Project Title: THE FOF-DESIGNER: DIGITAL DESIGN SKILLS FOR FACTORIES OF THE FUTURE



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Contributors:

ULBS, CONTI, UNIBG, UNIOULU, UNIBIAL, BOC, CLEX, VIAMECA, CIRIDD, AFIL, IDPC, PRELMET, OMILAB

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Table of contents

1	In	troduction			
2	How affect the COVID-19 challenge the DigiFoF project from perspective of NEMO summer				
school. Measures to mitigate!5					
3	3 NEMO Day 29.01.2021: DigiFoF Edition				
	3.1	Participant feedback	7		
	3.2	Open questions	11		
	3.3	Presenter's feedback			
	3.4	Summary of the results	13		
4	Co	onclusions	15		
	4.1	Nemo Day 2021	15		
APPENDIX I: Evaluation Questionnaire for Nemo Day 202116					
Α	APPENDIX II: Answers to open questions17				

1 Introduction

The DigiFoF WP5 package "The Factory of the Future Designer: Academic Programs" aims at creating, in a collaborative manner, guideline regarding establishing a joint Master program between HEIs and industry in the field of manufacturing digitalization and Factory of the Future (FoF) based on multifold experiences:

- a) Each HEI contributes by creating courses using the new materials, tools and advanced laboratories, support the creation of the academia-industry exchange framework, organizes student mobilities and contributes to the creation of the guidelines for the joint industry-academia Master. Some of staff from HEIs partners prepares lectures and exercises and will teach at the summer school.
- b) EMSE as WP leader, besides coordinating tasks, collaborates with UNIVIE and OMiLAB in the organization of NEMO summer schools (invites lecturers, designs program, plans teaching materials), organizes mobilities of staff and students, conduct lectures and exercises at NEMO summer schools and prepares OMiLAB with tools and functionalities for supporting lectures and exercises.
- c) From the individual knowledge exchange between academia and industry, the project partners will design in this task, guidelines for the creation of a Master program applicable for the design aspects of the Factory of the Future and for modernising HEIs curricula.
- d) The guidelines will contain all information necessary to create a curriculum (target group, prerequisite knowledge, competences and skills to be delivered, types of courses, structure, syllabi).

This report details the actions carried out by DigiFoF partners from joint academia-industry point of view by analysing the academic materials developed and presented during the NEMO Summer Schools (2020 and 2021).

Conducting the evaluation report of developed academic materials during the NEMO Summer Schools respects Quality Assurance plan that was set by the D6.1 deliverable which provides guidelines on the event organization and standards to ensure consistency between the events organized by the project partners.

The evaluation report structure consists in:

- Using the D6.1 to create NEMO evaluation report structure and content
- Applying the NEMO evaluation report in July 2020 and reviewing by OmiLAB
- Collecting feedback and update accordingly the deliverable D5.3 and providing QA report by OMiLAB
- Repeating the process for 2021

The NEMO 2020 organisers (University of Vienna - Austria and OMiLAB) provided with at least 6 months before the event a full information package to all potentially participants

(<u>https://nemo.omilab.org/nemo/call-for-participation/</u>). This includes agenda, information about the venue and how to reach it (suggested hotels, public transports available, etc.), link to online conference software (in case of webinar), material and tools required. Time for preparation activities depends on the event type (e.g. summer school, workshop or trainings).

A feedback form shall be distributed to all the event participants. This will be based on the guidelines of Q6.1 annex C and will be presented during this deliverable (D5.3).

The organisers are responsible for reporting the collected feedback using the DigiFoF standard template (annex D). This template has to be filled by organisers. It shall be used to inform colleagues and partners about events (NEMO 2020 and NEMO 2021 respectively).

2 How affect the COVID-19 challenge the DigiFoF project from perspective of NEMO summer school. Measures to mitigate!

Unfortunately, the sanitary conditions caused by the COVID-19 pandemic prevented the 2020 Next-Generation Enterprise Modeling (NEMO) summer school from taking place. This has caused disappointment among both students, teachers and organizers.

