



ON THE WAY TOWARDS AN E-COACH FOR SUPPORTING IMPLEMENTATION AND REALISATION OF THE EFFICIENT CONSUMER RESPONSE CONCEPT

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ABSTRACT. Efficient Consumer Response (ECR) is a concept for supply chain improvement using many methods related to supply chain management (SCM). To implement and run this concept in practice well-trained personnel are needed closely collaborating throughout the entire supply chain. The ECR e-coach realizes the idea of helping a person not to learn and gain knowledge directly, but in actively creating and successfully passing individual learning processes through guidance-on-demand (i.e. coaching) in a virtual environment (e-coaching). The paper presents the results of a project aiming to support the implementation of the ECR concept in Poland and Germany by providing an e-coach for understanding and implementing ECR. It briefly introduces didactics implications and design rationales taken into consideration, illustrates e-coach content and functionality as implemented, discusses results from prototype use and evaluation, and summarizes lessons learned with regard to trans-national, interdisciplinary collaboration and technological challenges to be mastered.

Key words: Efficient Consumer Response (ECR), Supply Chain Management, e-coach learning.

INTRODUCTION

Efficient Consumer Response (ECR) is a concept for supply chain improvement by collaboratively using appropriate methods of supply chain management. Due to the variety of problems in a supply chain ECR is expected to provide a solution to and because of the need to purposefully select from the many and diverse methods available to compose and apply them correctly for solving those problems, there is a strong need for well-trained human resources alongside the entire supply chain. To achieve this and ensure permanent updating of required competences, companies must be offered a comprehensive training support. From the didactics point of view this training support needs to be based upon a constructivist design, which assumes that in principle knowledge cannot be imparted by a teacher or trainer, but results from self-constructing ideas and concepts by the learner or trainee. The trainer supports this process by providing hints and feedback; his/her role changes from being a teacher towards acting as a coach. The task of such coach consists in non-directive questioning and helping coachees to analyse and address their own challenges rather than offering advice or direction. Against this background coaching is to be understood as helping a person in actively creating and successfully passing individual learning processes through guidance-on-demand [Neumann 2006].

E-coaching is coaching delivered over an electronic medium. It focuses on the same goals as regular coaching. Corresponding to the nature of ECR as being based on knowledge from different

fields and dealing with various and diverse problems an e-coach to support understanding and implementation of the ECR concept needs to implement a matrix approach reflecting these two main perspectives, the knowledge-based and the problem-based one [Neumann and Krzyżaniak 2007]. First of all, the e-coach should help the coachee to identify his/her individual needs:

- Do I want to develop knowledge and skills in a certain ECR-related area heading to better performance in and ability of problem solving?
- Do I want to tackle a just encountered specific problem in the company or supply chain collaboration as a primary task?

These two reasons for accessing (taking advantage of) the e-coach may be interlinked and therefore may intertwine in the course of the coaching and learning process. The final result - in terms of gained knowledge and skills as well as an ability to identify and solve a problem - can be the same, but the stresses will be put in different ways. Taking this into consideration the ECR e-coach needs to consist of two functional components: a diagnosis system and a learning environment.

As presented by Neumann and Krzyżaniak [2007] the learning environment of an ECR e-coach is formed by a learning management system with a wide range of information and communication tools as well as high-quality multimedia learning material embedded in it. More specific such learning material needs to contain a sufficient number of modules from the following main categories:

- *Description-oriented learning modules* deliver knowledge on a specific aspect of ECR such as shrinkage or RFID technology (What is ...?).
- *Problem-based learning modules* provide relevant knowledge for identifying, specifying and solving a particular problem, like shrinkage reduction or application of RFID technology in supply chains (How to ...?).
- *Assessment modules* enable individual knowledge application and evaluation within tests/quizzes at different levels of difficulty with extended feedback being provided to the user.
- *Case study modules* support free knowledge application within an interactive supply chain scenario by running case studies at four levels of difficulty.

With this, customization and individualisation of a user's learning process and learning path according to his/her needs (resulting from current skills and knowledge level as well as the required target competences) become possible by purposefully selecting the suitable modules.

To illustrate the individual focus and related design constraints of the different module categories the following sections present already available ECR e-coach modules as well as results and lessons learned from first student evaluations. Furthermore, they address technical issues, such as special challenges for platform-independent implementation.

THE E-COACH LEARNING MODULES

Learning modules aim at supporting knowledge transfer on certain topics in an either description-oriented or problem-based way. The e-coach learning modules developed so far introduce into the topic of Efficient Consumer Response in general and take up current problems in supply chain management (see Table 1):

- The module "Introduction to ECR" covers the wide range of knowledge and information related to the Efficient Customer Response (ECR) concept. It aims to provide an overview on the topic, to support knowledge transfer on methods, tools, challenges and benefits of Efficient Consumer Response (ECR), and to fertilize implementation of ECR among business partners in supply chains.
- The module "Introduction to Shrinkage" embraces several issues which give an overview of the shrinkage problem in supply chains, such as general problems in stock keeping, definition of

shrinkage, sources of shrinkage and responsibility for shrinkage in the supply chain. The aim of this module is to support knowledge transfer about the shrinkage problem in supply chains and to raise awareness of this issue.

