

Enhance

Maintenance - Production - Quality

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Capacity Building in the field of Higher Education

**strENgtHening skills and training expertise for TunisiAN
and MorocCan transition to industry 4.0 Era / ENHANCE**

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1.3		Final Version	Sabeur Elkosantini
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Executive Summary

The purpose of this document is to present the outcomes of first industrial workshop organized online on July 7th, 2021. The first objective of this workshop is to collect data from Moroccan and Tunisian industry and universities in order to identify gaps between targeted MPQ4.0 skills, existing curricula being offered in both Tunisian and Moroccan partner universities programs and also local industrial need. As a CBHE project, the ENHANCE vision is organised around five main pillars:

- The European vision about Maintenance, Production, and Quality engineering in the context of industry 4.0 (MPQ4.0). The programme country members synthesise the most impacting related work in MPQ 4.0, share the best practices of the teaching programmes in their institutions and finally, their Digital Innovation Hubs (DIHs) services and experimented solutions.
- The partner countries vision about the existing teaching programmes in the involved Tunisian and Moroccan universities. This vision is completed with current practices and new MPQ 4.0 requirements collected from selected industrial partners in different application domains.
- The MPQ 4.0 Learning Framework to cover the gaps and draw the path for training the trainers in the three main topics.
- The MPQ 4.0 pilots development to create effective skills, competencies, technology acquisition channels to support digital transformation in the industry. The generated materials are to be structured in the Longlife eLearning (LeL) platform to be deployed at each partner countryside.
- The creation of 2 DIHs, one in Tunisia and one in Morocco to sustain the ENHANCE outcomes and organise their exploitation model to support MPQ 4.0 industrial challenges in both countries.

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1. ENHANCE project Overview

ENHANCE – strENgtHening skills and training expertise for TunisiAN and MorocCan transition to industry 4.0 Era – is an Erasmus Plus project founded under the KA2 Cooperation for innovation and the exchange of good practices (Capacity Building in the field of Higher Education) programme by the European Commission under Grant Agreement N° 619130, to be conducted in the period January 2021 until January 2024. It engages 7 partners from 5 countries with a total budget of 779k€. Further information can be found at <http://eplus-enhance.eu/>.

The emergence of industry 4.0 concepts and applications brings new paradigms impacting all the industrial business domains when they need to conduct successful digital transformations or increase workshops connectivity. The evolution of Maintenance, Production and Quality Engineering (MPQ 4.0) represents the main application domains where Industry 4.0 produces effective beneficial results.

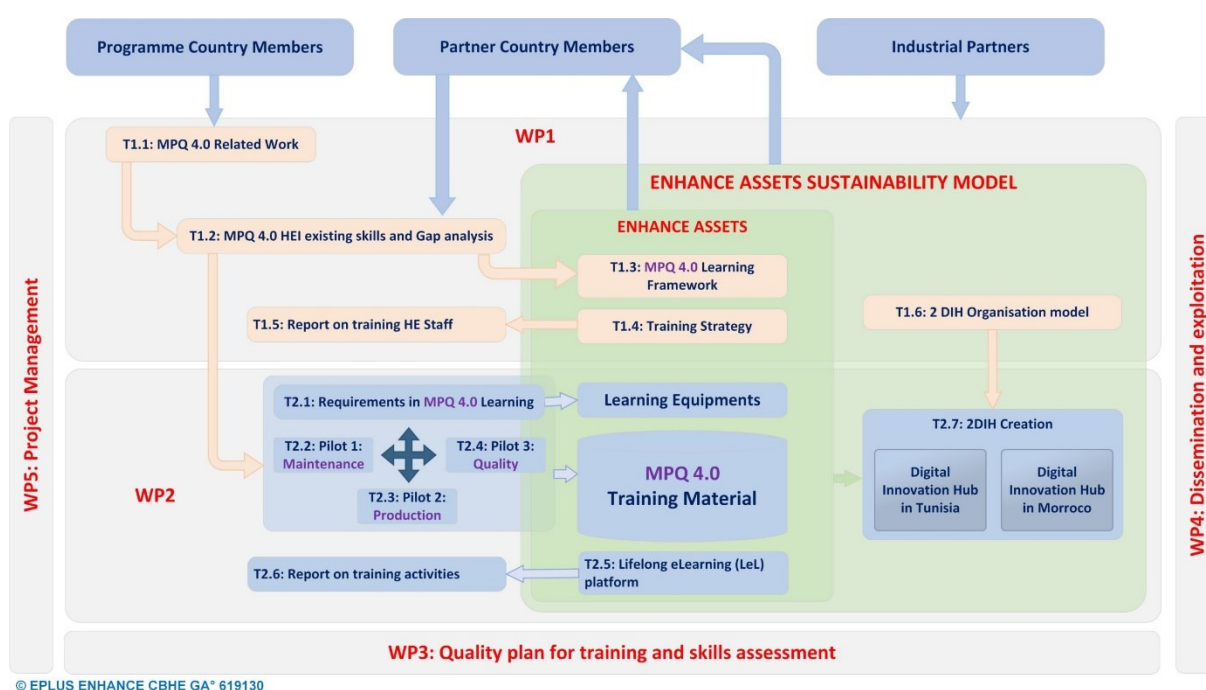


Figure 1 – ENHANCE project organization.

