



FINAL PROJECT TRAINING SUMMARY REPORT INCLUDING RESULTS FROM FELLOW FEEDBACK QUESTIONNAIRE

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 859957.

1. Introduction

The project ENHAnCE, which stands for European training Network in intelligent prognostics and Health mAnagement in Composite structurEs, is an H2020 MSCA-ITN project aiming to train a new generation of creative, entrepreneurial and innovative Early-Stage Researchers (ESRs), able to face current and future challenges and to convert knowledge and ideas into products and services for the economic and social welfare of society.

As a H2020-MSCA-ITN project, ENHAnCE has the objective to foster excellence and structure research and doctoral training in Europe (EU Member States and H2020 Associated Countries), extending the traditional academic research training setting, incorporating elements of Open Science and equipping researchers with the right combination of research-related and transferable competences. It aims to provide enhanced career prospects in both the academic and non-academic sectors through international, interdisciplinary and intersectoral mobility combined with an innovation-oriented mindset.

ENHAnCE targets a paradigm shift in the health management of composite structures. It is focused on ad-hoc sensing technologies and prognostics engineering within the structural system, leading to a new concept of intelligent structures understood as cyber-physical systems (CPS). Since its beginning on 1st January 2020, 10 Early Stage Researchers (ESR) have been recruited and trained, and they will be accomplishing all milestones and deliverables until the end of the project. The initial deadline of the project was 31st December 2023 yet it has received an extension of 6 months consequence of the delays suffered by the COVID-19 disease worldwide, finally concluding on 30th June 2024.

2. Training summary

As specified in the Grant Agreement Annex 1, a training strategy combined with a Personal Career Development Plan (PCPD) for each ESR was launched at the beginning of the project. The aim was to provide technical and professional skills to the ESRs fully in line with the purposes and nature of the Marie Skłodowska-Curie Actions (MSCA) programme and to improve the innovative potential of the researchers to enhance their career and to advance research based on opportunities of acquisition and transfer of new knowledge.



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ENHAnCE set up a structured training program to ensure that all ESRs obtain multidisciplinary, international and advanced-oriented translational knowledge so that they have the capacity, mindset and experience to successfully enter the market. Moreover, acting at the forefront of innovation is highly demanding and requires strong leadership skills. Hence, this will be complemented by network-wide training on transferrable skills. This enables to meet the objectives identified through each ESRs Personal Career Development Plan (PCDP) by attending specific social and economic training modules, along with the technical ones, whose purpose is to prepare the ESR for high-level positions in the public or private sector and industry. The training has been structured in the following blocks:



Figure 1. Training blocks

3. Tutoring

All ESRs had dedicated experienced principal supervisors from their host institutions along with the support of the Supervisory Board (SB). They had registered for a PhD within their host institution at the same time that they have been employed as MSCA Early Stage Researchers subject to all the scientific assessments valid for every PhD researcher. This involved submitting progress reports on their research work, attending regular seminars, and taking the required courses valid for PhD enrolment and final PhD defence. Equivalently, ESRs hosted outside universities were assigned an industrial main supervisor from the host organisation plus one co-supervisor from a doctoral school of an academic beneficiary or associated partner.

All ESRs were involved in the research activities of their host research groups and interacted with senior researchers and specialists around. Moreover, they had celebrated periodical meetings with their main supervisor and the project coordinator not only for technical advice and monitoring of the progress but also for mentoring and exploring career prospects. In Table 1 there is a list of the ESRs, their supervisors and their host institution by country:



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Table 1. Supervisors of the project ENHAnCE

ESR		Supervisors	Host institution	Country
1	Shankar Galiana	Peter Wierach Daniel Schmidh	DLR	Germany
2	Aravind Balaji	David Dumas Ingrid Lepot	CENAERO	Belgium
3	Amond Sarr Allouko	Alain Lhemery Vahan Baronian	CEA List	France
4	Tasdeeq Sofi	Maria Rodriguez M ^a Isabel Martín	FIDAMC	Spain
5	Morteza Moradi	Dimitrios Zarouchas Rinze Benedictus	TU Delft	Netherlands
6	Tianzhi Li	Francesco Cadini Claudio Sbarufatti	Politecnico di Milano	Italy
7	Javier Contreras	Athanasios Kolios Feargal Brennan	University of Strathclyde	U.K.
8	Wen Wu	Rasa Remenyte-Prescott John Andrews	University of Nottingham	U.K.
9	Juan Fernández	Juan Chiachío Francisco Herrera	University of Granada	Spain
10	Ali Saleh	Manuel Chiachío Juan Chiachío	University of Granada	Spain

The Personal Career Development Plan (PCDP) of every ESR is part of the action implementation in line with the European Charter for Researchers. According to this, a specific career development strategy for every ESR was developed with the support of the Supervisory Board (coordinator, supervisors and tutor mentor specifically) to achieve a realistic and well-defined set of objectives in terms of career advancement. The focus was to develop and significantly widen the competencies of the researcher, particularly in terms of multi/interdisciplinary expertise, inter-sectoral experience and transferable skills. The PCDP of each ESR was evaluated during the project and updated according to the ESR progress, in order to:

- Ensure a sound academic/industrial feedback provision to the ESRs;
- Maintain high research standards for an award of a PhD to the ESRs;
- Identify any conflicts between academic assumptions and industrial applicability;
- Identify project risks (including those affecting fellow's personal performance).



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4. Secondments

An important element of training within the project was the opportunity to experience life in the different sectors (academia, industry and government). The composition adopted for the ENHAnCE network is based on large and global universities (e.g. TUDelft, POLIMI, UGR, etc.), research organisations (CEN, CEA, FID), top government agencies (DLR), important international companies (e.g. RAM), as well as SME (O&B). Such a variety of research environments ensured that all ENHAnCE ESRs had significant exposure to the academic, government and industrial sectors and that they spent the appropriate time in each one in order to achieve successful training, apart from the interaction between the different members of the consortium (ESRs, Supervisors, etc).

The secondments were planned in out of two ENHAnCE institutions. However, not all the researchers could enjoy them due to the COVID pandemic circumstances, time constraints and other difficulties encountered. In Table 2 there is a summary of the ESRs and their secondments including details of dates and locations:

Table 2. Secondments in the project ENHAnCE

ESR		SECONDMENT		START DATE	END DATE	DURATION (MONTHS)
1	Shankar Galiana	DelftUniversity of Technology (TUDELf)	Netherlands	05/09/2022	07/12/2022	3,10
2	Aravind Balaji	Politecnico di Milano (POLIMI)	Italy	08/06/2022 25/08/2022	31/07/2022 30/09/2022	3,00
3	Amond Sarr Allouko	Ku Leuven	Belgium	21/11/2022	23/12/2022	1,10
4	Tasdeeq Sofi	German Aerspace Center (DLR)	Germany	11/07/2022	20/09/2022	2,33
5	Morteza Moradi	*				
6	THianzi Li	Cenaero (CEN)	Belgium	07/02/2022	07/05/2022	3,03
		DelftUniversity of Technology (TUDELf)	Netherlands	10/10/2022	10/11/2022	1,03
7	Javier Contreras Lopez	Oritia&Boreas	Spain	07/03/2022	29/04/2022	1,77
8	Wen Wu	Ku Leuven	Belgium	01/10/2022	12/12/2022	2,40
9	Juan Fernández	KBR	U.S.A.	01/11/2022	17/04/2023	5,57
10	Ali Saleh	University of Nottingham (UNOTT)	UK	24/03/2022	30/07/2022	4,23

* Morteza Moradi could not undertake his planned secondment due to difficulties encountered by the hosts and the visa, which were not possible to overcome.



5. International conferences

Attending international conferences can provide numerous benefits for researchers. A major complementary factor contributing to the maturity and evolution of ESRs is presenting their advancements in front of technological experts and being exposed to their feedback and criticism. The ESRs were invited to attend and present their results in major conferences like PHM, EPHM, EWSHM, IWSHM, PSAM, ESREDA, FTC, to name but a few.