- The module "Introduction to RFID Technology" explains RFID technology, its components and application, but also problems or challenges resulting from the current state-of-development of this technology. With this, basic knowledge is to be achieved on what is behind the term RFID, how this technology works and what has to be taken into consideration when making use of it in practical application.
- The module "How to Reduce Shrinkage" focuses on the Shrinkage Reduction Roadmap including an introductory description of the policy, methods and measures. It wants to deliver knowledge and understanding on how to identify, prevent and reduce shrinkage in supply chains.
- The module "How to Apply RFID in Supply Chains" presents practical instructions, general guidelines and useful hints on when application of RFID technology in a supply chain might make sense, how appropriate components are selected and integrated in an application and how the supply chain can be run by use of RFID technology.

Table 1. The ECR e-coach learning modules
 Tabela 1. Moduły kształcenia ECR metodą e-coach

Module	Type	Learning Goals	Contents
Introduction to ECR	D	Know basic terms on ECR Know ECR methods and tools Know problems and benefits of ECR	Challenges in supply chain collaboration Definition, objectives, benefits of ECR History and development of ECR ECR components The ECR Global Scorecard
Introduction to Shrinkage Reduction	D	Know about problems in stock keeping Know and be able to identify shrinkage Understand causes of shrinkage Have a basic idea on how to cope with shrinkage	Problems in stock keeping Definition, sources and effects of shrinkage Responsibilities and possibilities for coping with shrinkage Case studies
How to Reduce Shrinkage	P	Be able to develop a strategy for reducing shrinkage Know about the Shrinkage Reduction Roadmap and be able to apply it Be able to measure shrinkage	How to develop a shrinkage reduction policy The Shrinkage Reduction Roadmap How to measure shrinkage Case studies
Introduction to RFID Technology	D	Know basic terms related to RFID Know about RFID technology Know RFID components and applications Understand problems in using RFID	RFID technology (components, how it works, advantages, disadvantages) RFID applications (smart card, data verification, tracking & tracing etc.) Global RFID Deployment (standards, national/regional activities) RFID and Privacy & Security
How to Apply RFID in Supply Chains	P	Know about possibilities, problems and chances of applying RFID in supply chains Be able to introduce RFID to supply chain management Be able to design RFID technology Be able to run logistics processes and supply chains by use of RFID	Definition and components of RFID RFID in a particular supply chain context – yes or no? How to design RFID technology How to implement RFID in supply chain management How to run a logistics process or supply chain by use of RFID

Types of learning modules: D = descriptive module; P = problem-based module

With this, descriptive and problem-based modules are available to be selected and used according to the needs of a particular target group or individual user. Generally, the target audience of those learning modules might cover:

- students (at private or public schools or universities),
- attendees of ECR learning programmes,
- supply chain professionals, i.e. employees of manufacturers, retailers and service providers.

To achieve this, all modules are designed along the same lines and well-structured according to both logical steps of knowledge acquisition and context-dependency of knowledge units. Furthermore, requirements of platform-independent implementation have been met to allow embedding of one and the same module into a WebCT-based learning environment as well as into a Lotus Learning Space. Each module works on its own, but can also be combined with any other to form a particular course (learning path). For this, module content has been well-structured into topics which are respectively covered by separate web pages enriched with pictures and illustrated graphs, Macromedia Flash animations (see Figure 1), examples or multimedia quizzes. Application of common design rationales to all pages ensures a similar look within the modules, but also same navigation principles no matter which content or topic is currently represented. For course creation the link between independent learning modules is technically being realized through the infrastructure of the learning management system they are embedded in.

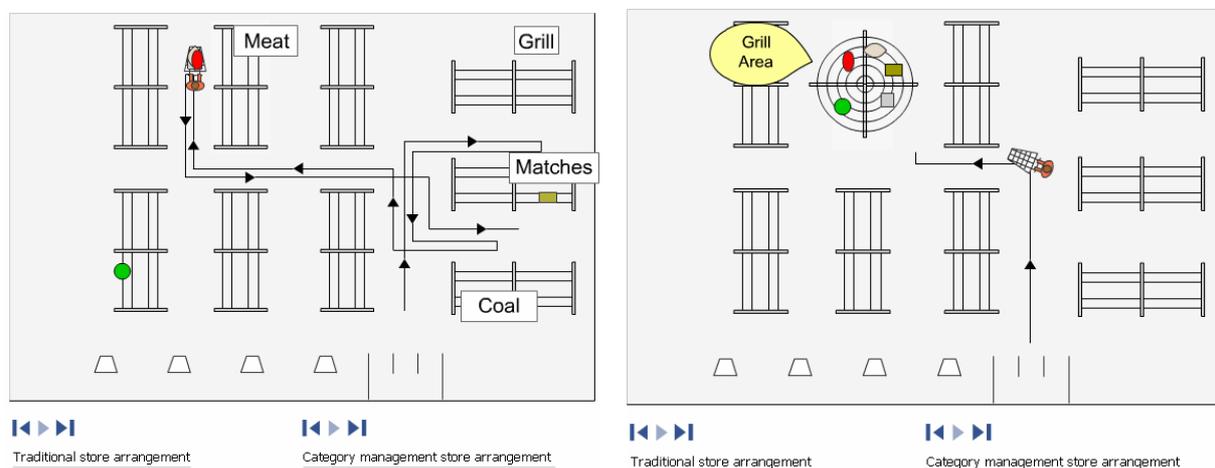


Fig. 1. Illustrating animations on the effects of Category Management (to the left: without CatMan; to the right: with CatMan)