Through the NEMO Day event from 29.01.2021 we set out to initiate a series of online events to make up for the loss of the summer school of 2020 but also to test to what extent online teaching methods can replace physical teaching face to face, if there is interest from the students' part, how the courses are appreciated and understood, etc.

Judging by the large number of participants but especially by the number of questions at the end, I think the event has reached its goal. In addition, I was pleasantly surprised by the depth of the students' questions and especially by the new suggested research ideas that we will study, analyzing them in our research groups.

One thing is for sure, NEMO Day should not remain a singular event but should continue, maybe even extending the target audience toward companies activating in the Manufacturing sector but not only! Adrian Florea, Technical Coordinator of DigiFoF project

3 NEMO Day 29.01.2021: DigiFoF Edition

Following the NEMO Summer School Series, the NEMO Day 2021 aims to provide participants insight into the EU project DigiFoF, results achieved, and further development activities within this project and the OMiLAB network. Moreover, the NEMO Day 2021 will give participants an idea of the two-week event, namely the NEMO Summer School, that usually takes place at the end of July at the University of Vienna.

The NEMO Summer School Series focuses on the design and implementation of Enterprise Digital Twins and Ecosystems based on conceptual modelling methods. NEMO provides a vertical overview across different application domains as preparation for all dimensions of digitization.

The NEMO Day 2021 was organized by the DigiFoF project to elevate student's expertise in design aspects of the factory of the future and gain insights on the applicability of developed design artefacts, methods and tools. Participants had the chance to interact with experts in the field, provide their reflection as an evaluation and were awarded a learning badge.

All details related to the event can be found online at: https://www.omilab.org/activities/events/nemoday2021/

Presentation	Presenter(s)						
Introduction DigiFoF Project	Prof. Dr. Adrian Florea						
Design of Product Service Systems supported by Conceptual Models	Prof. Dr. Xavier Boucher						
Conceptual Models of Production Processes by	Prof. Dr. Adrian Florea and Prof. Ion Mironescu						

Presentations given during the NEMO Day 2021 are presented in the table below:

Number of registered participants was 54 from 10 different countries and 13 organisations. After the event precipitants were asked to fill a questionnaire to evaluate event. Questionnaire was divided in five parts:

- 1. Satisfaction in various aspects
- 2. Agreement to statements
- 3. Yes/no questions
- 4. Miscellaneous multiple-choice question
- 5. Open questions

The questions presented in the evaluation form are presented in appendix I. Results from multiple choice questions are presented below.



3.1 Participant feedback

Figure 1: The overall satisfaction in the event

Participants were highly satisfied in organisation of event. In every aspect event gained mostly highest score. Only the satisfaction in presentation had significant number of score one point lower than maximum. Overall event was very successful



Figure 2: Participants level of agreement to statements

Event fulfilled participants expectations well. Participants felt that material was useful and informative, and style and communication suited well the nature of the event. Almost every participant that answered the evaluation form would recommend similar event to colleagues. Materials and style of the communication suited online format. Topics were largely what participants were expecting showing that student had some prior knowledge in conceptual modelling.



Figure 3: Answers to Yes-No questions

According to participants topics in NEMO day 2021 required moderate to high prior IT-knowledge. Similarity prior economic knowledge was also required to fully understand the lectured. Lecturers' performance was rated high even though materials were not rated as easy to follow as teacher's performance. Student backgrounds were diverse but still most of the students felt that material was easy to follow. Regardless of the requirement for moderate knowledge in IT and economics materials were relatively easy to follow demonstrating that presentations were well aimed for the target audience.



Figure 4: Answers to miscellaneous questions

Participants felt that event will be useful in their future career and only one student felt that event lessened their interest in the topics presented. Students believe that they could repeat experiments demonstrated with only moderate effort. Software worked fairly well during demonstrations with only minor problems. Students appreciated applicative parts of presentations over theoretical parts.

