Chapter 2 Literature Survey

2.1 Introduction

"*The information society can perhaps best be understood as a society that has developed information technology and is learning to use it.*" (Feather, 2004:209).

This research is in its essence a holistic investigation into a complex information system in the context of the dynamic systems theory, in which the organization, information and communication technology, the employees and the society each play an important role, are interconnected and influence each other (Boonstra, 2000). Davenport & Prusak (1997) call this 'information ecology'. The social nature of information systems is seen as an important element in this research. This is in accordance with Nobre (2002), Roode (1999) and Davenport & Prusak (1997) who argue that in order to optimize any information system as a whole the human interaction with the systems as well as their interpretation of the systems has to be investigated in the specific context in order to implement information systems effectively. Roode as well as Davenport argue further that in order to achieve insight in an integrated information system, a multidisciplinary approach is required and hence understanding was sought in the disciplines of Psychology, Sociology, Education, Management & Organization and Information and Communication Technology.

The structure of this literature review leading to and informing the first part of the main research question: ***What is the influence of ICT and the information society on the labour environment of officers in the Netherlands Defence Organization*** is illustrated in figure 2.1.
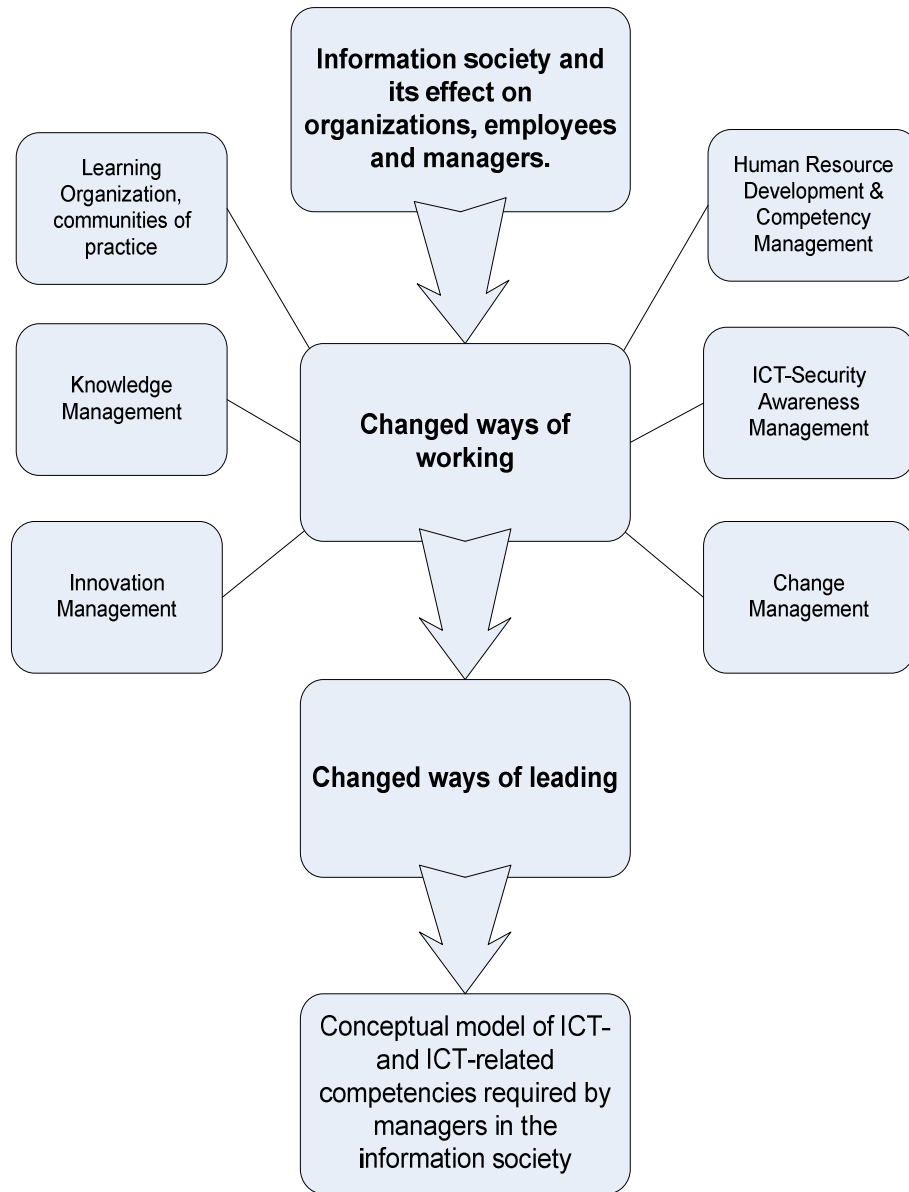
Information society and its effect on organizations, employees and managers.

Learning Organization, communities of practice

Human Resource Development & Competency Management

Knowledge Management

Changed ways of working

ICT-Security Awareness Management

Innovation Management

Change Management

Changed ways of leading

Conceptual model of ICT- and ICT-related competencies required by managers in the information society

Figure 2.1 Structure of the first part of the literature review

2.1.1 Searching for information

An attempt was made to consult sources from important authors in each of the knowledge fields and thus create a sound interdisciplinary theoretical basis to base the research on. However since this research spreads out over a number of themes and knowledge fields and is thus broad rather than deep, a selection was made from available sources in order to come to a basic understanding of the themes and knowledge fields. Searches were conducted using PiCarta which is a search application that searches in the Netherlands Central Catalogues, in which the collections of most of the libraries, including university libraries, in the Netherlands can be found. PiCarta also searches in Online Contents (OLC), which includes the articles that are included in more that 14 000 academic journals. The OLC is daily updated (Nederhoed, 2004). During the orientation period and course of the research a number of searches were done in PiCarta, using keywords like 'learning organization' or 'information society' and combinations of keywords. Many results were found of which the researcher selected a number of sources during the course of the research in accordance of the guidelines which were used to select literature for this research. The guidelines are described in the next paragraph. The sources thus selected and found to be relevant are listed in the bibliography of the research. The research results that were found by using a combination of at least two concepts are indicated in a table that can be found in addendum one. This table contains the number of the results of the specified searches done in PiCarta when the research was commenced in August 2004.

The researcher used the following guidelines to make a selection from the literature thus found: Textbooks and (journal) articles published from 2000 onwards, selected on relevance for the topic that is being studied, although in some instances older sources were used based on the relevance for this research. The important authors for each subject field were identified on the basis of recurring referencing by authors of mentioned textbooks and (journal) articles. Relevant sources from the important authors in each subject field were then consulted. No restrictions were placed on time of publishing, but a selection was based on the relevance for the specific topic.

2.2 Organizations and managers in the information society

For the purpose of this research the information society is seen as a society in which organizations in modern countries currently need to operate in order to be effective and be able to compete. Globalization, privatization and Information and communication technologies play an important role in the information society (Castells, 1996). The ethical discussion whether the information society is a technological determined and capitalistic ideology that excludes large parts of the world (Muddiman, 2003) is certainly an important discussion, but for the purpose of this research not taken further. The relative value of information technology in organizations is also often debated (Byrd, 2001), but this debate falls outside the scope of this research. However it needs to be noted that the technology of the information society can never replace the social networks and resources that make learning and working possible (Brown & Duguid, 2000).

In the next paragraph is discussed how an organization is affected by ICT and the information society. The focus is on what aspects have changed and why this has occurred.

2.2.1 The effect of ICT technology and the information society on organizations

2.2.1.1   Clear ICT policy on strategic level and management on an operational level

Organizations have been greatly influenced by the opportunities that information technology has added to the economy and this influence continues as new technology is developed in the future and organizations are changing as a result of this (Boonstra, 2005; Hargrove, 2001). Terms like global organizations, knowledge economy, E-economy, interactive-, information-and network society indicate some important changes in the way organizations function in the information society compared to the way they functioned in the industrial society. Florijn (2001) argues that organizations need to develop clear policy in dealing with the required changes. In this sense Rowlands (2003) argues that such information policy ought to be seen as a verb and not

a noun, by which she means that it is a continuing process and can not be a finished product. Feather (2004) and Brown & Duguid (2000) support this notion and argue that it is important that the changing processes need to be carefully managed. Beijen, e.a. (2003) emphasize that management of ICT in organizations should not be seen as exclusive tasks of information specialists, but that managers should share responsibility to implement effective ways of dealing with the ICT in the workplace.

2.2.1.2   Knowledge in organizations

Knowledge is a problematic concept since there are different perceptions about what it entails. Some researchers claim that knowledge can only exist through individual consciousness and reject the idea of a material reality independent of consciousness. However other researchers claim that there is an objective, material world, which exists independently of consciousness and which is knowable by consciousness (Sayers, 1985). The last perception of knowledge makes it possible to believe that knowledge could thus be present in systems, processes as well as in individuals in organizations and as such it is possible to capture the knowledge of an organization digitally or through other means. However it needs to be noted that tacit knowledge is difficult to describe and document (Kessels, 1999) and only possible to achieve if employees understand the importance of this aspect of knowledge and are willing and able to share this.

The importance of knowledge is increasing in the Dutch economy as knowledge has become an important production factor (Florijn, 2001). One of the consequences of this in combination with the technological developments is that if knowledge is not kept up to date, it loses its value (Steyaert, 2000). Knowledge is growing exponentially. Information about concurrency, opportunities on the market and innovations can mean the difference between success and failure (Hargrove, 2001). Globalization, mobility, technological possibilities and growing complexity all contribute towards the need for knowledge (Florijn, 2001). He accentuates that if organizations want to obtain access to the right knowledge at the right time, it is essential that knowledge management is pro-actively pursued and a learning organization created. Wenger (2000) argues that this can best be achieved when an organization is able to design itself as a social learning system and communities of practice are created.   Van der Kleij & Ooms (2004) claim that effective communities of practice in organizations improve the quality of decision-making and

transfer of knowledge in such organizations and Swieringa & Elmers (1996) argue that re-organizations need to be avoided as far as possible because re-organizations create a number of problems like troubled relationships, problems in the work processes and dysfunctional teams. They claim that becoming a learning organization is a means to achieve a reduction in the number and intensity of re-organizations. Boonstra (2000) states that a combination of organizing, renewal and learning works best in the information society.

In the Netherlands the knowledge economy means a growing need to a higher trained workforce and thus makes higher education an attractive option (Steijn, 2001).
In the industrial age, employees could often easily be replaced. However in a society where knowledge and expertise is directly connected to individuals, an organization could lose this knowledge as employees become more employable and less dependent on the organization for which they work.

According to Nobre (2002) there are three types of competencies that are important in organizations in the information age: core competencies within an organization, competencies that the intelligent workforce possesses and competencies that the customers as the ultimate decision makers have. This requires a new way of dealing with competencies in an organization.

2.2.1.3   ICT-security in organizations

With improvements of ICT the global security environment has changed dramatically (English, 2005; Elletson, 2005) and education needs to play a vital role in new security solutions. According to Elletson the dominant debate in the military context is global security. It is necessary to deal with the risks in a fundamentally different and more effective way. He argues that the world economy is made strong by privatization, the global economy and systems of mass communication, but at the same time those are the factors that make the current security risks possible. Privatization has gone so far in some countries that even the critical infrastructure is in private hands. At the same time there is an increase in cyber-crime and terrorist threats have greatly increased because of the anonymity, global connectivity and lack of traceability of the Internet (Eckert, 2005). In this sense it is important that employees in organizations are aware of the consequences of the security risks (Parker, 2001).

Security professionals need specialized ongoing training, but this is not enough to ensure the security of an organization (Eckert, 2005). He claims that in an organization each employee needs to be aware of the security risks, since a combination of small security breaches could have major consequences. This is supported by a number of authors (English, 2005; Siponen, 2001; Westby, 2005; Smith, 2005) who claim that information in an organization can not be safe without the awareness of all its employees despite stringent security measures like security personnel and technical solutions.

The recent incidence of a memory stick that contained military secret information and was left in a rented car, illustrates the vulnerability of organizations in the information society (Olde Kater, 2006). A further example is that a spam attack could easily block mail servers and thus seriously influence the flow of information in the organization (Eckert, 2005). Unfortunately security awareness is often neglected, or in the words of Siponen (2001: 26) "*Nothing is done as long as nothing goes wrong.*"

2.2.1.4   Importance of innovation

To optimally exploit the latest ICT- technology, organizations need to adjust their services and improve their working methods continuously (de Jong & den Hartog, 2005). De Jong and den Hartog claim that participation of employees in generating innovative ideas is essential and their research shows that strategic attention to innovation has a positive correlation with innovative behaviour of employees in an organization. Innovation in an organization is further enhanced if the organization is able to attract talented and creative people of diverse backgrounds and is able to create an open working climate (De Pree, 2006). Lee, Florida & Gates (2002) argue similarly based on empirical research that the capacity to innovate for cities or local environments is dependent on whether such environments are able to attract talented people and is open and creative.

A changing world requires individuals and organizations to adapt. Hoekstra & Sluijs (2003) describe adaptation as a process of change as a result of problems and opportunities in the surroundings. Successful adaptation of an organization requires learning, but also un-learning (Rampersad, 2002). Hargrove (2001) takes this argument

even further and argues that new ways of learning are required. Those new ways of learning are further discussed in the next section of this chapter.

In conclusion it can be said that as a result of ICT technology and globalization in the information society, organizations need to fundamentally change in order to continue to function effectively (Hargrove, 2001). One of those changes is that organizations need to become adaptive and flexible (Belasen, 2000) and another fundamental change is the way in which organizations communicate internally and externally (Feather, 2004).

Furthermore, in order for organizations to effectively participate in the information society it is important that they change into learning organizations (Florijn, 2001; Wenger, 2000; Hargrove, 2001; Senge, 1990) and knowledge needs to be managed effectively (Steijn, 2001). Competencies need to be managed differently than before and effective management of human resources becomes essential (Nobre, 2002; Burke & Cooper, 2006). New ways of dealing with information security awareness are necessary (Elletson, 2005; Bailey, 2005; Westby, 2005) and innovations need to be encouraged (de Jong & den Hartog, 2005; Burns, 2003).

In the next paragraph the factors that have an influence on employees and their labour environment are identified and the human factors in the implementation of ICT are emphasized.

2.2.2 The effect of ICT technology and the information society on employees

Implementation of ICT has a substantial influence on working processes and therefore also on individuals and teams in an organization and even the way society functions (Batenburg e.a., 2002). The implementation of new ICT brings many opportunities, but also contains risks, since it has a serious influence on people (Boonstra, 2005; Steijn, 2004; Nobre, 2002) and therefore careful consideration of human factors has become an essential requirement during organizational change like the implementation of ICT. Furthermore, if ICT is not used and managed effectively in an organization it can cause

many problems (Boonstra, 2005). In this regard it is important to note that in the Netherlands most employees work daily in an ICT environment (Schoemaker, 2004).

