Evaluating E-Learning in the Process Industry
A case study at Corus Strip Products IJmuiden
Preface and Acknowledgements

In February 2004, I started my Master’s Project at the Corus Training Center, located at ‘Corus Strip Products IJmuiden’ (Corus IJmuiden). Corus IJmuiden is a process industrial organization, which is exploring and using a relatively new educational concept called ‘e-learning’. This research is about evaluating and using the experiences from e-learning projects, carried out at Corus IJmuiden.

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- Ben Scheltens5, external supervisor from Corus IJmuiden: vice manager of the Corus Training Center.

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Summary

In the present competitive market, knowledge and education are critical factors to achieve and maintain a competitive advantage. Education and training are basic concepts to attain the desired level of knowledge. A relatively new educational concept is ‘e-learning’, the core of which is facilitation of education by the use of Internet and communication technology (ICT). This research includes a case study carried out at Corus Strip Products IJmuiden (Corus IJmuiden). Corus IJmuiden is a process industrial organization that is exploring and using the possibilities of e-learning to deal with emerging educational demands.

E-Learning is quite often employed in environments that can be characterized by an upper-intermediate educational level, good availability of ICT and knowledge of ICT. The general research context of e-learning might be considered as a typical ‘white collar e-learning context’. The focus of this study is the use of e-learning on shop floor level in the process industry: ‘blue collar e-learning’.

The setting of e-learning at Corus IJmuiden, differs a lot with respect to the ‘white collar e-learning context’. Recently, several e-learning pilot-projects were started at Corus IJmuiden. These projects were meant to provide information and insight about the best practices and crucial factors regarding blue collar e-learning. Nowadays, that kind of knowledge is lacking and can not easily be acquired. The aim of this research is to develop an evaluation procedure by which the user experiences of e-learning at Corus IJmuiden can be evaluated. On the basis of these experiences, knowledge and best practices about e-learning can be derived, which will eventually enable improvement of blue collar e-learning in the broadest way.

The methodology of this research was specified from a naturalistic viewpoint, in which interaction between inquirer and object of inquiry plays a central role. Nearly all elements of the naturalistic design are specified in the research methodology, which consists of four consecutive steps to come up with an evaluation tool:

1. carry out an organizational analysis and identify key-players
2. identify the organizational requirements and interests with respect to evaluation
3. develop the prototype of the evaluation tool
4. apply the evaluation tool to several pilot projects

The conceived evaluation tool was applied to four e-learning projects, tailor made as well as off-the-shelf. The end users, i.e. course participants, were interviewed using the evaluation tool: an e-learning evaluation questionnaire. The collected data were analyzed statistically in order to derive general results. Besides general project-independent results, specific project-dependent results were obtained.

The main objective, to generate an e-learning evaluation format, was achieved and the prototype of the evaluation tool was tested. Based on both the objective evaluation results and the qualitative subjective data acquired by interviews, recommendations and conclusions were formulated. The success of e-learning varies from project to project, but on an average the e-learning concept provides large benefits. E-Learning enables Corus IJmuiden to cope with rapidly changing and emerging educational demands. Evaluating e-learning provides multiple benefits: besides obtaining insight in the e-learning process performance, it provides a multilateral instrument to improve the processes in the educational e-learning chain.
1 Introduction

There is an ongoing search for the factors that make a company successful. Can these factors be identified? Is it continuous innovation? Brilliant leadership? May a ‘fertile organization culture’ be the key to success?

This search was current in the late 80’s, when Japanese companies appeared to have a better competitive position in comparison with European and other western companies. ‘Dynamics of innovation’ appeared to become a vital concept. It became clear that knowledge and knowledge creation played a major role in the way Japanese companies create dynamics of innovation (Nonaka and Takeuchi, 1995 - 2000).

Even now, in the present competitive market, knowledge and knowledge creation is still a topical subject. Organizations, both profit and non-profit, need to keep up their know-how to maintain competitive advantages and to meet rapidly changing market demands. Education and training provide concepts to create organizational knowledge. A relatively new educational concept is ‘e-learning’. Facilitating education by the use of internet and communication technology (ICT) can roughly be seen as the core of this concept. This new educational concept gains increasing acceptance and is explored by various organizations, among which Corus Strip Products IJmuiden (Corus IJMuiden).

In the late 90’s, Corus IJMuiden started e-learning pilot projects in several business units. These pilot projects were the first steps in the implementing process of e-learning at Corus IJMuiden. Corus IJMuiden is using e-learning at the shop-floor level in order to train those employees who are involved in the basic business processes. This form of e-learning might be called ‘blue-collar-e-learning’, referring to the education and training of workmen by the use of e-learning.

The strategy to introduce e-learning at Corus IJMuiden, is based on the Corporate E-Learning Strategy (CES). The CES model consists of three consecutive phases; (1) start, (2) pilot and (3) integration (De Vries, 2004). The structure of the CES model shares its architecture with the ‘model of change’, described by Fullan (Fullan, 1993).

Corus IJMuiden is currently going through the pilot phase, and is preparing for widespread integration of the e-learning concept. The focus of this research is to develop an evaluation methodology enabling Corus IJMuiden to make optimal use of the experiences of e-learning pilot projects. This report describes the conceptualization of this evaluation method including the construction of an evaluation prototype. This prototype has been used to carry out pilot evaluations. The results of these pilot evaluations are used to derive recommendations towards the e-learning strategy and the business model, including the service concept.
This report is organized in six chapters, including this introduction. The second chapter, called ‘Research Situation’, provides a description of the research context. The general e-learning concept as well as ‘blue collar e-learning’ are introduced and defined. In the last section (2.3) the problem statement and research questions are discussed.

The third chapter, ‘Methodology’, deals with the stepwise methodology that has been used during this research. This methodology consist of four consecutive steps, each discussed in a separate section. The first section (3.1) covers the organizational analysis and key-player selection, followed by the organizational demands and interest towards evaluation of e-learning (3.2). After the evaluation prototype is constructed in section 3.3, the last section (3.4) is about the pilot evaluations.

Data collection and the description of the data analysis and statistical methods are addressed in the fourth chapter. This chapter is concluded by a reflection on this analysis and methodology, given in the last section (4.3).

The results of the pilot evaluations are divided into two categories; general results and specific project depending results. Both categories are discussed in the fifth chapter called ‘Results’, consisting of two sections.

The final chapter provides the conclusions and recommendations. The first section (6.1) is about the conclusions and recommendations towards the e-learning strategy. Recommendations and conclusions regarding the business model and service concept are listed in the second section (6.2). The chapter is concluded with a section containing subjective recommendations and conclusions, based on the author’s opinions and insights.
2 Research Situation

This chapter describes the research situation and context. In the first section (2.1), called E-Learning in General, the e-learning concept is introduced. Besides the introduction of the e-learning concept, also the historical background and definition are addressed.

The second section (2.2) is about a specific application of e-learning called ‘blue collar e-learning’. This section describes the e-learning concept in the way it has been used in the process industry. Also, the case study at Corus IJMuiden is described in more detail.

The problem statement and research questions are mentioned in the last section of this chapter (2.3).

2.1 E-Learning in General

E-Learning is a form of dispersed education in which learners follow their courses on different times at different places. This flexibility is markedly facilitated by the use of ICT, e.g. participants can access the courses and learning contents via standard internet technology. The ‘E’ of e-learning points at the role that ICT plays in this process. ICT is the medium via which the participants can access courses, share information, give or receive feedback etcetera. The ‘learning process’ itself is a very complex process that has been studied widely.

Learning-processes are beyond the scope of this study. The primary focus is on the increase of knowledge and skills as a result of learning, e.g. following a course. This view of learning-processes can be seen as a ‘black-box approach’ (In ‘t Veld, 1992); the learning process itself can be seen as a monolithic aspect that will not be analyzed.

Internet and ICT are relatively new kinds of technology with a common military background. After the initial military phase of the creation of internet during the 60’s and early 70’s, the internet became available to society. From early days on, ICT has been used for a variety of purposes. In the educational field, ICT has been used for both the creation of the learning content and the facilitation of the learning process, e.g. sharing or accessing information and data. There has been an important shift in the way ICT has been used for educational purposes. In the early stage, the very use of ICT itself played a central role and the learning process was of minor importance. At that time, there was a tendency of ‘ICT-push’ contrary to an ‘educational demand for ICT’. Nowadays, ICT plays a facilitating role in e-learning. The use of ICT in the Learning Management System (LMS) is far more sophisticated and less dominant. The early visions of superiority on computer assisted training or computer assisted learning, finally met with disapproval of students and teachers. (Selinger and Pearson, 1999). This disapproval resulted in a shift towards open learning systems that are easily accessible and flexible in use. In an open learning system, ICT is used to lower the barriers for acquisition and distribution of knowledge and information.
Nowadays the role ICT plays can be characterized as network-oriented. When organizations are to use e-learning, the traditional way of education and training will have to be changed, in order to satisfy the e-learning concept. In general, when a new way of education is introduced, it should be supported with a model of educational change (Fullan, 2001). Attention should be given to both the e-learning as a concept and to the organizational process of implementing e-learning.

Now that the outlines of the e-learning concept are sketched, we will focus on the way e-learning can be defined. Reasons of transparency and consistency impose the need to define the term ‘e-learning’. As described above, e-learning is a concept that is undergoing a constant change and improvement. There are various definitions with different scopes, from broad to narrow. One of the broader definitions is used by the American Society of Training and Development (ASTD). The ASTD is a large community of practice for professionals in the field of workplace learning. According to the ASTD, E-learning is a ‘Term covering a wide set of applications and processes, such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet (LAN/WAN), audio- and videotape, satellite broadcast, interactive TV, CD-ROM, and more.’ From this perspective, the majority of all education can be seen as e-learning. Besides the fact that it is a broad definition, the members of the ASTD tend to adjust and refine it in several ways. The wide scope of this definition and its relatively vagueness make this definition less useful. In contrast to the ASTD, Rosenberg uses a narrower and more specific definition. According to Rosenberg e-learning can be defined as follows: ‘E-learning refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance. It is based on three fundamental criteria: (1) E-Learning is networked, which makes it capable of instant updating, storage/retrieval, distribution and sharing of instruction or information. (2) It is delivered to the end-user via a computer using standard internet technology. (3) It focuses on the broadest view of learning: learning solutions that go beyond the traditional paradigms of training’ (Rosenberg, 2001). This definition has a strong focus on the network role of ICT as described earlier in this section. The definition is in some ways, similar to the definition of e-learning used within Corus IJmuiden; ‘E-Learning is the process of learning and teaching in which the connections among the participants and with the resources are initiated by means of communication technology’. This definition was introduced by P. de Vries, a consultant of the ‘Centrum voor Innovatie van Opleidingen’ (CINOP). This consultancy firm advised Corus IJmuiden about the introduction and facilitation of e-learning at Corus IJmuiden from the start in late 90’s. For reasons of consistency and compatibility, this definition of e-learning will be adopted in this study.
The underlying strategy with respect to e-learning at Corus IJmuiden, is to use e-learning in order to deal with educational problems that emerge. These problems are not only applicable to Corus IJmuiden, but are common in the process industry. This specific application of e-learning will be referred to as ‘Blue Collar E-Learning’. The following section is about this specific form of e-learning.
2.2 Blue Collar E-Learning

For decades, new employees at Corus IJmuiden were trained by older craftsmen on a ‘master-apprenticeship’ basis. ‘Training on the job’ was the central form of education. In that particular situation, a large part of all transferred knowledge can be considered as ‘tacit knowledge’. Tacit knowledge is implicit knowledge and can only be transferred or shared in the right context. This context should satisfy several requirements, including frequent face-to-face meetings, support for micro-communities, a space- and time-framework that enables knowledge sharing, knowledge creation and unlocking of tacit knowledge (Von Kroch, Ichijo and Nonaka, 2000).

In the 90’s, a clear demand for more efficiency and higher productivity emerged from the economic recession. Which resulted in reorganization and revision of the basic processes, and in the end lead to more production by fewer employees. The need for higher efficiency resulted in hardly any slack in different shifts. As a result of the forthcoming changes in age distribution, many experienced workers will soon retire. These developments implicate a dramatic decrease of training capacity and a loss of organizational knowledge. While the organizational context was rapidly changing, the educational model still remained the same. Therefore, training and learning became more and more difficult and even impossible in some cases. As a consequence of these developments, Corus IJmuiden was recently confronted with disappointing operating results. The Chief Executive Officer (CEO) of the ‘Corus Group’, Philip Varin, introduced the ‘Restoring Success’ program, that comprises several initiatives designed for better operating results. Traditional management interventions such as manpower reductions and other efficiency programs were part of the Restoring Success program. Another important venture within this program is the aim to improve performance by sharing and implementation of best practices across the Corus Group.

New educational concepts, such as e-learning, can play major roles to achieve the goals as mentioned in the Restoring Success program. But how should e-learning be implemented in a production facility? What are the best practices for e-learning in basic industries? Most of the research on e-learning and its applications is done at intermediate or higher educational level, such as high-schools and universities. A lot of research pertaining to the facilitation of such a service by digital learning environments has been carried out. These studies deal with two sub-fields of interest:

On one hand, there are studies from a technical perspective. These studies focus on the necessary features of e-learning and how to build these features into digital learning environments (e.g. Van Merriënboer and Paas, 2003).
On the other hand, there is a sub-research space dealing with the social processes and interactions linked to e-learning. Here, the focus is on social aspects related to the overall performance of e-learning. For instance, a recent study deals with the social processes in virtual learning communities with respect to the success or failure of e-learning (Orey, Koenecke and Crozier, 2003).

Both the technical oriented as well as the socially oriented studies in the field of e-learning are mainly carried out at the upper and intermediate educational level, such as schools, universities. A relatively high level of education, good availability of ICT and knowledge of ICT characterize these environments. So, the general research context of e-learning might be considered as a typical ‘white collar e-learning context’.

As said before, in the late 90’s a clear need for improvement of the educational model emerged at Corus IJmuiden. E-learning seemed to be a promising tool to achieve a new concept. In 2001 a project team called ‘Knowledge Centre E-Learning’ was formed at Corus IJmuiden. The focal task of this project team was supporting and facilitating e-learning projects in the broadest sense. The consultancy firm CINOP supported the project team Knowledge Center E-Learning (KCEL). CINOP mainly focuses on educational innovations such as e-learning and learning within the education structure, e.g. learning-on-the-job. The strategy to introduce e-learning at CORUS is based on the Corporate E-Learning Strategy (CES). The CES model (figure 1) consists of consecutive phases; (1) start, (2) pilot and (3) integration (De Vries, 2004). The structure of the CES model shares its architecture with the ‘model of change’, described by Fullan (Fullan, 1993). The distinction in three phases applies to several levels, from micro up to macro, so that the same structure can be found at course level as well as at management level. The model is not meant to be exclusive, but it should be appreciated as an approach to create structure and transparency.

![Figure 1](image_url)  
**Figure 1** The introduction of e-learning within Corus, a stepwise approach in three consecutive phases (corresponding with the CES model).


2.3 Problem Statement and Research Questions

Recently, several e-learning pilot-projects were started at Corus IJmuiden. These pilots are part of the second phase, pilot phase, of the CES model. This pilot phase can be split into two parts;

− carry out e-learning pilot projects and preparation for widespread integration (green shading in figure 1);
− analyze and evaluate e-learning pilot projects, and use evaluation results to develop a business model and integration strategy (red shading in figure 1).