Rys. 1. Zilustrowanie efektów Category Management (z lewej: bez CatMan, z prawej: przy zastosowaniu CatMan)

To provide context-related access to the topics (pages) a module always starts with a structured overview of its content. As Figure 2 shows for the module on "Introduction to ECR", this mindmap also provides interactive hyperlinks to the respective parts of the module and therefore allows easy-to-use navigation. On the contrary each of the pages contains a little mindmap logo being hyperlinked to the overview page for returning to the overall structure and/or easily jumping into another topic of interest. In general, the topics mentioned in the overview form the main learning path as it has been suggested by the module's author. Additional information, cases or illustrating animations can be reached from there via local hyperlinks (and a return path to the page this information has been called from) without leaving this standard learning path the user eventually might follow.

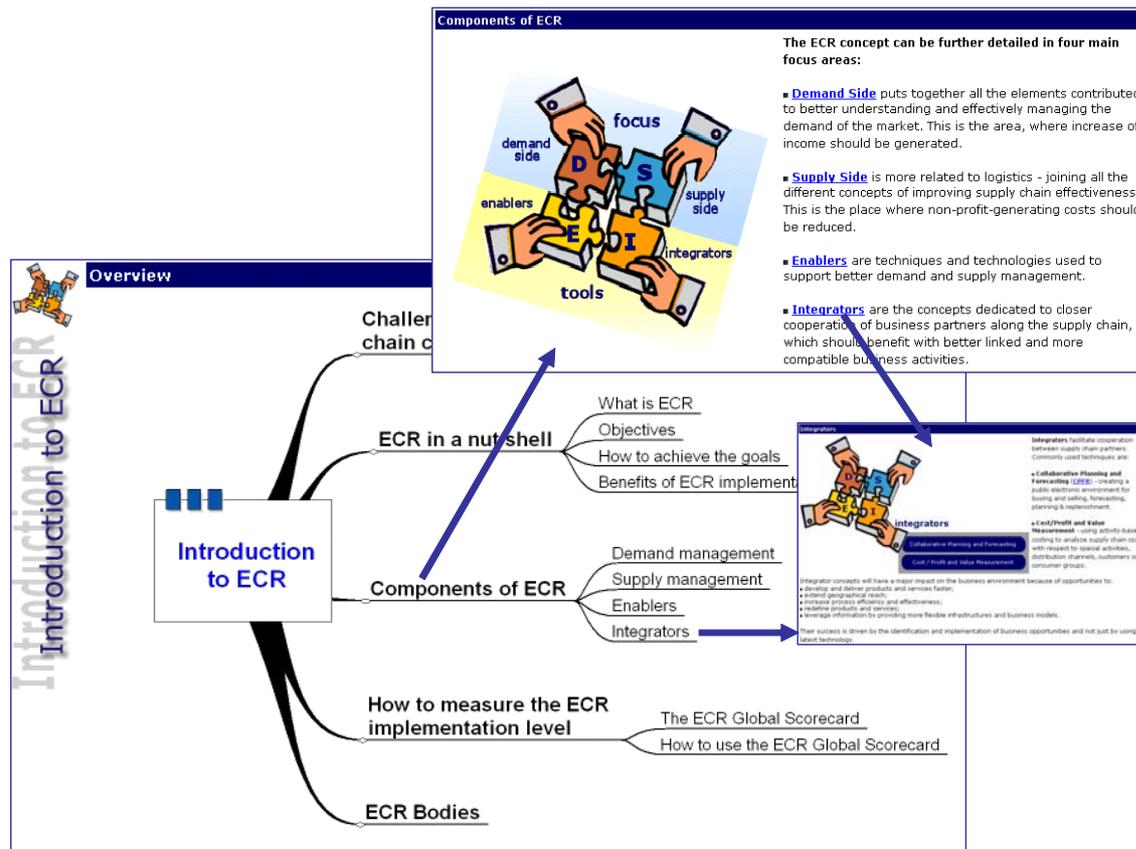


Fig. 2. Module 1 "Introduction to ECR"
 Rys.2. Moduł 1 „Wprowadzenie do ECR”

THE E-COACH ASSESSMENT MODULES

For interactively applying gained knowledge and assessing any existent or achieved knowledge level on one's own some test questions, exercises and case studies have directly been embedded into the modules. In addition to this a separate assessment module implemented by use of Macromedia Authorware is available, too (see Figure 3).