The technological innovations have caused the production, commerce and service to be more knowledge intensive than before (Hoekstra & Sluijs, 2003) and thus labour in many organizations has been transformed as a direct result, although Steijn (2001) suggests that this should not be exaggerated. Changes as a result of technological innovations are still increasing exponentially (Belasen, 2000) and it is unlikely that this tendency will stop in the near future. Feather (2004) argues that it is therefore expected that the influence on the labour situation of employees will continue to change and hence continuous research in this regard remains necessary.

In table 2.1 the changes that have occurred in many organizations as a result of the introduction of information technology and the effect of those changes on employees in the Netherlands according to some research results are summarized.

Table 2.1 Comparison between labour in the industrial society and the information society, based on research done by Steijn (2001), Boonstra (2002), Schoemaker (2004) and Dhondt & Kraan (2001).

	Industrial society	**Information society**
Working relationship Employment	Permanent loyalty, obedience and discipline, transactional relationship and employer directs career of employee.	No permanent loyalty between an employer and employee. Employability (knowing, wanting and being able to do) is important for employees to control his/her own career and for the employer to create opportunities in order to stay attractive for the employee. Commitment is expected of employees, although employability could have a negative effect on loyalty towards the organization.
Attitude towards learning	Learning the profession before becoming a professional, thereafter learning mainly through experience.	It is necessary to continue to learn after initial training and employment. An attitude of lifelong learning has become essential. But also learning how to learn is emphasized.
Mobility	The working environment was mostly static and dependent on location and time.	Mobility is essential; work is not necessarily dependent on location and time. Just in time learning and access to information when needed is important for all employees.
Communication	Mostly inside the organization, often top-down.	Effective communication has become an essential competency and this includes knowing how to use the tools of communication. Hierarchies in organizations generally decrease.

Table 2.1 (continued) Comparison between labour in the industrial society and the information society

	Industrial society	Information society
Type of work	Industrial production. Often limited tasks. Autonomy is regulated.	Knowledge workers. Work has often become complex and tasks have been broadened. Autonomy has increased and is essential to encourage innovation and creativity. Employees expect to participate in interesting projects.
Pressure of workload, work-related stress and work-satisfaction.	Work-satisfaction was often low; this caused work-related stress.	High workload correlates positively with work-related stress. Information overload causes work-related stress. Increase in autonomy and broadening of tasks results in more work-satisfaction.
Working foundation	Working was based on production process and not so much dependent on employees that could relatively easily be replaced. Stability in the working environment.	Working is based on the competence of employees, social capital and ICT. The right person in a function is essential. It is difficult to replace qualified and experienced employees. The employee needs to be flexible since the working environment continues to change.
Characteristics of workforce	Enough work for uneducated employees. Often such employees had to be brought into the Netherlands from other countries. Employment is dependent on employer.	Highly trained workforce required and in some sectors there is not enough supply. Work opportunities for uneducated employees are reduced in the Netherlands, since the economy has changed into a knowledge economy. Employment becomes less dependent on the employer.

According to Batenburg e.a. (2002) there is a complex relationship between technology and labour. They claim that further research in this regard is important in order to increase understanding about the influence of ICT on employees. Some research has been done about the effect of the information society on employees in general, but not specifically for workers at a managerial level. The work of managers often involves leading change and innovations in organizations and in the context of the information society leaders often play a crucial role in establishing those changes for their followers (Hargrove, 2001). The effect of the information society on leaders in the organization is therefore in its essence different from workers in general. This is supported by Boonstra (2005), who claims that it is not ICT itself that determines success, but effective management of ICT and change. Furthermore, Yukl (2006) calls for further research on managerial activities in relationship with the information society. He suspects that managerial activities have been influenced by the information and communication technology. This leads to the first part of the main research question:

What is the influence of ICT and the information society on the labour situation of officers in the NLDO?

In the next few paragraphs the literature review will focus on alternative ways of dealing with information and knowledge, competency management, ICT-security awareness and management of innovation and change in organizations in the information society. The changed ways of working are further investigated in order to understand the context in which the managers have to do their work and to understand how this affects the roles they have to perform in organizations in the information society. Each section will start with defining the new way of working.

2.2.3 New ways of working in organizations in the information society

2.2.3.1   Learning organizations

Defining learning organization

Learning Organizations can be defined from different perspectives. The focus can be placed on learning by an organization as an integral system: "*The learning organization is the capacity of an organization to gain insight from its own experience and the experience of others and to modify the way it functions according to such insight.*" (Shaw & Perkins, 1992: 176) or the focus can be placed on learning by individuals in an organization (Senge, 1990; Argyris, 1999). Senge (1990:3) does agree that an organization functions as a dynamic system, but describes a learning organization with the focus on the people as a place '*where people continually expand their capacity to create results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together.*"   The two perspectives are not necessarily contradictory, but could be two sides of a coin, since the organization as an integral system will learn, but so will the individuals in it. Learning and working have become entangled in the information society and the organization as well as the individuals in it will benefit (Kessels & Keursten, 2001) and the strategies and techniques that are available go beyond training alone and include aspects like performance support (Rosenberg, 2006).

Alternative mental models and learning strategies

Senge (1990) places emphasis on the critical search of alternative mental models and improving system thinking by which he stresses the dynamic relations between problems. Argyris (1999) and Hargrove (2001) argue that inadequate mental models prevent people to learn from experiences and feedback. They claim that it is important to learn from experiences without being defensive and having prepositions.

A number of authors regard the cognitive habits and mental models of individuals in the organization as important factors that have an essential influence on the effectivity of a learning organization (Kluytmans, 2001; Yukl, 2006; Senge, 1990). They claim that a

new way of learning, new mental models and a different behaviour is required by individuals in order for an organization to become adaptive.

Hoekstra & Sluijs (2003) argue that carefully selected mental models need to form the core of the thinking and working in an organization itself. This idea is supported by Hargrove (2001) and Kamperman (2005) who places learning in the context of a task, and connects learning processes with the new context of an organization and visionary objectives. Hargrove calls the learning progress in a learning organization transformational learning and identifies three successive learning processes. The first learning process is single-loop learning, which means learning through stepwise improvements to obtain new skills and competencies. In this process assistance is often needed. The second learning process is double-loop learning, which means a fundamental change in the way learners think and behave; Learners can independently reflect on their actions and bring about changes where possible. In the third learning process a transformation in the way learners see themselves and their context takes place.

Yukl (2006) also states in this regard that an attitude of lifelong learning is not sufficient any longer, but that learning how to learn is increasingly important in organizations and that it is necessary to redefine mental models. He calls this meta-cognition and states that it is different from other thinking and social skills in that it is '*the ability to introspectively analyze your own cognitive processes (e.g., the way you define and solve problems) and to find ways to improve them. It also involves self-awareness, which is an understanding of your own strengths and limitations (including both skills and emotions).*' (Yukl, 2006:203-204). This notion is supported by Zaccaro, e.a. (2004) who claim that effective global leadership skills require different ways of learning and thus different development strategies. Interesting in this regard is also that in a study of military officers by Marshall-Mies and others (2000) in Yukl (2006:204) it was found that meta-cognition has a positive influence on leadership effectiveness.

Factors that influence learning in an organization
According to Kluytmans (2001) learning in an organization is often about obtaining new techniques and ideas. He claims that a number of factors, like the organizational culture

and accessibility to development programmes, have a direct influence on the way workers think, learn and behave in their interaction with others in an organization. Hoekstra & Sluijs (2003) see knowledge and knowledge management as a product of learning; however knowledge and knowledge management can also be seen as an important starting point for new learning by individuals and organizations (Argyris, 1999). According to Rampersad (2002), the learning capacity of an organization can be increased by implementation of a knowledge infrastructure, allowing mistakes and dealing with an integral and systematic approach and working with self-steering teams in a network-organization.

A further aspect of the learning organization is just-in-time learning and the role mobile technology could play in this (Hargrove, 2001; Traxler, 2005). Advantages of mobile technology are their independence of location and time in providing access to essential information when it is needed (Kukulska-Hulme, 2005; Traxler, 2005). However little research has been done to determine what the added value is that mobile technology could bring to managers and their staff in the information society.

Changes require learning, but learning can also inspire change in an individual and an organization (Hargrove, 2001). Especially for large organizations adaptation is essential to survive. Changing a large organization takes a long time, but organizational learning can be developed and implemented incrementally and in fact in the information society learning has become a part of the daily work (Kessels & Keursten, 2001). Effective individuals are continually in a cycle of reflection, action and learning, trying to avoid ineffective routines (Boonstra, 2000; Hoekstra & Sluijs, 2003) and experimental learning often happens in teams. However it is also true that learning organizations demand another strategy and structure than traditional organizations. According to Florijn (2001) learning organizations require another style of leadership and management. The culture of a learning organization needs to support the development and distribution of knowledge in the organization. Trust between staff members and also between staff members and line management is important. Open communication, commitment and a willingness to work together is very important. Kamperman (2005) agrees that a manager plays an important role in this regard.

Changes require learning (Swieringa & Elmers, 1996) but learning also implies change. Hence a learning organization is in its essence a changing organization.

It is important to understand the implications of those changes in particular for staff at managerial level. This argument will be further discussed in paragraph 2.2.3.7 'change management' of this chapter.

Steyaert (2000) argues that life-long-learning in the information society requires ICT as a learning tool for employees and those digital skills have become essential to function effectively in an organization. He claims that in order to have access to the information and knowledge when needed and being able to evaluate the relative importance of information, requires competencies like structural (finding quality information when needed) and strategic (evaluating the relative importance of information and sources) digital skills.

The need for a corporate curriculum and performance support
Kessels & Keursten (2001) argue that since it is agreed that learning is important in organizations then a corporate curriculum would be essential. With a corporate curriculum they do not mean a formal learning programme, but rather a curriculum that makes transforming the daily work environment into an environment where learning and working come together and where just-in-time learning is stimulated and supported for all employees. They claim that it is important for individuals to develop competencies through which they are able to participate in a working environment that is focused on dealing with and the production of knowledge. Rosenberg (2006) and Rossett (2007) argue that performance support, like on-line job-aids to support procedures and information and useful resources are also increasingly important in organizations and could even reduce the need for training away from the job. Gery (2002) argues that performance support could be cheaper and faster than training, since employees could obtain support when needed in their work situation, however Rosenberg (2006) emphasizes that performance support could not entirely replace training, but should be seen as an additional means of learning that could improve performance.

2.2.3.2   Communities of practice and learning

Defining communities of practice
Communities of practice (COPs) are defined in this research as communities that support professional discussion and work by sharing knowledge and experiences, called

best practices. COPs can also be seen as communities of learning and often have some kind of online presence. This definition is partly based on a definition of Preece, Abras & Maloney-Krichmar (2004: 3). *"Online communities that support professional discussion and work."* The definition of Preece e.a. does not say how professional discussion and work are supported and COPs do not necessarily need to be exclusively online, but could also have a physical presence or form.

Factors that influence communities of practice

Team learning can play an important role in learning organizations (Senge, 1990; Rampersad, 2002). This is supported by Wenger (1998) who argues that learning can best be carried out in so-called learning communities, which he defines as social environments in which group members are dependent on each other in order to work together. He claims that if learning communities share a vision, use systems thinking and its members can work in a team, then this will result in communal experience gained and all participants will learn as a consequence.

There are different dimensions identified by Preece e.a. (2004) that influence the nature and success of the COPs. Some of those dimensions are: whether the community exists only virtually or has also a physical presence or form. The form could be face-to-face or via other physical connections like the mobile phone; the primary purpose for the community existing, the type of software environments that support the community, the size of the community and for how long the community has existed.

In order to develop a successful online community it is necessary to consider sociability and usability as important determining factors (Preece e.a., 2004). Participating in a COP is a cognitive and social experience, but in the past little attention was given to social aspects when computer-supported cooperative work systems (CSCW) were designed with a strong task and work focus. In order to evaluate online communities for their effectiveness and to contribute in this regard to instructional design of those communities it is important to develop new evaluation techniques.

Virtual meeting places, project groups and extensive networks are new aspects that many managers and professionals have to deal with on a regular basis. Schoemaker (2004) also argues the importance of organizations as working communities and argues

that working in the information age is based on a mix of competence of employees, social capital and ICT; however he does not identify the specific competencies that employees need to develop. Human networks with cooperation processes remain in tact even if a re-organization takes place (Swieringa & Elmers, 1996) and hence provide some stability in a rapidly changing world.

Wenger (2000) as well as Brown & Duguid (2000) argue that the success of organizations is largely determined by the ability of the organization to create communities of learning and practice. Wenger emphasizes the importance of the role of the leader in such a community and Brown & Duguid (2000) warn that ICT cannot replace the social networks that make working and learning possible but that ICT makes communities of practice more effective and flexible.

2.2.3.3   Knowledge management

Defining knowledge

Knowledge is seen in accordance with the critical realist view in that knowledge and a social reality do exist separately and independently of the individual consciousness, but that this reality can be influenced by the perceptions and cognition of the individuals and societies (Benton & Craib, 2001). Furthermore, knowledge is seen in this research as a function of information about systems and processes, including experiences of individuals and teams like best practices as well as what is being learnt from mistakes, skills and attitudes in accordance with the definitions of a number of authors (Florijn, 2001; de Vries, 2001) and as such knowledge makes it possible for humans to act. Florijn (2001) describes knowledge as something with which data can be interpreted to information. Knowledge is furthermore needed to apply the information, including having insight in the consequences of using and applying information. Knowledge is hence of a higher level of complexity than information is. It contains not only facts and insight in those facts, but also experiences, attitudes and skills. This tacit knowledge is difficult to transfer (Kessels, 1999).

Defining knowledge management

Knowledge management includes the planning, storing, controlling, using and distributing of knowledge that is important for the organization as well as for the individuals in it (Weggeman, 2000).

Knowledge management is an important theme in management literature. Knowledge is present in systems, processes and individuals and it is important to realize that knowledge is perishable because new information and knowledge is added to the existing knowledge at an exponential rate (Belasen, 2000).

Factors that influence knowledge management

In the industrial age, employees could often easily be replaced. However in a society where knowledge and expertise is directly connected to individuals, an organization could lose this knowledge. Therefore digital knowledge management has become important for an organization and requires a cultural change. Furthermore, in the Netherlands organizations often make it financially attractive for older employees in the organization to go with early retirement when they want to reduce personnel in the organization and since the older employees have years of unique experience and knowledge that has often not been stored and managed electronically, the organization could loose vital knowledge if those employees leave (Feather, 2004). According to Feather one of the key aspects of knowledge management in an organization is to ensure that the informal knowledge that underpins effective operation is included. It is therefore essential that the explicit knowledge of an organization is evaluated continually (Belasen, 2000).

Knowledge management organizes the creation of knowledge, the distribution of knowledge and the exploitation of knowledge. This often requires a cultural change in organizations. In the past people often protected knowledge in order to keep a level of power. In the information society sharing of knowledge has become essential (Belasen, 2000). An important notion in this regard is however that tacit knowledge is difficult to describe and document (Kessels, 1999) and only possible to achieve if employees understand the importance of this aspect of knowledge and are willing and able to share this.