This study is about the second part of the pilot phase. The pilot projects that have been or are being carried out, generate valuable information. As described earlier on, there is a lack of knowledge about ‘blue collar e-learning’. Very little is known about the characteristics of e-learning in industrial plants or non-stop production facilities. One could state that the existing theory and knowledge about e-learning can be applied irrespective to the setting in which e-learning is implemented. But, because of the great differences in both physical and social aspects this assumption is very unlikely. The setting in which e-learning at Corus IJmuiden is positioned differs a lot with respect to the setting that is described in recent studies. The problem statement can consequently be formulated as follows: ‘Corus IJmuiden is exploring the possibilities of e-learning to develop a new educational concept. Therefore, there is a strong need for knowledge about experiences of users of blue collar e-learning.’

Nowadays, that kind of knowledge is lacking and can not be acquired. Therefore, the aim of this research is to develop an evaluation procedure by which the user experiences of e-learning at Corus IJmuiden can be evaluated. On the basis of these experiences, knowledge and best practices about e-learning can be derived, which will eventually enable improvement of blue collar e-learning in the broadest way.
The main research question of this study can be formulated as follows: “In what way can Corus IJmuiden learn from the experiences of e-learning pilot-projects to improve e-learning, and come up with outlines or adjustments of a strategic model and a business model?” This main research question can be differentiated into several specific sub-questions:

A. What are the components of a sound and standardized evaluation format for e-learning (pilot-) projects, which allows for optimal acquisition of experience?

B. What are the results and experiences of some e-learning pilot projects within Corus IJmuiden, by using this ‘evaluation format’?

C. What are the outcomes of a meta-evaluation of the experiences with e-learning at Corus IJmuiden?

D. What recommendations can be derived from the outcome of the evaluation of the e-learning projects for the improvement of the e-learning implementations strategy?

E. What are the recommendations for the e-learning business model for Corus IJmuiden, by using the outcomes of the evaluations?
The research sub questions are placed in the context of the second phase of the CES model (figure 2).

Figure 2  The research sub-questions are part of the second phase of the CES model.
3 Methodology

As described in the previous chapter, the main focus of this study is to determine how Corus IJmuiden can learn from the experiences of e-learning pilot projects. The methodology that is used in this research can be described as a naturalistic research methodology (Lincoln and Guba, 1985). The naturalistic perspective differs a lot from the positivistic point of view, which is generally called the ‘rational viewpoint’. To grasp the characteristics of these views and the contrast and difference between them, some viewpoints (axioms) of both positivistic and naturalistic perspective are addressed in the following sections.

The nature of reality

Positivist version: Reality is single, tangible and separable.

Naturalist version: There are multiple constructed realities and reality can be seen as just one single ‘projection’ (holistic approach).

Link to present research methodology: According to the naturalistic view, the perception of e-learning and the results of e-learning heavily depend on the different perceptions. Therefore, an organizational analysis was carried out to select key-players and their subjective interests were used to identify the universal or organizational requirements.

The relationship of knower to the known

Positivist version: The inquirer and the object of inquiry can be separated and there is no interdependency, the knower and the known constitute a discrete dualism.

Naturalist version: There is interaction between the object of inquiry and the inquirer. Therefore, knower and known are inseparable.

Link to present research methodology: A large part of this research is about the conceptualization of the evaluation format. Interaction between researcher and the research subject was of major importance. Besides the conceptualization of the evaluation tool, the validation of the tool was also based on interactive processes.

The possibility of generalization

Positivist version: The aim of inquiry is to develop general universal knowledge that is truth, independent of from both time and context.

Naturalist version: The aim is to develop ‘knowledge’ that is applicable to an individual case.

Link to present research methodology: The evaluation format that was conceived during this research, is primarily applicable to Corus IJmuiden. Nevertheless, the positivistic view is present to some extent: The conceptualization process to develop the evaluation tool, which is described in this report, can be useful to develop similar tools in the process industry.

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The possibility of causal linkages

Positivist version: Every action can be explained as the result of a real cause that precedes the effect.

Naturalist version: All entities are in a state of mutual simultaneous shaping so that it is impossible to distinguish causes from effects.

Link to present research methodology: The e-learning process is observed as a complex process involving lots of actors and stakeholder. There is an apparent similarity to the naturalist version of 'causality and causal links'. Therefore, the evaluation of e-learning can hardly be done by measuring simple factors that cause certain effects. The aim of this research was not to identify single factors that cause success or failure, but to measure the overall performance of the concept. The complexity of the process is reduced by measuring results of e-learning projects. Therefore, the research methodology shares its characteristics of naturalist version, although the methods used are mainly rational.

The role of values in inquiry

Positivist version: Inquiry is value-free and can be guaranteed to be so by virtue of the objective methodology employed.

Naturalist version: Inquiry is value-bound in several ways, the inquiry is either value-resonant (reinforcing congruent) or value-dissonant (conflicting). Value-resonant means that the inquirer’s personal values are consistent with and reinforce all other contextual values, resulting in findings and interpretations that are agreeable from all perspectives. Value-dissonant is the opposite situation, the inquirer’s value conflict with the contextual values. In that case, the inquiry will be cumbersome and produces findings and interpretations that are questionable and non-credible.

Link to present research methodology: The research methodology shares attributes from both perspectives. The evaluation tool is shaped by several choices such as the selected data, collection method, the focus and the underlying theory. During this conceptualization process, the contextual values were adopted resulting in value resonance.
According to the naturalistic approach, there are certain measures that can be employed to underline and confirm the results of a research or inquiry. These measures ensure that ‘a judgment of trustworthiness will be achieved or provide the data that will subsequently be needed to reach that judgment’. (Lincoln and Guba, p 281) One of these measures is triangulation; validating the outcome and results each against at least one other source. Based on the information of two sources the research outcome and results can be validated. The term ‘triangulation’ has its origin from radio triangulation: ‘Determining the point of origin of a radio broadcast by using directional antennas setup at the two ends of a known baseline. By measuring the angle at which each of the antenna’s receives the most powerful signal, a triangle can be erected and solved, using simple geometry, to pinpoint the source at the vertex of the triangle opposite the baseline.’ (Lincoln and Guba, p 305)

Both the results of the statistical analysis and the underlying motivation of the respondents are of major importance. These two sources of data can be seen as the antennas that were used to come up with conclusions and recommendations in the last chapter of this report.

The research methodology of this research was specified from a naturalistic viewpoint. Nearly all elements of the naturalistic design are specified in the research methodology, which consists of four consecutive steps:

1. **carry out an organizational analysis and identify key-players (3.1)**
   The organization of Corus IJmuiden is characterized and described in the first section. Taking the theoretical framework of Mintzberg as a starting point, the organizational structure of Corus IJmuiden is analyzed and key-players towards e-learning are identified.

2. **identify the organizational requirements and interests with respect to evaluation (3.2)**
   All key-players have specific subjective opinions and insights with respect to e-learning and the evaluation of e-learning. These opinions and insights were drawn up during several interviews. Based on that, requirements and demands with respect to the evaluation were generated and were divided into two categories;
   - **2.1. selection of the evaluation methodology (3.2.1)**
     Besides content related requirements, the evaluation process itself had to satisfy several specific needs. These needs were the result of the typical process industry context of Corus IJmuiden. In the third section of this chapter, these process-related requirements are used to select a suitable evaluation methodology. The selected methodology is based on a stated preference model using several review statements.
2.2. generating ‘evaluation content’ based on the organizational requirements in combination with a literature review (3.2.2)
The key-players expressed their interests and views towards e-learning. All concurring aspects were combined into three sub-categories;
A. Organization and Management
B. Course
C. Output
Each sub-category represents a specific field of interest. Within these sub-categories, review statements were generated based on the views of the key-players in combination with a literature review on these topics.

3. develop the prototype of the evaluation tool (3.3)
Combining the selected evaluation methodology and the evaluation content, the prototype of the evaluation tool was developed. This prototype met the process-related and content-related requirements.

4. apply the evaluation tool to several pilot projects (3.4)
Several e-learning pilot projects were evaluated using the prototype of the evaluation tool. The selection and description of the projects that have been evaluated and the data processing, are described in the fourth chapter called ‘Data Collection and Analysis’.
3.1 The Organizational Analysis and Key-Player Selection

This section contains two components; an organizational analysis (3.1.1) and the selection of the key-players (3.1.2).

The characteristics of e-learning projects and the way these projects are carried out differ from place to place. Perception of e-learning projects and their relevant components differ from person to person as well. Therefore, it is difficult to determine an objective and consistent ‘field of interest’ that contains universal relevant items. A possible answer to this problem is to interview a representative set of key-players and gain a balanced set of review items. In order to select these key-players, an organizational analysis was carried out. Taking the theoretical framework of Mintzberg as a starting point, the organizational structure of Corus IJmuiden was analyzed. The organizational analysis is described in the first section of this subsection (3.1.1). The second part of this subsection (3.1.2), describes the selection of the key-players.

3.1.1 Organizational Analysis Based on Mintzberg’s Framework

The way e-learning projects are carried out, and the e-learning project characteristics are directly linked to the organizational structure of Corus IJmuiden. The organizational structure and lay-out of Corus IJmuiden corresponds with the characteristics of a ‘decentralized organization’. All factories at Corus IJmuiden are supposed to be independent and supposed to operate as their context is a ‘perfect market’ (Png, 1998). One should realize that this economic model was imposed on Corus IJmuiden being a former public institution. It is clear that just imposing a competitive organizational model does not imply that this model is adapted in all its aspects. The discussion about this process and fundamental choice is beyond the scope of this study. Nevertheless, this choice resulted in some specific organizational characteristics such as isolated actors, independent actors who have no or few common goals and objectives. This results in several barriers and sometimes even a lack of overall strategy. All these aspects make it quite difficult to easily identify all parties and actors involved (stakeholders). To cope with these aspects, the organizational structure is unraveled by carrying out an organizational analysis. This analysis is based on the organizational theory of Mintzberg (Mintzberg, 1983a / 1983b).

Mintzberg states that organizations vary in their structure and complexity, from simple up to complex systems. Besides on their structure, organizations can be characterized by the relations throughout and interdependencies within the organization. According to Mintzberg there are five basic organizational structures made up of a combination of five basic elements:
the ‘operating core’, dealing with the actual work;
− the ‘strategic apex’, which does the planning and controlling;
− the ‘middle line’ that links the operating core to the strategic apex;
− the ‘techno structure’, planning the work and organizing the assets of the organization;
− the ‘support staff’, provides support outside the workflow of the organization.

The several components that can be distinguished within organizations, are shown below (figure 3).

Figure 3   The internal organizational lay-out consisting of five basic components, according to Mintzberg’s theory.

Depending on the constellation of these five basic elements, five organizational structures can be distinguished:

1. simple structure
   The strategic apex is the key part of this organization, other parts are of minor importance or might even be not represented. Very little of the organizational behavior is formalized, and coordination is mainly based on direct supervision. This organizational structure is mostly a ‘starting point’, most organizations pass through this structure in their formative period. It is a flexible and organic structure that is suitable for a dynamic environment.

2. machine bureaucracy
   This structure is based on standardization of processes, routine tasks, lots of formalized procedures, rules, regulations and formalized communication. The operating core is the largest element on which the organization heavily depends. The primal focal of this organization is performance, and there is an ongoing search for efficiency and improving the processes and output.

3. professional bureaucracy
   A professional bureaucracy relies on standardization of skills. The operating core consists of specialists and highly trained workers. They act relatively autonomously and have considerable control over their own work or field of interest. Workers adhere to their autonomy and act in an inflexible structure.
4. **divisionalized form**

The divisionalized form can partly be seen as a real organization structure. It can also be a structure that can be super imposed on other organizational structures. The coordination is mainly based on standardization of output. A divisionalized form consists of several divisions, which have their own structure.

5. **adhocracy**

The adhocracy is a flexible and organic structure with little formalization and specialization. Within an adhocracy, there is a tendency to form functional cells/groups that are market oriented. Coordination within the adhocracy is based on ‘mutual adjustment’.

When looking at the organizational structure of Corus IJmuiden, there is a striking similarity to the machine bureaucracy. The operating core is relatively large, the job descriptions are very specified and consist of routines. There is a large amount of rules, regulations and specifications. Coordination and communication is based on an extensive hierarchical structure. On a higher level of aggregation, one ‘level’ higher Corus worldwide can be seen as to have a divisionalized form. This form consists of a group of organizations that can be characterized as machine bureaucracies. The focus of this study is limited to e-learning at Corus IJmuiden, resulting in the machine bureaucracy being the dominant organizational structure.
3.1.2 Selection of the Key-Players

The initial objective of this organizational analysis is to make a transparent actor selection. Taking the typical organizational structure of Corus IJmuiden as a starting point, the key-players will be selected from each of the organizational components. In the organizational structure of Corus, the machine bureaucracy, all five components are represented. In the table below, each organizational component is linked to the e-learning process and e-learning projects at Corus IJmuiden.

Table 1 Selecting the key-players regarding e-learning projects at Corus IJmuiden by linking them to the five basic components, according to Mintzberg’s framework.

<table>
<thead>
<tr>
<th>Organizational Component</th>
<th>Key-players</th>
</tr>
</thead>
<tbody>
<tr>
<td>the ‘operating core’</td>
<td>End-users of the e-learning courses (workman at shop floor level).</td>
</tr>
<tr>
<td>the ‘strategic apex’</td>
<td>Managers, those involved in the strategic management process (setting overall goals).</td>
</tr>
<tr>
<td>the ‘middle line’</td>
<td>Middle / line management who are the link between the ‘shop floor’ and management, for instance foremen and shift coordinators (‘chef van de wacht’).</td>
</tr>
<tr>
<td>the ‘techno structure’</td>
<td>Analysts, trainers and teachers that are involved/dealing with standardization of knowledge (Knowledge Center of E-Learning).</td>
</tr>
<tr>
<td>the ‘support staff’</td>
<td>Those players that are providing e-learning related support: system administrators, e-learning support team and so on.</td>
</tr>
</tbody>
</table>
### 3.2 Organizational Requirements and Interests with respect to Evaluation

All key-players have specific subjective opinions and insights with respect to e-learning and the evaluation of e-learning. These opinions and insights were drawn up during several interviews. Based on that, requirements and demands with respect to the evaluation process were generated and are divided into two categories. This section has two subsections, each dealing with one category:
- Requirements concerning the evaluation process (3.2.1);
- Requirements towards the content of the evaluation (3.2.2).

#### 3.2.1 Evaluation-Process Related Requirements

The evaluation tool or method had to satisfy several specific needs. This was a result of the typical context of e-learning projects at Corus IJmuiden. Besides the several views on the content of the evaluations, the key-players addressed a couple of issues regarding to the evaluation process itself. A rough distinction into three categories can be made:
- Independence of place

The evaluation-process should provide maximal flexibility, so that it can be used in various settings. The evaluation tool should be suitable for evaluation ‘on the job’.
- Independence of time

In a non-stop production facility like Corus IJmuiden, time is valuable and limited. For that reason, the evaluation process should fit into narrow time frames and take as little time as possible.
- Easy to use (minimal barrier to participate)

The group of respondents is inhomogeneous concerning level of education and interests. The evaluation should therefore have a low barrier and be ‘easy to use’, that enables acquiring maximal data and information with minimum efforts.

Now, let us focus on the typical methods for data collection, i.e. survey methods. In general, there are two ways to collect data from a response group: conducting interviews on a face-to-face basis or gather data non face-to-face basis, e.g. by response forms, questionnaire.

When selecting a survey method, the contextual factors should be leading (Fink, 1998 - 2003b). The contextual requirements mentioned earlier in this section, clearly indicate that the flexibility and independence of time and place is of major importance. Because a non face-to-face method provides maximal flexibility, regarding to time and place, the preferable evaluation method is a non face-to-face method.
In the end, the data acquired by the survey needs to be processed and analyzed. Therefore, there are some practical prerequisites to the data and data-format; One of the objectives is to carry out a meta-evaluation on all project evaluations. To allow such (statistical) analysis, the data from each evaluation should be homogeneous and comparable. Homogeneous output is easily obtained by using the same evaluation scheme. The comparability can be achieved by numerical output. Also, the statistical analysis requires that the output consist of numerical values.