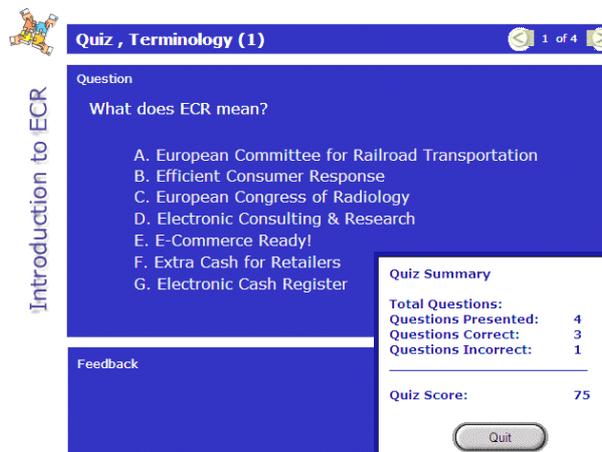


Fig. 3. Quiz example "What does ECR mean?"
 Rys.3. Pytanie testowe „Co oznacza pojęcie ECR?”

This assessment module again and again creates new quizzes by combining on-the-fly questions of a varying level-of-difficulty and from different topic areas. A separate question bank implemented in Microsoft Excel pools all questions including their right and wrong answers as well as their specific feedback. Each question is additionally characterized according to its content by category, subject and topic information, whereas information on a question's level-of-difficulty and type support the processes of its selection and use. To create a new quiz, only as many alternative questions for a particular topic as wished need to be selected and embedded into the quiz frame (see Figure 4). If the user starts the assessment module, a number of questions is selected at random from the available alternatives and put into the pre-defined quiz structure. This way, every time a user re-starts the assessment module a quiz new to him/her appears. Assuming the question bank contains a sufficient number of questions, the own state-of-knowledge and conceptual understanding can repeatedly be tested without just re-producing what has been learned before.

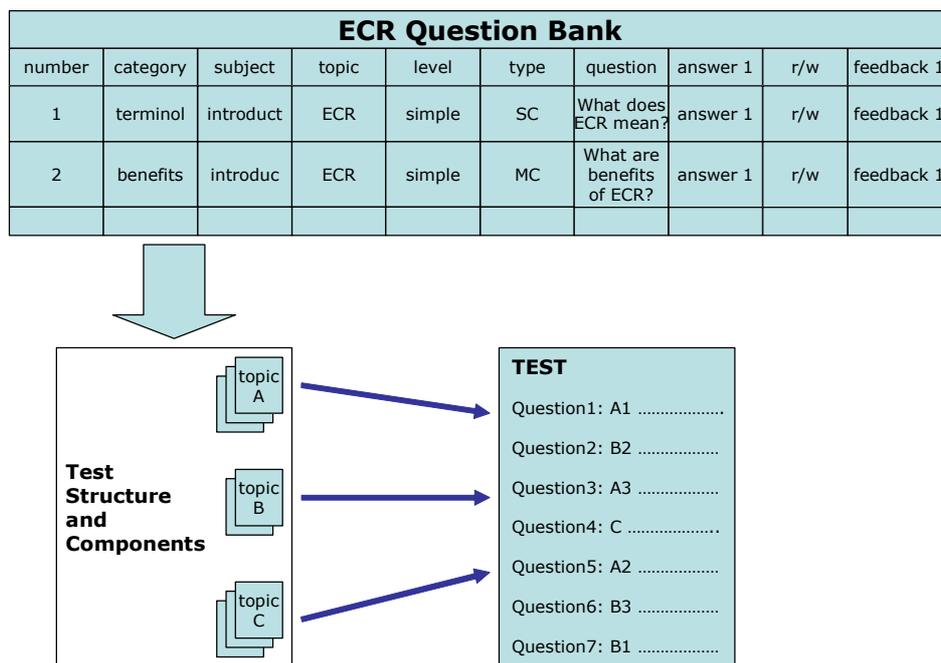


Fig. 4. The ECR question bank and quiz module
 Rys.4. Moduł testu oraz bank pytań dotyczących ECR

THE E-COACH CASE STUDY MODULE

In contrast to the assessment module where a user answers questions within quizzes to give proof of conceptual knowledge, the case study module enables free knowledge application within an activity-oriented scenario. Here, the user has to get familiar with new situations and eventually deal with different problems. Thus, s/he is expected to demonstrate competences by understanding situations, applying methods and finding appropriate solutions in an effective and efficient way. To provide an experience as authentic as possible a fictitious supply chain of three partners - raw material supplier, manufacturer of potato chips and retailer with distribution centre and a number of shops - has been created.

Each partner has a public website and a private Intranet including various company-specific information and data (see Figure 5). They cover all aspects of the company from presenting its vision, mission, history, products and services (public information) to providing process descriptions, staff lists, resource data, performance data, customer/purchase orders, stock levels etc. (private information).



Fig. 5. Company-specific websites of the supply chain partners (to the left: the manufacturer; to the right: the retailer)
 Rys. 5. Strony internetowe partnerów w łańcuchu dostaw skierowane do przedsiębiorstw (z lewej: wytwórcy, z prawej: detalisty)

This scenario serves as case development framework; a specific case study is finally created by attaching problems or tasks to the supply chain as a whole or any of the partners individually (see Figure 6).

