



White paper for IO5:

Designing of templates and content
for the format of learning mater



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Executive Summary

This report addresses the fifth intellectual output (IO5) of the PERSIST Erasmus+ project. Previous IOs included a systematic literature review on Industry 4.0 skills and competencies within purchasing and supply management (PSM), multiple explorative World Café studies addressing future roles and skills within PSM in the era of Industry 4.0, interviews addressing the use of gamification in education, and a Delphi study assessing the Industry 4.0 roles and skills in PSM. The last intellectual output, IO4, addressed the design of a PSM course that reflects the skills and competencies required by PSM in the era of Industry 4.0. IO5 continues the design of these course elements by realising the development of learning material, lectures, gamification elements, case illustrations, and videos. IO5 resulted in a 5 EC course that is accessible via the PERSIST Moodle environment. Further, the complete course can be downloaded as a zip file and implemented within various learning management systems. This report provides an overview of the course, and a guideline on how to use the course is provided.

The course consists of five modules constructed according to the purchasing process. The learning experience starts with introducing the course and Industry 4.0 in PSM. The second module focuses on the foundation for advanced automation in PSM. Third, eSourcing activities to select suppliers in Industry 4.0 are discussed. The fourth module focuses on eProcurement to facilitate operative procurement activities in Industry 4.0. Last, module five describes Data analytics for Industry 4.0 purchasing. During the whole course, the company example of the PERSISTCo case is used to provide a use-case on how Industry 4.0 impacts the field. The project team developed this case example and focused on a mid-sized company within the food industry. Within the course, the case example is introduced by various videos. Further, the course uses various gamification elements to deepen the student's understanding. These gamification elements are mostly built as H5p elements and can be implemented within various learning management systems.

The designed course has been tested during an international learning and training event with students and lecturers within the PSM domain. All elements of the course can be accessed via the project website. The following report summarises how the course should be used and provides guidelines for accessing or implementing the elements.

1. Introduction and structure

1.1. Background of the PERSIST project

The focus of project PERSIST is to investigate the role of Purchasing and Supply Management (PSM) in the era of Industry 4.0 (machine-to-machine communication). The project aims to provide new content, including new forms of education, to prepare European higher education students for future developments by providing a framework for PSM skills in dealing with the challenges and opportunities brought about by increased digitalisation. The project's aims are as follows:

- a. identifying those skills which are likely to prevail and those which are newly added to the profile of a European purchaser to develop an Industry 4.0 PSM Skills framework,
- b. developing a module-based course for higher education to teach these skills,
- c. to develop new, gamification and playful interaction-oriented didactical elements for a purpose student-centred teaching approach, including a gamified MOOC.

The contribution of the PERSIST project is relevant for PSM students and employees who are already working in practice. Following the course, learners will prepare themselves for the upcoming challenges in PSM in the era of Industry 4.0. The input from the empirically-based findings of this project (especially the Delphi study in IO3) clearly shows that those skills identified by experts as being relevant have only been represented to a limited extent in existing training programs. Therefore, enhanced levels of knowledge and understanding should be developed through the implementation of and participation in the developed modules. The developed course has a total scope of 5 EC and an effort of one EC per module. The skills are developed in an application-oriented manner with the help of H5p elements. The advantages of digital learning formats combined with gamification elements can also be an interesting example for training programs in practice. Participants can complete the course at their pace, motivation is usually very high due to direct feedback and from participants experiencing success, and the micro-lectures and mini-games mean that the time required is much less compared to seminars lasting several days.

The starting point of this research project is the inadequate preparation of students in PSM for successfully operating in the Industry 4.0 environment. The earlier IOs of this project identified relevant Industry 4.0 PSM skills through a literature review and empirically collected in World Cafés, and a Delphi study. These were consolidated into five modules harmoniously. The modular structure of the course has been chosen to enable educators to select individual modules to add missing components to an existing course, although the authors recommend completing the entire course according to the scheme.

In addition to presenting relevant content for PSM in Industry 4.0, this content is also designed according to innovative didactic concepts, namely gamification. The concepts developed contain different gamification elements to engage the students through varied practice-focused tasks. The design of the concepts of the five modules is consistently oriented towards solutions that many universities can use after completing the project. Light and full versions will be available for this purpose. In the light version, each material created (micro lecture, H5P element etc.) can be downloaded separately. In the full version, linking of the individual modules and H5P elements is realised, in which continuous feedback is provided. However, the prerequisite for the full version is the existence of an LMS (e.g. Moodle, Canvas, et cetera) or through the PERSIST Moodle environment. Since every university should have an LMS, this is not a significant hurdle for interested educators.

1.2. Building on the outcomes of IO1, IO2, IO3, and IO4

This report addresses the fifth intellectual output (IO5) of the PERSIST Erasmus+ project, which is to realise a Purchasing and Supply Management (PSM) course that reflects the skills and competencies required by PSM in the era of Industry 4.0. IO5 will operationalise these into a tangible modular format course that many PSM educators can use. The previous IOs (IO1 and IO2) used a systematic literature review on Industry 4.0 skills and competencies within PSM and multiple explorative World Café studies to identify and describe future roles and skills within PSM in the era of Industry 4.0. A Delphi study in IO3 identified and defined six future roles and nine future skills needed by PSM to deal with the new technologies and ways of working brought about by Industry 4.0. These future roles are Process Automation Manager, Data Analyst, Supplier Onboarding Manager, Master Data Manager, System Innovation Scout and Legislation Specialist, with the suggested future skills being: Data Analytics skills, Strategic Management skills, Supply Network Management skills, E-Procurement Technology skills, Robotic Process Automation (RPA) skills, Digital Contract Management and Legal skills, Digital Partnership Management skills, Digital Negotiation skills and Digital Leadership skills.