Taking all requirements and needs into account, the best solution is the use of a non face-to-face method based on a standardized evaluation format. To satisfy the requirement of ‘numerical output’, a format was chosen in which the responses were categorized into four ordinal categories and one exit option (see table 2).

<table>
<thead>
<tr>
<th>Score</th>
<th>Fully agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Fully disagree</th>
<th>can’t tell / not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;&lt;review statement X&gt;&gt;</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Each statement has to be scored by selecting one of the options. There is an even number of classes, to avoid the respondent’s tendency to ‘keep to the middle’. More information about the data processing is listed in chapter four.

3.2.2 Content Related Requirements Combined with a Literature Review

The next step was to resolve the key-players’ insights and views about e-learning. During the first couple of months of this research, interviews were conducted with all key-players. These interviews were meant to gain optimal insight in each subjective fields of interest regarding to e-learning. Nevertheless, there was a general consensus that an e-learning project could be visualized as a cyclic process (figure 4).

Figure 4 General e-learning concept, a cyclic process on a demand driven basis.

The concept of e-learning is based on a service model that is based on the educational demand (van Valkenburg, 2003). When an educational demand emerges, an e-learning course is developed within the given conditions that have to be met. Implementing this course will generally result in an increased level of knowledge and/or better skills. The ‘new situation’
will be compared to the desired situation. Any variation that occurs and exceeds a certain bandwidth will result in another process cycle. For that reason, the e-learning concept is a cyclic process.

During the interviews, each key-player expressed a specific view on the e-learning concept. For instance, the end-users are primarily confronted with the actual course. In contrast; the managers are primarily focused on managerial aspects of e-learning and have a more strategic approach.

The following section provides an outline of their interest, concerns or questions they would like to express. In the table below, the left column contains the key-player and the right column contains the subjective view.

**table 3  Key-players and their views.**

<table>
<thead>
<tr>
<th>Key-players</th>
<th>Views</th>
</tr>
</thead>
<tbody>
<tr>
<td>End-users of the e-learning courses (workmen at shop floor level).</td>
<td><strong>Course</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Content fit</strong></td>
</tr>
<tr>
<td></td>
<td>The content of any course should be applicable to the business-as-usual. Common problems and malfunctions should be addressed and described. The course content should be up-to-date and useful.</td>
</tr>
<tr>
<td></td>
<td><strong>Time</strong></td>
</tr>
<tr>
<td></td>
<td>On shop-floor level, a paradox regarding to 'time' emerges; on one hand, a flexible timeframe allows for variation in study-pace and study schedules. But on the other hand, this flexibility dispels any deadline or ‘pressure’, resulting in undisciplined studying. As a result, some courses are never finished or only at the very last moment.</td>
</tr>
<tr>
<td></td>
<td><strong>Interaction</strong></td>
</tr>
<tr>
<td></td>
<td>How does e-learning deal with the lack of interaction and face to face meeting? More general remarks: “...e-learning is lacking any form of human interaction, and therefore can never be a full-grown alternative learning possibility...”</td>
</tr>
<tr>
<td>Managers, those involved in the strategic management process (setting overall goals).</td>
<td><strong>Organization Management / Output</strong></td>
</tr>
<tr>
<td></td>
<td>Management is primarily concerned with managerial aspects, business administration and strategic issues. Some frequently expressed concerns or addressed issues;</td>
</tr>
<tr>
<td></td>
<td>- What role can e-learning play in the educational model and strategy?</td>
</tr>
</tbody>
</table>
- In what way can e-learning results be visualized, or related to other educational concepts?
- How should e-learning be started up, tested, integrated, embedded and so on...
- What are the costs for creating a full-grown e-learning concept?

Another often heard issue is the overall output of e-learning. ‘Overall’ in the sense that the output is not related to course level but concept-related.

**Middle management**, who are the link between the ‘shop floor’ and management, for instance foremen and shift coordinators (‘chef van de wacht’).

**Output**
Ironically, the middle management is caught in the middle... On one hand there are clear demands and problems on shop-floor level ‘screaming’ for immediate reaction. On the other hand, solving problems systematically or even business process improvement of any kind demand a long term strategy.
The issues that were addressed by this group of key-players were quite practical and tangible.
- Can e-learning be implemented within the existing shifts?
- Is there sufficient time available?
- What are the preconditions for implementing e-learning (concrete: PC, intranet connection etc.)?

**Analysts, trainers and teachers that are involved/dealing with standardization of knowledge (Knowledge Center of E-Learning).**

**Course**
Analysts, trainers and teachers tend to focus within their field of study; designing courses and delivering trainings and so on. Because they lack the necessary know-how in the field of e-learning, they are not very eager a priori to participate in an e-learning concept. However it must be stressed that once the necessary insight is gained, this group is very eager to participate!

Commonly heard questions in this group:
- What are the possibilities of e-learning in the broadest sense?
- Can I use e-learning to generate training or examination facilities?
- Where should e-learning be used and in what way?

**Those players that are providing e-learning related support: system administrators, e-learning support team and so on.**

**Performance and implementation of LMS / ICT**
In this group the line of approach can be split into a focus on the content related issues and process related issues.
Content: for instance, course specific matters such as developing a course, testing it etcetera.

Process: e.g. gain insight in the system performance by analyzing the number of users, systematic problems etc.
All different views towards e-learning were considered and the following categories were distinguished:

Management and Organization (A)
The e-learning concept is based on several consecutive steps, as shown in figure 4. This category is about all managerial and organizational aspects (e.g. procedural steps and implementing processes).

Product / Course (B)
Several key-players were interested in the actual e-learning course that can be seen as a product or service. Therefore, ‘product or course’ is the second category of evaluation items.

Result / Output (C)
This last category covers issues about the output and result of e-learning of the e-learning course. This category contains a wide range of aspects, varying from clear managerial demands for detailed return on investment calculations, up to the need for general performance indicators.

The division into these three categories is based on the overall picture about e-learning and how this is worked out at Corus IJmuiden. This division is based on the interviews that were conducted, and can to some extent be seen as a subjective choice. Nevertheless, this division has no content related consequence whatsoever and is solely used for purposes of clarity and transparency.

The items and issues addressed in the three categories will be complemented by the information from a literature review. This literature review is divided into three subsections (A, B and C) corresponding to the categories mentioned previously. The objective of the literature review is to acquire various insights and views related to the e-learning pilot projects. In order to meet the third process requirement of ‘easy to use’, the evaluation has a limited broadness and is not meant for in-depth analysis. In some cases, similar or exactly the same aspects or issues are mentioned in various sources. Consequently, one review question can be derived from more references and may be mentioned in more than one place.
3.2.2.1 Ad A (Project-) Management / Organizational Aspects

A lot of research has been done in the field of project management. Various approaches and theories are known, using different definitions and distinctions. In order to grasp the issues that are relevant to the management and organization of e-learning projects the insights of Turner were used. The reason for this choice can be found in the integrative approach of scope, organization and the more common known aspects time, quality and costs (Turner, 1999).

In the organizational analysis, Corus is classified as a Machine Bureaucracy (3.1.1) with highly detailed processes. This structure and its characteristics and the integrative and rational view of Turner match very well.

In ‘The Handbook of Project Based Management’, Turner discusses a rational approach towards integral project management. The most common characterization of a project: delivering objectives within constraints of time, costs and quality. Additional to this definition: “Project-management should not be limited to these three aspects, project-management should contain five functions: scope, organization, time, costs and quality. The last three functions; time, costs and quality should be seen as important constraints, but just constraints” (Turner 1999 p. 8). According to Turner, these five functions should be managed throughout the project:

− Cost is managed through a cost breakdown structure (CBS) of cost types, e.g. labor, materials, overhead;
− Organization is managed through an organization breakdown, a breakdown of the skill sets of people who will do the work. A so-called work breakdown structure (WBS) shows the work to be done in relation to the skills;
− Quality is managed using techniques of total quality management (TQM);
− Scope is managed through product breakdown structure (PBS): a hierarchy of objectives from vision, mission, facility, team and individual objectives. The levels vary from integrative strategic down to detail level;
− Time is managed using mathematical tools to help calculate the time scale.

From this shortlist of criteria, review items or aspects were distilled. A decisive factor to formulate a review item is the extent to what it can contribute to an evaluation in the current field of interest: management and organizational aspects.

Cost (according to the CBS)

The approach towards cost and cost accounting is integrated in part (C) Result / Output.
Organization (according to the WBS)
Regarding organization, Turner pictures a rational and analytical view, called Work Breakdown Structure (WBS). This methodology addresses questions like: What are the skill-sets of people who will do the work? Breaking down a complex into a combination of ‘set of skills’, is the essence of the WBS methodology. This approach sheds light on the importance of skill sets.

Review questions derived from ‘organization’:
A7.1 What is the link between the ‘set of skills’ and e-learning?
A7.2 Does the actual ‘set of skills’ correspond with the e-learning course?
A8 Does e-learning fit to other ways of education and training such as traditional teaching methods, or practical(s).
A3 To what extent does the e-learning course match with the ‘business as usual’?

Quality and Time
The methodology with respect to quality pointed out by Turner is Total Quality Management (TQM). TQM is a quality management method including various techniques, such as quality control, quality assurance, configuration management, procedural manuals and audits. Turner advocates a deterministic and analytical approach towards the management of time. A set of tools such as Critical Path Analysis / Method (CPA/M) and Program Evaluation and Review Technique (PERT) are deployed.

These methods and techniques are quite specific and are therefore less applicable to the e-learning situation at Corus, because the e-learning concept is not yet fully developed and institutionalized. On the other hand, the underlying theory of quality management is a useful insight. This insight was not directly linked to one or more review questions, but were taken into account by formulating some recommendations.

Scope
The last aspect Turner describes is ‘scope’; this concept can be distinguished at three levels:

The integrative level
At this level the general purpose is stated, the basic parameters and constraints are determined. The functional design of a facility (such as e-learning) is developed. Applying this on an e-learning training program: the major elements of the e-learning program and their objectives are defined.
A4.1 The reason(s) for using e-learning are clear.
A4.2 State the ground for the use of e-learning.
The strategic level
Intermediate goals and sub-objectives called milestones are defined. A milestone represents the end of a detached package of work. These milestones are scheduled in the project and a more or less stable plan is developed by the manager(s) involved. Applying this to an e-learning program: the elements will be broken into parts. These parts will form the sessions/lessons. These sessions or lessons are linked to learning objectives.

The tactical or operational level
At this level, the activities required to achieve each milestone are defined. These activities are linked to the responsibilities and resources are addressed to the activities. Applying this to the e-learning course, this will include the script and slides of lectures, structure of exercises, details of tests or exams and so on.

End-users are more appealed to the lower two levels because of their more tangible aspects; such as exams, the setup and lay-out of courses. Therefore it is interesting to what extent the purpose e-learning course is clear.

A6 Is the purpose of e-learning course clear to the users?

Another view on e-learning is the link towards the educational model of change. This implies that any new concept of learning implicates an organizational change (Fullan, 2001). All links in the ‘educational chain’ play key roles in the process of change from traditional learning towards e-learning. According to Fullan, there are several phase models in the educational field. Most common phase model consists of three phases, (1) initiation also called mobilization, adoption and so on, (2) implementation or initial use, and the last phase is called (3) continuation, incorporation, routinization or institutionalization.
Each of these three phases is affected by a number of factors. Below, a shortlist of criteria according to M. Fullan is given:

Factors affecting initiation (also called mobilization), listed in alphabetical order:

- Access to innovation, the accessibility of innovations determines to what extent an institution can operate effectively in this complex system;
- Advocacy from central administration, the major point that should be taken into account is the importance of a ‘visionary’ (a influential person with mandate and vision);
- Community pressure / support / apathy, the major point is the fact that “communities can instigate educational change” (Fullan, 2001 p.61);
- Existence and quality of innovations, which innovations ‘are out there’ and what is there actual quality (what do they provide);
- External change agents or facilitators, they (e.g. consultants) play an important role in the initiation process;
- New policy (federal / state / local), in this respect there are two angles: first, a new policy can initiate developments that otherwise would never happen. Second, new policy can result in more resistance despite the opposite intension(s);
- Problem-solving and bureaucratic orientations;
- Teacher advocacy, this focuses on the teacher as a link in the educational chain. The role that teachers play is crucial because without their support, change is bound to fail. The majority of teachers is willing to innovate, although the direct setting (schools and so on) are not conducive to sustain these innovations. (McLaughlin and Talbert, 2001; Newman and Wehlage, 1995; Rosenholtz, 1989)

Review questions derived from ‘initiation’:
A5 Little slack occurs and little time was lost by the use of the digital learning environment.
A9 Was there enough time to participate in an e-learning course?
A10 Are all requirements met to participate in an e-learning course? Such as a suitable place to study, a personal computer, intranet connection.

Factors affecting implementation or initial use can be divided into three main categories: factors related to the organizational change, local factors and external factors.

The following factors related to characteristics of change (Fullan, 2001):
- The ‘need’ is an important factor in the perception and orientation of the problem and possible solution(s). The need can be defined as the degree to which an organization is aware of the actual demands and unmet requirements.
- Clarity about goals and means, this issue is linked to the preceding aspect of ‘need’. Clarity indicates whether there is a clear perception of the goals of a certain change, and by what means can a solution successfully be implemented?
- Complexity addresses the difficulty and extent of the change that should take place. It is a more or less abstract concept, which can hardly be captured in this type of project evaluations.
- Quality and practicality of the program reflects on the process of change. This issue focuses on the process of change and the characteristics of change, seen in the light of organizational behavior. Also, this is an abstract issue what can not be integrated in this type of project-evaluations without discarding the prior expressed requirements for the evaluation.

The social conditions of change are part of the local factors. The local social setting represents and imposes a set of situational constraints and opportunities for effective change. In this case, the ‘social setting’ involves the social situational factors like the shift(s), user community, colleagues, teachers or tutors and so on. In fact, all involved at local level together form the social context.
External factors, factors resulting from the ‘broader society’. Corus IJmuiden or perhaps Corus at global scale, can be seen as the broader society. It depends on the aggregation level and should be reflected and be consistent with the previously mentioned local factors and social conditions.

Review questions derived or linked to the issue of ‘implementation’:
A1 What was the response time to any questions or problems you mentioned about the e-learning course?
A2 Were the answers to your questions satisfying? To what extent were you satisfied by these answers?
A4 The need or reason to provide this course via e-learning is clear.
A6 The purpose of this e-learning course is clear.

Continuation / Institutionalization of initiated reforms
Once a process of change is initiated and implemented in an organization, the institutionalization and embedding of the change need attention. Imposing the concept of change on an organization does not guarantee adoption and exception of it by the organization in all its facets.
It is hard to put together the criteria to measure the extent of institutionalization of the obtained change. Performance criteria are often factors that are influenced via a complex process. Occasionally, these processes appear to be linear causal processes. In most cases, the complex process has to be simplified with a set of assumptions. Reflecting to e-learning at Corus IJmuiden: Examining the issue of continuation or institutionalization of e-learning at Corus IJmuiden, one could state that optimality is achieved when e-learning is a full-grown educational concept and alternative.