The ENHANCE project focuses on building new MPQ training capacities at Higher Education Institutions (HEI) in Tunisia and Morocco to establish interactions between the following stakeholders:

- European universities and research institutions (from France, Germany and Portugal) confirmed MPQ 4.0 competencies, training materials, collaborative research projects, full operational Digital Innovation Hubs (DIH), technology transfer experiences, etc.
- Partner country universities (from Tunisia and Morocco) with teaching and training activities in MPQ and existing connections with their local industrial partners.

The ENHANCE project will create several outputs and two primary tangible outcomes:

- New MPQ 4.0 equipment and training materials developed in connection with the existing training programmes and consolidated through three industrial pilots. The new material will be used to train the trainers and the students in the different partner country universities.

- Two DIHs, one in Tunisia and one in Morocco to sustain the project outcomes through their reuse for training in industry.

ENHANCE aims to become the reference model for creating effective and sustainable training material for MPQ 4.0 in both partner countries with content approved by academia and industry.

2. Introduction

In recent years, the industry in North Africa (also called Maghreb) region, especially Morocco and Tunisia, is facing a historical turning point when considered on a global scale. The digital age comprises a new way of thinking regarding manufacturing and operations. To improve the attractiveness for investment and to meet market requirements of competitiveness, in terms of performance, quality, and sustainability, both Morocco and Tunisia need to support industrialization. In this context, this project focus on industry 4.0 and particularly on the three following topics: Production 4.0, Maintenance 4.0 and Quality 4.0, which represent key industrial business processes that particularly need attention, investment and improvement. Through this project, several Tunisian and Moroccan universities and companies showed their interest to develop skills and knowledge to take full advantage of industry 4.0 paradigm and technologies related with these three core business processes of Industry 4.0.

2.1. Purpose of the document

The objective of this document is to present the different organized dissemination events. Some statistics are presented.

2.2. Structure of the document

The structure of the document is :

- Chapter 3. Erasmus Morocco Cluster meeting
- Chapter 4. Seminar for presentation of the new master industry 4.0 of IIT
- Chapter 5. Seminar MPQ 4.0
- Chapter 6. DIH in Tunisia and Morocco
- Chapter 7. Transferable research and Laboratory outcome

3. Erasmus Morocco Cluster meeting

During the first year of the project, the Moroccan ERASMUS+ Office organized an online cluster meeting for all ERASMUS+ project involving Moroccan partners. The event was organized on October 11th, 2021. During this event, 7 ERASMUS+ projects were presents: Wemag, Mathics, Icfal, Fosamed, Enhance et AgriEngage (see Figures 2 and 3).



Figure 2 – Moroccan Erasmus+ cluster meeting

For ENHANCE, Moroccan representatives, Pr. Abdelmajid Elouadi from University Ibn Tofail and Pr. Saber Darmoul from Ecole Centrale Casablanca presented project, its consortium, objectives and its organizations.



Figure 3 – Online meeting of Moroccan Erasmus+ cluster meeting

4. Seminar for presentation of the new master industry 4.0 of IIT

The project partner IIT developed a new master titled “industry 4.0”. IIT organized a seminar to present their new master on October 13th, 2021. During the seminar, Dr. Sabeur Elkosantini from University of Carthage (Tunisia) presented the project and Dr. Lounes Bentaha from University Lumière Lyon 2

(France) presented the activity “predictive maintenance” which is developed in Task 2.2 (WP2). (see Figure 4)



Figure 4 – flyer and program of seminar of the presentation of the new master industry 4.0 of IIT

5. Seminar MPQ 4.0

This seminar was organized on November 25th 2021 in Sfax during the physical plenary meeting hold in Sfax during the same period. The title of the workshop was “**Batir les compétences humaines pour l’industrie du futur**”. Around 150 participants (professors, industrials and students) were present (see Figure 5).



Figure 5 – Flyer and agenda of the workshop.