The ESR had the opportunity to attend international conferences offering opportunities for professional growth, collaboration, and staying at the forefront of their field, as they were the following:

- COMPDYN 2021.
- CISM Course (Advanced Theories for Deformation, Damage and Failure in Materials (03/05/2021 – 07/05/2021))
- PHM 2022 - Nashville, Tennessee, USA
- The Era of AI and Digitalization for Structural Applications, Center of Excellence in AI for Structures, TU Delft. 14-16 June, 2022.
- WAVES 2022: ENSTA Paris, France AFPAC 2023: Frejus, France
- EWSHM, Palermo, Italy, Palermo, Italy, Jul. 5, 2023.
- ICCM 23, Belfast, 31st of July to 4th of August, 2023 (PREDICTION OF PROCESS-INDUCED DEFORMATIONS USING DEEP LEARNING INTERFACED FINITE ELEMENT CONSTITUTIVE MODELS)
- ECCOMAS 23, Trapani, 12th to 14th of September, 2023 (ANALYSIS OF CURE BEHAVIOUR UNCERTAINTIES IN THERMOSET COMPOSITE PARTS)
- ECCOMAS SMART2023, University of Patras, Patras
- Future Trends in Guided Ultrasonic Waves and Acoustic Emission 2023, DGZfP, Wetzlar (2 days)
- WCEAM: 16TH WORLD CONGRESS ON ENGINEERING ASSET MANAGEMENT, 2023.
- 9th Asia Pacific Workshop on Structural Health Monitoring; 2023.



6. Training modules

Training modules are structured educational units within an H2020 MSCA-ITN project. They include a series of lectures, workshops, seminars, or practical exercises designed to address specific learning objectives. Training modules cover a range of topics, including technical research skills, transferable skills, and broader aspects related to the project's objectives. A training module may encompass various activities such as:

- Lectures and presentations by experts in the field.
- Hands-on workshops or laboratory sessions.
- Discussions and interactive sessions.
- Networking events and conferences.
- Training on research ethics, intellectual property, and responsible research conduct.
- Career development sessions.

Each training module is tailored to meet the needs of ESRs and aligned with the project's goals. They are an integral part of the structured training program in H2020 MSCA-ITN projects, contributing to the professional and personal development of the researchers involved. The ESRs have attended numerous training modules as part of the official training of their PhD programmes.

6.1. Training Weeks

The ESRs have attended formal thematic training weeks (TWs) arranged as Network-wide Schools around a specific ENHAnCE's topic, which had a public character and were free to attend for all the interested scientific community. TWs were organised and hosted by the partner beneficiaries and brought all the ENHAnCE's researchers together for a 1-week event at each host institution. The main aim of TWs was to provide ESRs with advanced theoretical background from European experts as well as methods and tools to carry out their own research projects and to perform appropriate exploitation and dissemination of research products.

The initial schedule of the TW was modified due to the particular circumstances. All modifications were previously discussed at the SB level and communicated to the REA. Table 3 includes a list of the celebrated TWs including details about content, date, lead institution and modality. The programme of each TW is attached in Annexes 1 to 9.



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Table 3. Re-scheduled training weeks (TWs) from M1 to M48

Module title		Summary of content	Lead Institution	Date (Project-month)	Notes
1	Introductory Week (TW1)	Basic training in research methods, scientific writing, literature review, programming, laboratory methods, Project Management and conflict resolution.	Dept. Structural Mechanics and Hydraulics Engineering (UGR)	10	Held online
2	Foundations on Prognostics and Health Management (TW2)	Prognostics foundations, metrics for prognostics and Bayesian methods used for prognostics.	Dept. Structural Mechanics and Hydraulics Engineering (UGR)	16	Held online
3	Introduction to Composite Science and Technology (TW3)	An introduction to key composite design technologies including an understanding of the principles of mechanical behaviour, testing & characterisation, and manufacturing.	Institute of Composite Structures and Adaptive Systems (DLR)	23	Held in person in FIDAMC facilities (Madrid, Spain),. Celebrated jointly between FIDAMC and DLR to avoid further delays in the schedule
	Latest trends in manufacturing of intelligent composites (TW7)	Manufacturing engineering of composite parts with embedded sensors, and monitoring of manufacturing quality.	R&D Department (FIDAMC)		
4	Understanding the fatigue damage in engineering materials (TW5)	Fatigue quantification methods, training about laboratory experiments, design and calculation methods, latest trends for fatigue damage mitigation.	Dept. Mechanical and Aeronautical Engineering (TUDelft)	27	Held in person at TUDelft (Delft, Netherlands)
5	SHM methods using GWs and AE in composites (TW4)	Foundations about simulation and study of GWs interaction with composite damage, as well as mixture monitoring techniques between GWs and AE.	List Institute research on Non-Destructive Testing (CEA List)	30	Held jointly with the H2020 - MSCA project GW4SHM-ITN in Paris, France
6	Numerical methods for virtual laboratory engineering	Virtual laboratory simulation and cyber-physical systems for optimisation of manufacturing processes.	Polymer Processes and Composites Lab. Cenaero (CEN)	34	Held in person at Cenaero (Charleroi, Belgium)
7	Latest trends in prognostics algorithm architecture	Up-to-date advances in algorithmic methods for computing prognostics signatures, like prognostics fusion with Artificial Intelligence methods, post-prognostics methodologies, Open-Access prognostics implementation, etc.	Dept. Mechanical Engineering (POLIMI)	37	Held in person at POLIMI (Milano, Italy)
8	Asset management and Maintenance modelling	This module deploys useful tools for the asset management and maintenance of systems such as rails.	Dept. Aerospace Engineering (UNOTT)	39	Held in person at the University of Nottingham (United Kingdom). Celebrated jointly between UNOTT and STRATH.
	Turbine blade design and technology	Foundations of design, analysis and blade manufacturing techniques. Monitoring techniques. Assembly technology and maintenance.	Dept. Naval, Ocean & Marine Engineering (STRATH)		
9	Pathways to Commercial end-product Impact and final ENHAnCE results	Global view, foundations and pathways to allow end-user product development, business & entrepreneurial skills, and leadership. ENHAnCE results workshops.	University of Granada (UGR)	41	Held in person at the University of Granada (Spain)



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6.1.1 Training Week 1 (TW1)

The Introductory Week was held once all ESRs were recruited, with a small delay (1 month) due to the COVID-19 pandemic effects. This training was delivered online from 26th to 30th October 2020 and a streaming link was provided to the general public to follow the sessions in real-time. The attendance varied between 40 to 70 participants.

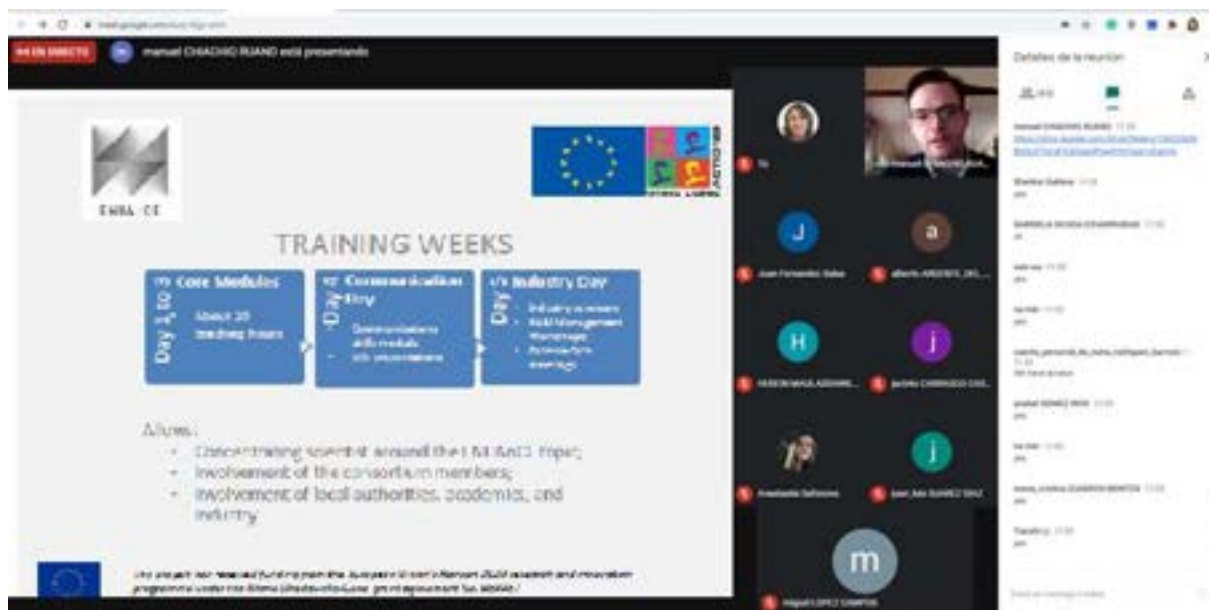


Figure 2. Screenshot of the Introduction to the First TW, by Dr. Manuel Chiachío (coordinator)

In addition to the technical content, two thematic workshops were held: the Communication day, with an info session given by Ms. María Megía (Research Communication), Project Manager of ENHance, and the Industry day, with two conferences carried out by Prof. Guillermo Rus, Founder & CEO of Innitius, S.L. with a talk named “from research to industry: pathways to entrepreneurship”, and Dr María Ros (expert of the H2020 and Horizon 2030 programmes, University of Granada), who gave a talk named “European research opportunities after H2020”.