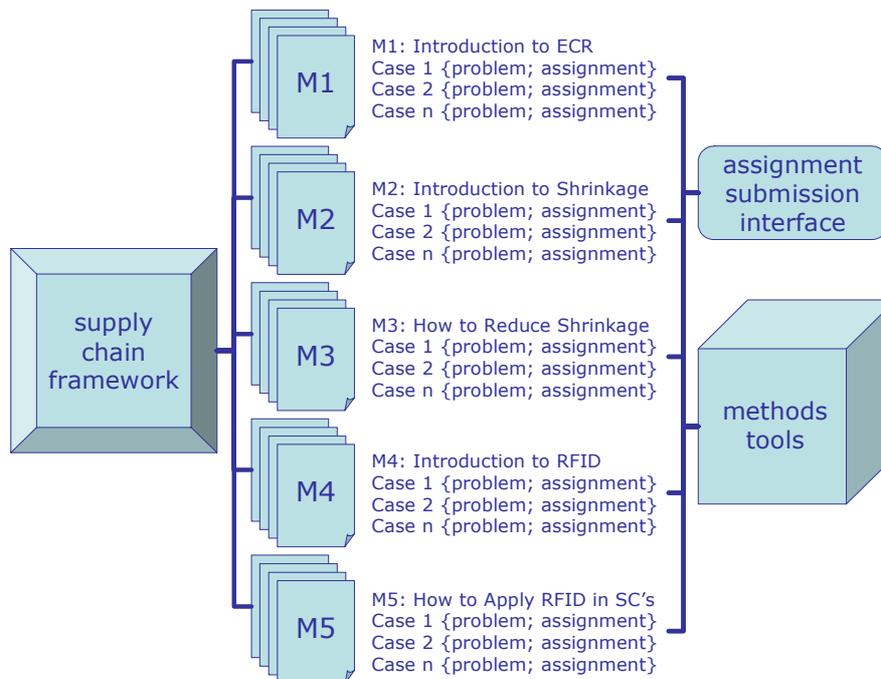


Fig. 6. How to create a case study within the case module
 Rys.6. Jak stworzyć case study w oparciu o case modul

Finally, case studies with different targets and varying levels of difficulty result from this, which can aim at:

- i. *Characterizing a situation.* The user describes the situation in the supply chain or company e.g. by choosing from different descriptions presented. Feedback is returned directly on his/her decision.
- ii. *Identifying problems or potential improvements.* A list of problems and potential improvements is presented to the user from which s/he chooses the ones s/he identified. Feedback is returned directly on his/her decision.

- iii. *Recommending actions to solve problems.* The user chooses from a set of actions/methods the ones s/he recommends to use. The effects of his or her choices will be presented to him/her.
- iv. *Applying methods to solve problems.* The user applies certain methods to solve the problems as identified and specified before by use of tools (EXCEL based or others) provided to choose from and work with. The results are assessed e.g. according to an exemplary solution.

It is obvious, that those different types of cases do require different methods to support the user (guidance-on-demand) and also different ways for gaining the user's results: whereas the first three types of case studies might force the user to answer questions or fill in a check list, a case study of the last category can only be performed within the e-coach when sophisticated tools (similar to those being used in real supply chains to apply the ECR concept for solving particular problems in collaboration) are available. Therefore, the project focused on implementing a framework and cases challenging the user in analysing the situation in any of the partner companies and the supply chain as a whole as well as identifying problems and potential improvements with them. Here, the user has to work selectively with the material available and delivers his/her results by answering multiple-choice and matching questions. This ability to get into a situation, see problems and their causes as well as link these findings with knowledge about best practices or suggestions from theory as it is demonstrated by the user here forms the pre-condition for any purposeful and promising problem solving at a later stage.

STUDENT EVALUATION OF THE "INTRODUCTION TO ECR" LEARNING MODULE

Evaluation process and results

To understand if and to what extent the e-coach learning environment supports individual learning processes as intended, a summative student evaluation of the learning modules has been carried out in correspondence with the progress of module implementation. Since the jointly developed "Introduction to ECR" learning module has been available first and in English language only, this module was the first one to be evaluated by a small group of Polish students from the Poznan School of Logistics with sufficient English knowledge, but without knowledge on the ECR concept (see Kopanska 2006). Based upon a guided learning process and a classical pre-/post-design, the evaluation process aimed at assessing the quality and effectiveness of the module (by use of a knowledge test containing 20 multiple-choice questions from four different areas) and at understanding student expectations in e-learning in general and the module in particular as well as experiences from learning with the module (via targeted surveys). So, each student completed an on-line survey on his/her prior experience with e-learning and expectations in the module and passed an electronic knowledge test on ECR basics before s/he got access to the learning material. After a given period of individual learning, all students answered the same questions again in a second knowledge test and provided feedback on the module's contents, structure, design and implementation within another survey.