An integrated approach has been taken to project PERSIST, and so the findings from previous IOs, i.e. the future roles and skills, have been used as the basis for this IO and underpinned the development of the PERSIST PSM Industry 4.0 course concept. To develop a motivating and interesting experience for students, the course will use gamification elements and playful interaction concepts.

1.3. Aims of the white paper

IO5 aims to develop a modular course that can be used within university study programs and professional training to educate future PSM skills in the era of Industry 4.0. In IO5, the suggestions for developing the 5 EC course are followed, dividing the course into five separate modules. Learners and educators can choose to follow all elements of the course or focus on separate modules to increase their understanding of Industry 4.0 in PSM. Although the course is modular in structure, an overall storyline was developed to provide orientation for participants and reflect tasks and activities from a real business environment. In addition, this approach ensures that the course is not just a collection of gamified learning objects and this practice focus ensures that the participants are optimally prepared for future tasks and requirements they may face in industrial contexts.

This white paper provides an overview and instruction on accessing and implementing the outcomes of the PERSIST project within PSM-related study programmes. Therefore, detailed instruction is provided, which allows educators to include the relevant competencies in their education. Further, the white paper can be used by learners to access the PERSIST Moodle environment and start learning future skills.

1.4. Structure of the white paper

Having connected the work of IO5 to the previous four IOs and presented its objectives, the following parts of the white paper address the development of the course elements. Here, the project focuses on developing lecture slides, collecting reading materials, recording micro lectures, designing the case example and related videos, and realising the H5p gamification elements. In addition, the white paper addresses how educators and learners can access the developed course elements and how to implement the elements within learning management systems and PSM education. Last, the white paper closes with a brief overview of the PERSIST project's achievements and future research objectives.

2. The online MOOC

The requirements analysis results for the content concept showed that there needed to be an overall storyline, but the skills from IO3 needed to be assigned to the individual stage activities of van Weele's purchasing process to form the course structure. Based on the first version of the five modules described, the assignment of the nine skills to the PSM process steps, according to Van Weele (2014) and Schiele (2019), was refined and is shown in Figure 1.

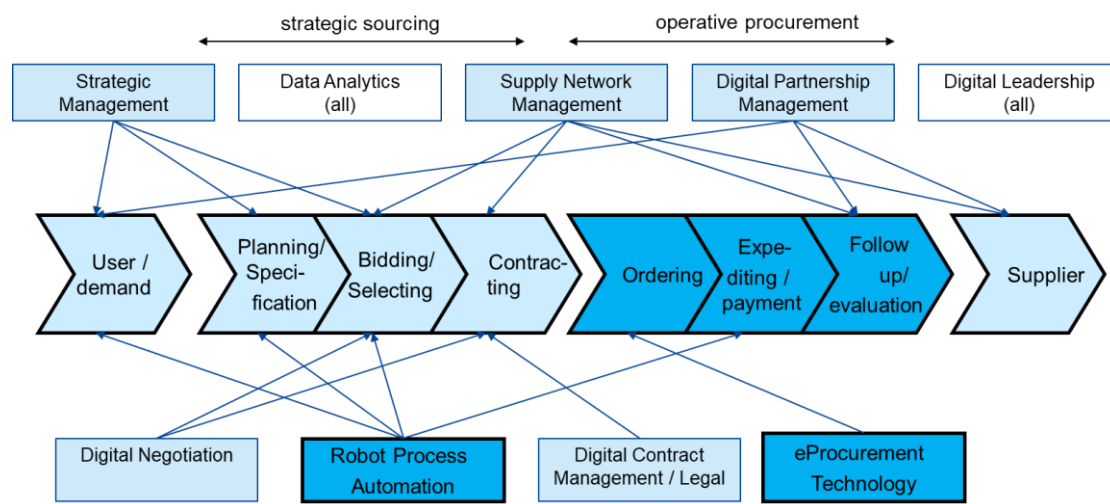


Figure 1 - The technological influence on the PSM process and related skills

The final overview of the modules, a short description, and the responsibility for the development in the project consortium and the assigned skills are shown in Figure 2. Each partner within the consortium focused on developing the module elements to teach the assigned skills. After each module had been developed individually, the consortium further discussed the overall storyline of the course and aligned the content by using a consistent case example throughout the course. Further, the consortium used the same design elements, for example, PowerPoint layouts and video software.