Review questions derived or linked to the issue of ‘continuation / Institutionalization of initiated reforms’:
As described in the previous paragraph, it is very hard to determine the level of institutionalization in a direct manner. The only way to determine this level, is to simplify the process based upon a set of assumptions. Besides this practical hurdle, another problem emerges: Corus IJmuiden is going to implement e-learning, it is not yet implemented. Therefore, the issue of institutionalization was not explicitly part of the evaluation format. Perhaps, some questions or statements might contribute to the perception of institutionalization, but the evaluation format was not meant for this purpose.

3.2.2.2  Ad B  Product / E-Learning Course
The organizational analysis, which was carried out in the first part of this chapter, provided insight in the different fields of interest of the key players involved in the e-learning process. All fields of interest or so called ‘line of approach’ were classified in three categories. This section deals with the second category (B) ‘Product / E-Learning Course’. Several key-players indicated that they were interested in course related aspects. From that point of view, e-learning will be analyzed in an ‘object-oriented way’. In other words: e-learning is an object...
with several characteristics and components. The evaluation statements are formulated in order to acquire insight into these characteristics. For that reason, the level of aggregation is quite low and the statements are more specific.

All interests and remarks in this category can be divided into subcategories:

- the approach of e-learning and how this relates to the context (fit versus misfit);
- accessibility issues in relation to the course content, course structure and transparency of this structure;
- performance and quality in general;

These subcategories are discussed in the paragraph below. The literature review is linked to these subcategories; each category is discussed and placed in the context of available literature.

The approach of e-learning and how this relates to the context (fit versus misfit)

During the interviews conducted to determine the organizational demand, quite a few remarks and assumptions about the approach of e-learning were made. The ‘approach of e-learning’ in general and how e-learning relates to the context it is used in. ‘Designing groupware in the context of its use is the key to producing an effective solution’ (Bock and Marca, 1995). To determine the fit of the e-learning course to the context, the following four review statements were generated:

B1 The approach and structure of the e-learning course matched well to my knowledge and experience of ICT (both hardware and software).
B2 The approach and structure of the e-learning course matched well to my practical experience.
B3 The approach and structure of the e-learning course matched well with previous education.
B8 The e-learning course matched well with my daily work.

B12/13 Questions in course and exams are relevant and up-to-date.

Course structure and transparency of this structure (accessibility of the course (content) and trace ability of the content)

In particular, actors involved in the educational and didactic process were interested in the accessibility of the course content. Main question and concerns that were expressed involved the track and trace ability of the content, and whether the content presented in the right manner. From those involved in the didactical process, there was a clear demand about the self-explanatory capacity of the course content. This resulted in the following review statement:

B4 The e-learning course content was easy to understand.
Besides the content of the course, its internal structure is relevant. In this internal course structure, all pieces of content are composed and linked together. This internal structure determines the way to accesses and to going through the course from start to end. To obtain insight in the success of this internal structure, the following review statements were generated:

B5 The e-learning course content was easy to track and trace within the e-learning course.
B6 The structure and approach of the e-learning course was transparent and easy to understand.
B7 It was straightforward to go through the e-learning course.

Presenting the content in an attractive and appropriate way is crucial. Courses that are meant for on the job learning require suitable lay-out and structures. Besides numerous concrete requirements with respect to the underlying technology, attention for the appearance and interface of the e-learning course is important. Although it might be evident, a good looking design or interface, or even interactive designs are critical success factors (Greenspun, 1997).

B10 The graphical interface consisting of both pictures and animations, are a valuable contribution to the e-learning course.

Performance and quality in general
The performance of e-learning in general and its value perceived by the students, these issues are mentioned in this category. The success of e-learning is determined by quite a large set of factors (Rosenberg, 2001): organizational culture, support from the management and communication. The last factor might be seen as a bonding factor, communication enables the development of a fruitful organizational environment that will support e-learning. This set of factors can be considered organizational requirements for e-learning. Neither the use of e-learning nor its integration can be seen without the management of change. Change management is about ‘moving the organization toward its goals by improving the performance’ (Rosenberg).

B9 If I could choose between attending an e-learning course or a traditional course, I would prefer e-learning.
B11 An e-learning course provides more insight and understanding than a corresponding traditional course.
3.2.2.3 Ad C Result and Output

From the beginning of this research, there has been an organizational demand to determine the return on investment in the e-learning process. Obviously, a proper cost-benefit analysis provides insight in the organizational performance. In this particular case some question arise:

*What is it worth... and can we measure?*

As mentioned earlier in this chapter, there are several analytical approaches towards cost and cost accounting such as the Cost Breakdown Structure methodology (Turner 1999). Analytical cost accounting frameworks like CBS, are based on the assumption that data is available and accurate. Non-tangible factors such as educational value, knowledge level or usefulness of training, determine the overall performance in the educational branch. These factors, in relation to the cost, determine the cost-effectiveness of projects. (Philips, 1985 - 1997). The existence of these non-tangible factors, which are hard to express in monetary value(s), impedes most form of traditional business economical analysis. Nevertheless, it can be done by using a suitable analytical framework and a thorough analysis. Then, there are some hurdles to be taken. For instance, there is hardly any data available about the investments for e-learning on project level; such as man-hours spent on programming, developing content and so on.

Taking this into account: although the return on investment of e-learning projects could have been determined or estimated, it could not be so in a long lasting and structural way. When this organizational and managerial demand to determine the return on investment will persist, the project organization should be modified to allow this type of analysis.
If we know…. Now what?
This question brings up the issue of strategic choices and the bandwidth of these choices. From the late 90’s, Corus IJmuiden explored several solutions to tackle the emerging educational problems. After a thorough selection process, facilitated by external experts and consultants, the e-learning option appeared to satisfy the needs. After this fundamental choice for e-learning was made, the main direction has been defined and cannot easily be altered, although within a certain bandwidth. Despite all this, the organizational demand for a ROI calculation is most of the time proposed to be ‘a go or no go’ to start up e-learning projects. In view of the history as described above, this is quite a strange attitude and should be interpreted as an indication that the organization is not yet fully ready for e-learning (Rosenberg, 2001).

Taking these remarks into account, the focus of this category shifted towards less ROI-focused aspects. There were still a couple of clear organizational demands with respect to the output of the projects and these demands could roughly be divided into two groups; the items related to the course content and usefulness and on the other hand some issues related to the flexibility of e-learning courses.

Review statements with respect to the content and usefulness (fit-misfit):
C2  My daily performance is improved by this e-learning course.
C3  My insight and understanding of process(es) and technical installation(s) is improved by this e-learning course.
C4  The e-learning course satisfied my expectations.
C6  After following this e-learning course, I can more easily solve daily problems.

Review statements to determine the flexibility of e-learning:
C1  The e-learning course takes less time than a traditional classroom course.
C5  If the course was not available by e-learning, I would not have been able to attend the course.
### 3.3 Developing the Evaluation Prototype

This section is about the construction of the prototype of the evaluation tool. In the previous section (3.2) the format and content of the evaluation tool is conceptualized.

Below, all review statements are listed in one table. Note that due to the chosen evaluation format (3.2.1), a stated preference model, the list only contains statements formulated in a positive sense. Therefore, there may be minor differences in the formulation of some statements.

<table>
<thead>
<tr>
<th>A1</th>
<th>‘Any questions that I sent in about e-learning (for instance by e-mail) were answered in a satisfying and quick manner.’</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>‘Questions related to the content of an e-learning course were answered in a satisfying and quick manner (for instance by a tutor or co-worker).’</td>
</tr>
<tr>
<td>A3</td>
<td>‘The problems that I encounter on a daily basis are described in the course.’</td>
</tr>
<tr>
<td>A4</td>
<td>‘The reason why this course was offered and facilitated by e-learning, is clear to me.’</td>
</tr>
<tr>
<td>A5</td>
<td>‘There was no or very little time-loss due to problems with the LMS (Whizzdom).’</td>
</tr>
<tr>
<td>A6</td>
<td>‘The purpose of this e-learning course is clear.’</td>
</tr>
<tr>
<td>A7</td>
<td>‘The e-learning course matched well to the other course related information (such as process description and protocols).’</td>
</tr>
<tr>
<td>A8</td>
<td>‘The e-learning matched well to the other course components’</td>
</tr>
<tr>
<td>A9</td>
<td>‘There was enough time, or time could be arranged, during my shift to attend an e-learning course.’</td>
</tr>
<tr>
<td>A10</td>
<td>‘All requirements such as a suitable study-place, computer and intranet were met.’</td>
</tr>
<tr>
<td>B1</td>
<td>‘I had sufficient knowledge about computers to attend the e-learning course.’</td>
</tr>
<tr>
<td>B2</td>
<td>‘The e-learning course matched well with my practical knowledge.’</td>
</tr>
<tr>
<td>B3</td>
<td>‘My preparatory training matched well with the e-learning course content.’</td>
</tr>
<tr>
<td>B4</td>
<td>‘The content was easy to understand.’</td>
</tr>
<tr>
<td>B5</td>
<td>‘The course content was easy to find in the e-learning course.’</td>
</tr>
<tr>
<td>B6</td>
<td>‘The lay-out and structure of the e-learning course was transparent and easy to understand.’</td>
</tr>
<tr>
<td>B7</td>
<td>‘It is clear and transparent how to go through the e-learning course.’</td>
</tr>
<tr>
<td>B8</td>
<td>‘The e-learning course matched well with my daily work.’</td>
</tr>
<tr>
<td>B9</td>
<td>‘If I had a choice, I would prefer an e-learning course instead of traditional classroom education.’</td>
</tr>
<tr>
<td>B10</td>
<td>‘The graphical interface (e.g. an image, video and/or animation) was useful and provided more insight.’</td>
</tr>
<tr>
<td>B11</td>
<td>‘E-learning provides more insight in the course content than a traditional classroom course.’</td>
</tr>
<tr>
<td>B12</td>
<td>‘Questions in the e-learning course and/or in the question database are relevant.’</td>
</tr>
<tr>
<td>B13</td>
<td>‘Questions in the e-learning course or in the question database match well with the situation at my work.’</td>
</tr>
<tr>
<td>C1</td>
<td>‘The e-learning course takes less time than a traditional classroom course.’</td>
</tr>
<tr>
<td>C2</td>
<td>‘I have improved my daily work, due to this e-learning course.’</td>
</tr>
<tr>
<td>C3</td>
<td>‘My insight in the production process and technical installation has been improved by the e-learning course.’</td>
</tr>
<tr>
<td>C4</td>
<td>‘The e-learning course fully met my expectations.’</td>
</tr>
<tr>
<td>C5</td>
<td>‘If the course would have been given in the traditional classroom setting, I would not have been able to attend the course.’</td>
</tr>
<tr>
<td>C6</td>
<td>‘This e-learning course enables me to solve daily problems in a better way (like malfunctions in installations etc.).’</td>
</tr>
</tbody>
</table>
This evaluation content was put into an evaluation format constructed according to the requirements listed in the previous section (3.2.1). The review statements together with the evaluation format was merged into the evaluation prototype: the e-learning evaluation questionnaire.

### E-Learning Evaluation Format

<table>
<thead>
<tr>
<th>Statement</th>
<th>fully agree</th>
<th>agree</th>
<th>disagree</th>
<th>Strongly disagree</th>
<th>don't know / can't tell</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Code</td>
<td>Statement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>'I had sufficient knowledge about computers to attend the e-learning course.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>'The e-learning course matched well with my practical knowledge.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>'My preparatory training matched well with the e-learning course content.'</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B4</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B5</td>
<td>'The course content was easy to find in the e-learning course.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B6</td>
<td>'The lay-out and structure of the e-learning course was transparent and easy to understand.'</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B7</td>
<td>'It is clear and transparent how to go through the e-learning course.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B8</td>
<td>'The e-learning course matched well with my daily work.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B9</td>
<td>'If I had a choice, I would prefer an e-learning course instead of traditional classroom education.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B10</td>
<td>'The graphical interface (e.g. an image, video and/or animation) was useful and provided more insight.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B11</td>
<td>'E-Learning provides more insight in the course content than a traditional classroom course.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B12</td>
<td>'Questions in the e-learning course and/or in the question database are relevant.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B13</td>
<td>'Questions in the e-learning course or in the question database match well with the situation at my work.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>'The e-learning course takes less time than a traditional classroom course.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>'I have improved my daily work, due to this e-learning course.'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>'My insight in the production process and technical installation has been improved by the e-learning course.'</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C5</td>
<td>'If the course was given in the traditional classroom setting, I would not have been able to attend the course.'</td>
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<td></td>
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</tr>
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<td>C6</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.4 Application of the Evaluation Tool to Several Pilot Projects

The last step of this research involves a ‘pilot evaluation’. A couple of e-learning pilot projects were evaluated using the prototype of the evaluation tool. The selection process and description of e-learning projects that were evaluated, together with the data analyzing are described in the fourth chapter called ‘Data Collection and Analysis’.

This last step, the pilot evaluation, consists of two parts:
1. Carry out a small number of face-to-face evaluations by using the evaluation questionnaire in combination with interviews.
2. Evaluation on a non face-to-face basis, using the evaluation questionnaire with a larger amount of respondents.

Face-to-face evaluation by using the evaluation questionnaire

The first project evaluation was carried out at the Hot Strip Mill. The selection of the respondents was based on the user-data of the training coordinator H. Dekker. The criteria for the user selection were of a pragmatic kind. Users were selected who had recently attended an e-learning course and/or recently passed the e-learning examination. This was the first time the evaluation-questionnaire was used in practice. Because it was a prototype, the questionnaire was completed in combination with an interview. The goal of this interview was threefold:

- Checking the self-explanatory capacity of the questionnaire, and in case this appeared to be insufficient extra explanation and background information was provided.
- Reviewing the questionnaire and find out whether the tool needs refinement. (Determining whether the questions were appropriate and formulated in the right way.)
- Acquiring additional remarks and revealing the motivation behind the preference stated in the questionnaire. For some review statements, the underlying reasoning for the given answer appeared to be very interesting.
Evaluation by using the evaluation questionnaire on a larger scale

In this phase, the fine-tuned questionnaire was applied on a larger scale. Initially, all respondents received a hard copy of the evaluation questionnaire. After completion these questionnaires were collected or (e-)mailed. Unfortunately, this process appeared to be very time consuming; for instance, gathering just a couple of questionnaires took up to a week. For that reason the hard copy questionnaire was replaced by a questionnaire in an e-mail client based HTML format. The Word-file was transformed into a HTML-page that could be submitted and mailed by any e-mail client (e.g. Microsoft Outlook). Respondents were addressed and provided with the HTML questionnaire by e-mail. After filling in the digital questionnaire the respondent could submit the form and the results of the questionnaire were automatically returned.
4 Data Collection and Data Analysis

After the prototype of the evaluation format had been constructed, it was applied to some e-learning pilot projects in order to answer the second sub-research question: “(B) What are the results and experiences of some e-learning pilot projects within Corus IJmuiden, by using this evaluation format?” (as formulated in 2.3). This chapter deals with the data collection and the analysis and processing of the acquired data. The chapter is organized in three sections: In the first section (4.1), the selection of the e-learning projects that have been evaluated is discussed. Each e-learning project is briefly described and the players involved are mentioned. The following section (4.2), covers the process of data analysis and the statistical method used to obtain more general information from the individual evaluation results. In the last section (4.3), a reflection on the data analysis and statistical method is given.

4.1 Data Collection: Project Selection

This section is about the selection of the e-learning pilot projects that were evaluated. There are seven subsections, each describing one of the e-learning pilot projects.

Selection criteria

The criteria to select these projects were quite simple and straightforward;
- the projects should be up and running for some time, so that enough users could be selected;
- for each project, a dedicated key-player should easily be identified ensuring cooperation throughout the evaluation process.