Evaluation results from comparing student knowledge on ECR before and after the learning (see Figure 7) showed an average improvement of the total scores per student by approximately 22%. This result as well as an analysis of student expectations, feedback and comments in the surveys finally gave proof of the usefulness of the module's contents, structure and design, but also initiated further improvements of the materials, especially by increasing the amount of interactivity, vividness and clarity.

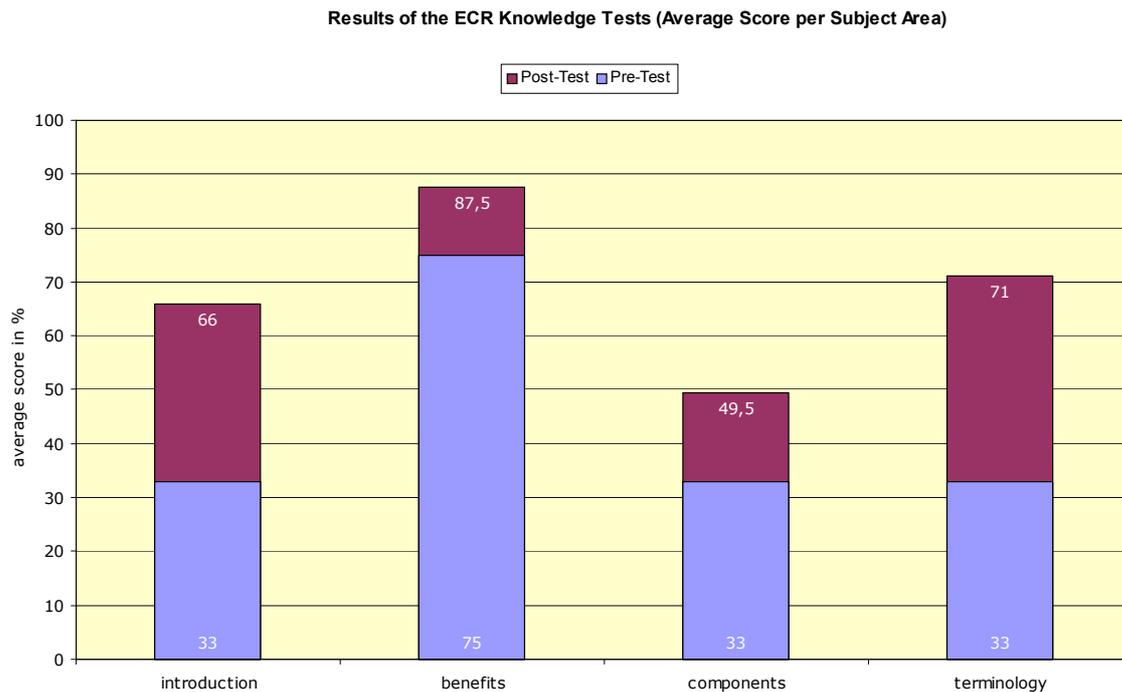


Fig. 7. Results from the ECR Knowledge Test with Polish Students (Learning module and evaluation in English language)

Rys. 7. Wyniki testu znajomości zagadnienia ECR wśród polskich studentów (moduł szkoleniowy oraz rozwinięcie w języku angielskim)

After translation of the module into local languages of the cooperating institutions, Polish and German, evaluation for the module has been re-run. Here, students from the University of Magdeburg worked with the same elements in German language, as students from Poznan did simultaneously with the Polish version. One of the key questions to be answered by this set-up was the influence of the language (home vs. foreign) on the learning outcomes. For this, evaluation design of this second stage was the same as in the first one with the same knowledge tests to be passed and surveys to be completed. The only difference was the language, because this time quizzes and surveys were provided in the respective local languages as the module was as well.

Here, evaluation again demonstrated a significant increase in the students' general knowledge about ECR by about 30% for the German students with some variations in the amount of increase between the different questions. As visualized in Figure 8, both phenomena were to be observed with regard to questions: whereas question no. 3 on which industries ECR did originate from (with three right and two wrong answers) had never been answered correctly, question no. 20 on what does FMCG mean (with Fast Moving Consumer Goods being the single correct answer) had only correct answers in both the pre- and the post-tests. Looking at the students and their individual knowledge increase (see Figure 9) we usually can observe a very successful development. Nevertheless, there are three exceptions from this: student 31 had not participated in the post-test and students 30 and 35 obviously did not learn well, since they had managed to even reduce their scores in the post-test compared to the pre-test with special problems in the terminology-related part. But these are exceptions, indeed, and should not be taken into further consideration when deriving lessons learned.

Instead, this gave a clear indication on the varying levels of difficulty of the questions on one hand and of the individual learning capabilities of the students on the other. The slight increase in the knowledge increments between the first evaluation stage (in English language) and second evaluation stage (in the local language, i.e. German in this case) might also be understood as indicator for the influence of language skills on the learning outcomes. Student feedback provided by the surveys

contained a variety of positive comments and critical views at the same time. The latter was expressed much clearer than in the first evaluation stage, which might have been caused by the fact that the German students were well experienced in e-learning whereas the Polish ones had had no prior access to e-learning material beforehand.