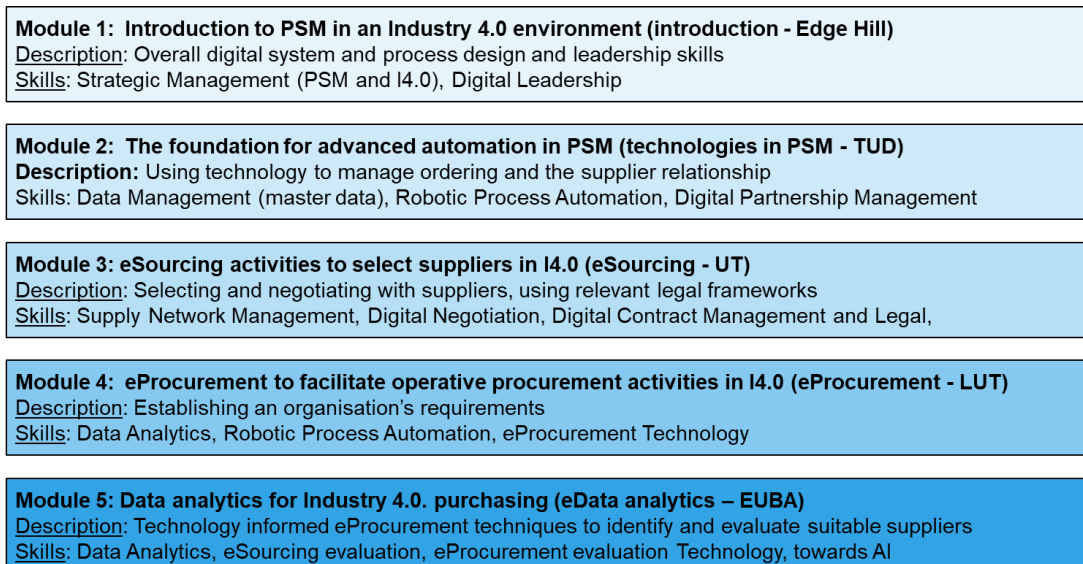


Figure 2 - Organisation of the different modules

2.1. Overall Storyline

An overarching storyline was created to provide a coherent narrative for educators and students navigating through the five modules. It also allows the different module developers from the project partners to relate the teaching materials and associated activities to this narrative and allows the students to develop their skills, knowledge, and understanding systematically.

As the start point of the development process, through brainstorming and intra-project member discussions, it was decided to create a fictionalised company with specific characteristics (as shown in Figure 3) that aims to implement several technologies and ways of working associated with Industry 4.0 to allow it to generate competitive advantage within the industry it operates within.

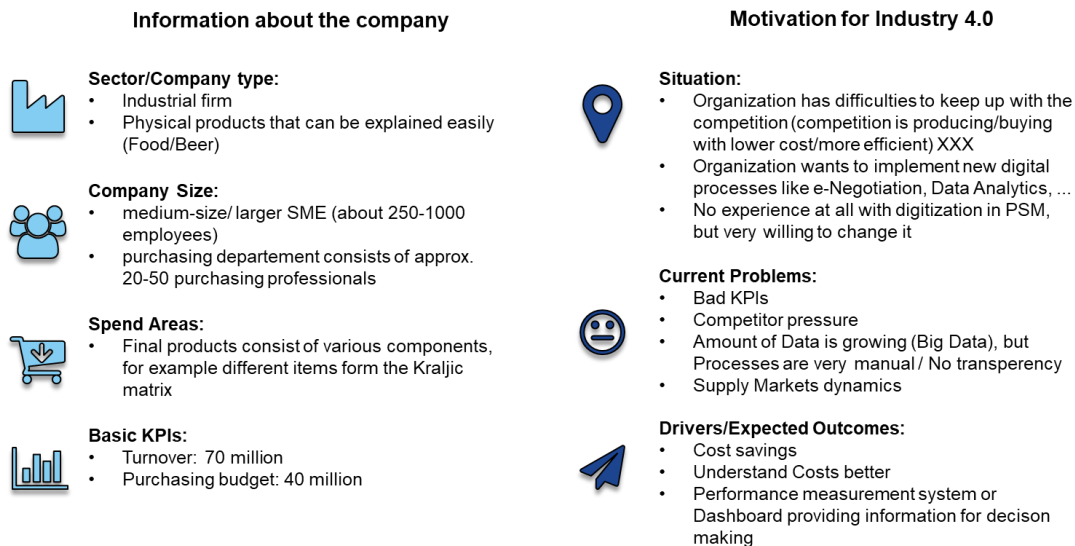


Figure 3 - Fictionalised company characteristics

Although a wide range of students is expected to find this course helpful, it was decided to base the storyline on an apprentice starter at the company, who needs to complete a designated training programme (i.e. the modules) in order for them to progress. This approach ensures the fundamentals of PSM and how these, and more sophisticated PSM activities, related to Industry 4.0 technologies and practices. The storyline shown below establishes the company's and the market's context, details of the PSM activities and the apprenticeship programme:

A warm welcome from PERSISTCo's senior management to the Purchasing and Supply Management (PSM) apprenticeship training programme, and we wish the student every success in the range of modules the student is going to study. This document provides information and background on the training programme, company, food industry and details of the spend categories that PERSISTCo currently buys.

PERSISTCo background

We thought it would be helpful to provide the student with some key facts about PERSISTCo before the student starts the programme, and the student can use these to help with studying the different modules. PERSISTCo supplies a range of different types of bread to large retailers who then sell directly to consumers, and more details are shown in Table 1.

Table 1 - PERSISTCo supplies

Company name	PERSISTCo
Sector/Company type	Food production
Location	European based with production operations in 5 countries (Netherlands, Germany, Slovakia, Finland and the United Kingdom)
Company size	500 employees (SME)
Turnover	€70m
Purchasing department	25 employees (managed by a Head of PSM, with a Senior Purchasing Manager, 2 Purchasing Managers, 5 Senior Buyers, 8 Buyers, 4 Assistant Buyer and 4 Purchasing Apprentices)
Purchasing spend	€40m (more details below)

The food industry

The food industry has undergone and will continue to be affected by changes, which can be summarised below, and PERSISTCo aims to use its new Industry 4.0 tools, processes and ways of working to adapt to these changes:

- Safety standards in a post-Covid-19 world.
- Sustainability.
- Changing habits: The rise of plant-based foods and healthy food/body and increased purchasing of food that lasts.
- The disruption of the just-in-time supply chain model.
- More significant investments in food manufacturing software.
- More significant investments in automation.
- Transparency.

SOURCE: www.unleashedsoftware.com/blog/10-global-food-processing-industry-trends-for-2021

PERSISTCo has also just signed a significant two-year contract with another major food retailer and will need to develop its ways of working to meet the challenges arising from the increased volume of sales this has brought about and to ensure that this contract is renewed after the two years is up.