To put into practice the theory learned, two challenges were launched: the latex challenge and the communication challenge, both with a symbolic economic price for the winner and a successful number of participants. The communication challenge gave a result the promotion of the ENHAnCE project and the MSCA-ITN network among the student community, in original and creative ways of exposition.



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6.1.2 Training Week 2 (TW2)

The second training week was also held online due to the pandemic situation of impending travelling and meetings, and open to all the scientific and engineering community. It was focused on the Foundations of the Prognostics and Health Management (PHM) technology and included Master Classes, Keynotes and specialized Seminars with worldwide leaders of the PHM technology, such as:

- Dr. Kai Goebel (Principal Scientist at Palo Alto Research Center (PARC), USA),
- Dr. Matteo Corbetta (Research Scientist. NASA, Ames Research Center, USA),
- Dr. Shankar Sankararaman (Staff Data Scientist. Intuit, Inc., USA),
- Prof. Marcos Orchard (Department of Electrical Engineering Faculty of Physical and Mathematical Sciences, Universidad de Chile, Santiago, Chile)
- Dr. David Acuña (Assistant Professor. Pontificia Universidad Católica de Chile)
- Prof. Enrico Zio (Full Professor Politecnico di Milano, Italy),

The attendance varied between 20 to 30 participants and the link of the recorded sessions is the following: <https://u.pcloud.link/publink/show?code=xEvitalK>



Figure 3. Screenshot of the Masterclass on “The path from PHM to decision making”, by Enrico Zio (Politecnico di Milano, Italy)



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6.1.3 Training Week 3 (TW3)

Two training weeks: “Introduction to Composite Science and Technology (TW3)” and “Latest trends in manufacturing of intelligent composites (TW7)” were combined in one Training Week organised by DLR and FIDAMC, and held in person at the facilities of FIDAMC in Madrid (Spain) on 15th to 19th November 2021. This fusion conferred a richer and wider view of composite structures, gathering a first introductory perspective with a more advanced view as a journey across the development of this material.

Due to the reserved character of the facilities and the pandemic circumstances, attendance was restricted to the ESRs. The Advanced Materials Training Center in FIDAMC has more than 500 m² of space focused on training, which includes classrooms, a trimming workshop and a training workshop, where each participant made a piece of composite with embedded sensors, detecting induced disturbances. The detailed schedule is included in Annex 3.



Figure 4. Session “Smart materials and structures” by Prof. Peter Wierach, DLR

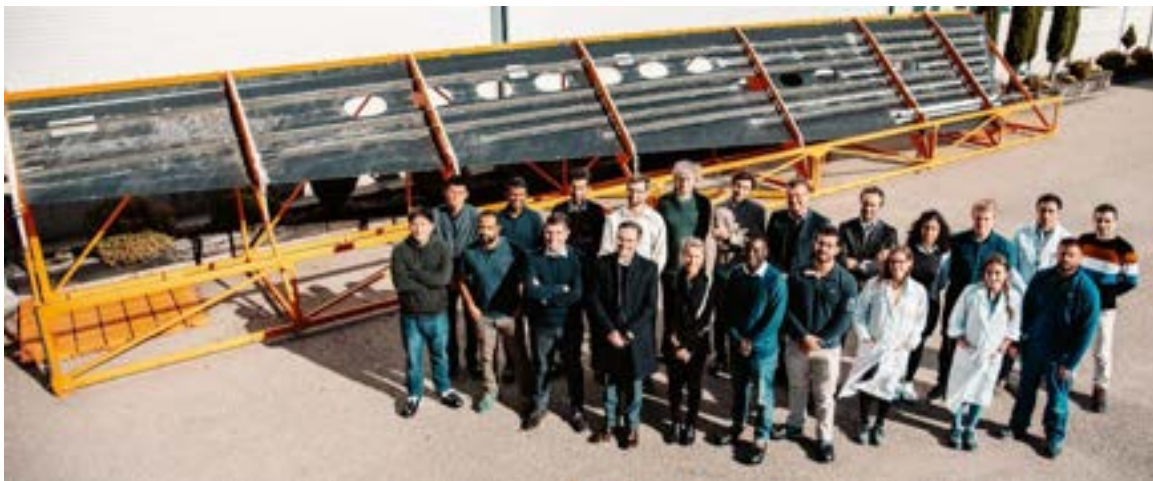


Figure 5. The ENHAnCE team at FIDAMC facilities (Madrid, Spain)



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6.1.4 Training Week 4 (TW4)

The fourth training week was delivered at the Department of Mechanical and Aeronautical Engineering of TUDelft, Netherlands, from the 28th of February to the 4th of March 2022. The title was “Understanding the fatigue damage in engineering materials” and numerous laboratory sessions at the Delft Aerospace Structures and Materials Laboratory (DASML) were undertaken, along with the corresponding lectures regarding the subject of fatigue in composites like how to test and what to measure in composites; theory and practicalities about guided waves and wavelet methods applied to the Finite Element Method; and a vision and path to Intelligent Manufacturing, to cite but any.

The Training Week also included a visit to the Smart Advanced Manufacturing XL (SAM|XL) and a social activity in Rotterdam visiting the port, one of its museums and a following dinner.

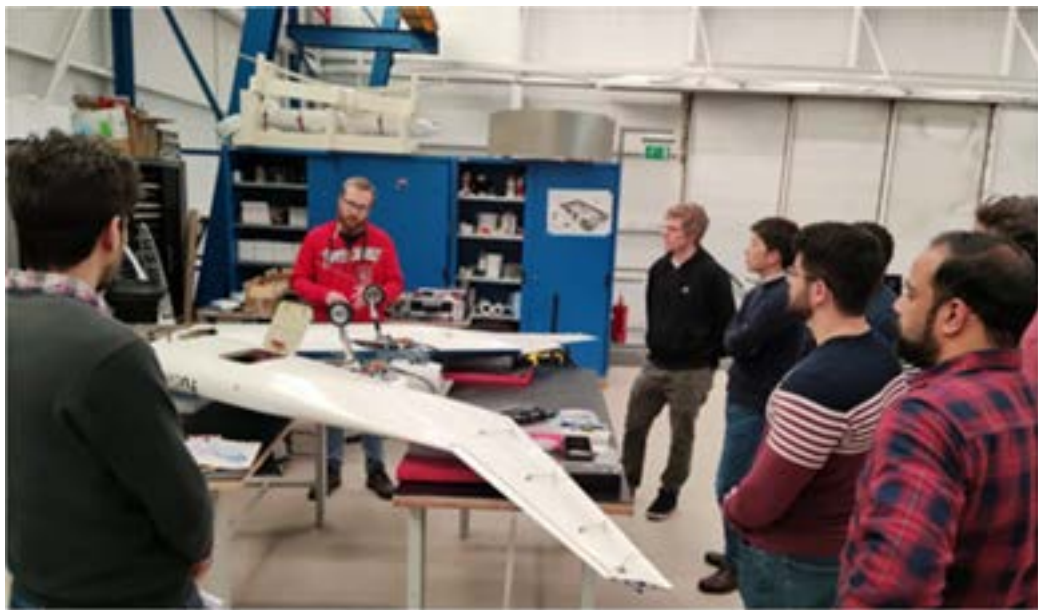


Figure 6. Laboratory session at TUDelft (Netherlands)

6.1.5 Training Week 5 (TW5)

The fifth training week was held at CEA Saclay (Paris, France), a research centre from CEA List, from the 20th to the 24th of June, 2022. CEA List (Commissariat à l'énergie atomique et aux énergies alternatives), is a French research organization devoted to the development and promotion of sustainable energy technologies, nuclear energy, and defence applications, and is one of the largest technological research organizations in Europe.