Projects that satisfied the two given criteria are discussed in the following seven sections. For reasons of clarity and overview, in each section the following topics are addressed:
- project description and context of the project
- (local) key-player(s) or organizational setting involved
4.1.1 Hot Strip Mill

The Hot Strip Mill (HSM) is quite a large factory producing strip product by ‘hot rolling’. At the HSM solid slabs are processed into relatively thin strip, by milling at high temperature.

One of the first initiatives with respect to e-learning was initiated at the HSM. In the late 90’s, the first steps were taken in the process of change towards an e-learning oriented educational service. There are various e-learning courses up and running for quite some time. The majority of these courses are intended for the education at ‘operational level’. In other words, these courses are intended to deliver basic and fundamental knowledge for the operational process. There are courses for various installations at various locations in the factory. All courses share the same structure, lay-out and functionalities. Because these courses are fairly similar, they are put into one single group that will be referred to as ‘HSM (courses)’.

At the HSM, there are several people involved in the educational process. Hans Dekker is one of them and can be considered a dedicated e-learning key-player. During several interviews and meetings he, together with Hilda Groen, provided insight in the e-learning courses and processes at the HSM.

4.1.2 ICT / Software courses

The Corus Training Center (CTC) provides several courses for the factories throughout the site of Corus IJmuiden, among which ICT or Software courses. These courses are available for widespread standard software, like the Microsoft Office package. All courses are ‘off-the-shelf’ packages, provided by external parties. The different courses are similar in structure, lay-out and functionalities. Therefore, these e-learning Software courses form one single group.

These e-learning courses are supplied by CTC, as a central service towards all factories at the site. Louis Mogaburo Jurado was the training coordinator for both e-learning and traditional courses until November 2004, when Jan Dekker succeeded him.
4.1.3 **Coated Products**

E-Learning at the factory of Coated Products is mainly used for introductory courses for new employees and meant to explain and clarify the basic processes. Next to it, there are several meetings to start-up and boost the use of the ‘knowledge-bank’. This is a database containing various information about the basic production processes of ‘coating’. Unfortunately, there has been no possibility to evaluate these e-learning trainings, due to several reasons varying from lack of a suitable response group to ICT-related problems resulting in substantial delay.

The key-player at Coated Products is Rob Smit, who is involved in the developing and facilitation of e-learning. Due to his personal preferences, the courses at Coated Products are mainly video-based or use a lot of graphics or animations. All e-learning material at Coated Products is clearly marked by the hand of Rob Smit. This in itself does need not be problematic, provided this knowledge and process is made explicit.

4.1.4 **Corus Packaging Plus**

Corus Packaging Plus (CPP) is one of the factories producing thin plate for the use as packing material. During the research period, there were a couple of e-learning courses already up and running and some other courses were under construction. A CPP quite a few people are involved in the e-learning process. Although interest and commitment with respect to this research were present at the educational staff, the evaluation of the projects failed. The cause for it was mainly the non-cooperative attitude of the end-users, resulting in minimal response.

4.1.5 **E-Environment**

Due to external regulations, large industries like Corus have to provide courses about environmental issues in relation to their activities. Corus chose to not purchase or develop a tailor-made course, but started the process to obtain a semi-tailor-made course. In the end, an ‘E-Environment course’ was supplied by ‘Search BV’. This course was provided and facilitated by CTC as a central service towards the factories all over the site.

At CTC, Willemieke Hof was the training coordinator involved in both the E-Environment course and the VCA course (see below).
4.1.6 Stripping (Beitsbaan22)

As a result of external factors such as temperature, humidity etc. the strip products suffer from oxidation. This thin layer of oxidation has to be removed before other processes, e.g. to apply coatings, can be carried out. At the stripping site (in Dutch called: ‘Beitsbaan’), an acid based immersing-stripping process is carried out. After this ‘acid bath’, the steel strip is washed, dried and in the end ready to be processed. There are some e-learning courses up and running at the stripping section. Wijnand Budingh is the local training coordinator at the stripping site. Unfortunately, as a result of personal matters there has not been any cooperation during the research period.

4.1.7 VCA (Basic Safety Course)

VCA is a course about the Basic Safety rules, originally intended for the use at construction sites. Corus IJmuiden is using this Basic Safety course to ensure minimal understanding of safety regulations for both internal as external workers. From 2004 on, VCA courses will only available by e-learning.

The training coordinator, Willemieke Hof is located at CTC. She is involved in both VCA and the E-Environment course.

4.1.8 Response Rates

The initial aim of the data collection was to invite course participants from all six projects. As mentioned in the preceding seven subsections, five out of seven projects were evaluated. The evaluation of these projects was done in two steps as described in section 3.4.

The first project, Hot Strip Mill, was evaluated by face-to-face evaluation using the evaluation questionnaire. All respondents were selected by the local training coordinator and have been informed by their superior. This resulted in a remarkably high response rate of 88%. Nearly all respondents of the other three projects were addressed on a non face-to-face basis. In the table below the response rates are listed.

<table>
<thead>
<tr>
<th>project</th>
<th>response</th>
<th>invitations</th>
<th>response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Strip Mill</td>
<td>14</td>
<td>16</td>
<td>88%</td>
</tr>
<tr>
<td>E-Environment</td>
<td>21</td>
<td>112</td>
<td>19%</td>
</tr>
<tr>
<td>Software</td>
<td>13</td>
<td>43</td>
<td>30%</td>
</tr>
<tr>
<td>Basic Safety</td>
<td>8</td>
<td>15</td>
<td>53%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>56</strong></td>
<td><strong>186</strong></td>
<td><strong>47%</strong></td>
</tr>
</tbody>
</table>

**mean response rate** 47%

**table 4** Response rates of the four projects, selected for the pilot evaluation.
4.2 Data Analysis and Statistical Processing

This section is about the basic principle of a meta-evaluation and how it was conducted in this case study. How do the results of all e-learning project evaluations relate to each other? A meta-evaluation can help to find out whether there are any similarities between these results. In a meta-evaluation, the outcomes of all project-evaluations are compared and checked for mutual consistency and similarity. The main question is whether there is coherence in the results between projects. This is formulated in the following assumption of independence (H0):

‘The result of a review question is independent of the project.’ The result of a review question is the distribution of the responses over the given response classes:

- Fully agree;
- Agree;
- Disagree;
- Fully disagree;

The last class: ‘Do not know / not applicable’ is the exit option for those respondents who were not able to give a valid response. This class doesn’t provide any (further) insight in the rejection or acceptance of a certain statement and therefore is ignored in the statistical analysis.
An adequate method to test whether the assumption of independence holds, is the Chi-square test. It will be demonstrated by applying it on the first review question (a1): ‘(A1) Any questions that I sent in about e-learning (for instance by e-mail) were answered in a satisfying and quick manner.’ The respondents in all four projects indicated to what extent they agree or disagree with this proposition. The distributions of the results for all four projects are listed in the contingency table below.

<table>
<thead>
<tr>
<th>A1</th>
<th>Score →</th>
<th>Fully agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Fully disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project ↓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSM</td>
<td>3</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>E-Environment</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>VCA</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>24</td>
<td>3</td>
<td>3</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

Table 5   Distribution of the results from four projects and totals.

Under the assumption of independence, the distribution of the total in the last row of the table above (underlined in the table) over the four response classes should return in all projects. Based on this assumption, a table of expected values is calculated.

For instance, the first row (HSM) of expected values (often also called fitted values) is calculated in the following manner:

\[(8/38) \times 13 \approx 2,737\]
\[(24/38) \times 13 \approx 8,211\]
\[(3/38) \times 13 \approx 1,026\]
\[(3/38) \times 13 \approx 1,026\]

The full table of expected values under the assumption of independence of the classifying factors score and project is presented below.

<table>
<thead>
<tr>
<th>A1</th>
<th>Fitted Score →</th>
<th>Fully agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Fully disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project ↓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSM</td>
<td>2,737</td>
<td>8,211</td>
<td>1,026</td>
<td>1,026</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>E-Environment</td>
<td>2,526</td>
<td>7,579</td>
<td>0,947</td>
<td>0,947</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>VCA</td>
<td>1,263</td>
<td>3,789</td>
<td>0,474</td>
<td>0,474</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>1,474</td>
<td>4,421</td>
<td>0,553</td>
<td>0,553</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>24</td>
<td>3</td>
<td>3</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

Table 6 Expected values under independence.
The following table provides the standard errors (se) of the corresponding estimated (fitted) scores.

<table>
<thead>
<tr>
<th>Score →</th>
<th>se</th>
<th>Fully agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Fully disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project ↓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSM</td>
<td>1,1468</td>
<td>2,4939</td>
<td>0,6356</td>
<td>0,6352</td>
<td></td>
</tr>
<tr>
<td>E-Environment</td>
<td>1,0777</td>
<td>2,3806</td>
<td>0,5916</td>
<td>0,5912</td>
<td></td>
</tr>
<tr>
<td>VCA</td>
<td>0,6506</td>
<td>1,6165</td>
<td>0,3259</td>
<td>0,3257</td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>0,7242</td>
<td>1,7583</td>
<td>0,3705</td>
<td>0,3703</td>
<td></td>
</tr>
</tbody>
</table>

Table 7  Standard errors of fitted values.

The next step is to determine whether the assumption of independence holds; to this end the ‘chi-square goodness of fit’ is calculated. For instance, the first row (HSM) is calculated in the following way:

\[(3 - 2,737)^2/2,737 \approx 0,025\]
\[(10 - 8,211)^2/8,211 \approx 0,39\]
\[(0 - 1,026)^2/1,026 \approx 1,026\]
\[(0 - 1,026)^2/1,026 \approx 1,026\]

These Chi-square contributions are displayed in the table below.

<table>
<thead>
<tr>
<th>Chi2contributions</th>
<th>Score →</th>
<th>se</th>
<th>Fully agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Fully disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project ↓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSM</td>
<td>0,025</td>
<td>0,39</td>
<td>1,026</td>
<td>1,026</td>
<td>2,468</td>
<td></td>
</tr>
<tr>
<td>E-Environment</td>
<td>0,922</td>
<td>0,329</td>
<td>1,17</td>
<td>4,447</td>
<td>6,868</td>
<td></td>
</tr>
<tr>
<td>VCA</td>
<td>0,43</td>
<td>0,164</td>
<td>0,585</td>
<td>0,474</td>
<td>1,653</td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>0,188</td>
<td>0,076</td>
<td>0,553</td>
<td>0,553</td>
<td>1,369</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,565</td>
<td>0,959</td>
<td>3,333</td>
<td>6,5</td>
<td>12,358</td>
<td></td>
</tr>
</tbody>
</table>

Degrees of freedom (df) 9
Pvalue 0,1939

Table 8  Chi-square contributions.
The total of all Chi-square contributions is called the Chi-square test-statistic (underlined value in the table above). Usually the Chi-square statistic is judged for evidence of dependence in the table by calculating its P-value from its limiting (asymptotic) distribution, which is indeed a chi-square distribution with 9 degrees of freedom. Here we could not safely rely on this asymptotic P-values, since too many cells in the contingency tables (not only in question A1) have very small expected values. So instead we determined P-values from the exact distribution of the test-statistic by using the statistical software StatXact. We find that the probability of 12,36 or a larger value, \( P(X \geq 12.36) \), in this case is 0.19 (19%), which is not significant at a significance-level of 0.05 (5%) that we have chosen. Therefore, the assumption of independency is not rejected. The distributions over the response classes, for this specific review questions (A1) may be considered to be similar for all four projects, apart from random fluctuations. Hence the four projects may be merged to give the following table:

<table>
<thead>
<tr>
<th>Score →</th>
<th>Fully agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Fully disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>All projects</td>
<td>21%</td>
<td>63%</td>
<td>8%</td>
<td>8%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Therefore, based on this analysis the following statements can be concluded:
- 84% of the respondents agree with the statement: ‘Any questions that I sent in about e-learning (for instance by e-mail) were answered in a satisfying and quick manner.’ One quarter of this group even fully agrees with the statement;
- 16% of the respondents did not agree, half of this group even ‘fully disagreed’.

The interpretation of these results is part of the following section. Now that the underlying principle of the meta-evaluation is demonstrated, the results for all evaluation questions are given in the following section.
4.3 Reflection on Data Analysis and Statistical Method

The analytical method to compare project evaluations and derive general results from several projects was discussed in the previous section. In this section, some additional remarks about this statistical analysis and methodology are mentioned.

The basis of the analytical methodology is to conduct a statistical analysis using a chi-square test for independence in a two-way contingency table. The statistical analysis in this chapter is not meant as formal or even rigid statistics, but rather as a means to obtain overall insight in the results. When implementing an evaluation process, a statistical analysis such as described in this chapter can be used to derive general recommendations. When conducting a statistical analysis, the objective of the evaluation should be kept in mind. The aim of this research is to derive general conclusions, therefore the statistical analysis is a functional method.

Earlier on in this report (3.4), it is mentioned that the background information or motivation of the respondents is of great importance. The results of the meta-evaluation are clear and unambiguous. This might result in a tendency to jump to conclusions about the underlying motivation. For instance: Regarding to the reasoning to provide a course by e-learning (A4), just around 80% indicated that ‘the reason to provide this course by e-learning is clear’. This does not necessarily imply that they also agree with this reason. In fact, some respondents clearly stated that they disagree with the underlying strategic choice. Although some ‘conclusions’ might concur with the results, they cannot directly be derived from the results! Therefore, the additional interviews plus comments and remarks that were received by the (digital) evaluation questionnaires should be used as a justification for such conclusions. This information enhanced the insight in the context and underlying factors that play a role in the e-learning processes. In all cases, the motivation and underlying factors that lead to the outcome should be well examined. Some questions should be revised or adjusted to acquire specific data.
During the evaluation process, it became clear that communication and mutual interest play an important role. The vast majority of the respondents appreciated the possibility to express their opinion about e-learning and the new educational concept. Besides this appreciation, a strong demand for information and background of e-learning was present. During the process of data collection both by interviews and by e-mail, the importance of communication and bilateral interest became visible. These factors can contribute to a valuable change of attitude and increase of commitment. In the end this will lead to ‘organizational citizenship behaviors’ (OCB’s): forms of positive behavior that are beyond the scope of the formal contract or obligation (Verburg and den Hartog, 2001). This effect is due to commitment as a result of the psychological contract between employee and ‘firm’. The fundamental idea of OCB’s is: The willingness to go beyond the formal contract, also called commitment. To make optimal use of this commitment or psychological contract, an (continuous) evaluation process can be used.

In other words; evaluation serves multiple purposes. Besides acquiring data and information for process improvement, it can be used as a multilateral instrument in the education chain within a complex network.
5 Results

In this chapter, the results of the pilot evaluations are discussed. The analyzing and statistical processing of the obtained evaluation data, resulted into two categories:

- general results (5.1)
- specific results (5.2)

In the first section, insight is given in the common outcomes of the evaluation results. In other words; the general outcome or outcome that is independent of the project(s). Therefore, the third research question can be answered: “(C) What are the outcomes of a meta-evaluation of the experiences with e-learning at Corus IJmuiden?”

Some results appeared to depend on the project that was evaluated. These 'specific' results are used to answer the second research sub-questions (2.3): “(B) What are the results and experiences of some e-learning pilot projects within Corus IJmuiden (by using a standardized evaluation format)?”

5.1 General Results, Based on the Meta-Evaluation

In the previous chapter (4.2), the methodology of the chi-square test was explained. In this section, the results of the chi-square test for all 29 review questions will be discussed. The first step is to reflect on the results of the chi-square test, followed by an interpretation of the numerical values. Because the interpretation of these numerical results can hardly be done without underlying information or background information, extra interviews and feedback from the respondents were used to generate a qualitative interpretation of the results. Each quote is derived from the remarks that came along with the evaluation results, or was acquired by extra interviews.
The results of the chi-square test for all review questions are listed in the table below. The first column indicate which review question has been analyzed (A = organization and management, B = product / course, C = output). If the hypothesis of independence was not rejected, in the last column ‘v’ is shown. When independence was rejected, a ‘x’ is listed, in which case the question number in the first column is underlined.