Supply market

From a supplier perspective, PERSISTCo's external spend can be broken down into the following categories shown in Table 2 (areas of spend):

Table 2 - PERSISTCo's areas of spend

Spend category	Spend value (€m)	Number of suppliers
Raw food materials	18	24
Transportation	7	3
Warehousing	3	1
Marketing services (media buying, agency fees)	2	5
Professional services (consultancies, advisors)	1	4
MRO (maintenance, repair and operations)	3	6
Information technology (hardware, software)	2.5	1
HR-related services (recruitment, training)	1	2
Utilities (gas, electricity, water)	2	3
Stationery	0.5	3
Totals	40	52

In addition, this spend has been categorised using Kraljic's matrix, a tool to classify the importance of suppliers' products and services and can be used to highlight supply chain weaknesses, support strategy development and minimise supply disruption Figure 1. A survey by several PERSISTCo's suppliers revealed dissatisfaction with how they have been dealt with, including late payments and consistently changing supply requirements. It is hoped that the new ways of working should improve these relationships and lead to better outcomes for both PERSISTCo and its supply base.

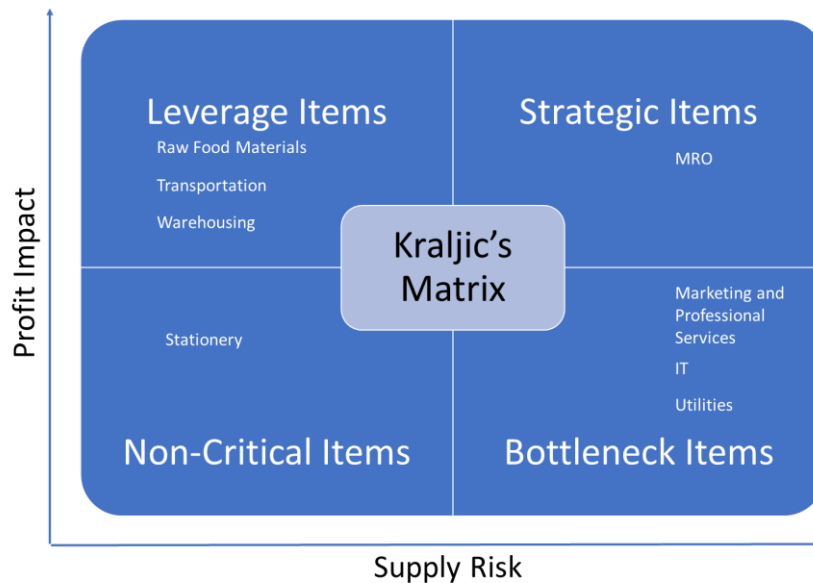


Figure 4 - Kraljic's matrix (Kraljic, 1983)

2.2. Introducing the case example by the use of Vyond videos

In order to illustrate how Industry 4.0 impacts the field of PSM, the PERSIST project group developed several videos that introduce the PERSISTCo case example to the learner. Here, each module of the course uses a case example to show the implications of technology. The VYOND video development software was used during the project to develop the video and transform the text into speech. Throughout the videos, several characters were used, which are employees of the PERSISTCo company. Most of these characters are working within the procurement department of the firm. To improve the alignment between the different modules, each character was used consistently with the same appearance and voice.

In addition, some videos were used within the later developed H5p elements of the course. The videos intend to stimulate the learners' motivation to follow and engage with the elements of the course. Also, the videos benefit the engagement to transfer the teaching content into the online course environment. Each video has been developed based on a video script that has been drafted according to the various learning objectives of the modules.

2.3. Recording of the micro-lectures

Each module or element of the PERSIST course is introduced by a short micro-lecture recorded by one of the project members. The micro lectures aim to summarise the main content of each module, its

relevance, structure and available learning materials. During the development of the micro-lectures, each partner was free to design the micro lecture according to their own preferences. Thus, some included a short recording of the lecturer, and others didn't. However, the course avoids to uses full lecture recordings (e.g., 90 minutes). The content of the course should be taught by a professional in a classroom environment. Thus, each micro-lecture was limited to a maximum length of 10 minutes.

2.4. Developing the lecture slides

A core outcome of the PERSIST project is the lecture slides used within the course's different modules. Educators can use these lecture slides within the PSM field to educate the relevant competencies in PSM in an Industry 4.0 environment. These lecture slides are the foundation of the separate lectures. The course content and illustrations summarise the needed learning objectives within the slides.

The learners or students within the course can use the lecture slides as study materials. Therefore, the design of the slides follows a report-style presentation that is understandable without further explanation. To achieve this, a presentation style was used that summarises the core aspects of each slide with the message title. To improve the storyline of the course and strive for consistency, each project group member used the same template and design of the slides.

2.5. Collecting reading materials

The course provides a list of reading materials for each course element. These reading materials aim to provide a deeper understanding of the module's content and are provided as a suggestion for educators and learners. The reading materials can be accessed via a link provided within the Moodle environment or course elements.

2.6. Developing gamification elements and learning assignments

The PERSIST course includes various gamification elements that help the learner's learning process by involving the learner with the addressed content. Therefore, the learner's understanding of the topic is deepened. These gamification elements have been developed using H5p elements and case examples. Each H5p element is embedded within the related course module. Within the H5p elements, quizzes are used to test the learner's understanding, memory games help to improve the learner's

retention rate of the context, and branching scenario models simulate a learning journey. All gamification elements are accessible individually or via various learning management systems.

3. The final PERSIST course

3.1. Introduction to PSM in an Industry 4.0 environment

Aim

At the start of the course, a brief overview of the aims and structure of the course is provided. This introduction includes a welcome introduction to PERSIST and a short description of the learning content (see Figure 5)

Content

- 0 Introduction to the PERSIST course.pptx

Impression in Moodle

The screenshot shows the Moodle course interface for 'Persist 2022'. At the top, there are tabs for 'Course', 'Settings', 'Participants', 'Grades', 'Reports', and 'More'. Below the tabs, the 'General' section is expanded, showing a 'FORUM Oznámenia' icon. The 'Introduction to the PERSIST course' section is also expanded, displaying three items: a 'PAGE' titled 'Welcome to the PERSIST course', a 'FILE' titled 'Introduction to PERSIST', and another 'FILE' titled 'Evaluation PERSIST learning content'. Each item has a 'Mark as done' button next to it.