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The title of the Training Week was “Guided Wave (GW) Structural Health Monitoring (SHM): from modelling to applications” and the foundations of simulation and study of GWs interaction with composite damage, as well as a mixture of monitoring techniques between Guided Waves (GWs) and Acoustic Emission (AE) were taught to the researchers. The training program was thoughtfully designed to cover a wide range of topics, including advanced modelling techniques, signal processing methodologies, sensor technologies, and practical applications.

This Training Week was celebrated jointly with the H2020 -MSCA ITN project GW4SHM (<https://www.bam.de/GW4SHM/EN/Navigation/Home/the-project.html>), dedicated to transforming SHM research into practical applications to assess the integrity of structures and create ready-to-use tools for the industry and other SHM users. The remarkable collaboration between the two projects allowed us to combine expertise, knowledge, and resources in the fields of guided waves and structural health monitoring, fostering groundbreaking advancements and innovation.



Figure 7. Members of ENHAnCE and GW4SHM in CEA facilities, Paris, France

6.1.6 Training Week 6 (TW6)

The following training week was held at CENAERO's office in Charleroi, Belgium, from the 10th to the 14th of October 2022. CENAERO (Centre for Numerical Methods and Engineering Optimization) is a non-profit research centre specialized in the development and application of advanced numerical methods for engineering and industrial sectors. The centre collaborates with industry partners and academic institutions to address various engineering challenges and provide



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innovative solutions in the fields of computational mechanics, fluid dynamics, and multidisciplinary optimization.

The title of the Training Week was “Numerical Methods for Virtual Laboratory Engineering” and a virtual laboratory simulation was presented to the researchers, along with lectures based on cyber-physical systems for the optimisation of manufacturing processes, visiting the Manufacturing Laboratory and the Supercomputer centre. There was also a Career Session from the Tutor Mentor of ENHAnCE, Dr. Rafael Muñoz, who talked about the next steps the researchers can take through their careers.

The training week counted with a tour along SONACA facilities (SONACA is a Partner Organization of the ENHAnCE project), a Belgian aerospace company that specializes in the design, development, and manufacturing of advanced aerostructures and related systems for the aerospace industry. There the ESRs had the opportunity to present their PhD topics and the course of their research over a Poster Session, sharing with other researchers, industry professionals and experts their ideas and best practices, and enhancing their skills in the cutting-edge domain of numeric simulation.

The social activities were held in Charleroi and Brussels with great enthusiasm from the researchers and other participants.



Figure 8. Lecture in CENAERO, Belgium



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6.1.7 Training Week 7 (TW7)

The seventh training week was delivered at the Department of Mechanical Engineering of the Politecnico di Milano (POLIMI), Milano, Italy, from the 23rd to the 27th of January 2023. The topic of this TW was “Latest trends in prognostics algorithm architecture”, and covered aspects such as the Bayesian Inference, Montecarlo Sampling and Particle Filters, equipping participants with the necessary tools to apply these techniques in their research and enabling them to tackle challenging mathematical problems that arise in prognostic algorithm architecture.

Other significant sessions were focused on Artificial Neural Networks (ANNs) and their role in condition monitoring and prognosis algorithm architecture. Participants were introduced to the fundamentals of ANNs, including different network architectures: Convolutional neural networks, Recurrent neural networks and Physics Informed neural networks. The session provided practical examples and case studies to demonstrate the effectiveness of ANNs in prognostic applications.

Several interesting visits took place, such as the one to the Mechanical Engineering Polimi Laboratories where experimental activities were undertaken regarding the use of acquisition systems, baseline acquisition, impacts, post-impact acquisition and post-processing.

The social activity was fully enjoyable at the Duomo cathedral in Milano and the following dinner.



Figure 9. Lecture in POLIMI



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6.1.8 Training Week 8 (TW8)

The following TW was held at the University of Nottingham, from the 27th to the 31st of March 2023, with the title “Asset Management and Maintenance Modelling, with Applications to Wind Turbines and Rails”. This TW was jointly celebrated between the University of Strathclyde and the University of Nottingham, to avoid delays in the training schedule. Both institutions delivered a comprehensive overview of asset management and maintenance applied to railways and wind turbines.

Lectures about Petri Nets as a mathematical representation of processes involving the flow of resources in systems and its importance in asset management were accompanied by Material's lectures focused on Composites. A quite interesting visit to the University's laboratory, showing the researchers their cutting-edge facilities regarding the study of composites, took place during the training week. The application of the maintenance policies to rails and wind turbines was fully developed by the lecturers and enjoyed by the researchers, along with the sessions dedicated to Communication Skills and Preparation for an interview.

The social activities brought the researchers to know the city and the caves in Nottingham, followed by a wonderful dinner.



Figure 10. Lecture (Prof. Jonh Andrews) and laboratory visit in Nottingham, U.K.

6.1.9 Training Week 9 (TW9)

The last training week took place at the University of Granada, Spain, hosted by the project coordinator, Dr. Manuel Chiachío, and the rest of the local supervisory team: Dr. Juan Chiachío, Dr. Rafael Muñoz and Ms. María Megía. Spanning from May 22nd to May 26th, 2023, the training week was titled "Pathways to Commercial End-Product Impact and Final ENHAnCE Results".



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This training week aimed to provide a global view of the ENHAnCE findings, along with foundations and pathways to promote end-user product development, business & entrepreneurial skills, and leadership on the ENHAnCE researchers, showing their results across several workshops.

The sessions commenced with an overview of the project's accomplishments thus far, presented by the Coordinator Dr. Manuel Chiachio. Next, several tutorials were conducted, covering topics such as doctoral European programs and research opportunities within the Horizon Europe context, along with tutorials for thesis preparation, and dissertation. Additionally, an engaging 3-Minute Thesis Contest was held, recognizing the outstanding contributions of the ESRs and presenting them with well-deserved prizes.

The Tutor Mentor Dr. Rafael Muñoz delivered a series of informative talks on leadership, transitioning PhD work into the market, and the preparation of a business plan. Throughout the week, the ESRs actively worked on developing their business plans and presented them as part of team activities. Simultaneously, they also focused on finalizing the submission of project demonstrators. In addition to the core program, several lecturers conducted thought-provoking "Thinking out-of-the-box" sessions. These sessions covered topics such as explosions in structures, industry trends, market opportunities in the asset management field, and digital twin technologies.

The training week concluded with various cultural and social activities, providing an opportunity to showcase the city to the visitors and allowing all participants, including researchers, supervisors, and attendees, to create memorable moments together. These activities aimed to foster a sense of network and create a positive, inclusive environment for everyone involved in the project.



Figure 11. Members of ENHAnCE in Granada, Spain



6.2. Training program on soft skill development and entrepreneurship

The technical training plan of the ESRs has been combined with a parallel soft skill development and entrepreneurship training plan. This part has been led and executed by the Senior Mentor Tutor, Rafael Muñoz, in coordination with the Coordinator and the Project Management Team. The objectives of this plan were the following:

- To provide knowledge of the aspects that determine human behaviour, and how these determine professional and personal success. To understand the skills that must be present in a good professional.
- To understand leadership, the conditions for it to happen, and how to execute it.
- Detect the most urgent points of personal improvement for The ESRs, and help them promote changes that will help them.
- Establish the foundations for the strategic management planning of organisations.
- Integrate leadership skills with the strategic management of organisations.

6.2.1 Activities of the plan

A training program focused on soft skill development and entrepreneurship should encompass a variety of activities to provide a well-rounded and practical learning experience. In order to implement the plan, the following categories of actions were carried out with the ESRs:

- Accompaniment and support to the ESRs in the Training Weeks (TWs).
- Organization of sessions on soft skills and entrepreneurship in the TWs.
- Individual coaching sessions

By incorporating these activities, the training program could offer a comprehensive and engaging experience, equipping participants with the skills and mindset needed for success in entrepreneurship and research.

6.2.2 Accompaniment and support to the ESRs in the Training Weeks (TWs)

The Senior Mentor Tutor attended the TWs in person, except for the one in Milan and the online TWs (due to COVID-19), where he was present but with limited capacity for interaction. The objectives of his presence were several:

- To meet and interact personally with the ESRs during the official and unofficial activities of the TWs. This activity is basic to know the ESRs and approach the coaching process suitably.
- Mentoring on the evolution and difficulties that the ESRs had to deal with.