<table>
<thead>
<tr>
<th>Question</th>
<th>Chi² test-statistic</th>
<th>Pvalue</th>
<th>Significance (v=no, x=yes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>12.36</td>
<td>0.19</td>
<td>v</td>
</tr>
<tr>
<td>A2</td>
<td>12.19</td>
<td>0.18</td>
<td>v</td>
</tr>
<tr>
<td>A3</td>
<td>19.53</td>
<td>0.02</td>
<td>x</td>
</tr>
<tr>
<td>A4</td>
<td>12.64</td>
<td>0.17</td>
<td>v</td>
</tr>
<tr>
<td>A5</td>
<td>11.45</td>
<td>0.25</td>
<td>v</td>
</tr>
<tr>
<td>A6</td>
<td>9.66</td>
<td>0.38</td>
<td>v</td>
</tr>
<tr>
<td>A7</td>
<td>12.70</td>
<td>0.17</td>
<td>v</td>
</tr>
<tr>
<td>A8</td>
<td>14.42</td>
<td>0.09</td>
<td>v</td>
</tr>
<tr>
<td>A9</td>
<td>12.93</td>
<td>0.16</td>
<td>v</td>
</tr>
<tr>
<td>A10</td>
<td>10.11</td>
<td>0.34</td>
<td>v</td>
</tr>
<tr>
<td>B1</td>
<td>6.62</td>
<td>0.37</td>
<td>v</td>
</tr>
<tr>
<td>B2</td>
<td>7.10</td>
<td>0.32</td>
<td>v</td>
</tr>
<tr>
<td>B3</td>
<td>16.09</td>
<td>0.06</td>
<td>v</td>
</tr>
<tr>
<td>B4</td>
<td>16.72</td>
<td>0.03</td>
<td>x</td>
</tr>
<tr>
<td>B5</td>
<td>19.93</td>
<td>0.02</td>
<td>x</td>
</tr>
<tr>
<td>B6</td>
<td>4.80</td>
<td>0.92</td>
<td>v</td>
</tr>
<tr>
<td>B7</td>
<td>6.90</td>
<td>0.69</td>
<td>v</td>
</tr>
<tr>
<td>B8</td>
<td>23.74</td>
<td>0.00</td>
<td>x</td>
</tr>
<tr>
<td>B9</td>
<td>15.02</td>
<td>0.09</td>
<td>v</td>
</tr>
<tr>
<td>B10</td>
<td>8.27</td>
<td>0.54</td>
<td>v</td>
</tr>
<tr>
<td>B11</td>
<td>6.29</td>
<td>0.76</td>
<td>v</td>
</tr>
<tr>
<td>B12</td>
<td>9.97</td>
<td>0.35</td>
<td>v</td>
</tr>
<tr>
<td>B13</td>
<td>11.91</td>
<td>0.21</td>
<td>v</td>
</tr>
<tr>
<td>C1</td>
<td>11.88</td>
<td>0.22</td>
<td>v</td>
</tr>
<tr>
<td>C2</td>
<td>10.93</td>
<td>0.29</td>
<td>v</td>
</tr>
<tr>
<td>C3</td>
<td>9.88</td>
<td>0.13</td>
<td>v</td>
</tr>
<tr>
<td>C4</td>
<td>7.13</td>
<td>0.66</td>
<td>v</td>
</tr>
<tr>
<td>C5</td>
<td>5.81</td>
<td>0.81</td>
<td>v</td>
</tr>
<tr>
<td>C6</td>
<td>7.31</td>
<td>0.64</td>
<td>v</td>
</tr>
</tbody>
</table>

Table 9  Chi-square test-statistics and P-values for all review questions.
The chi-square test indicates that the assumption of independence must be rejected for four out of 29 questions (A3, B4, B5 and B8). That indicates that the distributions of the answers over the response categories depend on the project. Therefore, these results will be mentioned in the following subsection ‘Project Evaluations’. The outcomes of all 26 other questions are subsequently discussed below in the following outline. The additional information from interviews and feedback from the respondents, as mentioned above, were used to generate a qualitative interpretation of the results. For each statement the distribution between pro and contra is mentioned. For both the pro and contra parts, additional information and motivation are given. Comments or citations from the interviews are indicated by quotation marks.

The following structure is used to describe the results in detail;
- The number and statement is given, respondents indicated to what extent they agree or disagree;
- In a one-row table, the distribution over the four response categories is given;
- Nearly all results are described and illustrated by the information and comments acquired in additional interviews.

A1
‘Any questions that I sent in about e-learning (for instance by e-mail) were answered in a satisfying and quick manner.’

<table>
<thead>
<tr>
<th>% fully agree</th>
<th>% agree</th>
<th>% disagree</th>
<th>% fully disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>21,05%</td>
<td>63,16%</td>
<td>7,89%</td>
<td>7,89%</td>
</tr>
</tbody>
</table>

In general, most respondents (84%) had a positive opinion about the feedback and the response time regarding to e-learning related questions. One quarter of this group even fully agrees with the statement. A small group did not agree with the statement and indicated that they didn’t receive any reaction or the reaction was very late.

An important remark on this item: ‘...the communication (mainly by e-mail) was impersonal and sometimes even discourteous...’.

A2
‘Questions related to the content of an e-learning course were answered in a satisfying and quick manner (by for instance a tutor or co-worker)’

<table>
<thead>
<tr>
<th>% fully agree</th>
<th>% agree</th>
<th>% disagree</th>
<th>% fully disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,26%</td>
<td>76,32%</td>
<td>7,89%</td>
<td>10,53%</td>
</tr>
</tbody>
</table>

During the interviews it became clear that the social context of e-learning is of major importance. In each shift, of approximately nine persons, there are experienced workers (senior) and a couple of inexperienced freshly recruited workers (juniors). Within these shifts, the senior workers share there (tacit) knowledge about best practices and so on. On the other
hand, the junior workers share their fresh insights and sometimes more up-to-date knowledge. Therefore, 82% indicated that they got enough feedback about unclear issues or other problems related to the e-learning course. This should be seen in the light of a strong learning community: Learning is not limited to individual level but also comprises a form of ‘collective’ knowledge sharing and learning. Social interaction is a very important aspect in these processes.

Approximately 18% did not agree with the statement, the motivation and main criticism was about the lack of content related support, e.g. from a teacher.

A4
‘The reason why this course was offered and facilitated by e-learning, is clear to me.’

% fully agree% agree% disagree% fully disagree
17,86% 62,50% 12,50% 7,14%

Although the majority (80%) indicated to agree with the statement, a remarkable large part of these respondents and those who disagreed, gave the following feedback: ‘...the reasoning about e-learning is clear, but I do not agree with the logic or strategic choice that have been made...’. Interesting is the lack of understanding and insights in the fundamental choice for e-learning. Clearly, even at higher levels within the organization e-learning is not well advocated.

A5
‘There was no or very little time-loss due to problems with the LMS (Whizzdom).’

% fully agree% agree% disagree% fully disagree
11,11% 38,89% 31,48% 18,52%

Half of the respondents encountered problems with the LMS and were delayed. The other half did not have any problems.

This statement should be refined, because it was somewhat confusing. The distinction between the e-learning course and the LMS is vague for most participants. Therefore, some problems that occurred in a particular course were marked as ‘LMS related problems’.

A6
‘The purpose of this e-learning course is clear.’

% fully agree% agree% disagree% fully disagree
21,82% 67,27% 7,27% 3,64%

Although a vast majority (almost 90%) does agree with the statement, those who disagreed gave the following motivation: ‘...without any announcement or introduction I received an e-mail with a login name and password for a course ...’. The majority of the people had no idea
what this email was about. Later on it became clear which course they were supposed to participate in. Based on the outcomes and underlying motivation, it is clear that large improvements can be obtained in the field of communication and appropriate initiation of the e-learning course.

A7
‘The e-learning course matched well to the other course related information (such as process description and protocols).’

% fully agree% agree% disagree% fully disagree
10,00%  57,50%  25,00%  7,50%

The most common complaint expressed by one third (32,5%) of the respondents involved the misfit between business as usual and the e-learning course. Procedures on ‘daily basis’ were not mentioned in the e-learning course, or did not correspond very well. Nevertheless, the majority of 68% indicated that the e-learning course did match course related information.

A8
‘The e-learning course matched well to the other course components such as classroom meetings and practicals.’

% fully agree% agree% disagree% fully disagree
6,45%  54,84%  25,81%  12,90%

It became clear that there were very few additional classroom meetings and practicals. This lead to a small number of valid respondents (31 persons could react on the statement).

A9
‘There was enough time, or time could be arranged, during my shift to attend an e-learning course.’

% fully agree% agree% disagree% fully disagree
16,67%  48,15%  29,63%  5,56%

Each participant has access to an e-learning course for a period of maximum one year. The issue of time and time availability, brought up an interesting paradox: all respondents agreed that e-learning offers great flexibility to attend a course. A course can be attended at any time and any place. On the other hand, this flexibility does not offer any clear timeframe or deadline(s). A large amount of the respondents indicated that the lack of a fixed time frame resulted in undisciplined study behavior. Students indicated that they started the e-learning course at the last moment (e.g. in week 47, when 52 weeks are available). Therefore, the wide time slot of 52 weeks (1 year) is seldom used.
‘All requirements such as a suitable study place, computer and intranet were met.’

% fully agree% agree% disagree% fully disagree
34,55%  50,91%  10,91%  3,64%

Even though all participants attended the e-learning course in the direct work environment, which can be seen as non ICT related, 85% indicated that the requirements were met. Often, an important additional remark was made: “...the primary business processes or core business, always prevails. Therefore, sometimes it occurs that the computer is claimed for core business purpose(s) at the expense of e-learning...”

‘I had sufficient knowledge about computers to attend the e-learning course.’

% fully agree% agree% disagree% fully disagree
20,75%  71,70%  7,55%  0,00%

Barely 8% of the respondents encountered problems related to insufficient computer knowledge, when attending an e-learning course. This minority indicated that they encountered some problems, which, however, could easily be solved or straightened out. The respondents frequently stated: ‘...colleagues and fellow course participants provide ‘first line support’ when it comes to computer related problems...’

‘The e-learning course matched well with my practical knowledge.’

% fully agree% agree% disagree% fully disagree
16,36%  67,27%  16,36%  0,00%

‘My preparatory training matched well with the e-learning course.’

% fully agree% agree% disagree% fully disagree
18,87%  67,92%  9,43%  3,77%

Ad B2 and B3

During the interviews it became clear that the statements B2 and B3 are perceived to be somewhat similar. Therefore, it is recommended to sharpen the statements and provide insights in the definition of ‘preparatory training’ and ‘practical knowledge’. This can easily be achieved by some examples to make both terms more explicit.

Roughly 15% indicated a misfit between the e-learning course and ‘preparatory training’ or ‘practical knowledge’. This specific outcome should carefully be examined, and the following context should be taken in to account: Several respondents indicated that the e-learning
course did not match well with their practical knowledge neither with their preparatory training’. This was due to the fact that the e-learning course was their first (basic) training as they were junior employees. This bias is only present in the situation of ‘basic training’ or for those who are ‘new’ in a specific production setting.

B6
‘The lay-out and structure of the e-learning course was transparent and easy to understand.’
% fully agree% agree% disagree% fully disagree
19,64% 69,64% 8,93% 1,79%
Approximately 10% find that the structure and lay-out of the course are not transparent and easy to understand. The majority of roughly 90% agrees with the statement.

B7
‘It is clear and transparent how to go through the e-learning course.’
% fully agree% agree% disagree% fully disagree
8,93% 60,71% 26,79% 3,57%
About 30% disagree with the statement, and find the structure or ‘path’ through the course is unclear.

Ad B6 and B7
There is almost no frequently expressed additional comment, some point out that: ‘...the lay-out is not user-friendly, a lot of ‘mouse movements’ are necessary to click through the course. Minor adjustments in the lay-out can take away this nuisance...’

B9
‘If I had a choice, I would prefer an e-learning course instead of traditional classroom education.’
% fully agree% agree% disagree% fully disagree
13,46% 38,46% 25,00% 23,08%
This statement brings up a lot of comments and additional feedback. There are various motivations given pro and contra, but there are a few common aspects:
Pro: Those respondents who agree, indicate that the flexibility of e-learning is the decisive factor. E-learning enables them to follow a course in their own pace, timeframe and setting (place).
Con: The most frequently heard comments about e-learning are: ‘...social interaction is lacking in an e-learning course. The classroom meetings can hardly be replaced by e-learning without a significant decrease of quality...’ Another commonly raised aspect is the link between business
as usual and the e-learning course content. It is often indicated that there is a misfit between daily practice and problems and the content of e-learning course. There is a clear demand for more problem-focused learning, or at least more ‘recognizable’ case studies in the course.

B10
‘The graphical interface (images and video) was useful and gave more insight.’
% fully agree% agree% disagree% fully disagree
8,00% 68,00% 16,00% 8,00%
Almost a quarter (24%) of the respondents stated that they found the graphical interface not useful. The most common heard comment was about the ‘simple and even childish images or video’s being used in the course’. Regarding the video-elements; ‘...the video’s were mute, that’s a shame because sound makes it a lot interesting...’.

B11
‘E-learning provides more insight in the course content than a traditional classroom course.’
% fully agree% agree% disagree% fully disagree
6,12% 16,33% 59,18% 18,37%
These statements points out an issue that has already been addressed in B9: the social aspect. The majority f the respondents disagree with the statement, they experience the lack of interaction and passive elements in e-learning. This criticism underlines the importance of social aspects.

B12
‘Questions in the e-learning course or in the question database are relevant.’
% fully agree% agree% disagree% fully disagree
2,04% 79,59% 12,24% 6,12%
Roughly 80% find the questions relevant, the other 20% disagrees. Almost all of the participants gave feed-back similar to the following quote: ‘...Questions are very useful to test and improve knowledge. It is handy to do a pre-test before starting the course that improves the educational value of a course. Make sure that the number and variety of questions is abundant, preventing people to fall back in ‘trial and error’ without any deeper understanding...’
B13
‘Questions in the e-learning course or in the question database match well with the situation at my work.’
% fully agree% agree% disagree% fully disagree
2,00% 60,00% 28,00% 10,00%

C1
‘An e-learning course takes less time than a traditional classroom course.’
% fully agree% agree% disagree% fully disagree
23,08% 46,15% 19,23% 11,54%
This statement addresses the issue of the ‘asymmetric distribution of knowledge’ regarding to educational problems. In the comments presented by C6 (see below), this issue is illustrated in another way. When a traditional classroom course is planned, there is a minimum number of participants to ensure the effectiveness of the course. It is clear that the ratio students to teacher should exceed a certain number to generate an acceptable output (setting the lower limit is a managerial choice). In general, it takes at least a couple of weeks to provide a certain course. Even though it might be an of-the-shelf course, there is still time needed for the teaching itself. These difficulties and ‘educational management problems’ emerge at certain education related organizational levels. At shop-floor level, there is a hardly any understanding of these difficulties and complexity.

C2
‘I have improved my daily work, due to this e-learning course.’
% fully agree% agree% disagree% fully disagree
7,84% 49,02% 31,37% 11,76%

C3
‘My insight in the production process and technical installation has been improved by the e-learning course.’
% fully agree% agree% disagree% fully disagree
0,00% 44,90% 42,86% 12,24%
A small majority of 55% shows that the e-learning course didn’t improve their insights in production process or technical installation. The other 45% agrees with the statement.
Ad C2 and C3
Some respondents addressed the issue of problem-oriented education. In their opinion, the course could be improved by focusing on the problems that frequently occur. On the other hand, they admitted this might be a difficult task given the various specializations and ‘expert functions’.