Figure 5 - Start of the course in the PERSIST Moodle

3.2. Module 1: Introduction to PSM in an Industry 4.0 environment

Module Aim

Introduce the overall structure and flow of the course and provide an introduction to the core concepts of Industry 4.0, Purchasing and Supply Management and Digital Leadership.

Intended learning outcomes

By successful completion of the module, the student will be able to demonstrate:

1. Summarise how the overall structure of the course fits together and the interrelationships between the different modules.
2. Illustrate how Industry 4.0 affect Purchasing and Supply Management.
3. Explain how digital leadership skills may be used in a Purchasing and Supply Management context.

Content

- M1A Introduction - Recorded Session.pptx
- M1B Learning Goals for the Introduction to PSM in an Industry 4.docx
- M1C Introduction to PSM Slides.pptx
- M1Cr Introduction to PSM Slides-Recorded Session.pptx
- M1D Introduction to PSM PERSISTCo Case Study Video and Activities.mp4
- M1E Additional Learning Materials - Introduction to PSM.docx
- M1E Introduction to PSM Quiz.h5p
- M1F Digital Leadership.pptx
- M1Fr Digital Leadership - Recorded Session Final.pptx
- M1G Digital Leadership PERSISTCo Case Study Video and Activities.mp4
- M1H Digital Leadership Quiz.h5p
- M1I Additional Learning Materials - Introduction to Digital Leadership.docx
- M1J Industry 4.0.pptx
- M1Jr Industry 4.0 - Recorded Session.pptx
- M1K Industry 4.0 PERSISTCo Case Study Video and Activities.mp4
- M1L Industry 4.0 Quiz.h5p
- M1M Additional Learning Materials - Industry 4.0.docx
- M1N Module 1 Simulation.h5

Impression in Moodle

▼ Module 1: Introduction to Purchasing and Supply Management (PSM) in an Industry 4.0 environment

FILE	Module 1 Introductory Video	Mark as done
PAGE	Learning Goals for the Introduction to PSM in an Industry 4.0 environment module	Mark as done
FILE	Introduction to PSM Slides	Mark as done
FILE	Introduction to PSM Recorded Session	Mark as done
Using slide show will play this session automatically.		
FILE	Introduction to PSM PERSISTCo Case Study Video and Activities	Mark as done
H5P	Introduction to PSM Quiz	Mark as done
FILE	Introduction to PSM Additional Learning Materials	Mark as done
FILE	Digital Leadership Slides	Mark as done
FILE	Digital Leadership Recorded Session	Mark as done
Using slide show will play this session automatically.		
FILE	Digital Leadership PERSISTCo Case Study Video and Activities	Mark as done
H5P	Digital Leadership Quiz	Mark as done
FILE	Digital Leadership Additional Learning Materials	Mark as done
FILE	Industry 4.0 Slides	Mark as done
FILE	Industry 4.0 Recorded Session	Mark as done
Using slide show will play this session automatically.		
FILE	Industry 4.0 PERSISTCo Case Study Video and Activities	Mark as done
H5P	Industry 4.0 Quiz	Mark as done
FILE	Industry 4.0 Additional Learning Materials	Mark as done
H5P	Module 1 Simulation	Mark as done

Figure 6 - Introduction to PSM in an Industry 4.0 environment in the PERSIST Moodle

3.3. Module 2: The foundation for advanced automation in PSM

Module Aim

Using technology to manage ordering and the supplier relationship

Intended learning outcomes

By successful completion of the module, the student will be able to:


1. Understand how Industry 4.0 technologies and trends can be used in operational procurement.
2. Apply some simple applications to make use of RPA in operational procurement.
3. Analyse the impact Industry 4.0 will have on traditional operational procurement.

Content


- M2A The foundation for advanced automation in PSM.mp4
- M2B Fundamentals operative procurement.mp4
- M2C Fundamentals operative purchasing.pptx
- M2D Introduction to operative procurement challenges.h5p
- M2E Operative procurement quiz.h5p
- M2F The era of Data Analytics.mp4
- M2G Big Data in purchasing.pptx
- M2H Description of 6Vs of big data.h5p
- M2I Memory game 6Vs of big data.h5p
- M2J RPA in purchasing.mp4
- M2K RPA in purchasing.pptx
- M2L Explain the 5 phases of RPA.h5p
- M2M Complete the message on cognitive automation.h5p
- M2N RPA is more achievable than a utopia.h5p

Impression in Moodle


Module 2: The foundation for advanced automation in PSM




Mark as done



Mark as done




Mark as done




FILE
PPT: Fundamentals operative purchasing

Mark as done




H5P
Introduction to operative procurement challenges

Mark as done




H5P
Operative procurement quiz

Mark as done




Mark as done




FILE
PPT: Big Data in purchasing

Mark as done




H5P
Description of 6Vs of big data

Mark as done




H5P
Memory game 6Vs of big data

Mark as done




Mark as done




FILE
PPT: RPA in purchasing

Mark as done




H5P
Explain the 5 phases of RPA

Mark as done



H5P
Complete the message on cognitive automation

Mark as done



H5P
RPA is more achievable than an AI/ML

Mark as done

Figure 7 - The foundation for advanced automation in PSM in the PERSIST Moodle

3.4. Module 3: eSourcing activities to select suppliers in I4.0

Module Aim

Selecting and negotiating with suppliers, using relevant legal frameworks and I4.0 technologies

Intended learning outcomes

By successful completion of the module, the student will be able to:

1. Understand the concept of supply networks,
2. Understand simple contract management tasks at the buyer-supplier interface
3. Apply some simple applications to make use of digital negotiation

Therefore, module 3 will focus on the following three skills:

- **“Supply Network Management skills** in purchasing relate to a coherent and integrated understanding of the vertical and horizontal supply chain of goods and services, which allows management of the supply chain from economic, social, and environmental perspectives.”
- **“Digital Contract Management and Legal skills** to implement legislative and other legal requirements into automated purchasing processes, utilising, for example, blockchain technology and smart contracts to create and maintain transparency in the supply chain.”
- **“Digital Negotiation skills** include negotiating within a digital environment, e.g., E-Sourcing technologies and auctions, where Industry 4.0 negotiation focuses on machine negotiation and digital marketplaces.”