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- Giving feedback, both general and specific on soft skills, sometimes in specific activities, e.g. in oral presentations.

The presence and active involvement of the Senior Mentor Tutor during the Training Weeks was crucial for optimizing the learning experience and fostering a supportive environment. The Mentor provides essential guidance, tailoring training to individual needs, and ensuring that ESRs derive maximum benefit from intensive learning sessions. With a personalized approach, the Mentor facilitates networking opportunities, encourages active participation, and connects the training content to the broader context of the research project. Additionally, the Mentor supported the well-being of ESRs, addressed concerns, and tracked their progress, contributing to a positive and collaborative learning atmosphere. This mentorship ensures that the acquired skills are effectively applied to practical research scenarios, aligning with the researchers' individual development goals and enhancing their overall professional growth within the scope of the research project.

6.2.3 Organization of sessions on soft skills and entrepreneurship in the TWs.

The inclusion of sessions on soft skills and entrepreneurship during Training Weeks is pivotal for the integrated development of the ESRs. These sessions go beyond technical expertise, providing ESRs with essential communication, teamwork, and leadership skills that enhance their effectiveness in research projects. Moreover, the emphasis on an entrepreneurial mindset equips researchers with strategic planning abilities and a creative approach to problem-solving. These skills are transferable across diverse research environments, fostering adaptability and collaboration within international teams.

Furthermore, the sessions prepare ESRs for future career paths by instilling skills applicable to academia, industry, and entrepreneurial ventures. The comprehensive training in both technical and soft skills aligns with funding objectives and positions researchers to make a broader impact by effectively communicating their findings to varied audiences. Overall, these sessions contribute to the success of research projects and the professional growth of ESRs within the dynamic landscape of contemporary research and innovation.

Related to soft skills, the following sessions were organised as in Table 4:

Table 4. Sessions of Soft Skills

TW	Place	Session	Duration
5th	Paris (FR)	Short presentations of ESR's work	1.5h



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Table 4. Sessions of Soft Skills

TW	Place	Session	Duration
6th	Cenaero (BE)	Soft skills for a professional	2h
8th	Nottingham (UK)	Communication skills	1h
		Preparing for an interview	1.5h
9th	Granada (ES)	Thesis preparation and dissertation tutorial	1h
		Deploying leadership	1.5h
		3 minutes thesis contest	1.5h

With regard to entrepreneurship, the sessions and workshops organised are included in Table 5:

Table 5. Sessions of Entrepreneurship

TW	Place	Session	Duration
9th	Granada(ES)	Pathways to commercial end product: how to create a business plan	1h
		Industry tendencies and market opportunities in asset management	1h
		Sandpit: PhD work to the market (Innovation process and skills)	1h
		Sandpit: PhD work to the market (hands-on workshop)	5h
		Showcase & Discussion of Business plan proposals from the ESRs	3h

The ESRs received training about the strategic planning of a business, both with the traditional SWOT building, and the Canvas model combined with the basics of Lean Startup Theory. They also were trained in the innovation process. After this theoretical content, they were divided into three teams, selected a possible business related to the project scope, and spent five hours developing the business plan strategy, making a final presentation of their proposals.

6.2.4 Individual Coaching Session

Soft skills competency self-assessment questionnaire

A soft skills competency self-assessment questionnaire empowers individuals to reflect on and evaluate their own proficiency in essential interpersonal and behavioural skills. This self-assessment tool provides a structured framework for individuals to gauge their strengths and areas for improvement across various soft skills such as communication, teamwork, adaptability, and



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leadership. The questionnaire serves as a valuable instrument for personal development, allowing to identify specific skills the ESRs need to enhance and tailor their training accordingly. Moreover, it promotes self-awareness, helping the ESRs recognize the significance of soft skills in their professional and personal growth.

At the 5th TW in Charleroi (Belgium), the ESRs were given a self-assessment questionnaire on soft skills at the end of the soft skills session they received. The questionnaire was afterwards produced in a digital version and sent to the ESRs for them to fill in. The questionnaire and the averaged results of the answers can be found in Appendix 10.

The self-assessment questionnaire results were used as initial information driving the coaching sessions to the point. They helped to explore the ESRs' improvement points to be addressed during the coaching session, although it was not closed to these points.

Conducting the coaching sessions

Coaching sessions are focused interactions between a coach (the Mentor) and the ESRs, aimed at supporting the ESRs' personal and professional development. During coaching sessions, the coach uses various techniques to facilitate the exploration of goals, challenges, and potential solutions. The primary purpose of coaching is to empower the ESRs to reach their objectives, improve performance, and enhance overall well-being. The coach's role is to help individuals unlock their potential, overcome obstacles, and achieve their goals through a process of self-discovery and guided reflection.

All ESRs had at least a one-hour coaching session. They were conducted in videoconference format, except in the case of four ESRs that were face-to-face, either due to the proximity of the ESR to the coach or by taking advantage of the face-to-face nature of the last TW.

The structure of the session was based on the GROW model of coaching, where the ESR finally proposed the solution to be implemented and the commitments acquired.

6.2.5 Conclusions of the training program on soft skill development and entrepreneurship

The conclusions of the questionnaire reflected a significant level of self-confidence in the ESRs. They are very disciplined and used to making high efforts to achieve their goals. They have developed habits of efficiency, although in 30% of them, there is room for improvement in their personal self-management habits.



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Conversely, they perceive their readiness in intricate skills to be comparatively diminished. ESRs) are concerned with the effectiveness of their communication skills and, at a more advanced level, their capacity for influence. For example, they see that they have a lot of room for improvement in basic communication structures such as criticising, saying NO or making a difficult request. They are very interested in emotional self-awareness and self-regulation. ESRs with less developed public speaking skills have been given special feedback, and significant improvements have been observed throughout the project, although they continue with the improvement effort.

After the training plan, ESRs are more aware of what the ingredients of leadership are and have realised that putting them into practice is a long road. The impact that this training had on them is that they now perceive a clear path forward. Nevertheless, they acknowledge that mastering the associated communication aspects takes time and effort.

With regard to entrepreneurship training, it was highly demanded as it can be seen from the answers to the open question in the self-assessment questionnaire. The involvement of the ESRs in these activities was outstanding, surprising the facilitators of the sessions and the people who listened to the plans presented orally.

As a learned lesson, in spite of the significant effort that has been implemented in including training in soft skills and entrepreneurship in these projects, these subjects constitute a significant gap in training in the ESRs of this profile. It would be more suitable to modify the weight of these subjects in the TWs against the technical sessions.

3 Fellow feedback questionnaire

At the last stages of their fellowship, the ESRs were requested to complete a short survey covering various issues including their academic achievements and the impact of the fellowship on their skills development, career and employability. The evaluation questionnaire was intended to review their experience, skills acquired and immediate next steps after their MSCA project.

The responses to the questionnaire provide insights into various aspects of the researcher's academic and professional progress within the H2020 MSCA-ITN fellowship. The majority of ESRs reflect on their current status and express considerations regarding the likelihood of completing their studies by the project's deadline of June 30, 2024. The evaluation extends to the attainment of their Personal Career Development Plans (PCDP) goals, attendance at congresses or courses, and reflections on the main achievements of the fellowship.



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Noteworthy, the report delves into the publication of academic work, acquisition of patents, and the submission of PhD theses. Additionally, the questionnaire captures ESRs' perceptions regarding the adequacy of information received about the project, satisfaction levels, and the sufficiency of support for addressing project-related challenges. Importantly, researchers are invited to provide a quantitative score reflecting their overall satisfaction with the project, and qualitative suggestions for potential improvements in the H2020-MSCA-ITN projects are solicited. These comprehensive responses offer valuable insights into the researchers' experiences and contribute to a comprehensive assessment of the H2020 MSCA-ITN fellowship program.

Below, the key findings from the surveys are presented, based on answers gathered until December 2023.

3.1 Current status

The original deadline for the ENHAnCE project was set for December 31, 2023. However, due to the delays incurred as a result of the pandemic situation in 2020, this deadline has been extended to June 30, 2024. The purpose of this extension is to allow ample time for the effective development of the Early-Stage Researchers (ESR) research within the project.

