them. These information flows also create relations within and between organizations.

3.   Changing defence

The army is one of the oldest forms of organization and already at the end of the 16th century. Prince Maurice carried through changes in the conduct of war which would be guiding for a long time to come (Mastenbroek, 1993). Maurice was obsessed by the wish to increase the combat strength and flexibility of his troops. The massive, unwieldy square formation was replaced by a shallow one. This, however, had great consequences for the type of soldier he needed. This soldier had to show more discipline and self-confidence, be able to react rapidly to orders and at the same time sustain the cohesion in the group. Already in these early times there was an awareness of the consequences of certain structural arrangements for performance, but also of the importance of a good real-time information supply.
Since Prince Maurice realized a different design in his lines of battle in order to guarantee success on the battlefield, many things have changed in the Dutch military organization. We do not find these changes in the principles for military operations, but only in the application of new technologies, in other ways of commanding and carrying out operations. The greatest changes, certainly in the mental sphere, have taken place in the way of employing units in areas of operation. This is also based on international and economic developments, making the security risks almost impossible to foresee, at least not before a conflict has broken out (Militaire Doctrine, 1996).

3.1. Information in peace situations
In peace circumstances the defence organization has many features of a normal organization, in which efficiency and effectiveness take pride of place in the execution of the daily task. The realization of the operational management, however, is characterized by the demand to commit units operationally. Integral management, open and transparent accountability to higher management and steering on main lines are clear characteristics of this policy. They have to connect in such a way that the transition from the peacetime situation to operational action takes place faultlessly. Operational peacetime management and operational action are not only in line, but represent, as it were, one and the same reality which can only be divided in an analytical sense (Reitsma, 1996).
The occasional over-emphasis of the importance of the performance of the 'result-responsible units', in order to realize the aims of the management concept, has somehow caused this connection to be severed and two separate worlds of perceptions to emerge. This development has to be rejected from the perspective of information, because of the danger of the information provision getting entangled in the peace situation, losing its boundary-crossing character in the process. Information on operational management in peacetime circumstances in the context of result-responsible units and integral management must be equally meaningful for decisions that have to be taken for operational actions. The ability to link information systems across domains is therefore a prerequisite, necessitating great attention to infrastructures and architectures (Oonincx, 1998). Coherence and interdependencies between operational processes and domains have to be given a central place, especially in times when complexity and changeability are the dominant factors to be dealt with.
In order to reach this, there has to be a thorough awareness of the fact that decision makers often have a restricted rationality, which means it is impossible to get a clear view on all the

alternatives and to survey the consequences of a certain choice. Moreover, the imbalance in the availability of information plays an important role in decisions. This disadvantage can be overcome to a large extent by the use of information systems that support the decision making process, arranging data in a significant and meaningful way (Jägers et al., 1997). The more prominent the use of information and communication technology in the daily execution of activities, the more new patterns of collaboration will grow within and between organization units. This is where the actions in peacetime and crisis situations come together.

3.2 Information in operational action

For many years the armed forces were predominantly oriented towards action in a sizable conflict, but this posture is obsolete now and partially superseded by action in crisis control and peace support operations, often in an international context. The various policy documents that were published over the past years, one after the other, have made clear that the Netherlands wants a complete army that can act in an important range of the conflict spectrum. The Netherlands forces would like to deliver modules that can be deployed in international missions in situations of regional collective defence and crisis operations – these two distinctive types of operation being more and more in line with each other. Besides, modules will have to be available for humanitarian operations and the army must be ready to carry out civil tasks where necessary. The national level of ambition allows a maximum of four simultaneous peacekeeping operations and this requires a whole range of employable units. It presupposes the availability of a high-quality technology, guaranteeing the required output to an army that is constantly shedding personnel (Sonneveld, et al., 1999).

Military units are strongly dependent in their way of action on information about terrain, circumstances and opponent, own means and so on. To be successful, real-time information is a prerequisite. In this respect operational units are information-intensive units. In C2 and C3, ICT plays an increasingly important role. More and more, the commander is supported to an increasing extent by information systems such as the Integrated Staff and Information System (ISIS) and Battlefield Management System (BMS) in order to process information and to provide units with a shared image of the situation in which they find themselves. They will give him the possibility to execute at greater speed processes like the analysis of factors of influence and command and control, thus increasing operational swiftness (Hoppenreijs & Tak, 2000). Obviously, the well-known dangers appear here: overload of information, making it difficult to make the right choices, the threat to the sustainability of the information because of fast-changing situations and, finally, loss of overview through too great an attention for details. The 'digitalization of the battlefield', begun in the 1990ties, brings real-time information at the level of the group and the individual soldier, and the right decisions can be taken on the spot. Also the use of, for example, video conferencing at brigade and battalion levels increases the speed of the decision making. Flexibility in actions is a must and optimal structures to enable it cannot be designed in advance (Fukuyama & Shulsky, 1997). Creativity, also based on experience and knowledge, is a more important aspect than structures. On this basis the optimum mix for an action must be established, first and foremost, on the spot.