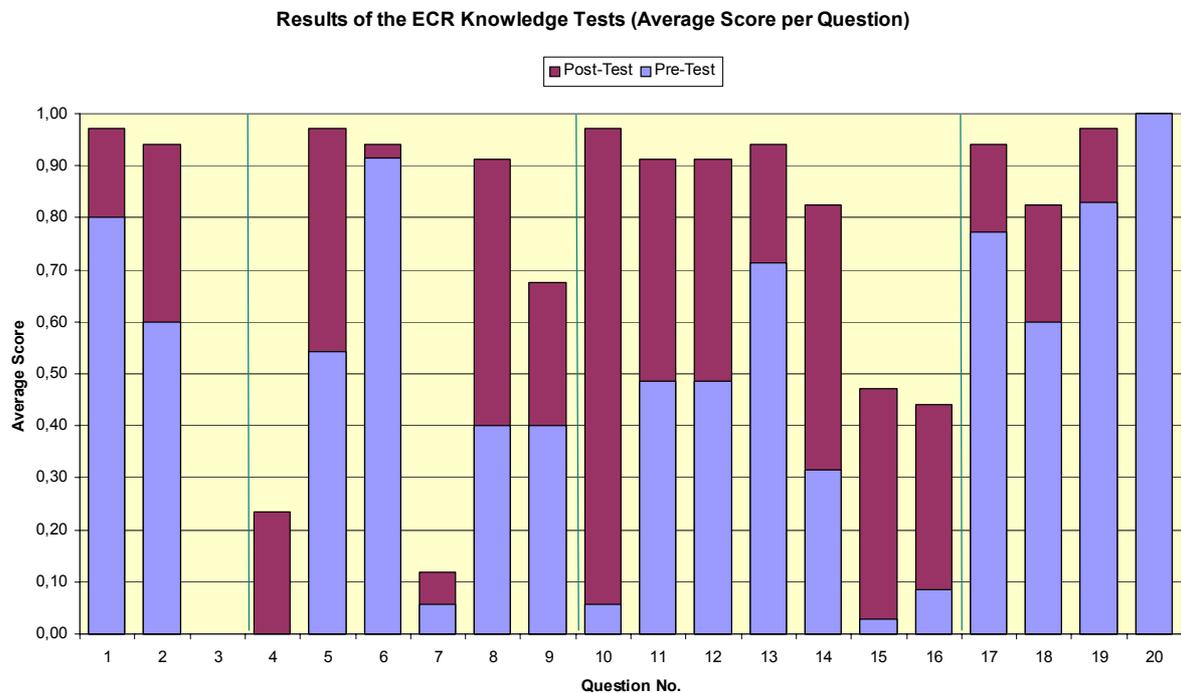


Fig. 8. Results of the ECR Knowledge Test with German Students (Learning module and evaluation in German language)
 Rys. 8. Wyniki testu znajomości zagadnienia ECR wśród niemieckich studentów (moduł szkoleniowy oraz rozwinięcie w języku niemieckim)

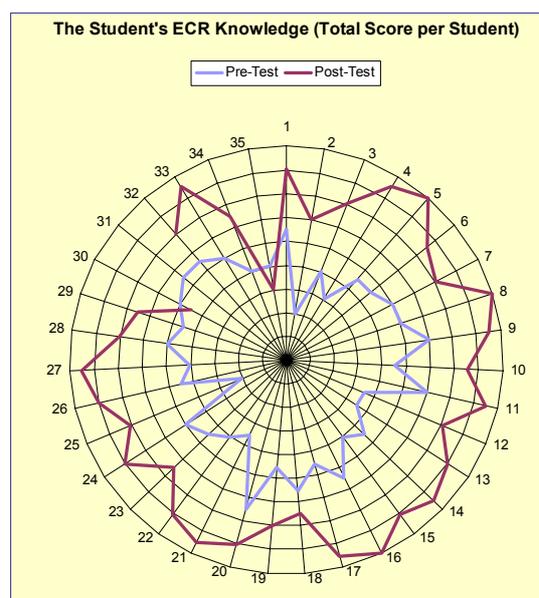


Fig. 9. Results of the ECR Knowledge Test with German Students (Learning module and evaluation in German language)
 Rys. 9. Wyniki testu znajomości zagadnienia ECR wśród niemieckich studentów (moduł szkoleniowy oraz rozwinięcie w języku niemieckim)

Lessons learned from student evaluation

In general, both evaluation processes confirmed that:

- the learning module is useful for reaching the intended learning goals and
- the quality of the content is satisfying.

At the same time, one has to notice that there is a strong need for enriching the content with more animations and simulations as the most relevant tools of computer-based learning.

Consequently, a concept and approach for module refinement is to be seen as the most significant outcome of the evaluation. Thanks to numerous remarks by the students and conclusions resulting from analysing quantitative and qualitative evaluation results a set of practical hints for improving the learning module could be derived. Examples of student recommendations are:

- Include more animations, simulations, exercises, workshops and project work,
- Show deployment of mentioned tools on the basis of practical solutions, supported by examples of existing companies,
- Apply simple language of narration,
- Give extensive descriptions of newly introduced issues,
- Place a glossary.