What is your current status?

10 answers

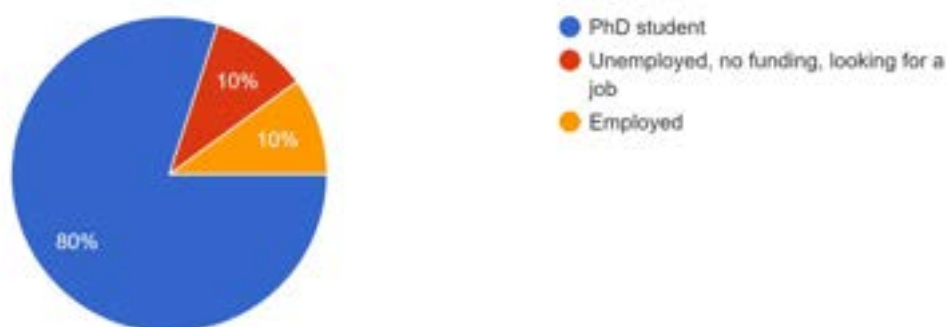


Figure 12. Current status of the ESRs (December 2023)

Considering this, as of December 2023, the prevailing status of the Early-Stage Researchers (ESRs) indicates that 80% are engaged as PhD students, with an additional 10% employed. The remaining 10% are actively seeking job opportunities or postdoctoral positions, with assignments already secured, pending administrative arrangements. ESRs currently pursuing their PhD were



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queried regarding their anticipated submission dates, and all respondents expressed confidence in submitting their theses before June 30, 2024.

The titles related to the PhD theses are already established, and they are explicitly listed in Table 6.

Table 6. PhD Thesis Titles of ENHAnCE

ESR AUTHOR		SUPERVISORS	TITLE	UNIVERSITY	STATUS
1	Shankar Galiana	Peter Wierach Daniel Schmidt	Reliable sensor networks for Structural Health Monitoring systems in highly loaded composite structures.	Clausthal University, Germany	In progress
2	Aravind Balaji	David Dumas Ingrid Lepot	Uncertainties and process induced defects and their influence on lifetime in thermosetting composite parts	Politecnico di Milano, Italy	In progress
3	Amond Sarr Allouko	Alain Lhemery Vahan Baronian	Hybrid modal simulation - Finite elements for elastic plate monitoring with ultrasonic-guided waves	Paris-Saclay University, France	Submitted Viva waiting
4	Tasdeeq Sofi	Maria Rodriguez M ^a Isabel Martín	A Novel Procedure for Designing, Manufacturing and Assembly of Smart Thermoplastic Composite Structures with Integrated AU-SHM Sensors	Clausthal University, Germany	In progress
5	Morteza Moradi	Dimitrios Zarouchas Rinze Benedictus	Designing Health Indicators for Aerospace Structures by Intelligent Information Fusion	TU Delft, Netherlands	In progress
6	Tianzhi Li	Francesco Cadini Claudio Sbarufatti	Particle filter-based damage prognosis in engineering structures subjected to fatigue loading	Politecnico di Milano, Italy	Submitted
7	Javier Contreras	Athanasios Kolios Feargal Brennan	Development of a System Level Post Prognostics Reasoner for FRP turbine blades	University of Strathclyde, U.K.	Submitted Viva waiting
8	Wen Wu	Rasa Remenyte-Prescott John Andrews	Physics-based Guided Wave Structural Health Monitoring, and its Integration in Asset Management Modelling	University of Nottingham, U.K.	Submitted Viva waiting
9	Juan Fernández	Juan Chiachío Francisco Herrera	A probabilistic framework for prognostics with uncertainty quantification based on physics-guided bayesian neural networks.	University of Granada, Spain	Submitted
10	Ali Saleh	Manuel Chiachío Juan Chiachío	Enhancing infrastructure maintenance: a prognostics-based self-adaptive expert system for cross-sectoral engineering problems	University of Granada, Spain	Submitted



3.3 Academic aspects

ESRs were questioned about their perception of achieving the objectives outlined in their Personal Career Development Plans (PCDP). Ninety per cent of respondents affirmed the attainment of these goals, while the remaining 10% are still actively working toward fulfilling them.

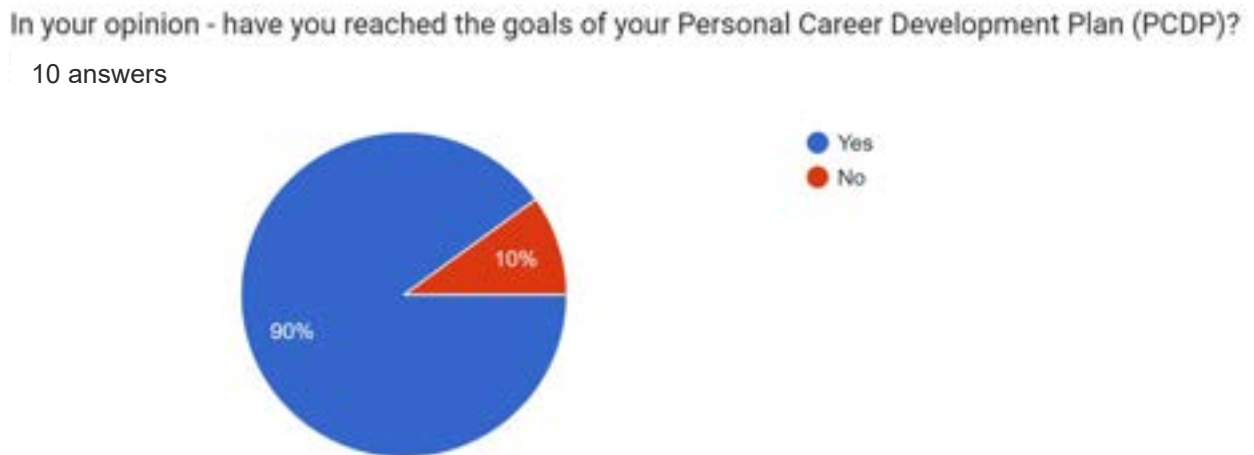


Figure 13. PCPD achievement

Regarding academic publications, it is acknowledged that publishing is a fundamental aspect of the academic research process, providing researchers with a platform to contribute to their field, establish their presence in the academic community, and advance their careers. Publishing has undergone by means such as peer-reviewed journals, conference proceedings, books, and online platforms. The peer-review process adds validation and credibility to the research, enhancing its quality.

For ESRs, publishing is integral to building a reputation, advancing in academic careers, and attracting collaborative opportunities. It also serves as a means of disseminating knowledge, contributing to the academic community, and showcasing researchers' advancements in their respective fields.

The publications of the ENHAnCE members up to date were the following included in Table 7. Up to 80% of the researchers have already published articles and the remaining ones are waiting for responses about the articles submitted. However, it was not possible to get a patent yet.



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Table 7. Publications of ENHAnCE