Content

- M3A eSourcing activities to select suppliers in I4.0 module.mp4
- M3B Learning Goals eSourcing activities to select suppliers in I4.docx
- M3C Introduction to Module 3 of PERSIST.pptx
- M3D Supply Network Management_PERSIST.mp4
- M3E Reading materials - Supply Network Management.docx
- M3F Supply Network Management.pptx
- M3G Supply Network Management.h5p
- M3H Digital negotiation.mp4
- M3I Reading materials Digital Negotiation skills.docx
- M3J Digital Negotiation.pptx

- M3K Digital Contract Management and Legal skills.pptx
- M3K Digital Contract Management and Legal.mp4
- M3L Reading materials Digital Contract Management and Legal.docx

Impression in Moodle

▼ **Module 3: eSourcing activities to select suppliers in I4.0**



Mark as done

PAGE: Learning Goals eSourcing activities to select suppliers in I4.0 module

Mark as done

FILE: Introduction to Module 3 of PERSIST

Mark as done


Mark as done

PAGE: Reading materials - Supply Network Management

Mark as done

FILE: Lecture M3 Supply Network Management

Mark as done

H5P: Supply Network Management H5P

Mark as done

PAGE: Reading materials Digital Negotiation


Mark as done

FILE: Micro-lecture Digital Negotiation

Mark as done

PAGE: Case example Digital Negotiation

Mark as done


Mark as done

PAGE: Reading materials Digital Contract Management and Legal

Mark as done

FILE: Micro-lecture Digital Contract Management and Legal

Mark as done

PAGE: H5P Digital Contract Management and Legal

Mark as done

Figure 8 - eSourcing activities to select suppliers in I4.0 in the PERSIST Moodle

3.5. Module 4: eProcurement to facilitate operative procurement activities in I4.0

Module Aim

Make strategic decisions about purchasing orders based on the internal demand of raw materials and inventory management data set.

Intended learning outcomes

By successful completion of the module, the student will be able to demonstrate:

1. Analysing internal demand data for different products
2. Evaluating order schedule and order size that is cost-effective and serves well
3. Create strategies for inventory management and compare them
4. Explain how a simple automated inventory management algorithm could work

Content

- M4A Module 4 Content video.mp4
- M4B Introduction to machine learning video.mp4
- M4C Introduction to Machine learning slides.pptx
- M4D A Inventory plans video.mp4
- M4E A Getting ready for the game data and instructions.zip
- M4F A Replenishment game.h5p
- M4G Module 4 Reading materials.docx
- M4H Data preparation for machine learning videofile.mp4
- M4I Small wine test.h5p
- M4K Module 4 Homework.docx
- M4L Decision tree video 1.mp4
- M4M Decision tree video 2.mp4
- M4N Decision tree slides.pdf
- M4O Decision tree map.png
- M4P Decision tree quiz.h5p
- M4R Process automation twitter bot demo video.mp4

Impression in Moodle

▼ **Module 4: eProcurement to facilitate operative procurement activities in I4.0**

URL	Module 4: Content	Mark as done
URL	Introduction to Machine learning video	Mark as done
PDF	Introduction to Machine learning slides	Mark as done
	<p>Welcome to the module 4. It consists of these elements:</p> <ul style="list-style-type: none"> Inventory replenishment game (A) Machine learning exercises (B) Decision tree videos and exercises (C) Twitter bot demo (D) 	Mark as done
PDF	A Inventory game video	Mark as done
PDF	A Getting ready for the game data and instructions	Mark as done
	Not available online. The activity A Inventory game video is marked complete	
HP	A Replenishment game	Mark as done
	Not available online. The activity A Getting ready for the game data and instructions is marked complete	
PDF	B Readings	Mark as done
URL	B Video: Data preparation for supervised machine learning	Mark as done
HP	B Small quiz test	Mark as done
ASSIGNMENT	B Explain MNM algorithm (homework)	Mark as done
	<p>Opened: Wednesday, 4 April 2023, 11:02 AM</p> <p>Due: Wednesday, 10 April 2023, 11:02 AM</p>	
URL	C Decision tree video 1	Mark as done
URL	C Decision tree video 2	Mark as done
	Not available online. The activity C Decision tree video 1 is marked complete	
PDF	C slides_decision_tree	Mark as done
PDF	C Decision tree map	Mark as done
HP	C Decision tree quiz	Mark as done
	Not available online. The activity C Decision tree map is marked complete	
URL	D Video: Process automation Twitter bot demo (14 min)	Mark as done
PDF	VideoBot	Mark as done
PDF	Inventory game videofile	Mark as done
PDF	Introduction to Machine Learning videofile	Mark as done
PDF	module 4 content video	Mark as done
PDF	twitter bot demo video	Mark as done
PDF	decision tree 1 and 2 video	Mark as done
PDF	Data preparation for machine learning videofile	Mark as done

Figure 9 - eProcurement to facilitate operative procurement activities in I4.0

3.6. Module 5: Data analytics for Industry 4.0. purchasing

Module Aim

This module aims to improve the decision-making of purchasing managers and stimulate procurement processes innovation uptake. Managers should improve their skills and competencies in understanding the digitalisation of procurement processes in two dimensions:

1. Data-driven decision making
2. Automatisation of procurement-related decision-making.

Managers will increase their awareness of different types of data used for data-driven decision making, its potential, risks, and circumstances in the following domains:

1. Market information,
2. Supplier performance analysis,
3. Data-driven E-negotiation efficiency management
4. Data-driven procurement efficiency validation and reporting (use of data for KPI)

Data analytics skills will be focused on:

1. Data understanding,
2. Data processing,
3. Data transformation,
4. Data visualisation

Intended learning outcomes

By successful completion of the module, the student will be able to demonstrate:

1. Identify suitable indicators and alerts for data-driven procurement making
2. Suitable dashboard proposition for the procurement department
3. Visualisation of procurement performance results
4. Data application for decision making to improve performance efficiency and reduce suppliers' behavioural risks a market risk

5. Setting rules for automatisisation of procurement processes

Content

- M5A Data and data science in purchasing.mp4
- M5B Data analytics for Industry 4.0. purchasing.mp4
- M5C Introduction to procurement business analytics.pptx
- M5D Procurement data analytics life cycle.pptx
- M5E Quality and standardisation of data.pptx
- M5F Procurement analytics tools and techniques.pptx
- M5G Reading- Advanced topics in procurement data analytics 1.docx
- M5H Reading- Advanced topics in procurement data analytics 2.docx
- M5I Introduction to Game Data Analysis of Procurement MT.pptx
- M5J Persitsco dataset for filter game.xlsx
- M5K PERSIST Co. Filter game quiz.docx
- M5Ka PERSIST Co. Filter game quiz (answers).docx
- M5L Evaluation of filter game using CHAID.pptx
- M5M Additional reading.docx

Impression in Moodle

▼ Module 5: Data analytics for Industry 4.0. purchasing















 FILE Data and data science in purchasing	Mark as done
 FILE Data analytics for Industry 4.0. purchasing	Mark as done
 FILE Basic Module 1. Introduction to Business Analytics Powerpoint 2007 presentation	Mark as done
 FILE Basic Module- 2. Procurement data analytics life cycle	Mark as done
 FILE Basic Module 3. Quality and standardization of data	Mark as done
 FILE Advanced Module - 1. Procurement analytics tools and techniques	Mark as done
 FILE Reading - Procurement analytics tools and techniques	Mark as done
 FILE Reading - Procurement data analytics problems	Mark as done
 FILE Reading - Biases	Mark as done
 FILE Reading - Identification of cartels and unfair practices in procurement data	Mark as done
 FILE Data analytics filter game	Mark as done
 FILE Persitsco dataset for filter game	Mark as done
 QUIZ PERSIST Co. Filter game	Mark as done
<p>Dear Junior Data Analyst</p> <p>PERSIST Co. company's market research team gathered, cleaned, transformed and prepared for you a Persist Co. dashboard containing a few thousand already executed procurement competitions.</p> <p>Your task is to provide answers to the series of questions, which will be used in the report.</p>	
 FILE Evaluation of Filter game using CHAID algorithm	Mark as done



Figure 10 - Data analytics for Industry 4.0. purchasing in the PERSIST Moodle

4. Accessing the course:


4.1. Dissemination of the course on the PERSIST website

The outcome of the project is published on the persist website and can be accessed via the following link: <https://www.utwente.nl/en/persist/project-results/intellectual-output-5/>


The IO5 document provides an overview of accessing and downloading the PERSIST course materials. Within the document, a step-by-step approach is provided.

INSTRUCTIONS TO ACCESS AND IMPLEMENT THE PERSIST COURSE	
IO5-White paper (instructions)	
OUTLINE OF PERSIST COURSE MATERIAL	

The course is accessible within the PERSIST Moodle environment via the following link. Here, learners can explore the implications of Industry 4.0 in purchasing and supply management.

MOODLE COURSE ACCESS	
PERSIST Moodle access link	

For everybody who wants to use the outcomes of the PERSIST project within their learning management system (LMS), the project provides an export file of the course via the following zip file.

PERSIST COURSE AS IMPORT FOR LMS	
zip file that contains the course as Import for LMS	

The PERSIST project also shares all developed educational content separately according to the designed five modules. These elements can be downloaded and implemented by educators separately.




SEPARATE COURSE ELEMENTS ACCORDING TO MODULES	
Module 1	
Module 2	
Module 3	
Module 4	
Module 5	

Figure 11 - Dissemination of the course on the PERSIST website

4.2. Accessing the PERSIST Moodle


The PERSIST-Moodle can be accessed via the project's website following the link:

<https://www.utwente.nl/en/persist/project-results/intellectual-output-5/>

Next, access to the Moodle is provided via the “PERSIST Moodle access link” (see Figure 12)

The course is accessible within the PERSIST Moodle environment via the following link. Here, learners can explore the implications of Industry 4.0 in purchasing and supply management.

MOODLE COURSE ACCESS

PERSIST Moodle access link 

For everybody who wants to use the outcomes of the PERSIST project within their learning management system (LMS), the project provides an export file of the course via the following zip file.

Figure 12 - PERSIST Moodle access link

Every learner can register via the Moodle online environment and follow the PERSIST course. An access link will be sent via mail after registration. An account can be created via the “Create new account option (see Figure 13).

Log in to Persist PHF Euke

Log in

[Lost password?](#)

Is this your first time here?

For full access to this site, you first need to create an account.