According to Florijn (2001), organizations obtain excellent results when knowledge systems and knowledge technology are introduced. Successful implementation requires a change in the way the organization works and a realization about how difficult it is to manage knowledge. Florijn however does not mention that knowledge management is a cyclic process and that employees need share a vision of the organization in order to continue to participate in this cyclic process (Weggeman, 2000). De Vries (2001) also emphasizes the importance of the employees in this process. Weggeman argues that the first step in knowledge management is to determine what knowledge is needed in the organization.

This need is based on the strategy of the organization. This need is then compared with the available knowledge and the missing knowledge needs to be developed. Hereafter knowledge needs to be shared, applied and evaluated. Based on the evaluation improvements are made where necessary and follows a new cycle of development of knowledge, updating existing knowledge and evaluation. A change in the strategy of the organization also requires this process to be re-evaluated. He sees Knowledge Management as a cyclic continuous process which is illustrated in figure 2.2. The knowledge-value-chain according to Weggeman (n.d.).
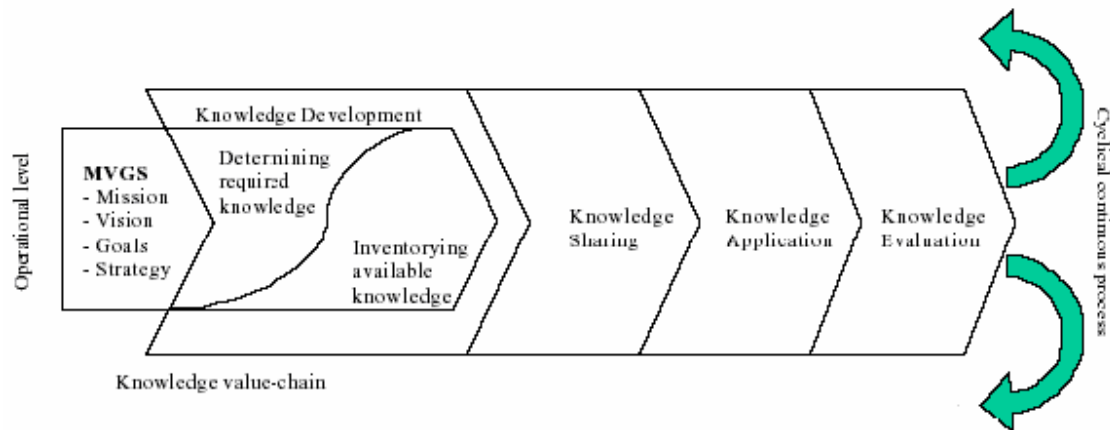

Figure 2.2 The knowledge-value-chain according to Weggeman

Steijn (2004) distinguishes three different approaches towards knowledge management. Firstly the focus can be placed on the technology, secondly on the process and thirdly on the knowledge. Steijn underlines the importance to combine the three approaches.

Nobre (2002) and Schoemaker (2001) argue a combination of those approaches with the importance of human factors and a social systems approach. Meaning that the dimensions: technology, processes, knowledge and human factors are inter-related and need to be studied integrally and holistically. Furthermore, the technology should be focused on processing rapidly changing information and not just on storing knowledge (de Vries, 2001).

From research done by De Long, Davenport and Beers (1996) as described in Florijn (2001:26) there are 7 aspects that are important during an implementation of knowledge management in an organization.

1. Structured knowledge needs to be stored and re-used
2. Work experiences and lessons learnt needs to be stored and shared.
3. Sources and networks for expertise need to be identified.
4. Knowledge that could improve performance needs to be identified and structured.
5. The economic value of knowledge needs to be measured and controlled.
6. Knowledge of external sources needs to be composed and applied.
7. Knowledge needs to be integrated in processes and products.

Hoekstra & Sluijs (2003) see learning more as the production of knowledge and hence regard effective management of knowledge as being more important than learning processes and adaptation of individuals. Other authors (Hargrove, 2001; Senge, 1990; Kessels & Keursten, 2001) place the emphasis more on the importance of the individual learning process. However agreement does exist about the importance of knowledge management in the information society and that the production of knowledge is too important to leave to change (Kessels & Keursten, 2001). Furthermore, it is clear that an organization as well as the individuals in it needs to consider how to best save, distribute and transfer the needed knowledge and expertise in the organization. A distinction can be made between two approaches: technocratic approach and learning-process approach. Since knowledge changes fast and new knowledge is created all the time, a combination of the above approaches is perhaps most appropriate. This is supported by Hoekstra & Sluijs (2003) who argue that a balance needs to be found between managing expertise and knowledge effectively using ICT technology and actualizing knowledge and expertise in individuals.

2.2.3.4   Human resource development and Competency management

Defining Human resource development (HRD)

"HRD is any process or activity that, either initially or over the long term, has the potential to develop adult's work-based knowledge, expertise, productivity and satisfaction, whether for personal or group/team gain, or for the benefit of an organization, community, nation or, ultimately, the whole of humanity."
(McLean & McLean, 2001: 322). This definition was developed by McLean and McLean, after they had collected definitions of HRD worldwide to compare and contrast them in an attempt to propose this global definition of HRD.

Defining Competency management

"*Competency management is a continuous, integrated coordination of strategic aims of an organization translated to competencies, with the competences of the employees*"
(Kluytmans, 2001:472).

A competency is a specific ability to perform effectively in a certain task or problem situation (Hoekstra & Sluijs, 2003:30) whereas competence is seen as the unique potential that an individual has to offer to add value to an organization (Kluytmans, 2001:472). For the purpose of this research 'competence' is stipulated based on the ideas of Robins & Coulter (2003) as a combination of knowledge about and insight (including understanding of the importance thereof), skills and behaviour including the use of ICT as well as attitude towards (this includes opinion about, commitment and self-confidence) and own perceived need for further knowledge.

Link between HRD and competency management

It appears to be beneficial for an organization to create a harmony in which the potential human resources are optimally available for the organization and at the same time the employability of the employee is increased (Kluytmans, 2001: Harrison & Kessels, 2004).   In this sense there appears to be a direct link between HRD and Competency management.

Factors influencing HRD and competency management

Nobre (2002) has analyzed the role of human resources development in the process of organizational innovation and in the context of the knowledge society of the information age. She claims that in the information society any organization should be considered as an information system, where the technology, especially ICT and other production factors should be seen as interrelated factors and a holistic view is needed. She stresses the importance of the human factor in such a system.

Conflicts, controversies and contradictions inherent in the complexity of human environments need therefore to be taken into consideration in organizations in the information society especially when dealing with HRD.

Hoekstra & Sluijs (2003) claim that the relationship between the required expertise and the required behaviour repertoire is the complexity of the tasks, by which they mean that the intensity of knowledge that is required to perform effectively in the information society, makes a flexible behaviour repertoire very important. Management of competencies is therefore increasingly an essential role in the field of Human Resource Management and therefore one aspect of competency management in the context of HRD is that the development of individual competencies of the employees is given enough attention. Managers play an essential role in this (Kessels, 1999).

Effective competency management requires a different way of managing the human resources available in the organization (Kessels, 1999). It is important to have a clear insight into the vital competencies of the broader organization as well as the working units in the organizations. At the same time a clear picture needs to be available of what the competences are that are available in the current staff of the organization at all levels. Gaps in the required competencies and the available competences need to be identified and development and recruitment programmes need to be adjusted accordingly (Harrison & Kessels, 2004). Employees often do not work within the strict limits of function descriptions of the organizations (role-oriented), but need to be flexible and become task-oriented (Kluytmans, 2001).

Koonce (1995) argues that change management should be linked to competency management. When employees have an insight in their potential and limitations of their competences and learn to take responsibility in their own career plan, they could anticipate possible new roles to improve their employability within the organization or

elsewhere. Learning occurs when the focus of the employees is on changing themselves on the basis of opportunities that are or could become available in the future and the focus of the managers is to support those changes but at the same time to steer the aspirations of the employees to harmonize with the competencies needed in the organization in accordance to it strategic vision. Managers need to play a facilitating role in this regard and need to encourage their staff to develop themselves further. When employees are motivated and committed to develop new competencies it could even have a greater impact on the organization than having a strategic policy in this regard according to Kessels (1999).

Each organization needs thus to develop a competency framework to appropriate for their unique needs according to Shellabear (2002). He describes competency profiling as a method for identifying specific competencies which are required to perform effectively in a task, an activity or a career. A design team could use a competency modeling toolkit. Research has shown that web based instruments could help in designing competency cards (Stoof, 2005).

Research has been done by Van Bemmel, Van Geel & Langefeld (2005) to develop and test a competency framework for a sub organization of the NLDO. This framework contains six areas of competence: cognitive intelligence, emotional intelligence, intuition, instinct, physical and psycho-motor. Their aim was to contribute to the area of competency management in order to increase the effectiveness and efficiency of placing personnel in the organization.

Competency management could be supported by electronic means and organizations select primarily software that facilitates informative applications and applications that are focused on the streamlining and increasing the efficiency of the HRM processes. However according to Cooper (2005) it needs to be avoided that individuals develop their own digital instruments to manage competencies. The organization needs to identify suitable applications in order to harmonize working processes.

2.2.3.5   ICT-security awareness management

Defining ICT-security awareness management

For the purpose of this research the focus is on the general role managers could play in influencing the policy regarding ICT-security issues, the secure management of the information that they are responsible for (in the sense of integrity, availability and exclusivity) as well as the management of ICT-security awareness amongst their staff. Security as such and in particular ICT-security by specialists falls outside the scope of this research.

Factors influencing ICT-security awareness

An important means of dealing with the information security threats is the involvement of managers. They play a vital role in influencing the policy regarding information security issues and making their staff aware of the information security risks (Elletson, 2005). Elletson and English (2001) argue further that policymakers need to have a holistic understanding of the situation in order to make the correct decisions in this regard.

Bonatti, e.a. (2006) argue that one of the most important causes of computer security violations on the Internet is the lack of technical knowledge of the users. They claim that users are typically not aware of the security policies applied by their system. The consequence is that they do not exploit the system's protection facilities appropriately and ignore their computer's vulnerabilities.

The leader plays an important role to make their staff aware of the security risks in the information society and they need to facilitate relevant information regarding the risks and how to prevent those risks. Furthermore, the manager needs to understand the importance of a high quality of information in terms of completeness and collective significance (English, 2005).   English defines quality of information in three dimensions;

- The quality of the information architecture should be such that the information is stable, flexible and re-useable.
- The content should be complete, accurate, precise and non-duplicate.
- The presentation should be such that the information is accessible and understandable.

According to English the management of the quality of information is essential in order to what he calls "*connect the dots*" (English, 2005: 19) and thus being able to prevent failure of security. Most importantly managers need to achieve a state of commitment themselves as well as from their staff to the security objectives of the organization so that all employees are intrinsically motivated to participate in ensuring the security, including the quality of information in the organization (Siponen, 2001; English, 2005).

A manager needs to realize what the security threats are in order to influence policy in this regard. To implement security related e-learning and to implement security measures requires continuous investments with no directly visible return. Yet the cost of doing nothing can be huge (Bailey, 2005; Siponen, 2001). Every time that the technology changes, the security policy needs to be evaluated and employees need to become aware of the new threats that come with the new technology. Hence an ideal situation is never possible (Eckert, 2005). In this regard the focus is often on security risks related to crime and unauthorized access, but in the context of this research securing the quality of information and the integrity of data is also included (Peltier, 2005). Siponen (2001) claims that educational institutes should get involved in order to keep such a process going and Elletson (2005) is convinced that e-learning can play a vital role in information security awareness.

2.2.3.6   Innovation management

Defining innovation management

In this research innovation is seen as the creation of new ideas, practices, services and goods that add value to the organization, the individuals in it or the customers it serves.

Factors that influence innovation

Lee, Florida & Gates (2002) argue that innovation is a joint product of human capital, creativity and diversity. They claim that diversity contributes significantly to innovation and that an organization that is able to make the work environment attractive to talented employees of diverse backgrounds is more likely to be innovative.

De Jong & den Hartog (2005) have done research into the characteristics of innovative behaviour in small and medium sized organizations and have found that variation in

work, autonomy and stimulation of innovative behaviour are important work characteristics that contribute positively to innovative behaviour of knowledge workers. Kluytmans (2001) also emphasizes the importance of autonomy. He claims that autonomy stimulates motivation and commitment of employees which are both important in organizations in the information society.

According to Janssen (2002) innovative behaviour could be distinguished in three ways: generating new ideas, promoting new ideas and realizing those new ideas. Generating new ideas is focused on realizing improvements.
New ideas are created by combining information and existing concepts to solve problems. The promotion of those new ideas is necessary to create a basis in the organization for implementation and to ensure that all necessary means are available. The new ideas are realized when the innovative idea is fully implemented in the organization. De Jong & den Hartog (2005) emphasize that each innovation starts with someone in the organization that sees new challenges or is trying to find a solution for a problem in the organization. Creativity is therefore an important factor in initiating innovation and change (Burns, 2003). This idea is supported by Kessels & Keursten (2001) who claim that creative disorder stimulates creativity.

2.2.3.7   Change management

Factors that influence change management
New competencies are required on management level to adjust to the changes that are inevitable in the information society. Managers also need to inspire their subordinates to adjust effectively to change. The manager needs to coach workers to 'want to change', instead of to 'have to change' (Rampersad, 2002; Stoker, 2005). Stoker argues further that the manager needs to change first and find his/her new role in the new organization before he/she can hope to change the behaviour of the subordinates. Stoker claims that research shows that leaders that are an inspiring role model are better able to inspire their subordinates to change and adjust to changes in the organization. Successful change projects in organizations have usually in common that the communication is open and effective and sufficient time is given to individuals that have a resistance against change (Kluytmans, 2001). Effective communication is hence an important competency that is required for managers in the information society. The minimum adaptation required from organizations and individuals in a changing society is

acceptance of change. Anticipating change has become necessary, but being at the forefront of the changes and innovations is best (Hoekstra & Sluijs, 2003). Development programs that foster a leader's ability to manage change will be beneficial to organizations in dynamic environments (Zaccaro, Wood & Herman, 2006).

Boonstra (2000) claims that change management in an organization in the information age could be approached in two different ways and has named them: the design- and the development approach. In table 2.2 the two approaches are compared

Table 2.2 Comparison between the design and development approach in change management according to the ideas of Boonstra (2000).

	Design approach	Development approach *"Lerend vernieuwen"* (Boonstra, 2000:3)
Vision on the organization	Formal system, grown shortcomings.	Integral system and source of knowledge, insight and experiences.
Problem orientation	Finding solutions to problems.	Problem directed.
End purpose	Stable end situation.	Enlarging change capacity.
Process course	One-off linear process.	Iterative continuous process.
Rationalization of process	Economical and technical.	Social and politic.
Managing of process	Initiated, coordinated and checked from the top. Tight standards and planning.	Initiative and control is determined in consultation between involved parties.
Decision-making	Formal, structured, large influence of top.	Negotiation and consultation with all parties concerned.
Disagreements	Denied and not discussed.	Discussed openly.
Change method	Task-structural, one approach.	***Combination of process -, negotiation - and task-structural approach.***
Way of working	From abstract models and organization description to concrete working method.	From concrete working method and problems to coordinating aims and abstract models.
Role of the advisor	Expert role.	Changing roles and strategies.
Implementation	Separation design and setting-up. Implementation aims at acceptable making the new situation.	Fluent passage of problem diagnosis to determining the aim and required change.
Participation	Difficult.	Good possibilities.