#	ENHAnCE MEMBER MAIN AUTHOR	AUTHORS	TITLE	JOURNAL/ CONGRESS
1	Shankar Galiana	Galiana, S.; Moradi, M.; Wierach, P.; Zarouchas, D.	Acousto-ultrasonic composite transducers integration into thermoplastic composite structures via ultrasonic welding	10th ECCOMAS Thematic Conference on Smart Structures and Materials 956- 965, 2023.
-	Aravind Balaji	Papers submitted, waiting for review	-	-
-	Amond Sarr Allouko	Papers submitted, waiting for review	-	-
2	Tasdeeq Sofi	Sofi, T.; Gude, M.R.; Wierach, P.; Martin, I.; Lorenzo, E.	An Efficient Procedure for Bonding Piezoelectric Transducers to Thermoplastic Composite Structures for SHM Application and Its Durability in Aeronautical Environmental Conditions.	Sensors 2023, 23, 4784.
3		Sofi, T., Gude, M., Garcia, J., & Wierach.	Novel Procedure of Integrating Transducers to Thermoplastic Composite Structures by Induction Heating for SHM.	In Proceedings of the 10th ECCOMAS Thematic Conference on Smart Structures and Materials, Patras, Greece, 3-5 July 2023; pp. 1291-1302.
4	Morteza Moradi	M. Moradi, R.Benedictus, D.Zarouchas	Interpretable Neural Network with Limited Weights for Constructing	Annual Conference of the PHM Society, 2002.
5		Moradi, M., Broer, A., Chiachío, J., Benedictus, R., Loutas, T. H.&Zarouchas, D.	Intelligent health indicator construction for prognostics of composite structures utilizing a semi- supervised deep neural network and SHM data.	Engineering Applications of Artificial Intelligence, 117, 105502. 2023.
6		M.Moradi, J. Chiachío, R. Benedictus, D. Zarouchas	Intelligent Health Indicators Based on Semi-supervised Learning Utilizing Acoustic Emission Data	European Workshop on Structural Health Monitoring.
7		Moradi, M., Chiachío, J., & Zarouchas, D.	Developing health indicators for composite structures based on a two- stage semi-supervised machine learning model using acoustic emission data.	In Proceedings of the 10th ECCOMAS Thematic Conference on Smart Structures and Materials (Vol. 10). 2023.
8	Tianzhi Li	Li, T., Sbarufatti, C., Cadini, F., Chen, J., & Yuan, S.	Particle filter-based hybrid damage prognosis considering measurement bias.	Structural Control and Health Monitoring, 29(4), e2914. 2022.
9		Li, T., Lomazzi, L., Cadini, F., Sbarufatti, C., Chen, J., & Yuan, S.	Numerical simulation-aided particle filter-based damage prognosis using Lamb waves.	Mechanical Systems and Signal Processing, 178, 109326. 2022.
10		Li, T., Cadini, F., Chiachío, M., Chiachío, J., & Sbarufatti, C.	Particle filter-based delamination shape prediction in composites subjected to fatigue loading.	Structural Health Monitoring, 22(3), 1844-1862.



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Table 7. Publications of ENHAnCE

#	ENHAnCE MEMBER MAIN AUTHOR	AUTHORS	TITLE	JOURNAL/ CONGRESS
11		Li, T., Chen, J., Yuan, S., Cadini, F., & Sbarufatti, C.	Particle filter-based damage prognosis by online feature fusion and selection.	Mechanical Systems and Signal Processing, 203, 110713. 2023.
12	Javier Contreras	J.Contreras, A. Kolios, L. Wang, M. Chiachío	A wind turbine blade leading edge rain erosion computational framework.	Renewable Energy
13		J. Contreras, J. Chiachío, A. Saleh, M. Chiachío, A. Kolios.	A cross-sectoral review of the current and potential maintenance strategies for composite structures.	SN Applied Sciences 4 (2022) 180.
14		J.Contreras, A. Kolios	Risk-based maintenance strategy selection for wind turbine composite blades.	Energy Reports
15	Wen Wu	W. Wu, A.Saleh, R. Remenyte-Prescott	Asset management modelling approach integrating structural health monitoring data for composite components of wind turbine blades.	32nd European Safety and Reliability Conference
16		W. Wu, S. Cantero-Chinchilla, W. Yan, M. Chiachío, R. Remenyte-Prescott, D. Chronopoulos	Damage Quantification and Identification in Structural Joints through Ultrasonic Guided Wave-Based Features and an Inverse Bayesian Scheme.	Sensors
17		W. Wu, D. Prescott, R. Remenyte-Prescott, A. Saleh, M. Chiachio.	An asset management framework for wind turbine blades considering reliability of monitoring system.	Nottingham repository
18		W. Wu, R. Remenyte-Prescott	Guided waves-based damage identification in plates through an inverse Bayesian process.	Ultrasonics
19	Juan Fernández	J. Fernández, J. Chiachío, M. Chiachío, A. Saleh	Probabilistic safety assessment in composite materials using bnn by ABC-SS	Annual Conference of the PHM Society, 2002
20		J. Fernández, J. Chiachío, M. Chiachío, J. Barros, M. Corbetta	Physics-guided Bayesian neural networks by ABC-SS: Application to reinforced concrete.	Engineering Applications of Artificial Intelligence
21		J.Fernández, M.Chiachío, J. Chiachío, R.Muñoz, F. Herrera	Uncertainty quantification in Neural Networks by Approximate Bayesian Computation: Application to fatigue in composite materials.	Engineering Applications of Artificial Intelligence
22	Ali Saleh	A. Saleh, M.Chiachío	An assessment of different reinforcement learning methods for creating a decision support system based on the Petri net model	Annual Conference of the PHM Society, 2002
23		A. Saleh, M.Chiachío Ruano, J. Fernández, A. Kolios	Self-adaptative optimized maintenance of offshore wind turbines by intelligent Petri nets	Reliability Engineering & System Safety
24		A. Saleh, R. Remenyte-Prescott, D. Prescott, M. Chiachío,	Intelligent and adaptive asset management model for railway sections using the IPN method.	Reliability Engineering & System Safety 241 (2024) 109687.



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Table 7. Publications of ENHAnCE

#	ENHAnCE MEMBER MAIN AUTHOR	AUTHORS	TITLE	JOURNAL/ CONGRESS
25		A. Saleh, M. Chiachio, J. Chiachio.	Optimized Petri net model for condition-based maintenance of a turbine blade.	World Congress on Engineering Asset Management, Springer, 2022, pp. 657–664.
26		D. Prescott, R. Remenyte, M. Chiachio, A. Saleh.	An optimized asset management Petri net model for railway sections.	Materials Research Proceedings 27 (2023).
27	Manuel Chiachio, Coordinator	M. Chiachio, A. Saleh, S. Naybour, J. Chiachio, J. Andrews.	Reduction of Petri net maintenance modeling complexity via approximate Bayesian computation.	Reliability Engineering & System Safety 222 (2022) 108365.
28		M. Chiachio, M. Megia, J. Chaichio, J. Fernández, M.L. Jalón.	Structural digital twin framework: Formulation and technology integration.	Automation in Construction, Volume 140, August 2022, 104333

3.4 Personal achievements

The ESRs highlighted several significant achievements stemming from their participation in the H2020 MSCA-ITN fellowship. These encompassed the acquisition of knowledge not readily accessible otherwise, taking on lead roles in multidisciplinary research teams, publishing journal papers, and presenting at international conferences. Involvement in a three-year EU-funded project enhanced their communication and presentation skills, fostering effective collaboration in diverse settings.

Other answers were particular to their research topic, such as the expanded research skills in artificial neural networks trained with Bayesian methods. Noteworthy outcomes included a broader understanding of machine learning in composites manufacturing and the study of manufacturing defects' influence on lifetime assessment. Additionally, the creation of an innovative model, the Intelligent Petri Net, integrating Reinforcement Learning for enhanced intelligence, demonstrated applicability in optimizing maintenance strategies for diverse sectors such as wind turbines and railways. The development as researchers was emphasized, encompassing a broad vision of research, European culture, and personal growth.



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3.4 Management aspects

In response to inquiries regarding the adequacy of information received concerning the project and the sufficiency of support with arising problems, all ESRs unequivocally affirmed their positive experiences, with 100% indicating that they have received all necessary information and perceived the support provided for addressing project-related challenges as sufficient. This unanimous agreement underscores a high level of satisfaction among the ESRs regarding the comprehensiveness of project-related information and the effectiveness of the support mechanisms in place for addressing arising issues within the research endeavours.

3.5 Final score and feedback

The project received an average score of 9.5, reflecting an overall positive evaluation. The scores were comprised of one 7, two 9s, and an impressive seven 10s, acknowledging the project's high level of achievement and recognition. The following picture shows the results of the final score given by the ESRs.