There might be a certain bias in these answers: Some courses provide basic knowledge about the production processes and technical installations. That kind of courses creates a deeper understanding but do not provide do’s and don’ts or other first line support. Nevertheless, deeper understanding or profound knowledge about the processes can indeed contribute to a better daily performance.

C4
‘The e-learning course fully met my expectations.’

% fully agree% agree% disagree% fully disagree
5,77% 61,54% 23,08% 9,62%

Almost one third disagreed with the statement, there is no motivation given. This statement can be more functional if it is combined with initial expectations and course objectives. When conducting this evaluation study, these aspects were neither defined nor compared.

C5
‘If this course was given in the traditional classroom setting, I would not have been able to attend this course.’

% fully agree% agree% disagree% fully disagree
3,77% 11,32% 50,94% 33,96%

In particular this question demonstrated the great difference between the viewpoints of those at shop floor level, and those providing the educational services. The employees at shop floor level are not aware of the problems to provide a specific course within limitations of time, number of participants etc. They do not realize that providing a course for just 2 or 3 ‘students’ implies enormous costs and low efficiency from an educational point of view.

Instead, they have the impression that if there was no e-learning facility at all, the traditional education would fill in that ‘educational gap’ instantaneously.

This brings up again the issue of communication and advocation: this particular aspect about e-learning and education in general needs to be improved. It will create transparency and understanding of the educational problems, and eventually yield better output.
C6

‘This e-learning course enables me to solve ‘daily problems’ in a better way (like malfunctions in installations etc.).

% fully agree% agree% disagree% fully disagree
1,89% 45,28% 39,62% 13,21%

A small majority of nearly 53% indicated that the e-learning course did not improve their problem solving capability. According to several respondents: ‘...The problems we encounter on a daily basis vary a lot, and some are not even mentioned in the course. It is almost impossible to cover the whole spectrum of possible malfunctions and failures...’.
5.2 Specific Results, Based on the Project Evaluations

In the previous section, the meta-evaluation has been described. For 26 out of 29 review questions, the outcomes do not depend on the projects that have been evaluated. This section focuses on the remaining four review questions (A3, B4, B5 and B8) for which there is a significant dependence between results and project. In the following four sub-sections, the results for these four questions are described. Because the assumption of independence does not hold for the results of these questions, the differences per project will be illustrated. In some cases, one or more graphs will be shown. All graphs, general and detailed, are presented in the appendix.

The first review question was formulated about the match between frequently emerging work-related problems and the e-learning course. Statement A3 says: ‘The problems that I encounter on a daily basis are described in the course.’

In the table below, the results for this review question are listed per e-learning course (Hot Strip Mill etc.).

<table>
<thead>
<tr>
<th>A3</th>
<th>% fully agree</th>
<th>% agree</th>
<th>% disagree</th>
<th>% fully disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Strip Mill</td>
<td>0,00%</td>
<td>30,77%</td>
<td>69,23%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Basic Safety</td>
<td>0,00%</td>
<td>87,50%</td>
<td>12,50%</td>
<td>0,00%</td>
</tr>
<tr>
<td>E-Environment</td>
<td>5,00%</td>
<td>45,00%</td>
<td>35,00%</td>
<td>15,00%</td>
</tr>
<tr>
<td>Software</td>
<td>8,33%</td>
<td>83,33%</td>
<td>8,33%</td>
<td>0,00%</td>
</tr>
</tbody>
</table>

At the Hot Strip Mill (HSM) the majority of roughly 70% disagreed with the statement, and 30% agreed. The e-learning courses that are reviewed are related to the basic processes, they share the same basic lay-out and structure (for more information about the type of e-learning courses, see: ‘Project Selection’). During the interviews, a commonly expressed remark about the match between the e-learning course and frequently occurring problems can be summarized by: ‘...The e-learning course describes the basics and fundaments of the process. It is not like a ‘questions and answers’ or a FAQ-list that provides insight in the most common problems and malfunctions. Therefore, the e-learning course doesn’t cover these problems...’
The overall majority (87.5%) of the participants of the e-learning course about Basic Safety, agrees that frequently emerging problems are covered. There is very little extra feedback about this particular review question, which is to be expected, since the Basic Safety course is an obligatory course to ensure the minimally required knowledge about safety (regulations). Regulations and rules about safety are the core of this obligatory course. Therefore, it is not unexpected that most ‘problems’ are covered according to the participants.

About half of the respondents agreed that the E-Environment course covers the frequently occurring problems. The other half disagrees with the given statement. There were quite a few additional comments and remarks related to this question and the following criticism was expressed: ‘... The course was not suitable for the context of Corus IJmuiden, it was a standard course that could be used in many settings but did not match the daily context at Corus IJmuiden...’

Overall, the respondents of the Software courses indicated that most daily occurring problems were addressed. A minority of just about 8% indicated that they disagree, no specific motivation was given.

The second review item, which will be discussed, is statement B4: ‘The course content was easy to understand.’ The distribution over the response categories depends on the projects. In the table below, this distribution on project level is given.

<table>
<thead>
<tr>
<th></th>
<th>% fully agree</th>
<th>% agree</th>
<th>% disagree</th>
<th>% fully disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Strip Mill</td>
<td>14,29%</td>
<td>85,71%</td>
<td>0,00%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Basic Safety</td>
<td>0,00%</td>
<td>100,00%</td>
<td>0,00%</td>
<td>0,00%</td>
</tr>
<tr>
<td>E-Environment</td>
<td>19,05%</td>
<td>52,38%</td>
<td>23,81%</td>
<td>4,76%</td>
</tr>
<tr>
<td>Software</td>
<td>38,46%</td>
<td>61,54%</td>
<td>0,00%</td>
<td>0,00%</td>
</tr>
</tbody>
</table>

In three out of four projects, none of the respondents disagreed with the statement. In these projects, they indicated that the content of e-learning courses was easy to understand. For one project, the E-Environment course, this is different.

Roughly 28% of the respondents indicated that the course content was hard to find. Some stated: “...This course is a ‘repository’ of all kinds of questions about environmental issues in general...” According to the respondents, the course was based on questions and content was barely present. Some respondents indicated that this formed an insurmountable problem, which could only be overcome by trial and error, hoping to pass the exam.
The third review question is a course related item; how easy can content be found and traced in an e-learning course. The statement B5 is: ‘The course content was easy to find in the e-learning course.’ The table below, provides an overview of the distribution over the response categories.

Table 12   Distribution of the results for review question B5, listed for all four e-learning projects.

<table>
<thead>
<tr>
<th></th>
<th>% fully agree</th>
<th>% agree</th>
<th>% disagree</th>
<th>% fully disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Strip Mill</td>
<td>7,14%</td>
<td>92,86%</td>
<td>0,00%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Basic Safety</td>
<td>0,00%</td>
<td>100,00%</td>
<td>0,00%</td>
<td>0,00%</td>
</tr>
<tr>
<td>E-Environment</td>
<td>14,29%</td>
<td>47,62%</td>
<td>19,05%</td>
<td>19,05%</td>
</tr>
<tr>
<td>Software</td>
<td>23,08%</td>
<td>46,15%</td>
<td>30,77%</td>
<td>0,00%</td>
</tr>
</tbody>
</table>

For both the HSM and the Basic Safety course the majority agrees that the content is easy to find. None of the respondents encountered problems to locate the course content.

There was a lot of criticism about the E-Environment course. Approximately 40% indicate that the course content was hard to find. ‘From start to finish the course was based on questions, almost no course content was provided. After a (too) short introduction, a number of questions had to be answered to proceed with the course.’

As to the Software course, around 70% of the respondents could easily find the course content. The other 30% disagreed with the statement. No particular motivation was given.

Finally, the fourth review question is also a course related item: how does the e-learning course relate to the daily work? The statement B8: ‘The e-learning course matched well with my daily work.’ The table below displays the distribution of the results over the response categories.

Table 13   Distribution of the results for review question B8, listed for all four e-learning projects.

<table>
<thead>
<tr>
<th></th>
<th>% fully agree</th>
<th>% agree</th>
<th>% disagree</th>
<th>% fully disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Strip Mill</td>
<td>0,00%</td>
<td>92,86%</td>
<td>7,14%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Basic Safety</td>
<td>0,00%</td>
<td>85,71%</td>
<td>0,00%</td>
<td>14,29%</td>
</tr>
<tr>
<td>E-Environment</td>
<td>0,00%</td>
<td>33,33%</td>
<td>57,14%</td>
<td>9,52%</td>
</tr>
<tr>
<td>Software</td>
<td>8,33%</td>
<td>75,00%</td>
<td>8,33%</td>
<td>8,33%</td>
</tr>
</tbody>
</table>

At the HSM, roughly 93% agrees with the statement. The remaining 7% that disagrees with the statement, indicated that the course covers all basic processes and is far to ‘general’. As mentioned before ‘…attention for frequently occurring problems is far too little...’.
The Basic Safety course displays a remarkable distribution: around 85% agrees and 15% fully disagrees. It is curious that the intermediate category is not represented at all. This can be explained by the context of the course. Basic Safety is an obligatory course for both employees at shop floor level, as well for a certain group line managers. The largest group (85%) is those at the shop floor level, they find that the course fits quite well to the daily work situation. It is clear that the line management is located in a complete different setting, and therefore indicated that the course does not match well with the daily work.

The third course, E-Environment, is an of-the-shelf package from an external supplier. Without exceptions, all respondents were very skeptical about this course. During the interviews (and by e-mail) the following remarks were made: In general, the lay-out of the course was characterized as ‘far too childish’. The content of the course, and in particular the examples and questions were ‘far from relevant to the situation at Corus Ijmuiden’. For instance: The course contains an examination question about the ‘natural food chain’. In order to pass the examination, this question about sparrows snakes and falcons should be answered correctly. It is clear that such a question is far from relevant to the type of environmental issues at Corus Ijmuiden. About the structure and didactical aspects, the following comment was often expressed: ‘The E-Environment course mainly consists of questions. There is no background information, just questions...’. This resulted in a lack of interest and a ‘trial and error’ behavior, hoping to pass the test without deeper understanding.

Software courses matches quite well with the daily work, according to 83% of the respondents. The minority of 17% disagreeing with the statement, pointed out that some frequently occurring problems were not mentioned in the course.
6 Conclusions and Recommendations

This chapter is about the conclusions and recommendations based on the results of this study. In the second chapter of this report, the aim and objective of this research was stated: ‘Develop an evaluation procedure by which the user experiences of e-learning at Corus IJmuiden can be evaluated.’ In the third chapter of this report (Methodology) this evaluation format was conceived. Later on, this evaluation format was tested and the acquired data was processed to derive specific and general conclusions and recommendations. Therefore, the following fundamental conclusion can be made:

The evaluation format is conceived and an evaluation prototype is constructed. The prototype is tested by carrying out a pilot evaluation on four different e-learning projects. The outcome and results of these pilot evaluations formed a solid ground to come up with conclusions and recommendations.

Regarding the conceptualization of the evaluation tool and to the actual evaluation process itself, the following recommendation can be made: Evaluation is a complex and difficult process because of the large number of actors and stakeholders involved. The KCEL can play a crucial role by facilitating such evaluation processes and creating multilateral dependencies (Miller and Lessard, 1999). This will smoothen the evaluation process and in the end lead to better insight in the results of e-learning projects.

It might appear that the evaluation of e-learning does not contribute to the basic processes of Corus IJmuiden, resulting in a low priority when it comes to participation in the evaluation process. Nevertheless, it provides valuable data from e-learning perspective and one should realize that evaluation is a time intensive and expensive process.

Now that the main conclusion and recommendation are dealt with, the last two remaining research sub-questions will be addressed:

(D) What recommendations can be derived from the outcome of the evaluation of the e-learning projects for the improvement of the e-learning implementations strategy?

(E) What are the recommendations for the e-learning business model for Corus IJmuiden, by using the outcomes of the evaluations?

This chapter consists of three sections, the first section (6.1) focuses on the recommendations that can be made in relation to the e-learning strategy (answer to research sub-question D). The e-learning strategy, as described in the Introduction (first chapter), is taken as a starting point. Conclusions and recommendations are made with respect to the e-learning strategy currently used by Corus IJmuiden.

Recommendations with respect to the e-learning business model and corresponding service concept are described in the second section (6.2). These recommendations and conclusions are made in addition to the already existing business model and corresponding service concept.
The conclusions and recommendations discussed in the first two subsections of this chapter, are the result of triangulation using the objective results from the evaluation as well as the qualitative subjective results from additional interviews.

The last section (6.3), contains the conclusions and recommendations based on subjective experiences and insights obtained by the author during this research. These conclusions and recommendations cannot directly be linked to one of the research sub-question and do not result from objective obtained results. Nevertheless, these remarks can indirectly contribute to the main research question because they provide additional information how to evaluate e-learning pilot projects in an optimal way.

6.1 E-Learning Strategy

In the first chapter of this report, the e-learning strategy is described. A short overview of the e-learning strategy that is currently in use at Corus IJmuiden:

The strategy to introduce e-learning at CORUS is based on the Corporate E-Learning Strategy (CES). The CES model, consists of consecutive phases (de Vries, 2004);

(1) start phase
Main objective of this phase is to ‘make the organization acquainted with e-learning’. Analyze what possibilities e-learning provides and to what extent it can be used.

(2) pilot phase
This phase is meant to tackle some emerging educational problems by executing ‘pilot projects’. These pilot projects are part of the implementation strategy, and should therefore be followed closely. Experiences or lessons learned in these pilots, should be used for further implementation of e-learning.

(3) integration phase
This phase is mainly about the integrating e-learning and the e-learning concept in the overall education and training facilities at Corus IJmuiden.

As explained in this report, Corus IJmuiden is currently going through the second phase of the corporate e-learning strategy. Therefore, the results from the pilot evaluation are used as the basis for the following conclusions and recommendations towards the e-learning strategy and especially with respect to the third phase. The conclusions are listed below, related recommendation are italicized:
THE DILEMMA OF TIME

As stated in the result section (review statement A9): “Each participant has access to an e-learning course for a period of maximum one year. The issue of time and time availability, brought up an interesting dilemma: all respondents agreed that e-learning offers great flexibility to attend a course. A course can be attended at any time and any place. On the other hand, this flexibility does not offer any clear timeframe or deadline(s). A large amount of the respondents indicated that the lack of a fixed time frame resulted in undisciplined study behavior. Students indicated that they started the e-learning course at the last moment (e.g. in week 47, when 52 weeks are available). Therefore, the wide time slot of 52 weeks (1 year) is seldom used.”

The dilemma regarding to ‘time’ emerges with the following advantages and disadvantages:

Positive: a flexible timeframe allows for variation in study pace and study schedules.

Negative: the flexibility dispels any deadline or ‘pressure’, resulting in undisciplined studying. As a result, some courses are never finished or only at the very last moment.

Adjust the timeframe to the subjective wishes and preferences of the user. This can create higher efficiency (same result in shorter period), without the loss of quality and flexibility.

ACTION: Develop an interactive planning tool to allow the end-user, course participant, to select the preferred timeframe within the given possibilities. Such a planning tool can be a basic course-agenda in which the training coordinator indicates all possible timeslots, participants can make a reservation that suits their personal preference. Because this paradox of time is present at various e-learning courses, KCEL should take the initiative.