SUMMARY AND CONCLUSIONS

The ECR e-coach can be seen as a valuable support for all those who already have a certain level of knowledge in the field of supply chains and supply chain management, but who wish to update and develop this knowledge and competences towards the Efficient Consumer Response concept. Therefore the target group comprises students, of course, but the ECR e-coach much more addresses practitioners employed in companies where ECR (or at least some of its components) have just been, are being or will soon be implemented.

The e-coach learning, assessment and case study modules as presented in this paper form the core part of a learning environment coaching functionality might be applied to. Here, platform-independent implementation and cooperative multilingual development by distributed authors provided a special challenge.

Although ECR was found to be attractively foiled where advantages of e-coaching could be demonstrated in the most spectacular way, the developed aide can easily be extended towards many other logistics issues, leading to a holistic educational tool enhancing competences and skills of logisticians of different levels of responsibility. Nevertheless, application of the pedagogical principle of coaching to an emerging field of knowledge and competence like Efficient Consumer Response within a web-based environment delivers a number of challenges to be faced. First of all, coaching (and e-coaching all the more) is more than just guided learning. It requires to personalize learning and to stay in close contact with the learner. Forwarding those tasks to a technical system can only be successful if (i) learning materials are designed in an appropriate way and (ii) true coaching functionality in the form of a sophisticated diagnosis component is provided. The process of developing and implementing the ECR e-coach took both aspects into consideration and mastered the challenges by selecting those fields of knowledge that represent some crucial problems in today's supply chains on one hand and creating well-structured, attractive multimedia learning modules in English, German and Polish languages on the other. By use of a classical pre-/post-design with surveys and knowledge tests evaluation results finally gave proof of the usefulness of the learning modules' contents, structure and design, but also initiated further improvements of the materials, especially by increasing the amount of interactivity, vividness and clarity.

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NA DRODZE DO E-COACHINGU DLA WSPARCIA WDRAŻANIA I STOSOWANIA KONCEPCJI ECR

STRESZCZENIE. ECR to koncepcja poprawy funkcjonowania łańcucha, w której znajduje zastosowanie szereg metod pokrewnych zarządzaniu łańcuchem dostaw (SCM). Dla wdrożenia i praktycznego stosowania tej koncepcji niezbędne jest posiadanie dobrze wykształconej kadry, ściśle współpracującej w całym łańcuchu dostaw. E-coaching dotyczący ECR to idea pomocy tym osobom nie tylko w uczeniu się i zdobywaniu wiedzy, ale stworzenie możliwości aktywnego kreowania i pomyślnego stosowania procesów uczenia się w ramach indywidualnego toku kształcenia w środowisku wirtualnym (e-coaching). Artykuł przedstawia rezultaty projektu, który ma na celu wdrożenie koncepcji ECR w Polsce i w Niemczech poprzez wprowadzenie tej formy kształcenia dla zrozumienia i stosowania ECR. Przedstawione zostały zależności dydaktyczne oraz założenia, krótko przedstawia istotę i funkcjonalność tej formy nauki, omawia wyniki zastosowania prototypu oraz prezentuje wnioski w zakresie potrzebnej współpracy interdyscyplinarnej oraz potrzeb natury technicznej.

Słowa kluczowe: Efektywna obsługa klienta (ECR), zarządzanie łańcuchem dostaw.

AUF DEM WEG ZU EINEM E-COACH ZUR UNTERSTÜTZUNG DER UMSETZUNG UND EINFÜHRUNG DES EFFICIENT CONSUMER RESPONSE KONZEPTE

ZUSAMMENFASSUNG. Efficient Consumer Response (ECR) ist ein Verbesserungskonzept für Supply Chains, das viele Methoden aus dem Supply Chain Management (SCM) nutzt. Um dieses Konzept in der Praxis umzusetzen und zu betreiben, sind gut ausgebildete Mitarbeiter erforderlich, die entlang der gesamten Supply Chain eng zusammenarbeiten. Der ECR-E-Coach setzt die Idee um, einer Person nicht direkt beim Lernen und Wissenserwerb zu helfen, sondern diese stattdessen beim aktiven Kreieren und erfolgreichen Absolvieren individueller Lernprozesse durch bedarfsgerechtes Führen (d. h. Coaching) in einer virtuellen Umgebung (E-Coaching) zu unterstützen.

Der Beitrag präsentiert die Ergebnisse eines Projektes, das die ECR-Einführung in Polen und Deutschland mit einem E-Coach für das Verstehen und Umsetzen von ECR unterstützen will. Es werden didaktische Implikationen und zu berücksichtigende Gestaltungsgrundlagen kurz eingeführt, der umgesetzte Inhalt und die realisierte Funktionalität des E-

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Coaches illustriert, Ergebnisse aus der prototypischen Nutzung und Evaluation diskutiert sowie Erfahrungen und Erkenntnisse in Bezug auf die transnationale, interdisziplinäre Zusammenarbeit und die dabei zu meisternden technischen Herausforderungen zusammengefasst.

Codewörter: Efficient Consumer Response (ECR), Supply Chain Management, e-coach learning.

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