According to Boonstra (2000) the design approach is appropriate in dysfunctional organizations where drastic changes are needed to overcome a crisis situation. Innovation needs to be carried out quickly for the organization to survive the crisis situation. This approach is suitable in large organization where uniformity in technology and organizational management is required, the aims and norms are clearly described and it is not necessary to adjust those.

The development approach on the other hand is appropriate when an organization functions reasonably, but improvements and adjustments are needed to deal with changing trends in the surroundings. It is possible to gradually deal with adjustments. Flexibility, knowledge and experience are needed to innovate. Boonstra also claims that active involvement and commitment of all employees in an organization is needed to achieve the required changes. He states that when all employees are involved in the process of change *"Organiseren, vernieuwen en leren ontmoeten elkaar dan in een dynamisch proces."* [Organizing, renewal and learning meet each other in a dynamic process] (Boonstra, 2000: 4).

From a number of sources (Boonstra, 2005; Hargrove, 2001; Boonstra, 2000; Belasen, 2000; Yukl, 2006; Burns, 2003; Stoker, 2005) the following important factors are identified to make successful organizational change possible:

- Effective leadership during the period of change, with the emphasis on managing change.
- Commitment of employees in the organization, especially the leaders in the organization.
- Motivation of employees in the organization, especially the leaders in the organization.
- Clear vision and strategy of the organization, supported by the leaders in the organization.
- Effective communication by the leaders in the organization.
- Providing information by the organization and the leaders in the organization.
- Insight by the leaders in the organization in the relative importance of the organizational culture.
- Leaders in the organization should deal effectively with the resistance against change by employees.

The information society requires a different approach to dealing with changes. In a constantly changing organization, the traditional change model like 'unfreezing, changing and freezing' from Lewin (1951) appears very difficult to achieve. Lewin placed the emphasis on a time of stability following a period of change, but in the information society this is often not possible. Hence alternative ways of change management need to be sought. What is clear from the literature however is that managers play a vital role in ensuring the changes in the organization are managed effectively and that they need to change themselves and become role models during the period of change.

It needs to be noted in the context of this study that it is also necessary for a leader to be aware that the latest available technology and software does not always mean an improved working environment. Hype cycles provide a scorecard in this regard to separate hype from reality, but they also provide a model on which organizations could base their decision whether to implement a new technology or not. A hype cycle is a graphical illustration of this process over time. It is important for strategic leaders to be aware of this process. Rubens (2003) claims that three phases could be observed during the introduction of new technology; firstly a phase of enthusiasm, followed by a phase of disillusion and thereafter a phase of gradual improvement.

The changed ways of working in the information society also influence the roles of leaders in organizations. Those new roles are discussed in the following section of the literature review.

2.2.4 The role of leadership in organizations in the information society

Paradigm shift in leadership

Hargrove (2001) argues that in the 21st century mindset, behaviour and ways of being a leader need to drastically change and leadership needs to be rethought in a connected economy. He argues that the e-economy requires a complete paradigm shift in leadership. Hargrove focuses on e-business and making profits. Since a military organization is in its essence a non-profit organization, an entirely new leadership paradigm may not be required in a military context, but it can certainly be argued that a new dimension needs to be added to leadership in the military organization. This new

dimension of leadership is directly related to ICT and functioning effectively in the information society. According to Hargrove (2001) managers in their leading roles in organizations, play a vital role in firstly influencing the strategy of the organization, secondly regarding the implementation of the new way of dealing with information in the organization and thirdly in encouraging their staff to fully participate in the new ways of working and dealing with information in the organization (Kluytmans, 2001). Tijdens & Steijn (2005) found in this regard that an informed ICT strategy of the organization and intensive personnel policy has a positive effect on the willingness to acquire ICT competencies amongst all employees in an organization.

According to Tijdens & Steijn (2005) managers play a vital role in communicating a holistic vision and strategy to make the organization more innovative with regard to the management and communication of information. As organizations change their strategy to make it possible to work effectively in the information society, leaders can influence the policy and play a vital role in the implementation of those policy changes (Conger e.a., 2000). They need to improve the ways to obtain and deal effectively with ICT and the information that they themselves and their staff require. However according to Burns (2003) establishing substantial changes in organizations requires planned leadership. He sees this kind of leadership as a collective effort and interaction between leaders and followers who in turn become empowered and impel their leaders. He claims that in this dynamic way transformation takes place.

In a military organization officers mostly work in managerial positions and influence their staff by being a role model, by communicating the vision of the organization and inspiring the employees to believe in this vision (Vogelaar, 2002). Conger e.a. (2000) argue similarly for organizations in general. According to research done by Vogelaar, Kramer, Metselaar e.a. (1997) it is found that in the Netherlands relatively young officers need to take decisions independently in relative complex circumstances. In order to make the right decisions it has become essential to have access to up-to-date information when needed and to communicate the information effectively.

Changed role in a global environment

Opportunities to communicate effectively both nationally and internationally have increased greatly by ICT especially via web technology. The borders of the economy have expanded and for most organizations it is essential to work effectively across the national borders. This requires a new attitude to work especially for leaders in organizations (Hargrove, 2001). A professional competency of foreign languages, openness to other cultures and diversity have become essential to participate in the information society.

Changed role as a manager of ICT and consequent changes and risks

From the literature review in the previous sections it can be concluded that the implementation of ICT on its own cannot determine success. Effective management of ICT and the changes that occur as a result of the implementation are essential (Boonstra, 2005; Hargrove, 2001; Kluytmans, 2005; Belasen, 2000). Boonstra (2005) claims that this is a complex process that involves changes in power structures, organizational culture, tasks as well as motivation of employees. This is in accordance with the ideas of Davenport & Prusak (1997). A military organization is influenced in similar ways by the information society than other organizations and having the right person in the right function, human resource development and information security awareness are as important for a military organization as those aspects are in other organizations. Furthermore, dealing effectively with information and communication plays a vital role in the success of the military organization. In fact in some situations the stakes are very high; during military operations and in terrorist threats dealing effectively with information and communication may even mean the difference between life and death (English, 2005). Davenport & Prusak (1997) emphasize in this regard that not all important information is obtained via computer systems, but could come from a variety of sources. They argue that the role of a manager is essential in taking notice of the entire information environment.

Changed role in participating in creating a learning organization

Belasen (2000) and Senge e.a. (1999) argue that a leader has a crucial role in establishing a learning organization. Belasen (2000) mentions amongst other more traditional roles (coordinator, director, producer, and monitor) the following roles for managers in this regard:

- Innovator, in the sense that the manager needs to adjust to the environment and help the other employees adjust.
- Broker, in the sense that the manager plays a crucial role in organizing networking in the organization.
- Facilitator, in the sense that the manager plays an important role in enhancing organizational learning.
- Mentor, in the sense that the manager has learnt how to learn and that he/she is involved in coaching his staff to learn how to learn.

A leader also plays an important role in establishing and participating in communities of practice and making their subordinates aware of the importance of such communities. In this sense an awareness of the need to learn in combination with knowing where to find the information is the first step in the right direction (Steijn, 2005). Rosenberg (2006) argues that the following step is to organize and package the knowledge from the employee's point of view and information need.

Changed role in competency management

Competency management as described by Nobre (2002) requires leaders in organization to describe the core competencies required by an organization and the competencies their staff possess clearly and create a development plan for themselves as well as their staff for the benefit of the organization as well as for each employee individually (Kessels & Keursten, 2001).

Changed role in facilitating creativity and innovation

According to Koonce (1995) change management is an activity directly linked with creating innovative organizations that produce optimal results. Burns (2003) and De Pree (2005) place the emphasis on leaders when they claim that the creativity of leaders is the spark that initiates change, although he also recognizes that some subordinates are more creative than their leaders and that leaders need to recognize such potential and ensures especially for such personnel a working environment conductive to innovation. Florida (2002) claims that creativity always leads to innovation and he even claims that economic growth is mainly the result of human creativity and not just production factors like resources and knowledge as is commonly believed (Hospers, 2006).

Changed role as internal advisor

Successful leadership is a complex phenomenon that always takes place in a specific context (Peters, 2004). A leader in a military organization is expected to contribute towards the required changes in the organization by taking on a role as an internal advisor since the military expertise regarding dealing with information, communication and security is developed specifically for the military organization. External advisors will not have the know-how and insight of the specific circumstances.

In some circumstances external advisors could work with internal advisors in the organization, but the role of an internal advisor is to give advice regarding strategic and organizational policy and strategy.

Based on the ideas of Nathans (1997) to obtain results as an internal advisor in an organization, the following competencies are needed in a military organization:

- Effective communication in a variety of situations: standard organizational situations, operational situations, crisis and risks situations, international peacekeeping mission or a war situation.
- Realisation of the subjectivity, influence and impact of one's own paradigms. Cultural sensitivity is required. Observation of paradigms in the countries where the mission takes place as well as the paradigms of international military partners have an important influence on effectivity.
- Knowledge of acceptation strategies in the military organization as well as international military partners.
- Knowledge of policy, strategy of the organization and critical success factors of the military organization.
- Collecting the correct information and sharing this effectively with international military partners.
- Networking within the own military organization, but also with international partners and within the countries in which the operations take place.

The manager in his/her role of internal advisor is hence jointly responsible in providing clear structures, defining and communicating effectively what changes are required in the military context and under which conditions.

Commitment to the new ways of working

New ways of organizing have become necessary (Steijn, 2001) as well as a fundamental change in the ways that organizations are structured and in which the managers need to work differently than before as a result of ICT (Kluytmans, 2001; Boonstra, 2005) and information behaviour needs to change effectively (Davenport & Prusak, 1997). Without commitment of managers, the changes that are required in the information society will often not effectuate (Boonstra, 2005). Yet little research has been done to determine how managers have changed their information behaviour and how committed managers are towards the challenging changes that are required as a consequence of ICT.

From the above discussion it is clear that in order to participate in the information society, more is needed than access to a physical infrastructure, access to computers and connection to the internet. In the Netherlands a few years ago the focus of organizations was often still placed on this physical dimension (Steyaert, 2000), but this is slowly changing and organizations realize that the human factor plays an important role in effective implementation of ICT in an organization (Boonstra, 2005). From the literature it is however not clear how the required digital skills can be developed during the initial training period, or what kind of support is needed for managers to develop those skills on the job. Creative leadership as well as effective adaptability (Zaccaro e.a., 2006) appear to be important factors, since creative insight is transforming (Burns, 2003). Creative leadership according to Burns however lies not in having ideas, but in bringing those ideas of the ideas of others into practice so that the envisaged change occurs. Leadership in this regard means taking on the initiative. Kluytmans (2001) has a similar idea and connects the following tasks to managers in organizations in the information society: initiating, structuring, realizing and evaluating in a cyclic process.

From the literature it is has also become clear what the role of the manager is in the new ways of working that are required in organizations in the information society in order to function effectively. It has also become clear that managers play a crucial role in influencing the strategy and policy of the organization, implementing the new strategy and policy and encouraging their staff to participate in new ways of working. Managers have to change themselves first and thereafter motivate and coach their staff to change in order to participate effectively in a learning organization, communities of practice and knowledge management. Furthermore, it is clear that managers play a crucial role in

human resource development especially competency management and managers have to create an environment conductive to innovation and where sufficient ICT-security awareness prevails. All those changes need to be managed effectively.

Other ways of working and managing require new competencies (Hargrove, 2001). In order to participate effectively in the information society managers need to develop certain ICT- and certain ICT-related competencies to deal effectively with alternative ways of dealing with information, technology and communication. Although a number of managerial competencies have been described, the specific ICT- and ICT- related competencies for managers have not been identified and described as a group of competencies, nor for organizations in general nor for military organizations specifically. The competencies required by managers in the information society is discussed in the next section.

2.2.5 Competencies required by managers in the information society

A discussion about competencies in general in this section is followed by a discussion with the focus on ICT- and ICT-related competencies that managers require to function effectively in the information society according to the literature.
Yukl (2006) emphasizes that training and development need to be based on an analysis of essential competencies. He claims that research and systematic analysis in this regard is necessary. This notion is supported by Zaccaro e.a. (2006). According to Merriënboer, van der Klink, van der & Hendriks (2002), the concept of competencies is introduced to improve the connection between education and professional practice. It forms a basis to move from supply-driven to demand-oriented education. In this regard it is also important to investigate from literature what the changes are in the cognitive requirements of the workforce at an managerial level as a result of the changes that the information society brings in motion.

Such competencies of managers need to be seen in the perspective of the strategy and purpose of an organization according to Hoekstra & Sluijs (2003). They claim that competency profiling is a powerful method to manage performance in the organization as well as to steer organizational changes.

This notion is supported by Van Bemmel e.a. (2005) who argue further that competency management leads to more effective management of personnel because a framework of competencies offers a solid structure to measure competences and make the competencies transparent. Competences can thus more effectively be applied in the different activities connected to human resource management, like recruitment and selection, training, career planning of employees and outflow of personnel (Kluytmans, 2001).

Each organization determines in a unique way how to describe competencies and how to deal with competency management and as a consequence a number of definitions and lists of competencies have emerged (Van Bemmel e.a., 2005). Hence there are also a number of lists of competencies required in the workplace at managerial level. Table 2.3 presents a summary of the lists of Hoekstra & Sluijs (2003), Utrechtse Leercompetentie Inventory (Walter, 2002) and Rampersad (2002). In this regard it is important to note that a selection of competencies could never be final, complete or always correct under all circumstances. Therefore it is important to evaluate regularly if the list that is used, needs to be adjusted (Hoekstra & Sluijs, 2003). Furthermore, for the purpose of this research it is assumed that all students at the level of higher education have the intellectual potential to learn the required competencies. It is noted that a list of competencies does not clearly explain their relative priority, how they are interrelated and how they will be evaluated or achieved. Furthermore, it is important to evaluate regularly if the list needs to be adjusted to accommodate for new technologies or new insights in the information and communication technology, according to Hamel & Prahalad in Hoekstra & Sluijs (2003:17).

Table 2.3 a summary of managerial competencies based on the ideas of Hoekstra & Sluijs (2003), the Utrechtse Leercompetentie Inventory (Walter, 2002) and Rampersad (2002)

Competency	Performance indicators
Enterprising	Initiative, Courage, Independency, entrepreneurship
Influencing	Communicating, presenting, strength of conviction, sociability, contracting
Organizing	Planning, organizing, monitoring progress, organization awareness.
Managing	Competent to take decisions, delegating, leading (individuals), leading (groups), carrying out a vision, coaching.
Instilling mutual trust	Integrity, loyalty, responsibility
Performing	Focused on performance, handling characteristics, determination, focused on quality, ambition, energy.
Relating	Customer orientation, listening, cooperation, empathy, negotiating
Analyzing	Creativity, Problem analyses, learning orientation, conceptual thinking.
Transforming	Situational awareness, formation of judgment. Developing a vision, intercultural orientation.
Flexibility, showing impact strength	Adaptability, self-control, stress tolerance, flexibility.