CROSSWAYS KNOWLEDGE SHARING

The following citation is taken from the result section (review statement A2, p. 48):

‘During the interviews it became clear that the social context of e-learning is of major importance. In each shift, of approximately nine persons, there are experienced workers (senior) and a couple of inexperienced freshly recruited workers (juniors). Within these shifts, the senior workers share there (tacit) knowledge about best practices and so on. On the other hand, the junior workers share their fresh insights and sometimes more up-to-date knowledge. Therefore, 82% indicated that they got enough feedback about unclear issues or other problems related to the e-learning course. This should be seen in the light of a strong learning community. Learning is not limited to individual level but also comprises a form of ‘collective’ knowledge sharing and learning. Social interaction is a very important aspect in these processes.’

The citation indicates the role that support from the community played at the level of end-users. This also holds for the other levels, such as management, educational staff or teachers.
Generate and enforce ‘crossways knowledge sharing’ by facilitating communities of practice (e.g. ‘program or developers group’).

**ACTION:** KCEL should gather knowledge and experiences in a specific field of interest, e.g. exams and question databases, and distribute it throughout the KCEl members by publishing for instance a periodical.

**E-LEARNING REQUIREMENTS**

Based on the result from review statement A10, combined with the given underlying motivation, it can be concluded that all requirements regarding e-learning are met. Barely 15 percent of the respondents indicated that the requirements were not met.

*The minority of 15% should be interviewed in order to gain insight in the shortcomings regarding the fulfillment of e-learning requirements. Depending on the results of these interviews, improvements might be made.*

**ACTION:** Based on this result, a list of ‘minimal e-learning requirements’ can be drawn up. Such a list can be used as a starting point for a ‘things to do list’ for novice e-learning users such as other Corus factories that are not yet using e-learning.

**E-LEARNING PERFORMANCE**

Based on the outcomes of several review statements, especially B6; B7; B10; B12 and B13, in combination with the given motivation the following conclusion can be made:

*The evaluated e-learning courses perform quite well, 20% up to 30% indicated a sub-optimal situation. In order to determine whether this can be improved, further analysis should be carried out. As a rule of thumb, further inquiry regarding this approximately 20% will take 80% of the time and cost. Therefore, it is not advisable to spend more time, cost and effort to analyze the minority that disagreed.*

Based on the outcomes of the review statements (A7; A8; B1; B2 and B3) regarding the familiarization with ICT and preparatory knowledge and training:

In most cases, around 85%, the fit between the knowledge of ICT and preparatory training and knowledge does not cause any problems.

Review statement C6, together with the review statements C2 and C3, concerning the ‘problem solving ability’, insight in installations and daily work situation:

This indicated that the e-learning course did not improve the problem solving capability.

*E-Learning course should have a clear match to frequently occurring problems and the daily practice(s).*

**ACTION:** KCEL should draw up a list with best practices, this recommendation should be part of such a list.
FIRST LINE SUPPORT
The respondents who disagree with the statements A1 and A2 indicated a need for first line support, or stated that the existing first line support should be improved. This conclusion and forthcoming recommendation was mentioned earlier by Van Valkenburg in 2003. It is a basic requirement to gain optimal result of e-learning.

**ACTION:** Ensure optimal first line support, boost first line support from KCEL.

COMPETITIVE ADVANTAGE OF E-LEARNING
Based on the outcome of the review statements regarding the competitive advantage of e-learning with respect to traditional classroom education (B9; B11 and C5), the following can be concluded: The results indicated that, from end-user perspective, e-learning has a competitive disadvantage.

*The competitive advantages are apparent at the higher levels in the educational chain. These advantages should be shared and advocated towards the end users, in order to create understanding and commitment. This will eventually result in better overall performance of the e-learning concept.*

**ACTION:** Problems that were solved by e-learning, ‘success stories’, should be gathered by KCEL and spread throughout the community of end-users and potential e-learning users such as factories. This helps e-learning to become more concrete and the competitive advantage of e-learning becomes clear for all involved.

SENSE OF URGENCY AND COMMITMENT
The outcome of several review statements (e.g. A4) indicated that a sense of urgency and / or commitment is lacking sometimes. This results in an attitude that can best be described as passive and non-cooperative, the leitmotiv is: ‘What’s in it for me?’ Due to this attitude, the implementation or initiation of new concepts like e-learning is becoming hard or even impossible. In section 3.2.2 (p.18), the views of key-players are described. It is clear that in the e-learning process, the views and opinions differ a lot and a common sense of urgency should be aimed at.

*Improvement of the communication and minimization of the difference in perception can create more commitment and might be a useful leverage to enforce more cooperative behavior (de Bruijn and ten Heuvelhof, 1999).*

**ACTION:** In the current situation (2004), KCEL is already facilitating communication and tries to create a transparent view of e-learning. KCEL might focus more on the needs of all involved, matching the passive attitude described above.
E-LEARNING IS ABOUT PEOPLE

The outcome of review statement A1 indicated that most respondents were satisfied with the way questions were answered. In spite of this optimistic outcome, an important additional comment was expressed: there is a strong need for a personal approach.

*Apply a personal approach towards all people involved in the educational process. Personal and accurate communication is important to achieve this.*

*Action:* As previously mentioned; KCEL should draw up a list with best practices, this recommendation should be part of such a list.

ENSURE OPTIMAL FIT OF E-LEARNING

A commonly heard statement, when it comes to e-learning implementation: “Buy as much as you can…” (e.g.: Rosenberg, 2001). Considering the outcomes of review statements B11, C2 and C3 in combination with the ‘specific results’ from review statements A3 and B8, the following may be concluded: off-the-shelf packages and other material from external suppliers should carefully be examined for its usability.

*It is alright to buy as much as you can, but above all... Make sure that it satisfies the needs.*

*Action:* Formulate requirements and criteria conform the SMART methodology; the key is to set requirements and criteria that are specific, measurable, attainable, realistic and traceable (SMART). This can be done in several ways, e.g. in a Service Level Agreements (SLA) between supplier and Corus IJmuiden. One should realize that this seems easy and straightforward, but in fact is very hard.

QUESTIONS AND EXAMS

The results of the review statements regarding the questions used in the e-learning course, B12 and B13, indicate: examination questions should match the course content, the criteria to pass a test should be stated clearly. A review possibility for ‘wrong’ answered questions should be available, at questions level! Feedback on examination questions: unclear ‘terms for success’... when did I pass the test?

For instance: “Is 82% out of 100% enough or not enough? Did I pass or fail?”

*Action:* Ensure optimal fit and relevance of questions. Create transparency in the criteria to pass a test. Provide optimal and question-related feedback.
6.2 E-Learning Business Model

The e-learning business model used by Corus IJmuiden, has two components;
- determine how the e-learning service is provided;
- the financial structure of the service.

In the current business model, e-learning is facilitated by the e-learning support group located at CTC. The basic approach of the business model is ‘demand driven’, meaning that CTC is not acting in a pro-active way but primarily reacts to market demands.

The development of course content is done in a decentralized way by the educational staff members involved. This means that every factory develops its own specific course content. All cost made by the e-learning support group for general purpose, are at the expense of CTC. Specific support for ‘single clients’, is at the expense of the client. (CTC intern document, 2003)

The following conclusions and recommendations with respect to the business model and service concept are derived:

TIME AWARENESS

This is also mentioned in the strategy: On shop-floor level, a dilemma regarding to ‘time’ emerges with the following pro’s and con’s. Positive: a flexible timeframe allows for variation in study-pace and study schedules. Negative: the flexibility dispels any deadline or ‘pressure’, resulting in undisciplined studying. This leads to several negative effects, including non optimal use of resources (time and account availability).

**ACTION:** The business model and service concept should be complemented with a form of time-management. It is desirable to distinguish the situations that allow for more narrow time frames. Custom made timeframes and even ‘just in time’ delivery might be used. This ‘time awareness’ is the first step to develop a more analytical framework that eventually will have a positive influence on the cost-effectiveness.

GALLERY OF SUCCESS / SHAREWARE

The results from the review statements A4 and A6 indicate that the reasoning and grounds to provide education by e-learning is not clear. At higher organizational levels, the benefits for e-learning for all participants are clear. These benefits should clearly be stated and advocated to all participants because they result in better performance (due to more cooperative behavior). This may also be done by clearly addressing the benefits and successes of e-learning projects.

**Clearly advocate and state the success and benefits of e-learning in comparison with the traditional educational concept. This can be done by creating a ‘gallery of success’, or a similar method.**  

**ACTION:** KCEL should gather limited off-the-shelf packages, which have proven to be successful. The package itself, support and implementation should to some extent be free of charge just like ‘shareware’.
DEMAND-DRIVEN VERSUS PRO-ACTIVE
The approach characterizing the current business model is a ‘demand driven approach’ (van Valkenburg, 2003). This concept does not exclude a pro-active attitude of CTC, more specific: the e-learning support team. Additional comments, for instance the comment provided by review statement A2, indicated that this pro-active attitude sometimes is lacking. Demand driven service providing should be mixed with a more pro-active attitude.

**ACTION**: A representative of KCEL should gather all organizational demands in a pro-active way. Taking these demands as a starting point, services should be developed and provided. For instance, there are various demands for an online question-database that can be used for exams.

6.3 **Personal Recommendations and Conclusions**

**FULFILL THE DEMAND FOR HOME STUDY**
Give serious thoughts to the possibility of ‘learning in private time and place’. E-Learning provides this possibility, why not use it? As long as it stays an additional service no problems can occur. Note: keep it ‘free of charge and guarantees’.

**ACTION**: KCEL should explore the possibilities to allow e-learning in private time and place. This form of e-learning could be a supplemental service and may be launched in a pilot project to find out whether it is successful.

**STANDARDIZATION**
Decentralization and the results of decentralization with respect to the LMS is a serious barrier for optimal use of the LMS. Example; At several places within Corus, there is a tendency to create ‘own’ customized databases (Excel-files) because the user management is far from optimal. Standardization of software is lacking, there is no consistent set of programs and therefore little specialized programming experience or knowledge.

The e-learning support group should use standard material and programs, and give support that is restricted to that particular set of programs.

**ACTION**: As previously mentioned, KCEL should conceive a SLA for each supplier to ensure better performance and control. This method (SLA) can also be employed by CTC or KCEL to stimulate the use of a restricted set of programs.

**CREATE A ‘DO IT YOURSELF E-LEARNING COURSE’**
Creating a digital online course is just the beginning of providing e-learning. It is not just about developing a course, it is far more important to act in a pro-active way. Once a course is well introduced and participants are stimulated, success is almost guaranteed. This kind of know-how should be integrated in a ‘do it yourself e-learning course’.
**ACTION:** KCEL should develop a ‘do it yourself e-learning course’ combining technical ICT issues with know-how about best practices. Providing this course by e-learning lowers the barriers to entry and also provides standardization.

**USER MANAGEMENT**

User management within Whizzdom is lacking consistency. The database holding all user accounts is contaminated, meaning that there are several inactive ‘ghost’ accounts. In general; regarding user management and updating the data of participants or datasets in general, the following vicious circle emerges: Keeping datasets up-to-date can only be accomplished by frequent updates that demand lots of little time investment. On the other hand when a dataset is (slightly) polluted or not up-to-date, it takes a lot of time and effort to find the right data. Updating the dataset requires even more time, and will easily “slip one’s mind”. It is clear that when the dataset is up-to-date and not contaminated, a lot of time can be saved and updating the dataset is fairly easily done.

**ACTION:** Although it might be unpopular and less challenging, user data should be managed in very carefully. Taking the current e-learning service concept as a starting point, the user data management should be done at CTC.

**RECOGNIZE THE VALUE OF THE PSYCHOLOGICAL CONTRACT**

In the current e-learning concept, the psychological contract plays an important role. Employees voluntary participate and cooperate in the e-learning process and fulfill several roles, e.g. the mentor role. This willingness to perform action that are beyond the scope of the formal contract, are the result of the psychological contract. One could exploit this contract in order to achieve better performance. Organizational Citizenship Behaviors, as described in section 4.3 on page 43, and the psychological contract play major roles in the current e-learning concept.

**CREATE ‘OFF-THE-SHELF’ E-LEARNING MODULES**

In the previous subsections, the use of standardized ‘off-the-shelf’ e-learning packages is discussed. Another possibility is to use a modular system to create e-learning courses. Some modules can be used in multiple courses. Nowadays, the Corus IJmuiden is using a LMS that is based on the Sharable Content Object Reference Model (SCORM compatible LMS). This provides the necessary compatibility to create such standardized e-learning

**ACTION:** KCEL should create standard e-learning modules, like standardized exams or question-banks, so that e-learning courses can be constructed in a more or less ‘on-demand approach’.
USER DATA
When collecting data concerning user satisfaction or user experiences, contact information is of crucial importance. The absence of email accounts, telephone numbers or even the correct name and surname, formed a barrier in collecting data. Although Whizzdom does provide these possibilities, they are not or scarcely used.

User data are not complete, e-mail accounts are sometimes not available or listed. The name and location data are inconsistently listed.

**ACTION:** Gather standard user data in a consistent way, collect the data in a database, for instance the database of the LMS.

BOTTOM-UP AND TOP-DOWN
On several occasions it became clear that the cooperation and success of both e-learning and the evaluation of e-learning are improved when these initiatives are supported by the (line) management. This should not be mixed up with a command and control approach, since such an approach will be contra productive in the given organizational setting.

Regarding the evaluations; it turned out that the response rate increased when management supported the evaluation. The support of end-users and all those involved in the e-learning concept is also crucial.

Therefore, success of the e-learning concept and evaluation of e-learning can be empowered by a ‘both bottom up and top down’ support.

**ACTION:** Set up e-learning pilot projects at several locations at Corus IJmuiden (bottom), this is already being done. The results of these pilot projects, e.g. the results of the pilot evaluations mentioned in this report, should be used to persuade the management (top) to implement e-learning on the long term.

FOCUS ON THE E-LEARNING CHAIN
The overall process of knowledge sharing can be seen as a permanent cycle of several steps (Weggeman, 2000). Analyzing all steps and their restrictions and possibilities will create better performance of the ‘knowledge sharing process’. This view upon the procedural chain should be combined with the chain of key-players in e-learning, thus resulting in an integrated chain approach. In other words, a strategy should not be developed around just the e-learning process or a single stakeholder, but around the integrated chain.

The approach with respect to the e-learning concept should shift from ‘service supplier’ towards ‘e-learning integration service’. Meaning that the educational chain is taken as a starting point instead of being focused on the ICT/software.
COOPERATION
This conclusion is related to the previous conclusion; evaluation is not only a tool or methodology to acquire optimal insight in the experiences of projects. It can also be used as an instrument to create cooperative behavior, by participating in a continuous process of quality management (including evaluation). The overall performance of e-learning projects can be improved. (De Bruijn and Ten Heuvelhoff, 1999; Miller and Lessard, 2000).

ACTION: Create and use multilateral dependencies to boost cooperation. For instance: The actors that provide data about e-learning and the success of e-learning are given insight in the results of the evaluation. This creates a win-win situation and will be the first step towards long-term coalitions.

BE CRITICAL TOWARDS E-LEARNING SERVICE SUPPLIERS
The review statement A5 indicates that approximately half of the end-users experienced a time loss due to malfunctions of the LMS (Whizzdom). From my personal point of view, I concluded that Whizzdom (the LMS) tends to behave in a non-client-focused manner. On several occasions, questions or demands were not dealt with in a acceptable way. Besides this, it may take an unacceptable amount of time for Whizzdom to react.

ACTION: Be critical and keen towards the performance of the LMS supplier. Monitor the quality, or even construct a quality management system, and make detailed SLA’s with all involved parties.
References

name, year (, edition), title (, subtitle), publisher (, place)