The objective of the event was to highlight the importance to upgrade students and engineers' skills, mainly those related to MPQ4.0. Therefore, the event was organized in two parts. In the first, professors, from ULL, BIBA and UNL gave talks on these issues (see Figure 6). The second part of the event was a panel (see Figure 6) in which both professors and industrials were invited to discuss how ENHANCE and other academic and research project can contribute to reduce the gap between universities outcome and industrial requirements.



Figure 6 – Panel of the workshop.

6. DIH in Tunisia and Morocco

This event was organized on April 7th 2022 in Casablanca (Morocco) during the physical plenary meeting hold in Ecole Centrale Casablanca in Casablanca (Morocco) during the same period. The title of the workshop was “The contribution of ERASMUS+ ENHANCE in mounting Digital Innovation Hubs in Morocco and Tunisia”. 28 professors were present (Figure 7).

During this workshop, the project coordinator, Pr. Nejib Moalla gives a talk about European Digital Innovation Hubs and the experience of DIH of Lyon 2. Pr. Nejib presented other initiatives funded by the European Commission to develop DIH in Africa.

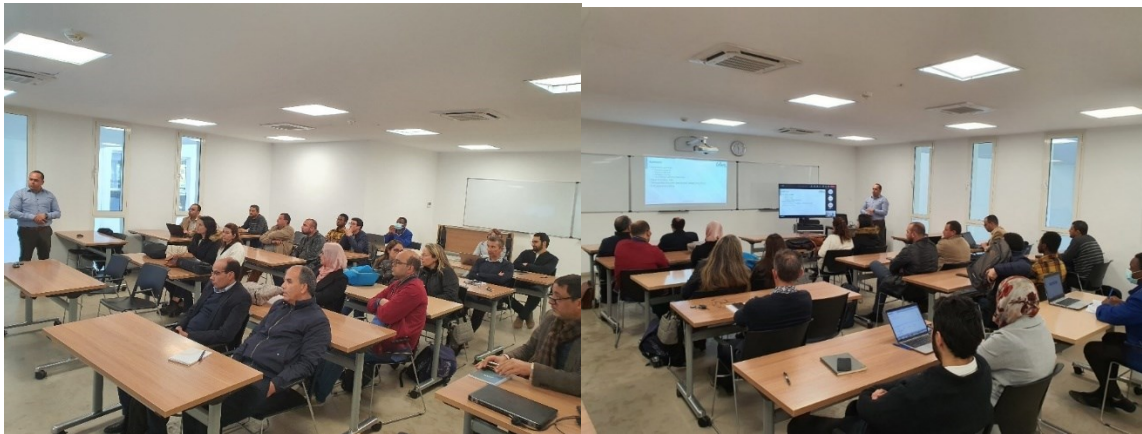


Figure 7 – The 4th ENHANCE workshop.

7. Transferable research and Laboratory outcome

This workshop was organized by UNL and held in Lisboa (Portugal) from April 28th to April 29th 2022. During this event, representatives from around 20 EU projects (such as ZDMP - Zero Defect Manufacturing Platform, INEDIT Project, DigiPrime, SHYFTE project, ENHANCE, QualiChain, edenhub, LAB-MOVIE Project, Vessel AI, DIGITAQ PROJET, yachay, Smart4Health, H2020-Faith, i4Q Project, EFPF Project). The flyer of the event is in the Figure 8.



Figure 8 – flyer of the Transferable research and Laboratory outcome

The main objective of this event to present some of their outcomes. With regards to ENHANCE, the following talks were held:

- Presentation of the project, by Pr. Nejib Moalla (ULL)
- Presentation of the conducted gap analysis (T1.2/D1.2), by Dr. Sabeur Elkosantini (UCAR)
- Presentation of the learning framework (T1.3/D1.3), by Dr. Joao Saraipa (UNL)
- DIH Sustainability (T1.6/T1.6), by Pr. Nejib Moalla (ULL)

This event was a good opportunity to share experiences and results of many EU funded projects addressing different scientific and technological challenges and problems.

8. Training workshops in Tunisian non-partners universities

ENHANCE project have co-organized a serie of workshops dedicated to industry 4.0 in different Tunisian Universities according to this schedule (see figure 9)

- ISET Kasserine : February 12th 2024
- Faculté des Sciences de Gafsa : February 13th 2024
- ISET Tataouine : February 14th 2024
- ISET kébili : February 15th 2024

The objective of these workshops is to disseminate about project results and present some of the project outcomes.