Create new account

[English \(en\) ▾](#) | [Cookies notice](#)

Figure 13 - Accessing the PERSIST Moodle

Within the Moodle environment, the learner can easily navigate the learning management system and start their learning journey. A tracking of completed course elements is provided (see Figure 14)

The screenshot shows the Moodle interface for the 'Persist 2022' course. The top navigation bar includes 'Persist', 'Home', 'Dashboard', and 'My courses'. The left sidebar contains a navigation menu with the following items:

- General**
 - Oznámenia
- Introduction to the PERSIST course**
 - Welcome to the PERSIST c...
 - Introduction to PERSIST
- Module 1: Introduction to Purchasing and Supply Management (PSM) in an Industry 4.0 environment**
 - Module 1 Introductory Vid...
 - Learning Goals for the Intr...
 - Introduction to PSM Slides
 - Introduction to PSM Recor...
 - Introduction to PSM PERSI...
 - Introduction to PSM Quiz
 - Introduction to PSM Additi...
 - Digital Leadership Slides
 - Digital Leadership Recorde...
 - Digital Leadership PERSIST...
 - Digital Leadership Quiz
 - Digital Leadership Addition...
 - Industry 4.0 Slides
 - Industry 4.0 Recorded Sess...

The main content area displays the course title 'Persist 2022' and a list of activities:

- General** (Collapse all)
 - FORUM: Oznámenia
- Introduction to the PERSIST course**
 - PAGE: Welcome to the PERSIST course (Mark as done)
 - FILE: Introduction to PERSIST (Mark as done)
- Module 1: Introduction to Purchasing and Supply Management (PSM) in an Industry 4.0 environment**
 - FILE: Module 1 Introductory Video (Mark as done)

Figure 14 - Impression of the PERIST course in the Moodle environment

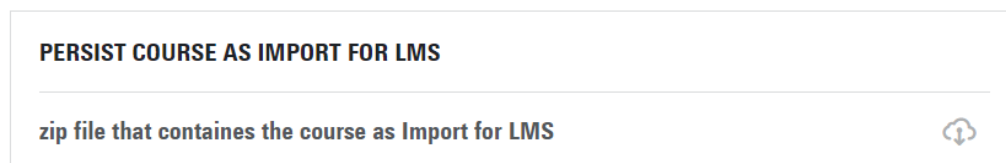
4.3. Implementing the course within various learning management systems

In addition, the PERSIST project provides an Import file that can be imported to learning management systems. This import file includes all elements that have been developed for the five-module course. Educators can download the import file via the PERSIST website following the link below:

<https://www.utwente.nl/en/persist/project-results/intellectual-output-5/>

Next, the file can be accessed via the “zip file that contains the course as Import for LMS” option (see Figure 15).

For everybody who wants to use the outcomes of the PERSIST project within their learning management system (LMS), the project provides an export file of the course via the following zip file.



The PERSIST project also shares all developed educational content separately according to the designed five modules. These elements can be downloaded and implemented by educators separately.

Figure 15 - Implementing the course within various learning management systems

4.4. Downloading the separate course elements according to the five modules

Lastly, the Th PERSIST project also shares all developed educational content separately according to the five designed modules. These elements can be downloaded and implemented by educators separately. The separate course elements can be accessed via the project website by following the link below:

<https://www.utwente.nl/en/persist/project-results/intellectual-output-5/>

At the bottom of the page, learners and educators can download the separate files by downloading the module packages under the “Separate course elements according to modules” option (see Figure 16).

The PERSIST project also shares all developed educational content separately according to the designed five modules. These elements can be downloaded and implemented by educators separately.






SEPARATE COURSE ELEMENTS ACCORDING TO MODULES	
Module 1	
Module 2	
Module 3	
Module 4	
Module 5	

Figure 16 - Separate course elements according to modules option

5. Discussion

5.1. Outcomes of the project

The PERSIST project analysed the business skills needed by purchasing professionals to perform within an Industry 4.0 environment. This was achieved based on the outcomes of IO1-IO3, which were conducted to assess the future skill requirements in PSM. These studies included a systematic literature review, world café studies and a Delphi study. The empirical insights were used to design in IO4 an educational approach to teach students and professionals the necessary skills for the future. In IO5, this design was used to develop the 5 Ec course within an online learning management system environment. The course makes use of a consistent case-study example, micro-lecture, slides, reading materials, and various gamification elements, which have been developed as H5p elements.

The outcome of these development activities is presented above. Educators can implement it to teach the necessary future skills in PSM. Also, the PERSIST-Moodle can be accessed by learners to start their learning journey.

5.2. Sustainability of the project

The sustainability of the project is ensured by four different elements 1) the outcomes are available on the project website, 2) the written publications are available within conference proceedings and journals, 3) the collected insights and developed elements are used by the project members PSM-related study programs, and 4) the outcome and future research directions are used in a future Erasmus+ application.

The first measure to ensure the sustainability of the project is to guarantee that the project results are available on the project website for at least five years. Here, teachers can download the developed elements and use the content within their learning management system. Also, based on the different intellectual outputs developed, it is ensured that the approach to how the outcome has been developed will be preserved.

Second, besides the different white papers, the written publications will be available within the related journals or conference proceedings. The work can be used here as a reference for future research activities and related educational practices.

Third, some of the outcomes are already in use within PSM-related lectures at the project members' institutes today. For example, the University of Twente implemented the outcomes within their

bachelor's and master's business administration programs. Further, the TU Dortmund implemented the research findings and gamification elements in their supply chain management-related studies. Last, the University of Economics in Bratislava uses the project's outcome to design a full 5 EC bachelor's course within their supply management education.

Last, the project's outcome will be used within a future Erasmus+ project that addresses the phenomenon of lifelong learning within the PSM domain. Here, the new project addresses the need to develop specific educational means to educate the older generation of workers. In order to endure the future employability of the ageing society, educational methods need to be developed that teach the future skill in the industry. This project addresses the current workforce professional development and not target students within their higher education study programs.



6. Acknowledgements

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