3.2 Open questions

Full results from the open questions are presented in the appendix II



Figure 5: Word cloud of the suggested improvements

Main improvements for the seminar were that seminar was too theoretical and had too little practical aspects. Another point raised was with problem statement. It was not clear to every participant what presented tools were for.



Figure 6: Word cloud of the seminar's main strengths

Participants found presenters to be engaging and passionate. Topics were interesting and novel for the participants. Time management and conference leading was friendly but efficient.



Figure 7: Word cloud of the main advantages and disadvantage of the online format

Seminar was organized as an online event and participants were asked the main advantages and disadvantages of online events. Main advantages are the ease of access to seminar and the fact that presenters and attendees come from diverse backgrounds and locations. The main disadvantages were the more difficult or unnatural interaction between lecturer and students. Also, the lack of physical access makes demonstrations less engaging.

3.3 Presenter's feedback

Feedback revived from the presenters is presented below:

The course was well-organized. I had some minor technical problems because of the digital platform. The short duration of the overall session is a positive point to enhance attractiveness.

Because of such short communications, the orientation is on sharing innovative ideas and initiatives, to open a larger international awareness on such emerging innovations. Somehow it is contributiong to more open innovation within the OMILAB Communittee. This could be more highlighted when we spread the porposal for participation : more communication on 'The innovation corner". The quite large international participation (10 countries) is a very good point and it emphasizes that the OMILAB community is already largely international.

Concerning the operational execution : 20mn is a very short time period when you want to be understood a minimum on a new innotative topic.

A solution with 30mn time slots would be great, at least when there is a demonstration of tool.

Having an introductory slide underlying how the contents various lectures are logically articulated one with regards to another could be great.

Interactions just after the talk were inactive : would it be possible to gather all interaction slots together after the lectures, to generate more interactions at this moment?

Professor Xavier Boucher

Unfortunately, the sanitary conditions caused by the COVID-19 pandemic prevented the 2020 Next-Generation Enterprise Modeling (NEMO) summer school from taking place. This has caused disappointment among both students and teachers.

Through the NEMO Day event from 29.01.2021 we set out to initiate a series of online events to make up for the loss of the summer school of 2020 but also to test to what extent online teaching methods can replace physical teaching face to face, if there is interest from the students' part, how the courses are appreciated and understood, etc.

Judging by the large number of participants but especially by the number of questions at the end, I think the event has reached its goal. In addition, I was pleasantly surprised by the depth of the students' questions and especially by the new suggested research ideas that we will study, analyzing them in our research groups.

One thing is for sure, NEMO Day should not remain a singular event but should continue, maybe even extending the target audience toward companies activating in the Manufacturing sector but not only!

Professor Adrian Florea, Technical Coordinator of DigiFoF project

Presenters felt that event was well organized and successful. There were minor technical issues with one presentation but otherwise there were no problems. Number and internationality of participants was quite large for so quickly organized event. Interaction after individual presentation was inactive but at the end of the event there was lot of questions. In addition. the depth of the students' questions was pleasant surprise demonstrating that this kind of online event is not only useful for students but also can give new insight to presenters. Allocated time for presenters was relatively short only 20 minutes which is a noticeably short time period when on a new innovative topic.

3.4 Summary of the results

Nemo Day 2021 was a successful event and number participants was high. Feedback from the event was mainly positive and many of the attendees would recommend event for their colleagues. Material presented were novel for several participants and raised their interest in the digital design skills for factories of the future. In future online events more practical aspects should be given attention. In case of ADOxx tools tool could be distributed to participants before event so they can follow demonstrations on their own machines. For demonstrating cyber-physical-systems pre-

recorded video could be considered to minimize technical issues. There is need to improve interaction between students and teacher during the seminar.