WORKSHOP
Erasmus CAPACITY BUILDING

Contributions of the ERASMUS+ programme to the development of Industry 4.0 in Tunisian universities

IOT
Internet of Things

4.0

Save the Date
February 12, 2024

CO-ORGANIZED BY

- ✓ ISET Kasserine
- ✓ ENHANCE
- ✓ SMARTECH
- ✓ INNOTECH
- ✓ COSINES
- ✓ TAPII Kasserine & 4C

More INFO
www.isetks.rnu.tn

Erasmus Capacity Building
Programme supports the modernisation and development of High educational systems in the Partner Countries.

Address:
Campus universitaire Kasserine, BP 448, 1200 Kasserine

Le projet ENHANCE et l'université de Gafsa
Organisent le workshop
Industrie 4.0

qui aura lieu le 13 Février 2024 à la faculté des Sciences de Gafsa-Salle Polyvalente

QR code: Lien d'inscription

Heure	Titre de l'intervention
9h - 9h15	Mot du bienvenu
9h15 - 10h45	Renforcement de capacité dans l'enseignement supérieur, l'exemple du projet ENHANCE
10h45 - 11h45	La réalité augmentée au service de l'industrie, Pr. Youssef Rochdi, Université Ibn Tofail, Maroc
10h15 - 11h	Cas d'études de la réalité augmentée en maintenance industriel, Pr. Youssef Rochdi, Université Ibn Tofail, Maroc
11h - 11h15	Pause
11h15 - 12h	Emerging uses of smart technologies for production planning and scheduling, Achraf Ammar, IIT, Sfax, Tunisie
12h - 12h45	KPI, Dashboarding and Visualization, Artem Schurig, BIBA, Allemagne
12h45 - 13	New opportunities for Erasmus+

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fet

North American Private Universities, SFAX TUNISIA

Semaine de l'Industrie 4.0 en Tunisie

12 > 15 Février 2024

À partir de 9:00

ISSET KASSERINE 12/02/2024

FAC DES SCIENCES GAFSA 13/02/2024

ISSET KEBILU 15/02/2024

ISSET FALGAOANE 14/02/2024

Logos: BIBA, INNOTECH, IIT, NXVA, Enhance, European Union

Le projet ENHANCE et l'ISET de Kebili en collaboration avec les centres InnoTech, SmartTech et Cosinus Organisent le workshop

La transformation des entreprises à l'ère de la 4ème génération

qui aura lieu le 15 Février 2024 à l'ISET de Kebili

Heure	Titre de l'intervention
9h - 9h15	Mot du bienvenu
9h15 - 9h30	Renforcement de capacité dans l'enseignement supérieur, l'exemple du projet ENHANCE, Dr. Achraf Ammar, IIT, Sfax, Tunisie
9h30 - 10h15	Les réseaux de neurones : de la théorie à la pratique, Dr. Sabour Elkasantini, Université de Carthage, Tunisie
10h15 - 11h	Cas d'études de la réalité augmentée en maintenance industriel, Pr. Youssef Rochdi, Université Ibn Tofail, Maroc
11h - 11h15	Pause
11h15 - 12h	Emerging uses of smart technologies for production planning and scheduling, Achraf Ammar, IIT, Sfax, Tunisie
12h - 12h45	KPI, Dashboarding and Visualization, Artem Schurig, BIBA, Allemagne
12h45 - 13	New opportunities for Erasmus+, Dr. Rami B.H. Kacem, Université de Carthage, Tunisie

Logos: SmarteCH, INNOTECH, IIT, NXVA, BIBA, Enhance, European Union

Figure 9 – Flyers of the training sessions in Tunisia

During this session, 222 participants were presents. The table below presents the number of participants in each category. and they are classified as follow:

Table 1: Participants in each category of Tunisian training sessions

Impact	Teachers	Students	Industrials
ISET Kasserine	1	26	2
Faculté des Sciences de Gafsa	15	43	3
ISET Tataouine	13	100	0
ISET kébili	11	8	0
Total	40	177	5

9. Training workshops in Moroccan non-partners universities

ENHANCE project have also co-organized a serie of workshops dedicated to industry 4.0 in different Moroccan Universities according to this schedule (see figure 9)

- FST Fes : May 6th 2024
- ENSA Fes : Mai 7th and 9 2024
- ENSA Tanger 8th and 9th 2024

The objective of these workshops is to disseminate about project results and present some of the project outcomes.



Figure 10 – Flyers of the training sessions in Morocco

During this session, 156 participants were presents. The table below presents the number of participants in each category. and they are classified as follow:

Table 2: Participants in each category of Moroccan training sessions

Impact	Teachers	Students	Industrials
FST Fes	5	34	0
ENSA Fes	0	13	3
ENSA Tanger	9	89	3
Total	14	136	6

10. Conclusion

In this document, all communication events are presented. This document deals with events presenting and introducing the project. All of these events are announced in both project website and social media (Facebook and LinkedIn).