In order to reach this it is important that operational units and individual servicemen learn to deal with information and to incorporate it in the familiar doctrines of analyzing, evaluating and revising operations (Richard & Barber, 1997). In doing so, they have to realize that information provision, to a large extent supported by ICT, is not a panacea (Bosch, 1999). A digitalized unit stands empty-handed when image and sound fall away. Then, a capacity and encouragement to think critically and creatively are essential conditions for handling a situation. This capability can only be acquired through training and education. Concepts of

learning processes will be acquired in order to counter the changeability and complexity in this information era.

4. Perspectives

The development of information networks brings along new strengths and vulnerabilities. Electronic media give us the opportunity to reach across the boundaries of the own organization and of ourselves. In that sense there are new possibilities every day and we, as individuals and participants in organizations, change along with this broadening of perspectives and visions. Of course this is a great boon, but the openness and connectivity also proportionally increase the vulnerabilities. Separate, previously unrelated, units have now been connected and the disruption of that connectivity can set off a chain reaction that hits an organization much harder than before, when an onslaught was fended off with classical tools of battle. The growing attention for information warfare is expressed as follows: 'the offensive and defensive use of information and information systems to exploit, corrupt, or destroy an adversary's information and information system while protecting one's own' (Shaker & Gembicki, 1999).

This phenomenon will still have to looked into close by the defence organization, although the problem as such has been recognized and labelled as 'info-sphere' in the (American) military doctrine. The 'info-sphere' is described as the place where in the future wars will primarily be waged. The first signs that our 'opponents' are searching out this vulnerability and are no longer attempting to first reach disorder on the ground, in the air, at sea or in space, are already there. Destruction of strength by crippling the systems of these units themselves has become the paramount objective. In fact the daily air attacks during Desert Storm on vulnerable government communication centres and the Iraqi troops, preceding the actual ground war itself, signified a clear recognition of the importance of such systems, and their destruction, for victory.

The concept of 'information warfare' is also known in the world of business and has the same connotation as described above. Winn Schartau has written a most fascinating and instructive book, entitled *Information Warfare: Chaos on the Electronic Superhighway* and his website http://www.infowar.com/ is worth a visit. In his way of thinking there are many aspects which are just as much valid within the context of the defence organization. He sees 'information compromise' and 'information destruction' as two important threats that must figure at the top of the agenda of every self-respecting counter intelligence service.

A final element worth mentioning is the perspective of the change in the military war room. With the rise of modern means of communication and almost real-time information, these war rooms have become more and more a link in command and control activities instead of a support in long-term planning and strategy formulation (Shaker & Gembicki, 1999). Decisions relating to action on the battlefield can be taken on the spot. During *Desert Storm* this development was clearly illustrated by General Schwartzkopf giving briefings to the media on the basis of maps which had been updated only minutes before. It is already possbile at the moment to equip and have a 'high-tech war room' operate in the short term. This development will surely continue and still more advanced tools will be used, allowing a greater grasp on situations and better decision making.

5. Conclusion

Information is a many-faceted and fascinating concept and it has acquired enormous power through the developments of ICT, which in the past decades has caused a great change in its applications and uses. It has progressed from (excessive) concentration on production increase

by means of all sorts of automation applications, via supporting information systems to multimedia applications with the help of information and communication technology – in other words, from support of basic activities to the creation of new possibilities and the bringing about of links via the growing synergy of network communication. 'In the enormous convergence of hypermedia, multimedia, virtual reality, neural networks, digital agents and even of artificial life, at this moment every medium changes different parts of our lives, our ways of communication, of labour and our entertainment', says De Kerckhove (1996). But more important is the fact the Internet affords access to an almost unlimited number of human intelligences, and because of that, it is the portal to as yet unknown and unrecognized dimensions. The influence of ICT on changes in internal and external functioning of organizations is enormous and touches on all the aspects of human functioning in organizations. The changes that already manifest themselves in the fighting soldier, who is equipped for the battlefield with the latest state of the art digital tools giving him a hold on his environment through a good information position, are clear signs of the recognition of the opportunities within reach at this moment in time.

Perhaps the most important problem in the present-day information economy is to find a way to get the required information in the right place and time in order to start transactions with the environment in every possible circumstance. This question is important both in peacetime and operational actions. Obviously, the creation of an adequate information structure and architecture is a basic demand in this. It lays down, as it were, the foundation on which the relation with the customer (stakeholders, collaborative partners) is realized and takes shape in a customer-specific way. The characteristics of the business process thus have a relation with the depth of the information that is needed in order to serve the customer as well as possible. This process of specification can be realized by the availability of information about relations, products/services and processes (De Vries & Stegen, 2000). The depth to which this information must be available depends on the situation in which a person finds himself. Information about relations/customers enables distinction between customers, so that products or services can be offered well-aimed and specified. Information about products and services offers the opportunity of presenting customer-made products/services and information about processes gives an insight into reliable prognoses about delivery.

Finally, information plays an important role in every organization. Both processes and products are dominated by it. Mostly we take the importance of information for granted, because it is everywhere, like the air that we breathe. The increase of the importance of information can be found more in the explosion of the connectivity and of the information standards which guarantee the open, almost free, exchange of a constantly growing world of rich information (Evans & Wurster, 2000). This phenomenon has greatly contributed to major breakthroughs and innovations and what we have seen until now only heralds much more. Therefore we must be aware of the importance of information as it can stimulate us to discover new possibilities and worlds.

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