4 Conclusions

4.1 Nemo Day 2021

The cancellation of NEMO 2020 Summer School affected DigiFoF project. Originally plan was to evaluate academic materials developed during the Summer School but the situation with COVID-19 made that plan infeasible The Nemo Day 2021 was organized partly to replace Nemo Summer School but also to test waters with online event and to see if online seminars would be suitable for teaching concepts of the Factory of the Future.

Nemo Day 2021 clearly demonstrated that there is a demand for online seminars. However, during such short event it is not possible to go into depth of the topic, so presentations will necessary be introductory to innovative ideas and initiatives. Raising awareness of the design tools for the Factory of the Future helps more students to become interested in the DigiFoF concept. Such short seminars cannot fully compensate for the cancellation of the Nemo Summer School 2020 but can be used to increase awareness of the concepts of the DigiFoF

APPENDIX I: Evaluation Questionnaire for Nemo Day 2021

How satisfied are you with the following aspects of the event? (1: Not satisfied - 5: Very satisfied)

- Overall organisation of the event
- Programme structure
- Time management
- Presentations

Please indicate your agreement with the following statements

(1: Strongly disagree - 5: Strongly agree)

- The topics of the event are what I was expecting.
- The distributed material is useful and informative.
- The style and communication of the organisers is suitable for this kind of
- event.
- I would recommend this kind of event to my colleagues.

Please choose the most fitting option for the following questions.

(1: No - 5: Yes)

- Were prior IT (especially modelling) knowledge and skills required?
- Was prior knowledge from the economic field (business management) required?
- Has the teacher performed as you expected?
- Were the case materials easy to follow?
- How useful is the information you received for your future projects or career development? (1: Not useful - 5: Extremely important)
- How easy would it be for you to repeat the experiments on your own at your university?(1: Very hard 5: Very easy)
- Which part of seminar did you appreciate most: the theoretical or the applicative part? (1: Theoretical 5: Applicative)
- This class has increased my interest in this field of study. (1: Disagree 5: Agree)
- Did the hardware / software applications work well during the practical experiments? (1: Didn't work 5: No problems)

Open questions

- What specific things about the seminar could be improved to better support student learning? (limit to 3)
- What are the strengths of this seminar?
- This seminar is developed in an online manner. What do you think are the most important benefits and disadvantages of such a development?
- What is your background? What specific domain are you studying? (e.g. Engineering, Economics, Computer Science, etc.) (Optional)

APPENDIX II: Answers to open questions

What specific things about the seminar could be improved to better support student learning? (limit to 3):

Quizzes at the end of presentations.

The ADOxx platform and its modules

sometimes not so easy to follow because it was quite theoretic; not everybody has the same background knowledge; not so easy to ask good questions in a certain amount of time because time is need to think about everything first;

Everything was great

Nothing to improve from my side.

The seminar was very informative and the speakers were engaging but the meet application didn't have a (visible/intuitive) way of seeing the speaker presentations in full screen, so there were times when it was difficult to read the slides.

From my point of view we had a both practical experimental and theoretical explanations, so it had every thing that needed in order to support student learning.

It was quiet good, but it could be even better if it would be a little bit more interactive. -maybe try to show something practical, not only theory more accurate examples

- providing The tools in advance or a virtual machine to be download for running on own computers Earlier notification of the appointment from the teacher

* I think only to improve the problem description - why it is a need for this (even though I understood the concept, I think I missed that part) * Anything else where really helpful and interesting in my point of view

The presentation to be more based on the application developed. The applications to be the center of the presentation and the starting point.

- motivate more students to take part! - Everything was fine, thank you very much! Providing more exemples

- motivate more students to take part! - Everything else was fine, thank you very much!

Video materials could be helpful.

the numebr of presentation can be more to support different topics.

This seminar is developed in an online manner. What do you think are the most important benefits and disadvantages of such a development?

It brings a new area in the field of study, that has not been approached during college. At least that is in my case.