Tasks and problems with which academics will be confronted in organizations have intrinsic characteristics that do not change, but different, sometimes unforeseen circumstances could influence the performance (Hoekstra & Sluijs, 2003). The specific situation, in which the manager will use his /her cognitive competencies, is determined by a number of factors, like the individual workers, circumstances and the characteristics of the task. Hoekstra & Sluijs argue further that generic managerial competencies need to be fine-tuned for the specific situation in which the task needs to be completed. The competency to make those adjustments is therefore also essential. Knowledge and expertise can be learned and behaviour can be adjusted.

According to Hoekstra & Sluijs (2003) it is possible to change and develop a behaviour repertoire and even to change the emotional style through learning. Competencies can be learnt and developed within the limits of the intelligence and temperament of the individual. Each competency can be described at the required level of functioning in the organization. For managers the scale of 'expert' is likely to be used, which is defined by Shellabear (2002) as a level where the task is consistently performed to the required standard, furthermore, the expert looks at ways to improve the working environment, has in-depth understanding and could coach others to obtain the competency. A competency describes behaviour in relation to its orientation to problems.

This is consisted with theories about the origin of behaviour. Problem situations have caused elements of behaviour to be shaped and structured and underlined mutual consistency (Hoekstra & Sluijs, 2003). The functional advantages of working with competencies are that this concept can be recognized and observed, can be evaluated on the basis of minimum criteria, are related to relevant practice and they can be developed within the limits of intelligence and temperament of the individual.

In a knowledge economy most workers at managerial level are required to deal with large amounts of information and have to deal with constant changes of the characteristics of the organization regarding its vision, purpose, culture and structure. Hence self-regulation in combination with effective processing of information has become important managerial competencies (Kluytmans, 2001). Since managers need to stimulate participation and commitment of their workers in order to implement innovations effectively (Boonstra, 2005), interpersonal and communication skills have become essential social competencies for managers in the information age (Kluytmans, 2001). This idea is supported by Yukl (2006). If managers and their employees understand that computer technology can be more than a tool to perform tasks and that ICT can be seen as an extension of their own capabilities, like an individual knowledge management system, extra opportunities are created according to Hoekstra & Sluijs (2003:27).

Yukl identifies four additional competencies that have been redefined over the last few years: emotional intelligence, which he describes as being aware of and being able to manage cognitively one's own feelings and the feelings of others. Social intelligence which he defines as "*the ability to determine the requirements for leadership in a particular situation and select an appropriate response*", systems thinking and the ability to learn (Yukl, 2006:202). Creativity and adaptability are seen by a number of authors as essential competencies for managers especially in a fast changing environment like the information society (Burns, 2003; Yukl, 2006)

In the following sections the focus of the literature review is on creating a theoretical framework which will form the basis for the research method in order to answer the first part of the main research question: ***What is the influence of ICT and the information society on the labour environment of the officers in the Netherlands Defence Organization?*** with a focus on two of the sub-questions: ***What are the ICT- and ICT-related competencies that are required in the information society by managers of the Netherlands Defence Organization?***
The purpose is to operationalize from existing literature the different dimensions and indicators of the main categories of the envisaged ICT- and ICT-related competencies that are required by managers in the information society.

2.3   Conceptual model of ICT- and ICT – related competencies needed by managers in the information society

The focus of this research is on the ICT- and ICT-related competencies that officers in the NDLO need to develop in order to function effectively in the information society. Two models related to ICT-competencies were identified during the literature review. In both models the emphasis is placed on digital skills and computer literacy. In the next section the models are described.

Steyaert (2000) categorizes digital skills as follows: instrumental skills, structural skills and strategic skills. Instrumental skills indicate the operational skills that are needed to deal with ICT technology as such, like using applications, sending someone an e-mail or downloading software from the internet and installing it. It is assumed that students in

higher education in the Netherlands have developed many of those basic ICT skills during high school and since the technology has become user-friendly to such an extent the students in higher education will be able to master the relevant techniques during their time at university. It needs however to be researched further to determine if this assumption is true. The more complex aspects of instrumental digital skills could be essential in a package of managerial competencies. Structural skills are related to the structure in which information is contained. Examples are using appropriate keywords and search engines to find relevant dynamic information via discussion sites, rather than via static information on web sites or finding relevant scientific sources in digital libraries on the section of the internet that is invisible for regular internet users. Strategic skills are focused on pre-actively finding strategic information needed to base decisions on. It includes aspects like critically evaluating information on relevance and integrity and being able to combine a variety of sources that are written on different levels, to a harmonious whole on which decisions can be based (Steyaert, 2000). Since the investments in ICT in organizations are huge, it is necessary to obtain as much value from the technology as possible (Byrd, 2001) by making sure that managers understand the implications of such decisions.

In America and England specific attention is currently given to concepts of ICT Literacy in Higher Education (Martin, 2002; Town, 2003). From the time that the computer was introduced in the 1940s, the perception was that the computer would have a profound impact upon the world. According to Martin the concepts of computer literacy in Higher Education in England has gone through three phases: the Mastery phase (from the 1960s up to the mid-1980s), the Application phase (mid-1980s to late 1990s) and the Reflective phase (late-1990s on). He describes the change of emphasis in the three phases as a gradual change. In the Mastery phase the emphasis is placed on gaining knowledge about the computer with a focus on programming. As the user interface of computer-applications become more user-friendly, in the Application phase the focus of ICT literacy changes to how to use the applications and from then on programming is seen as specialist knowledge. At many Institutes in Higher Education the idea was that students will pick up the necessary skills through regular usage of the applications because they are intelligent and well-motivated enough to identify the skills they need and learn them. The policy of those institutes was on providing enough suitable computers facilities to the students. Sometimes special attention was given to the

training of university staff so that they incorporate computers into their teaching, the notion being that if teachers use the applications, the students will automatically follow.

In the Reflective phase the emphasis changes towards reflective and evaluative aspects of using the computer, which Martin (2002:2) describes as: "*deciding upon appropriate usage of applications, evaluating the data which they give access to, interpreting the information they generate, and deciding upon appropriate use of the resulting document or product.* ". In the United Kingdom the MacFarlane Report motivated in 1992 for a fundamental role for ICT in Higher Education across the curriculum (Martin, 2002). This position was also emphasized in the Dearing report (NCIHE, 1997). Consequently seven pillars for information literacy were identified and placed in a 'seven pillars of information literacy' model. In this model, ICT- and basic library skills were combined. To obtain information literacy is seen as an iterative process and ultimately competency in all seven areas constitutes information literacy (SCONUL, 2004) as is illustrate in figure 2.3.
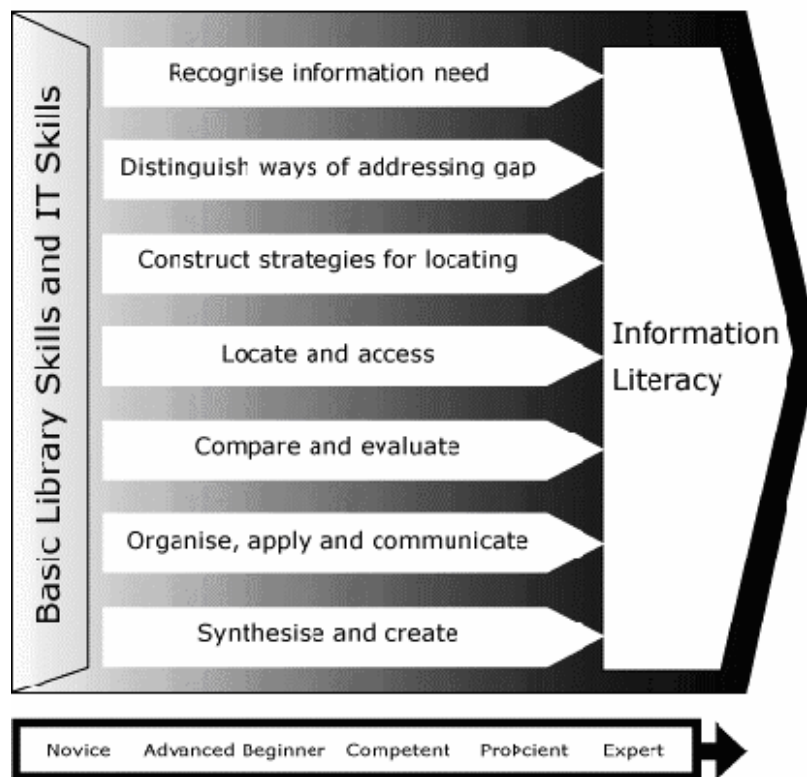

Figure 2.3 The Seven Pillars Model for Information Literacy according to SCONUL

Town (2003) emphasizes that it is important to understand that there is a difference between library skills and IT skills and states that this model will require different interpretations when applied to different subject fields, and to different levels of users. Furthermore, Town notes that the model does not mean that each stage is followed by the next stage, but that the required skills are developed within the model. Town (2003:94-95) explains the seven headline skills as follows:

1 The ability to recognize a need for information.

2 The ability to distinguish ways in which the information 'gap' may be addressed by:

- Knowledge of appropriate kinds of resources, both print and non-print.

- Selection of resources with 'best fit' for the task at hand.

- The ability to understand the issues affecting accessibility of sources.

3 The ability to construct strategies for locating information to:

- Articulate information need to match against resources.

- Develop a systematic method appropriate for the need.

- Understand the principles of construction and generation of databases.

4 The ability to locate and access information to:

- Develop appropriate searching techniques (e.g. use of Booleans).

- Use communication and information technologies, including terms for international networks in higher education.

- Use appropriate indexing and abstracting services, citation indexes and databases.

- Use current awareness methods to keep up to date.

5 The ability to compare and evaluate information obtained from different sources for:

- Awareness of bias and authority issues.

- Awareness of the peer review process and scholarly publishing.

- Appropriate extraction of information matching the information need.

6 The ability to organize, apply and communicate information to others in ways appropriate to the situation by:

- Citing bibliographic references in project reports and theses.

- Constructing a personal bibliographic system.

- Applying information to the problem at hand.
- Communicating effectively using appropriate medium.
- Understanding issues of copyright and plagiarism.

7 The ability to synthesize and build upon existing information, contributing to the creation of new knowledge.

Martin (2002) argues that in the current information society, ICT induction should move beyond the mastery of applications, to include the information competencies as discussed. However no mention is made of wider ICT-related competencies that are needed by academics in order to lead effectively in the information society.

For the purpose of this research two categories of competencies are identified: ICT-competencies which are directly related to using ICT in the working environment and ICT-related competencies which are related to working and leading in the information society and thus containing a leadership component. Change and innovation management competencies are also included in the last category. This last category is important since the literature review has shown the importance of effective management of ICT and changes that occur in the information society as a result of implementing ICT (Boonstra, 2005; Hargrove, 2001; Kluytmans, 2005; Belasen, 2000; Davenport & Prusak, 1997). In the models described in the previous paragraphs the focus is mainly on ICT-competencies and therefore the available models are insufficient to describe fully the ICT- and ICT-related competencies required by managers in the information society, since neither mentions the special role of a leader. ICT-related competencies contain a leadership component and are obtained from topics like the learning organization, knowledge management, competency management, information security awareness management and the vital role a manager plays in establishing a culture of lifelong learning. Furthermore, dealing with organizational changes and innovation in this context is also relevant.

Research has been done related to a combination of some of the ICT-related components of the conceptual model, but little research has been done in order to create a holistic model of ICT- and ICT-related competencies required by managers in the information society. The purpose of the conceptual model is to create an integral model

in a dynamic environment and to establish a theoretical framework for the research. It is envisaged that the conceptual model will need to be adjusted as new research results and technologies become available.

In the next section is explained how the literature review and previous researcher's work is used to build the list of competencies.

Three main dimensions of ICT-competencies are categorized as operational, structural and strategic ICT-competencies based on the ideas of Stayaert (2000), Martin (2002) and the seven pillar model as described by Town (2003).

- Operational ICT-competencies include knowledge about functionalities and limitations of generic and other applications, hardware as well as networks. Mastery of applications is also included in this dimension.

- Structural ICT-competencies include understanding about the structure of the Internet in order to find suitable information.

- Strategic ICT-competencies include evaluating the relative importance of information and sources as well as conceptual insight in ICT in order to participate effectively in decision-making in this regard.

The ICT-related competencies are divided into five distinct categories based on recurring themes related to the information society in the literature review. The first category is 'participating in the learning organization' and includes knowledge management and communities of practice. The other categories are competency management, ICT-security awareness, change management and innovation management. All those dimensions include a leadership component since managers play an important role in implementing the new ways of working in their organizations (Boonstra, 2005; Stoker, 2005; Hargrove, 2001; Belasen, 2000; Davenport & Prusak, 1997; Conger, e.a., 2000).

Four further dimensions were identified in 'participating in the learning organization':

- Willingness to be involved and understanding the organizational value (Steyn, 2001; Kessels & Keursten, 2001; Davenport & Prusak, 1997; Feather, 2004; Belasen, 2000; Senge, 1990).

- Knowledge management (Steyn, 2001; Florijn, 2001; Boonstra, 2005; Weggeman, 2000; Haines & Dunn, 2003; Town, 2003).

- Communities of practice (Preece e.a., 2004; Argyris, 1999; Wenger, 2000; Senge, 1990; Kamperman, 2005; Kluytmans, 2001; Schoemaker, 2004).

- Attitude towards life long learning which includes learning how to learn (Hargrove, 2001; Yukl, 2006; Kommers, 2004).

Based on research done by Nobre (2002) and Kessels (1999) two main dimensions were identified for the category 'competency management':

- Competencies required in the organization.

- Competences and talents of the employees, including the role of the manager. This dimension is related to employability (Hargrove, 2001), insight in the competences and talents of employees (Hoekstra & Sluijs, 2003; Kluytmans, 2001), insight in learning and training needs and a development plan for employees (Kessels & Keursten, 2001; Senge, 1990).

Two dimensions were identified using the literature review for the category 'ICT- security awareness':

- Ensuring security of information in the sense of exclusively, integrity and availability (Siponen, 2001; English, 2005; Peltier, 2005).

- Encouraging ICT-security awareness amongst the subordinates by the manager (Bonatti, e.a., 2006; English, 2005; Siponen, 2001; Westby, 2005; Peltier, 2005; Bailey, 2005; Elletson, 2005).

Three dimensions were identified using the literature review for the category 'change management':

- Change exposure, including knowing the effect of change and ability to deal with change and resistance against change constructively (Hargrove, 2001; Stoker, 2005; Burns, 2003; Yukl, 2006; Rampersad, 2002).

- Communication of the vision of the organization and changes required (Hargrove, 2001; Boonstra, 2000; Belasen, 2000; Yukl, 2006).