Clear explanations from participants The interesting topic about PSS presented by Pr. Boucher

you can follow from anywhere; I like online presentations when lecturers convey their ideas so that students gain understanding;

Focus to what matters related to the topic

The participants discover a lot of new and interesting things.

The organization was efficient and the speakers were engaging and passionate about their respective fields of interest. We were presented with a clear understanding of the goals of the Factories of the Future project, and the presented material was suitable for reaching those goals.

Some of the strenghts of this seminar might be that you get to see today how the desing of tomorrow will be in the production processes, which can give students an advantage .

The skills and the enthuziasm of the teachers.

-The teachers which present and have knowledges to answer The question when is needed -Most presented topics are related to future improvement

good information provided

The ability to see some of the most recent projects developed in the conceptual modelling field. The ability to interact with field experts and see their creations in action.

- develop skills even in pandemic period - The seriousness of The participants

Different projects

* good presentations with examples and demos * very good explanation of the DigiFoF concept

The applicative part was a interesting experience and that made the presentation very interesting.

- innovative ideas - discussion - clustering of new ideas - information on what is currently happening in this area - motivating for students

time management and Leading the conférence friendly

- innovative ideas - discussion - clustering of new ideas - information on what is currently happening in this area - motivating for students

Subjects were interesting and are actual worldwide.

Presenting conceptual and petrinet which I was not familiar previsouly.

This seminar is developed in an online manner. What do you think are the most important benefits and disadvantages of such a development?

The biggest benefit is that everyone can join remotely regarding that people all around the world attend these seminars. The disadvantage is that if you have a bad connection you won't understand anything from the seminar.

I think that interactions are easier.

benefits: allows participation of people from all over the world; interesting insights from other universities; disadvantages: quality of presentation suffers if presenters are not familiar with this kind of online presentation (handling of moderator role)

benefits are ease of access, disadvantage is the lack of live interaction

Networking

Benefit: There are no cost of organizing/participating in this sessions. Disadvantages: The interaction between presenters and students will be more strong in person then in the online manner.

The main advantage of participating in the online seminar is that it facilitated bringing together participants from various backgrounds as well as different places. We might have otherwise not had the opportunity to participate. The downside to this, however, is that it is not the same as interacting face-to-face.

The benefist might be that people from all over Europe can gather at the same time. A disadvantage might be that some people learn more from a "hands-on" perspective, and it might be a little hard for them to understand.

One good thing about it's that it's less time consuming in terms of organzitaion but I would prefer to attend a face tot face meeting.

The most important benefit is that everyone can take part in the meeting no matter where they are from The disantantage might be the fact that being online, we cant socialize the same as we would socialize being physically there.

benefit is that is no needed to travel disadvantage is that you can't socialize person to person with people involved

Benefits: ease of access, more comfortable Disadvantages: Maybe a f2f interaction could provide a better link between the attendees and the presenters

The Disadvantages: - the lack of networking between participants - the difficulty to see and put the hand on simulation of some physical devices, CPS tools The main advantage is that could freely participate a large number of people from all over the world

A discussion could be compromised because it feels different when discussing face2face and being able to ask spontanous questions.

Benefits: we stay healthy Disadvantages: might be connection issues

A benefit it was that you are in the home's comfort and you could assimilate the information very well. But also this is still a big disadvantage because you could easily lose the narrative thread.

benefits: - accessible at any time from anywhere disadvantages: - technical problems may occur - online discussions are ok, but cannot fully replace discussions in physical presence (that's not the same).

no disadvantage

benefits: - accessible at any time from anywhere disadvantages: - technical problems may occur - online discussions are ok, but cannot fully replace discussions in physical presence (that's not the same).

The benefits are that it is easly to take part of it. Home, office or where you are you just have to sign in. As disadvantage i would say that the interaction may not have been exactly what the teachers wanted(camera off, they didn't see our reactions for example)

disadvantage is loosing the internet connection during the seminar and benifit is saving money.