- Understanding the effect of organizational culture during change (Boonstra, 2000; Davenport & Prusak, 1997).

Two dimensions were identified for the category 'innovation management':

- Autonomy (De Jong & Den Hartog, 2005; Kluytmans, 2001).

- Stimulation of innovative behaviour and work climate (Hoekstra & Sluijs, 2003; De Pree, 2006; Florida, 2002).

In conclusion can be said that from existing literature and research results a number of ICT- and ICT-related competencies were identified that managers need to develop in order to function effectively in the information society and from this a conceptual model was created as is illustrated in table 2.4.

Table 2.4 Conceptual model of ICT- and ICT-related competencies required by managers in the information society, based on the literature review

	Dimensions	Indicators
ICT-competencies	Operational	Knowledge about functionalities and limitations of (generic) applications, hardware and networks. Mastery of applications. Conceptual insight in ICT in order to participate effectively in decision-making in this regard.
	Structural	Finding quality information when needed.
	Strategic	Evaluating the relative importance of information and sources.
ICT-related competencies	**Dimensions**	**Indicators**
Learning organization	Willingness to be involved	Recognizing a need for information. Identifying and understanding the organizational value. Addressing the information gap in organizations. Individual concern: individuals need to participate in storing and using the knowledge, sharing the knowledge, applying the knowledge and evaluating the knowledge. Managers play a special role in organizing and communicating the knowledge.
	Knowledge management	Ability of the individual to utilize opportunities. Practical accessibility of the information in the organization. Existence of applicable information. Knowledge of internal and external sources of information.
	Communities of practice	The need for networking (sources and networks for expertise need to be identified both nationally and internationally). Participation in COPs Usability (Work experiences and lessons learnt).
	Attitude towards life long learning	Understanding that lifelong learning is essential. Learning how to learn.

Table 2.4 (continued) ICT- and ICT-related competencies required by managers in the information society, based on the literature review

ICT-related competencies	Dimensions	Indicators
Competency management	Focus on organization.	Insight in competencies required in the organization. This includes requirement for functions, but also across functions.
	Focus on employees	Insight in competences and talents of employees/subordinates. Insight in learning and training needs of subordinates. Development plan for each subordinate. Encouraging employability of subordinates. Use of a competency library in order to match the needs of the organization with development plans for subordinates.
ICT-security awareness	Ensuring security of information.	Holistic understanding of ICT security (exclusivity, integrity, and availability) risks in the organization. Participation in improvement of the ICT-security situation.
	Encouraging information security awareness.	Encouraging ICT- security awareness amongst staff.
Change Management	Change exposure	Knowing the effect of change and ability to deal with change constructively. Dealing with resistance of subordinates against change.
	Communication and vision	Inspiring and motivating staff regarding the vision. Communicating vision and changes required.
	Effect of organizational culture.	Knowing the effect of the organizational culture during change.
Innovation management	Autonomy	Allowing subordinates autonomy in dealing with tasks.
	Stimulation of innovative behaviour and work climate.	Allowing subordinates to make mistakes. Encouraging subordinates to participate in generating new ideas. Being a role model by generating new ideas.

It is established from the literature that certain ICT- and ICT-competencies are important for managers and that their commitment to those aspects is also important in the information society. This leads to the sub-questions:

- How competent are the officers in the NLDO in their own opinion regarding some of the ICT- competencies?
- How competent are the officers in the NLDO in their own opinion regarding the identified ICT- related competencies?

In the information age there are new skills to be learned and new worlds to be discovered that cannot be learnt without a digital learning environment (Kozma, 1994) but without the commitment of the teaching staff and students however, the possibilities the digital learning environment brings to higher education will not be utilized fully (Reeves e.a., 2005). The question arises if the learning environment has changed in such a way that it does contribute effectively to the learning of the students and if the confidence of teaching staff and students to use information and communication technology has increased sufficiently to participate in a new learning environment. Early indications are that there are improvements in the learning landscape, but that the possibilities of the digital learning environment are not utilized sufficiently and in such a way that the students obtain the skills and experience needed in a knowledge-based society (Eaton, 2002) and teaching staff are often insecure in using a digital learning environment which hinders their participance (Adendorff, 2004).

In order to inform the discussion of the second part of the main research question: ***What are the implications of the changed working environment of the officers in the Netherlands Defence Organization for their learning environment?***
a theoretical framework for factors that influence the learning outcome and competencies that are required by teachers in a digital learning environment in higher education is established in conclusion of this chapter. To motivate the selection of the topics from the literature it needs to be noted that in the Netherlands Defence Academy (NLDA) ICT is used in a blended learning environment. Furthermore, although not all officers in training follow the same training programmes, the expressed intention is that officers in general are able to work and think at an academic level.

In paragraph 2.4 'Higher education in the information society' a background is provided by discussing the current situation in the Netherlands. This is followed by the last section of this chapter 'Learning and teaching in a digital learning environment in higher education'.

2.4 Higher education in the information society

"*It is the mark of an educated mind to be able to entertain a thought without accepting it*" Aristotle (384-322 BC).

According to Plomp (2006) it is necessary that education in the information society finds a balance between what is traditionally valued and what is considered important in the information society. In the past the independent Institutes of Higher Education in the Netherlands determined what the students needed to study and why. If a student had finished studying from a respectable institute of learning, the student was regarded academically formed. In the light of the fast changes in the information society and the specific requirements for managers in a knowledge economy, it appears to be important that Institutes of Higher Education re-consider their curricula. In the Netherlands information literacy is a relatively new term. However the understanding that information literacy is an essential study skill at universities is emphasized by the Dutch Association of thirteen university libraries and the National Library of the Netherlands (UKB, n.d.).

Eaton (2002) predicts that in the future the focus in higher education will move from course-based credits to assessment-based mastery of recognized bodies of knowledge and skills. Students will be accountable for attainment of outcomes. This will affect how institutions are organized and how evaluation takes place in educational institutions.
At the moment in the government of the Netherlands there are debates about the main principles for a proposal for a new law for higher education and research. At the moment it is envisaged that this law "Wet voor Hoger Onderwijs en Wetenschappelijk Onderzoek (WHW)" will be implemented in 2007. This law contains similar aspects that are discussed by Eaton (2002), like moving from complete degrees and delimited training to domains of recognized bodies of knowledge, corporate governance, increased flexibility

as well as opportunities for national and international joint degrees and more intensive cooperation between institutions (Studiecentrum voor Bedrijf en Overheid, 2005). Once the required competencies are identified, the next step is to evaluate whether the competencies are achieved. This needs to be evaluated for each individual and could be recorded in a student competency profile. The term performance outcomes will be used to describe demonstrated competencies. Performance outcomes can be defined as required learning capacities that must be demonstrated and should be specified by stated performances and assessment criteria according to the Human Sciences Research Council [HSRC], which defines performance as follows:

"*Performances are holistic or integrated demonstrations of mental, affective and manual activities. Performances also express particular values. Demonstration of performance for assessment requires completion of specified tasks, as well as explanation of the rationale for doing tasks in particular ways.*" (HSRC, 1995:1).

Performance outcomes indicate what the learners need to be able to do after having completed their studies. The performance outcomes need to be defined further to determine what each learner is expected to do for each performance outcome. Those further refinements are referred to as assessment criteria. A specific list of assessment criteria for each academic competency has to be decided on, before developing learning tasks. A holistic sense of what each learner can do after successfully working through their entire study is however also important:

"*…, the more specific an outcome statement is, the easier it is to determine if a learner has attained it or not. However, if all the outcome statements were defined in great detail, a holistic sense of capability would be lost.*" (Clarke, 1997:16 – 18).

It is important to understand that when learner actions are observed, a substantial number of unconscious mental and emotional judgments and decisions that inform or direct the particular action are not seen, but still need to happen in order for the learner to perform. The HSRC (1995:43) states in this regard:

"*Information or content interpreted within a particular value orientation through employing particular mental abilities such as problem-posing, problem-solving and judgment or decision-making abilities, is the invisible part or basis of performance (or, to return to our metaphor, the base of the iceberg which is under the water). The visible part of performance (the tip of the iceberg) includes the manipulation of 'tools' and*

manual dexterity and occurs within a communicative or interactive context, which
includes gesture."

The traditional equation
Knowledge & Understanding + Skills + Values & Attitudes = Performance
Needs to be enriched with the understanding that these components operate together in performance or as the HSRC puts it: "*They are undivided and indivisible*" (HSRC, 1995:44).

To describe competencies and performance outcomes clearly, is a complex task and the process of describing the minimum criteria and competencies clearly is followed by the next step, which is to evaluate whether those criteria and competencies are met by each learner individually in a competency profile in which performance outcomes are clearly described.

Although it is recognized that academic institutions need to remain independent, the dialogue with organizations is important in ensuring that the academic competencies that the students develop at those institutions is in accordance with the expectations of future employees working at an academic level in global organizations in a knowledge economy (Merriënboer e.a.,2002). Therefore the identified learning competencies in higher education need to be evaluated and adjusted regularly in order to remain focused on the changing requirements of organizations and to accommodate the latest technological innovations. This idea is supported by Ter Wee & Loog (2005) who emphasize that it is important to have a dynamic basis for a competency profile because the labour context is increasingly dynamic. Institutions of higher education need to generate new knowledge and therefore the term learning organizations is also appropriate in this context. An interesting debate in this regard is if it is acceptable that knowledge management in universities could create a situation which might exclude higher education in developing countries further (D'Antoni, 2005). According to D'Antoni an alternative choice is dealing with knowledge management by creating open resources of quality which could be shared by international communities of higher education and hence making quality education accessible to all. To change to a learning organization and implementation of digital learning environment means a change in the way the teaching and learning occurs. This will be discussed in the next paragraph.

2.5 Learning and teaching in a digital learning environment in higher education

The focus of this research is a digital learning environment (DLE) used in a blended educational setting. In the blended educational context the DLE provides an opportunity for the lecturer to enrich the courses that he/she is responsible for. Courses can be given extra structure by adding learning aims, presentations and important up-to-date information, a mix of work forms and learning activities like self-tests, web links and supporting applications can be used in addition to the contact time that a lecturer has with the students. Thus a blended learning environment provides an extra challenge for the students, who will need to be actively involved and take responsibility for their own learning. At the same time the lecturers also need to be supported in how to use the digital learning environment in such a way that it enriches their courses and the development of relevant competencies are supported.

The ideal model of a digital learning environment includes three broader aspects of the digital learning environment. Firstly the possibilities of **process** as a means of working and studying together in communities of learning, mobile learning, working and studying from home in addition to face-to-face learning, facilitating electronic communication and an electronic learning management system, investigating possibilities of distance education and opportunities for national and international cooperation in research. Secondly the possibilities of the **product** with a focus on the computer-assisted learning environment in general, including simulations and gaming and information repositories. Thirdly as a means of **support** where aspects like electronic remedial teaching, performance support and possibilities of electronic knowledge management and expert centers can be addressed.

Such use of the DLE needs to be coordinated so that enough attention is given to all the different aspects and categories of competence and it is important to anchor such innovative changes in education. According to Geerligs, Mittendorf & Nieuwenhuis (2004) this can be done through guaranteeing the quality of the innovations. Furthermore, innovations require new demands of quality assurance according to Kluytmans (2001).

Steyaert (2000) states that educational institutes need to develop a vision of the purpose of using a DLE in an educational setting and describe in an educational programme how and why to use a DLE. However Dutton e.a. (2004) warn that positive outcomes of e-learning could be hindered by technical, institutional, social and economic constraints on the innovation process. Ter Wee and Loog (2005) state that education is primarily developed serially and is based on regular evaluation techniques, whereas they are of the opinion that education needs to be designed in accordance with personal development plans and individual assessment of competencies, because education would then be more in harmony with the dynamics of the professional context. Ter Wee and Loog argue that the competency profiles of Institutes of Higher Education need to be become dynamic, because the professional context has become dynamic in the information society.

In order to implement a digital learning environment effectively it is essential that both students and staff are commitment to the new learning environment (Boonstra, 2005; Kluytmans, 2001). In order to achieve this commitment it is essential that sufficient support is available to learners and teachers in using and integrating the DLE effectively in learning and teaching. In the next sections of the literature review the focus is therefore placed on the factors that influence learning and teaching in higher education.

2.5.1 Learning in a digital environment

Research in education involves an understanding of what learning is and how learning takes place. In fact the theoretical basis on which learning models are based, affect not only the way in which information is communicated, but also the way in which the learner gives meaning to and constructs new knowledge from the information that is presented (Sherry, 1996). Generally agreement exists today that in an educational setting the focus should be learner-centered.

2.5.1.1   Defining learning

There are many different definitions for learning to be found in the literature. Rampersad (2002) and Ausubel (2000) state that learning is a continuous personal transformation; a cyclic and cumulative process of actualizing of knowledge and changing behaviour in such a way that the learner can function and act well. An essential prerequisite in learning is therefore a willingness to change oneself and as a result of learning change occurs and this should lead to changed and improved behaviour (Swieringa & Elmers, 1996). It could therefore be argued that learning has intellectual (thinking), affective (willingness to change) and pragmatic (doing) dimensions.

Verschaffel (1995) defines learning as a constructive, cumulative, self regulated, targeted, situated, cooperative and individual different process of acquiring knowledge, giving meaning to the knowledge and the development of skills. In this definition the intellectual (constructive, cumulative, giving meaning to the knowledge) and pragmatic (cooperative, acquiring knowledge, development of skills) dimensions are also visible, but in addition to those dimensions learning is also placed in a situation (situated) and a distinction is made between cooperative learning and individual learning. The cyclic dimension in the learning cycle of Kolb (1984) enhances this definition as is illustrated in figure 2.4.
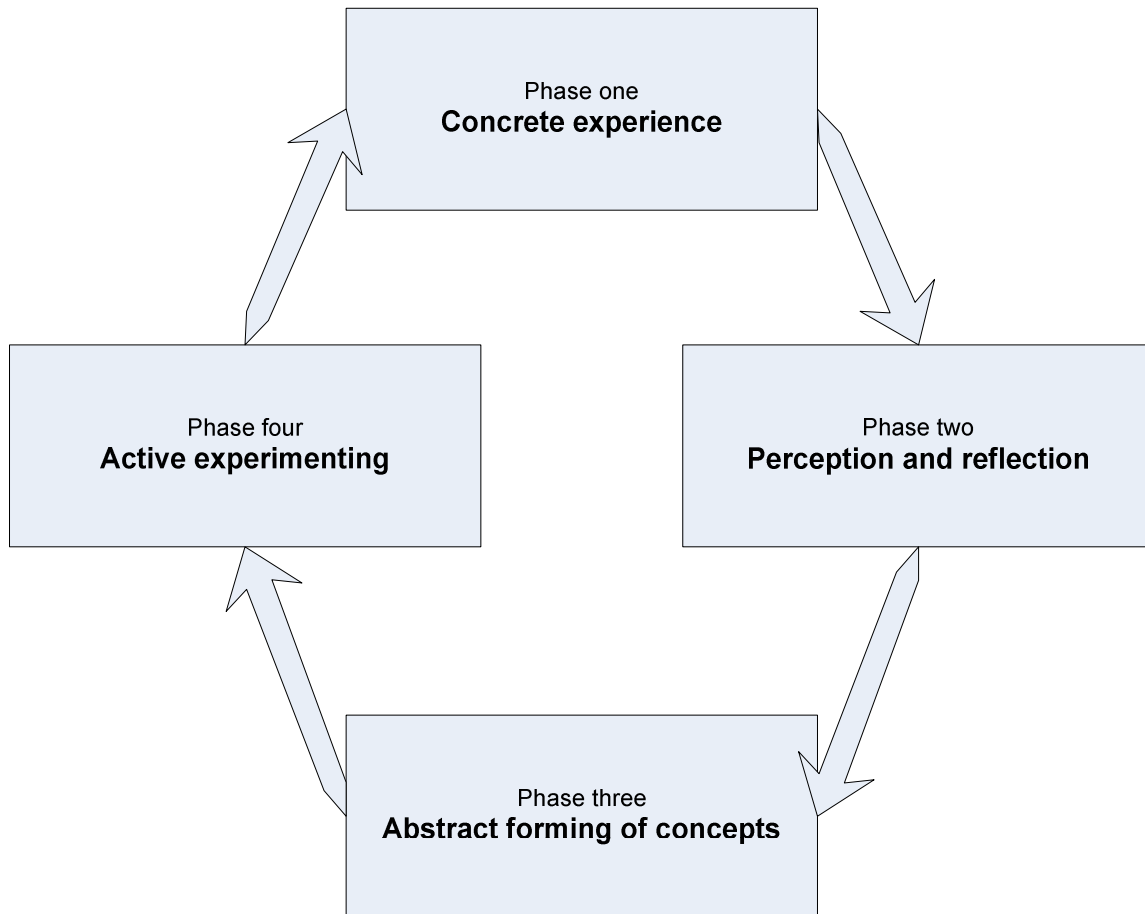
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                    ┌─────────────────────────┐
                    │       Phase one         │
                    │  Concrete experience    │
                    └─────────────────────────┘

┌─────────────────────────┐        ┌─────────────────────────┐
│       Phase four         │        │       Phase two          │
│  Active experimenting    │        │ Perception and reflection│
└─────────────────────────┘        └─────────────────────────┘

                    ┌─────────────────────────┐
                    │      Phase three         │
                    │ Abstract forming of concepts │
                    └─────────────────────────┘
```

Figure 2.4 Learning cycle of Kolb

Learning is defined by the Human Sciences Research Council (HSRC) as "… *a process which enables a learner to approximate, with increasing success, a capability, which integrates the use of information (or content) with a variety of general abilities (such as problem-posing and problem-solving, tool usage, communication and social interaction) within a context which has an informing value system."* (HSRC, 1995:2).

The capacity to be creative and innovative is important for leaders (Burns, 2003) and especially important in the information society with the emphasis on learning how to learn (Hargrove, 2001). Therefore it appears appropriate to include those aspects in a definition of learning in the context of the digital learning environment in higher education.

For the purpose of this study a number of definitions are combined to create the following definition for learning in an digital learning environment: ***Learning in a digital learning environment is a cyclic and iterative activity with intellectual, affective and pragmatic dimensions, where new knowledge is acquired and given meaning to, existing knowledge enhanced and more available, the capacity to be creative and innovative is expanded and attitudes are adjusted.***

Mobile learning is further defined as learning by using portable devices, such as hand held computers, personal digital assistance (PDAs) and smart phones independent of place and time or in classroom situations (Kukulska-Hulme, 2005).

2.5.1.2   Factors that influence learning

From the literature it becomes clear that a number of factors have an influence on the outcome of learning. The following section leads to figure 2.5 where the identified factors that influence learning are summarized. Firstly the characteristics of the learner that may influence the learning process and learning outcome are discussed, followed by other factors that influence the learning environment.

Learning strategies and learning styles
According to Streumer & Kommers (2002) meta-cognition and existential learning are seen as the vital factors in the longer-term attitude towards learning and cognitive growth. De Villiers (2002) argues that cognitive strategies help with problem solving, decision-making and creativity. Successful learners have a repertoire of meta-cognitive and learning strategies and they are able to transfer the relevant strategy to the specific learning circumstance. As such meaningful learning is even more important than learning meaningful materials (Ausubel, 2000). Ausubel explains that the process of being effective in learning and knowing how to learn is more important than knowing a lot as a product. This idea is supported by Plomp (2006).

Culture and learning expectations
Rogers, Graham & Mayes (2007), MacKeracher (2004) as well as Huai & Kommers (2004) found that the culture of the learner plays a role in how the learner approaches a learning task.

They found that there are differences amongst learners in general cultural and social expectations as well as in learning expectations related to learning tasks. Differences in the use of language and symbols as well as the familiarity with infrastructure and technology can also exist as a result of cultural background. They therefore argue that instructional designers need to be culturally aware and sensitive to cultural differences that may exist in learners.

Self-regulation and locus of control

Yukl (2006) also claims that effective self-management is important for successful learning to take place. Self-management includes both behavioural (for example positive self-talk) and cognitive strategies (for example mental rehearsal). He claims that self-efficiency and internal locus of control (for example taking initiative rather than waiting for things to happen) have an influence on the ability to learn.

Blok & Cuijpers (1999) found that there is a qualitative difference in the way that students regulate their learning process. In their research self regulation activities are identified as orientation, adjustment, reflection, testing, monitoring the process, self-steering and diagnosis. According to Vermeer & Seegers (1998) self-regulation draws on the locus of control of the students and on their motivation to control their own learning. In research conducted by Kluytmans (2001) it is also found that self-regulation has commitment and motivation as a consequence.

Commitment and motivation

According to Jonassen (1996) learners should be able to determine their goals for learning and monitor what and how they best learn. This is especially true for adult learners. Motivation is an important factor that influences learning and learning meaningful materials especially in the context of the working field increases the motivation of learners (Ausubel, 2000). Research conducted by Bidarra, Guimaraes & Kommers (2004) shows that concept mapping and mind mapping are effective tools to improve motivation since the learner has more control over the multimedia materials. Bidarra e.a. further claim that when learners enjoy their learning tasks they are more motivated to participate.

Mental models and willingness to change

Learning is highly affected by the changing attitude of the learner towards learning in such a way that the key factor in learning is a willingness to change oneself (Streumer & Kommers, 2002; Yukl, 2006; Kessels & Keursten, 2001; Hargrove, 2001).

Visual and dyslectic limitations

According to Lieshout and Steyaert (2004) about ten percent of the students in the Netherlands have limitations, like dyslexia and visual handicaps. These students have to overcome great obstacles in studying digital materials. Issues of accessibility have in the past mainly focused on physical infrastructure, extension of courses and modified test environments. Digitalization in higher education creates opportunities for students with mobility problems, however attention needs to be given to create accessibility functions for students with visual and dyslectic limitations. Lecturers need to be made aware of those possibilities and assisted in using them where applicable. Military officers can have minimal functional restrictions, like dyslectics, but serious functional restrictions are not possible because military personnel have operational obligations.

Pre-knowledge

According to Jonassen (1996) and Ausubel (2000) pre-knowledge and the kind of experiences that learners have had and how they have organized those experiences into knowledge structures determines how learners construct new knowledge. The fact that learners give their own meaning to new knowledge is well described by Bellis (1997:6):
"In most areas of human life, policies and process, systems and structures, activities and behaviours are largely determined by the meaning given to central concepts and issues, whether consciously articulated or not."
Ausubel (2000) claims that when learners actively construct knowledge, it is more meaningful, applicable and memorable.

Learning in a digital environment also requires a number of specific skills of the learners related to encompass information and ICT expertise. McPherson & Nunen (2004) claim that it should not automatically be assumed that the learner can utilize all those skills and support should be given by the teacher when the learner needs it.

In the next sections factors that are not inherent in the learner but also influence the learning outcome, are discussed.

Context of the learning task

According to a number of authors (Collis & Margaryan, 2005; Ausubel, 2000) the context in which learning takes place has an influence on learning in that the more meaningful the context is perceived by the learners, the better is the change on desired learning outcomes. Steinberg (1991) claims that the learner's characteristics and the context and nature of the task interact with each other to affect the outcome of learning.

Teacher and teaching style

Since the teacher has an important influence on the learning process and creative teachers contribute towards creative learning tasks and inspire creative learners (Burns, 2003) a separate section of the literature review (2.5.2) focuses on the teacher and teaching in a digital environment. It is noted however that the teaching style affects the strategy learners use and hence also the learning outcomes. As such the teaching style could facilitate learning, but could also hamper learning (Huai & Kommers, 2004).

Learning communities and social context

According to Wenger (1998) learning can best be carried out in so-called learning communities, which he defines as social environments in which group members are dependent on each other in order to work together. He claims that if learning communities share a vision, use systems thinking and its members can work in a team, then this will result in communal experience gained and all participants will learn as a consequence. If students regularly work in communities of learning, they are better prepared to work in communities of practice that become more prevalent in the information society. Bidarra e.a. (2004) and Slavin (1995) claim that the quality of the learning outcomes increase as a result of learners working in a collaborative way. Slavin claims that this is especially true when learners have to explain to each other and the learning outcome of the group includes ensuring learning of all group members. In this way the group goal is complemented by individual accountability. Preece e.a. (2004) also claim that working in relaxed social environments improve the learning situation.

Research conducted by Cronjé e.a. (2006) identified the affective dimensions of peer support as an important factor in why learners continue with an online course in a non-contact environment.

Content and characteristics of learning task

The emphasis of learning tasks is moving away from learning the content to learning where to find content and how to create content (Eaton, 2002). She emphasizes the importance of helping learners to discover how to frame meaningful questions, identify problems and find solutions to those questions and problems. Self-evaluation and reflection on the learning process by the learner is also seen by Eaton as an important part of the learning task. However when the emphasis is moving away from learning the content, this does not necessarily mean that learning the content is not important any longer. As discussed by Cronjé (2000) the underlying paradigms of objectivism and constructivism are not necessarily opposites, but could complement each other and learning tasks could contain both objectivist and constructivist elements. From this idea a model was developed and evaluated which showed how learning events could contain various combinations of objectivist and constructivist elements depending on the purpose and nature of the learning event (Cronjé, 2006).

Gagne e.a. (1981) claim that simulations are designed to develop problem-solving skills and enhance discovery learning. Zaccaro e.a. (2006) claim that those are very important competencies for leaders in the current information society. Flouris (1989) claims that competencies like problem-solving, decision-making, critical mindedness and meta-cognitive strategies are developed when higher mental processes are stimulated by using simulations. The digital learning environment offers alternative dimensions to such learning tasks and research has indeed shown that gaming and simulations can play an important role in a digital environment. Recently the possibilities of including mobile technology in a wider digital learning environment are also investigated (Abfalter, Mirski and Hitz, 2004) and opportunities in this regard are identified.

The discussion in this section about the important factors that have an influence on the learning process and outcome is summarized in figure 2.5 in a diagram. The assumption is that the learning task is set in a blended learning environment and a learner centered approach is used.
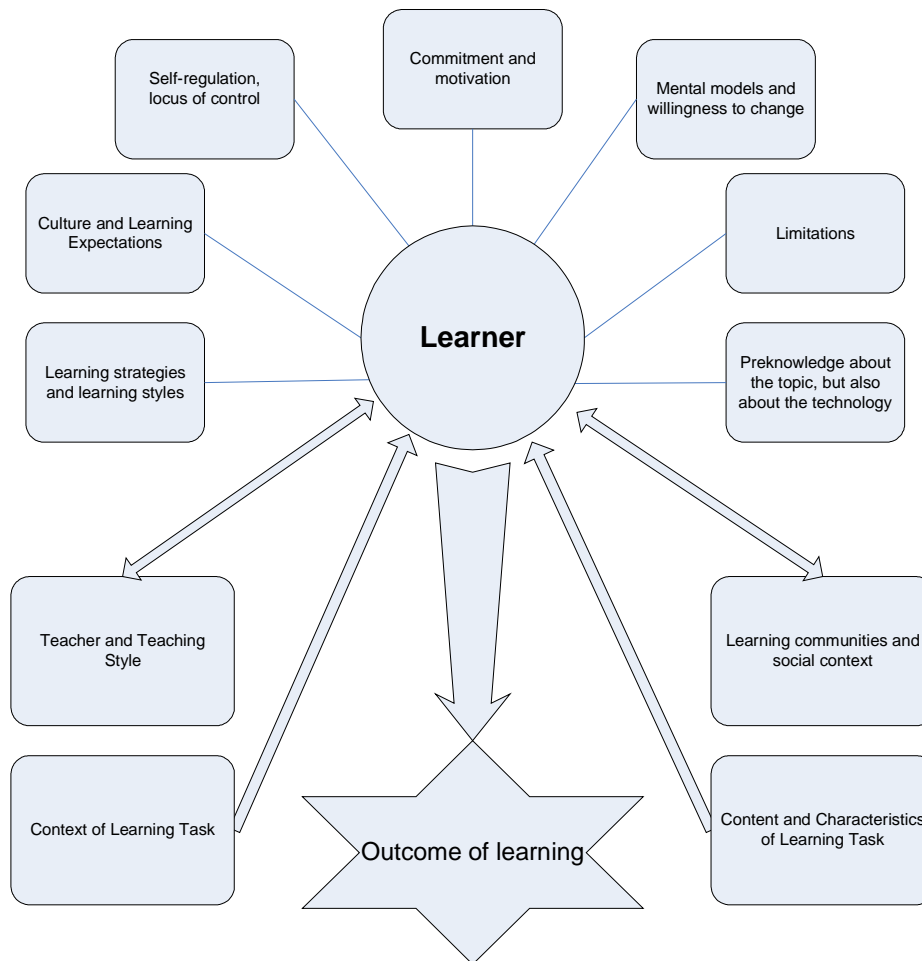
Figure 2.5   Diagram to illustrate factors that have an influence on the outcome of learning

2.5.1.3   Added value of learning in a digital learning environment

Digital innovations could make education dynamic. The digital learning environment could increase efficiency because of the greater density of information, increase in flexibility and increased accessibility (Collis & Moonen, 2001). Collis & Moonen mention five factors where flexibility adds value to a digital learning environment:

- Flexibility in terms of independence from place and time.
- Flexibility in terms of individual study programmes.
- Flexibility in interaction possibilities within a case.

- Flexibility in communication forms.
- Flexibility in study materials.

From existing literature and research it is clear that the didactical methods are more important than the delivery medium (Clark, 1994; Reeves e.a., 2005), but as Kozma (1994) argues, in the information age there are new skills to be learned and new worlds to be discovered that cannot be learnt without a digital learning environment. However if ICT in education is not implemented effectively, the quality of learning could be negatively effected (Merriënboer, 1999).

A number of communication opportunities are offered through a digital learning environment. Those opportunities include e-mail, newsgroup, digital workplaces and mobile technologies. The digital workplaces could be on-line (synchronous) or offline (a-synchronous). Authorized students and staff could participate in those communication opportunities. Feedback from lecturers to individual or groups of students and peer-reviews are possibilities to reflect on the work. The digital learning environment creates an opportunity where courses and curriculum become transparent and information about courses can always be up to date, since changes could be updated immediately as they occur. This makes it easier for teachers to ensure that their courses connect well to related courses. Information sources could be offered to learners in a structured way and learners could become partners in finding suitable information sources and making them available to other students. Independence from time and location offers opportunities for current students to study parts of the course in their own time and at a place that is convenient, even when they are working cooperatively on a task. This network of cooperative learning could continue after the learners have finished with their study and are working.

As discussed earlier Kolb (1984) identifies reflection as an important element in the learning process. In this regard it is interesting that social software tools like web logs, discussion fora and wiki's are becoming increasingly popular (Warburton, 2005). Warburton claims that social presence in web logs allows for reflection, emotional expression, open communication and increases group cohesion. Although it was also found in his research that some students find it a waste of time.

For this research it appears also useful to identify the aspects that play a role in adult education, since all the students are adult learners and place those aspects against the possibilities of a digital learning environment. Peterson (1988) highlights a number of principles that an adult learner needs in a learning environment as follows; Expectations, Experiences, Feedback, Freedom from Anxiety, Immediate application, Independence, Objectives, Open Climate, Participation, Sense of Relevancy, Self-Pace, Sense of Satisfaction and Self-direction. In table 2.5 those principles are placed against advantages that the digital learning environment could bring to the learning situation in order to emphasize the added value of learning in a digital learning environment.

Table 2.5 Adult learning needs against the advantages of learning in a digital learning environment

"*13 Powerful Principles for Training Success"* (Peterson, 1988:49)	Advantages that the digital learning environment could bring to the learning situation
Objectives Adults need to be aware of the objectives of instruction.	**Presentation of information** Objectives can be clearly stated for each topic. The adult learner could refer to the objectives at any time and decide what to study or practice next.
Self-direction Adults need to feel in control of their own learning. **Self-pace** **Independence**	**Learner choice** The learning situation can be controlled by the learner. **Adaptation of learning styles** Self management is encouraged and self pacing essential. **Individualized learning opportunities** Adults can control their own learning The learner needs to be **actively involved** in the learning environment and cannot hide behind other learners. **Customized learning materials** Learning materials could be customized according to the individual expectations.
Participation **Expectations** Adults need to know what the expectations are of their teachers and express their own. **Experiences** **Sense of Relevancy** Adults need to see a use for the information	Mastery of recognized bodies of knowledge and skills. Social software could be used. Simulations could link in with prior experiences in new learning endeavours. **Simulation and modeling** Creative learning sessions can be created; including sessions where dangerous situations are simulated or expensive experiments could be practiced as needed.

Table 2.5 (continued) Adult learning needs against the advantages of learning in a digital learning environment

"*13 Powerful Principles for Training Success"* (Peterson, 1988:49)	Advantages that the digital learning environment could bring to the learning situation.
Feedback Adults need assistance to assess their learning.	**Intelligent tutoring** Tutorial dialogue is possible and via e-mail feedback could be given by teachers. Via chat rooms fellow students could give feedback. **Communities of learning** **Personalized feedback**
Immediate Application Adults could practice where and when necessary soon after they have learnt it.	**Mastery learning, mobile learning** Possibilities for dual learning – working and learning
Freedom from Anxiety Adults need to be relaxed in learning.	The digital learning environment is a non-threatening environment. Individualized feedback and advice what to study next could be given when needed by the learner. Reassurance can also be given by the teacher by using e-mail.
Sense of Satisfaction Adults need to gain satisfaction from the learning.	**Motivation** The computer and the digital learning environment create a non-threatening environment, giving relevant feedback and remediation and allowing adult learners to make meaningful choices regarding their own learning. They are also able to evaluate their own learning and progress. This leaves a sense of achievement and creates confidence in the own ability. Mind mapping are effective means to improve motivation (Bidarra e.a., 2004)
Open Climate	**Computer conferencing, chatting, social software** Interactive communication increases critical thinking because issues are considered from many different perspectives. Equity of participation encourages adults to share opinions and ask questions. *"Computer conferencing can be used to develop student skills in analysis, constructing and defending an argument, assembling evidence in support of an argument and critiquing the work of other learners."* (Bates, A.W., 1995:207) **Distance education** Lectures can be downloaded from the web or a link send to students. CD's, DVD's and links to other learning sites to be studied in own time and place.

From the literature review, it can be concluded that learning in a digital learning environment can add value to the learning experience. However it is a complex process that is influenced by a number of factors and is dependent on the situation and the context of the learning situation. Merrill (2005:6) emphasizes that *"Measuring performance in complex tasks is in itself a complex task."* It appears to be very important that the teacher is aware of the factors that influence the learning experience and takes them in consideration when designing and facilitating learning in a blended learning environment. At the same time the teacher needs to be aware that change in education is a process that is difficult to manage (Lagerweij, 1994) and that proper preparation in order to participate in such endurable change is essential. Van der Klink, Kallenberg & Valche (2002) emphasize that it is important for teachers to participate as a team of innovators in order to successfully improve education.

2.5.2 Teaching in a digital learning environment in Higher Education

A digital learning environment can be seen as a social system (Koper, 2000) and in this light the interaction between the individuals and groups of people are very important. The teacher especially plays an essential role in this system to instruct and initiate activities and is in this sense a lot more than the provider of learning materials (Lam, Nab, Noorderwier & van Tartwijk, 2001). It is important that teachers see themselves as managers in the sense that they facilitate the learning environment and spend enough time guiding and communicating the learners (Schlusmans, 2001).

Adendorff (2004) claims that teachers are reluctant to implement digital learning environments because they are insecure as to what it is that they need to do. Collis e.a. (2000) have indicated four groups of factors that influence a teacher's likelihood of making use of technological innovation: environment (institutional culture), educational effectiveness (perceived or expected), ease of use and engagement, by which they mean the individual's personal response to technology and change. Fresen (2005) emphasizes the importance of a positive attitude, commitment and motivation from lecturers in order to facilitate quality web-supported learning.

According to Lieberman & Guskin (2002) higher education is marked by new instructional roles in many new educational settings.

This is supported by other authors (Adendorff, 2004; McPherson & Nunes, 2004; Turner, 2005). However different authors present the roles of teachers in a digital learning environment differently.

Lieberman & Guskin identify the roles as

- Expert, presentation, discussion
- Mentoring / reflecting Information guide / guide to resources
- Facilitator of group discussions
- Intensive workshop leader
- Research project leader
- Consultant problem-based experience
- Development of content software / adaptation of "off the shelf" software to local institutions needs
- Partnership between faculty and co-curricular educators

Adendorff (2004) has conducted research to determine the roles and competencies of an online e-learning facilitator and categorized five different roles: social supporter, administrator, instructor, guide and mediator as well as thirteen competencies in three categories: people competencies, thinking competencies and energy competencies. In further research conducted by Cronjé e.a. (2006) the importance of the roles and competencies of the facilitator was emphasized as one of the factors that motivated learners to continue with online courses.

McPherson & Nunes (2004) categorizes four main roles for teachers in e-learning, being pedagogical, social, managerial and technical and emphasize that the teacher should continually reflect about the educational process and the competencies required to participate effectively in this process. Turner (2005) has compiled a comprehensive list of technological competencies that educators should have in order to participate fully in the information society. Those competencies include skills like: word processing, spreadsheet, database, electronic presentation, web navigation, e-mail management, downloading software from the Internet, Learning management systems, deep web knowledge, educational copyright knowledge and security knowledge.

Merrill (2002) has done a meta-analysis regarding instructional strategy principles that are used with success in a digital learning environment and that are "*necessary for effective and efficient instruction*" (Merrill, 2002:44). Based on his research he has identified five instructional strategy principles being the task-centred principle, the activation principle the demonstration principle, the application principle and the integration principle. Merrill (2002:44-45) describes those principles in the following way: *"Learning is promoted when:*

1. *Learners are engaged in solving real-world problems.*
2. *Existing knowledge is activated as a foundation for new knowledge.*
3. *New knowledge is demonstrated to the learner.*
4. *New knowledge is applied by the learner.*
5. *New knowledge is integrated into the learner's world."*

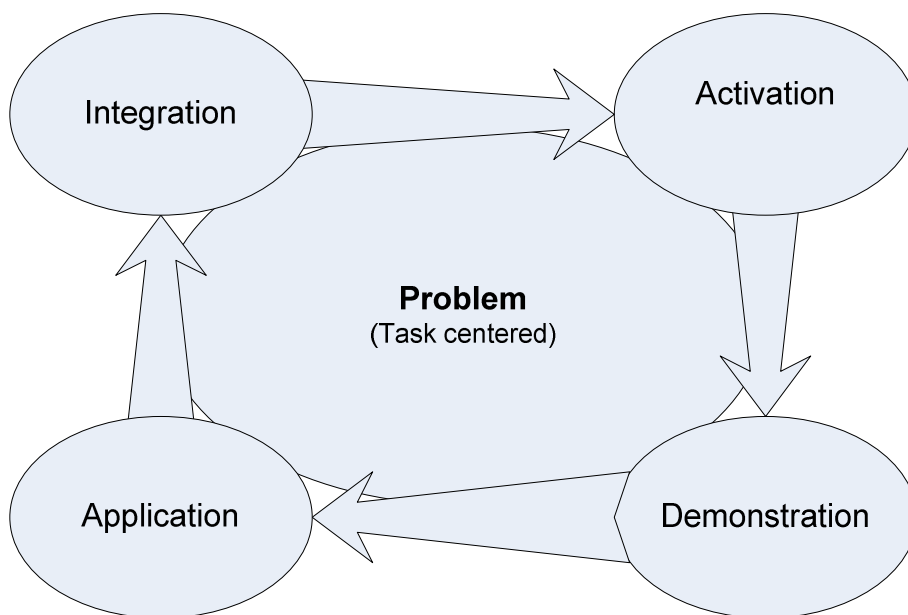How those principles are connected is illustrated in figure 2.6.

Figure 2.6 Illustration of the principles of instruction according to Merrill (2002)

Collis & Margaryan (2005) agreed that those first principles are necessary for good design regardless of the setting. Merrill's research showed further that the learning outcomes improved in direct proportion to the implementation of those first principles in the learning tasks.

Insight in those principles and knowing how to implement those could thus be seen as important competencies for teachers who teach in a blended learning environment. Furthermore Merrill (2005:6) emphasizes that

"Measuring performance level in complex tasks is in itself a complex task. Too often the measures used assess only component of skill or individual actions rather than level of performance on the whole task."

Collis & Margaryan (2005) have tailored the instructional design principles of Merrill further into what they call the 'Merrill Plus' approach especially for the corporate-learning setting. What they emphasize is that the learning tasks should be in a specific corporate context and evolve around a business problem. They add the following aspects to the learning environment: Collaborations and knowledge sharing should not only be with learners in a specific course but also with colleagues in the workplace; learning objects should be re-useable; differentiation should take place in that learners should be supported according to their individual needs and background; the learners' supervisors should be involved and the technology should be designed effectively.

A summary about the instructional roles and competencies for teachers in a digital learning environment is presented in table 2.6. The summary is based on the ideas of Lieberman & Guskin (2002), Adendorff (2004), McPherson & Nunes (2004), Turner (2005) and Merrill (2002).

Table 2.6 Summary of instructional roles and competencies for teachers in a digital learning environment

Role	Tasks	Required competencies	Motivation for required competencies	Examples
Administrator	Course administration	Managerial competencies Knowledge of LMS	Managing learning activities, clarifying procedural rules and decision-making criteria.	Keeping course particulars up-to-date. Placing presentations in the ELO for students to review or for students who were not able to attend the presentation.
Social supporter, mentor	Feedback, reflecting, motivating	Didactical principles. Interpersonal competencies	Understanding factors that influence the learning outcome.	Teacher ensures privacy and trust when learners use social software, like web logs (online logbooks). Teachers can review and comment on the progress of projects in a workplace, using blasts (quick forms of communication like an idea, attitude or posing a question).
Instructor. Facilitator of the learning process	Presenting courseware. Encourage interactivity so that learners construct new knowledge and are thus empowered.	Didactical principles, like setting objectives and problem-analysis. Instructional design principles. Technological competencies	Understanding factors that influence the learning outcome. Understanding instructional strategy principles. Understanding technological issues like downloading software, incl. e-books. Understanding educational copyright issues.	Workshop leader both for synchronous (e.g. a virtual workshop) and a-synchronous discussions. Encouraging communities of learners e.g. (inter)national research projects using wiki's. Using and adjusting learning repositories. Support could be given by experts.
(Information) guide	Provide additional information. Empower students to find information they need when they need it.	Didactical principles Technological competencies	Understanding factors that influence the learning outcome. Understanding aspects like the Deep Web and navigation skills.	Links can be provided to additional information. Answers to frequently asked questions can be placed on-line. Providing simulations or games.
Evaluator, mediator	Ensure fair play	Didactical principles Competency profile	Evaluating and reflecting if learning outcomes are achieved and how the course could be improved in future.	Teacher forms a partnership between faculty and co-curricular educators. Online assessment Ethical issues like copyright and plagiarism

From the literature review it has become clear that teachers in a digital learning environment require different competencies than those that they require in face-to-face situations. The additional competencies thus identified are:

- Being able to use the learning management system effectively and utilize all the opportunities it offers.
- Being able to apply general didactical principles in a digital learning environment.
- Being able to apply interpersonal competencies in a digital learning environment.
- Being able to implement instructional design principles in a digital learning environment.
- Being able to deal with a basic level of technology in a digital learning environment.
- Being able to deal effectively with a student competency profile.

2.6   Summary

Literature review identified gaps in our knowledge about the influence of ICT and the information society on the work environment of managers, how they are affected by it, how and why they use ICT and what this means for their training environment. The next step was to select a suitable research approach in order to try to narrow this identified gap. This research approach constitutes an integral view into a complex information system in which the organization, the information and communication technology, the employees and in particular the managers play an important role, are interconnected and influence each other. In the context of this research the purpose of the information systems and the use of ICT is in its essence to contribute towards meaningful work for the officer in order to benefit the NLDO. Hence it appears important to commence the research by means of interviews to obtain an insider's perspective of the officers directly involved in the information system as well as to obtain insight in the flow of information in the organization in the NLDO. It is understood that in this way a subjective interpretation of the organization and the role of the technology on the work environment of the employees and managers is obtained.

In order to come closer to a more objective reality the researcher believes exists separately and independently of individuals, it is decided to complement the qualitative research with quantitative research. By means of a questionnaire it is possible to obtain the opinions of a larger group of officers in the NLDO and it is easier to analyze the research data in a quantitative manner. Statistical analysis is also used to arrive at a model for information, communication and technological competencies for managers in the information society. The complete research methodology is described in the next chapter.