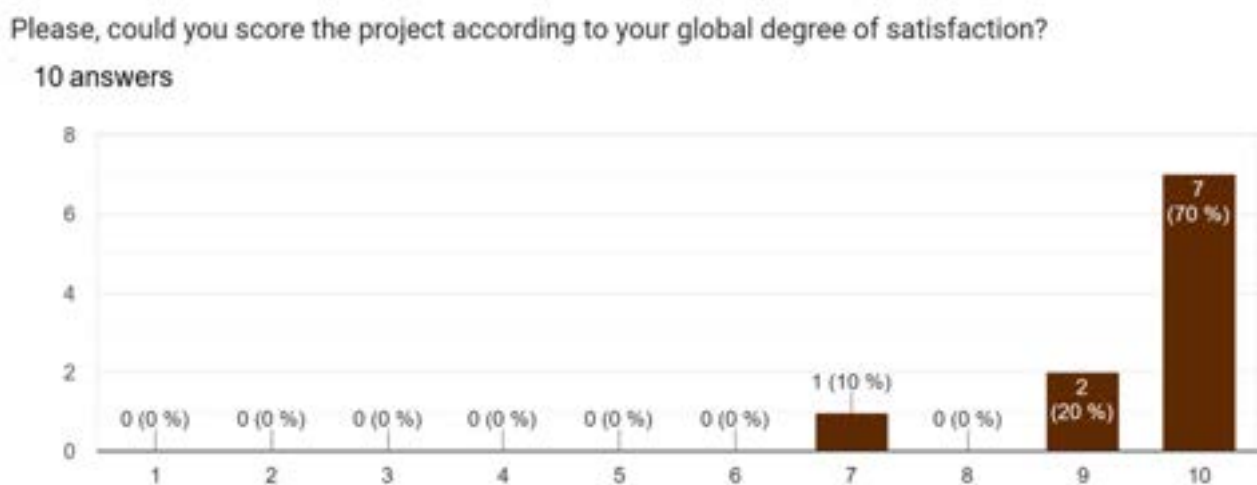


Figure 14. ENHAnCE project scored

In response to inquiries about potential improvements in the H2020-MSCA-ITN projects, the ESRs provided diverse insights. While some acknowledged the total satisfaction with the development of the project, others suggested enhancing academic collaboration among ESRs, increasing exposure to recruiters and potential employers, and emphasizing a clearer definition of salary conditions in MSCA job offers.



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Additionally, recommendations included a deeper understanding of project proposals by host institutions, more interaction with project officers, increased emphasis on technology transfer, and an extended project timeframe, particularly considering extensive travel commitments.

Suggestions for inviting experienced ESRs to share insights at the project's onset, extending grant durations to four years, aligning family allowances with the grant period's evolving status, and streamlining secondment procedures for visa and company clearances were also put forth.

Beyond project specifics, a broader call for a strengthened connection between research and industry was emphasized, advocating for aligned research objectives with the genuine needs of companies to incentivize fruitful collaboration. The feedback highlights a spectrum of considerations for optimizing the H2020-MSCA-ITN project experience that deserves to be taken into account for future endeavours.



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Appendixes



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A1. Programme of the Training Week 1: Introductory Week, University of Granada (Spain)



ORGANIZERS

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Prof. Francisco Herrera (DaSCI)
Dr. Juan Chiachío (Co-Chair)
Ms. María Megía (Chair of Secretariat)

LECTURERS

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Prof. Francisco Herrera (Univ. of Granada, Spain)
Dr. Manuel Chiachío (Univ. of Granada, Spain)
Dr. Sergio Cantero (Univ. of Bristol, UK)
Prof. Guillermo Rus (Univ. of Granada, Spain)
Dr. María Ros (Univ. of Granada, Spain)

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Dr. Daniel Sridith (DLR, Germany)
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Prof. Alain Lhernery (CEA Lis, France)
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Dr. Diego Sáez del Castillo (FIDAMC, Spain)
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Prof. Athanasios Kolios (Univ. of Strathclyde, Scotland)
Prof. Fernald Brennan (Univ. of Strathclyde, Scotland)
Dr. Dimitrios Chronopoulos (Univ. of Nottingham, UK)
Prof. John Andrews (Univ. of Nottingham, UK)
Dr. Juan Chiachío Ruano (Univ. of Granada, Spain)
Prof. Francisco Herrera (Univ. of Granada, Spain)



ENHANCE TRAINING WEEK

26th to 30th of October, 2020

(On-line event. Follow us on streaming)

<https://stream.meet.google.com/stream/0392c7bb-09dd-4aa5-89be-0fa9cdd00e56>

INTRODUCTION TO RESEARCH PRACTICE

PROGRAM

MODULES

[MD1] Opening, Introduction to the ENHANCE Research project (Dr. Manuel Chiachío, Assistant Prof. University of Granada. Coordinator of ENHANCE Consortium)

[MD2] PhD Practice I: Introduction to LaTeX & Beamer (Dr. Sergio Cantero, University of Bristol. Former Marie Curie Fellow of SAFE-FLY ITN project)

[MD3] PhD Practice I: Introduction to Scientific Writing (Prof. Francisco Herrera, Royal Academy Professor of Computer Science and Chief Editor of Information Fusion [Elsevier])

[MD4] PhD Practice II: Research Communication (Dr. Juan Chiachío, Assistant Prof. & Deputy Director of Internationalisation, Faculty of Engineering, University of Granada, Spain)

[MD5] PhD Practice III: Open Science/Open Data (Dr. Manuel Chiachío, Assistant Prof. University of Granada. Coordinator of ENHANCE Consortium)

COMMUNICATION DAY

[COD1] Research Dissemination: ENHANCE public website and Social Media (Mr. María Megía, University of Granada. Project Manager of the ENHANCE Consortium)

INDUSTRY DAY

[IND1] From research to industry: Pathways to entrepreneurship. Prof. Guillermo Rus, Spain. Founder and Co-Founder of 3 university-based Start-Ups (Oritia & Boreas, INNITIUS, & REGEMAT 3D)

[IND2] After the PhD: European Research Opportunities. Dr. María Ros, H2020/Horizon Europe International Project Manager, International Project Office, University of Granada, Spain).



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A2. Programme of the Training Week 2: Foundations on Prognostics and Health Management, University of Granada (Spain)

<https://www.granadacongresos.com/enhance>



#PROGRAM

Time (UTC+2)	Session	Lecturer
Monday, 19th April		
11:00-12:00	[MASTER CLASS] The PHM challenge of the ENHANCE European project	Dr. Manuel Chiachio
12:00-15:00	(SEMINARS) ENHANCE individual projects presentation	
Tuesday, 20th April		
16:00-18:00	[MASTER CLASS] Introduction to PHM, origins, and research vision	Prof. Marcos Orchard
19:00-21:00	(KEYNOTE) Fundamentals of PHM: Methods and algorithms	Dr. David Acuña
Wednesday, 21st April		
11:00-14:00	[MASTER CLASS] The path from PHM to decision making	Prof. Enrico Zio
18:00-20:00	(KEYNOTE) PHM/AI in Industry 1: Intuit, Inc.	Dr. Shankar Sankararaman
Thursday, 22nd April		
11:00-12:00	(KEYNOTE) PHM on the railway industry: Track degradation case study	Dr. Juan Chiachio
18:00-20:00	(KEYNOTE) Towards The True Hybrid PHM: Overview of Physics-Informed Trainable Models for Prognostics and Health Management	Dr. Matteo Corbetta
Friday, 23rd April		
16:00-18:00	[TUTORIAL] 3 hours tutorial conducted by Dr. Juan Chiachio, Dr. Claudio Sbarufatti, and Dr. Francesco Cadini	Dr. Juan Chiachio, Dr. Claudio Sbarufatti, and Dr. Francesco Cadini
19:00-20:00	[MASTER CLASS] PHM/AI in Industry 2: Palo Alto Research Center, Inc. The future of PHM	Dr. Kai Goebel



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A3. Programme of the Training Week 3 (joint event): “Introduction to Composite Science and Technology” from DLR, and “Latest trends in manufacturing of intelligent composites” from DIDAMC, held at FIDAMC facilities in Madrid (Spain)



ENHAnCE TRAINING WEEK
15th to 19th November, 2021

Introduction to Composite Science and Technology
Latest trends in manufacturing of intelligent composites



Venue: FIDAMC facilities, Av. Rita Levi Montalcini, 29, Getafe, Madrid

Monday 15/11

- 11:00 – 11:30 Welcome
- 11:30 – 12:30 Introduction to composite Materials
Álvaro Calero (FIDAMC)
- 12:30 – 13:30 Thermoset composites: manufacturing and properties
TBD (FIDAMC)
- 13:30 – 14:30 Lunch
- 14:30 – 15:30 Thermoplastic composites: manufacturing and properties
Isabel Martín (FIDAMC)
- 15:30 – 16:30 Coffee break
- 16:30 – 17:30 Industrial lecture - Aeronautical composites: where we are and where we go
Tamara Blanco (Airbus)

Tuesday 16/11

- 09:00 – 11:00 Smart materials and structures: session 1
Peter Wierach (DLR)
- 11:00 – 11:30 Coffee break
- 11:30 – 13:00 Smart materials and structures: session 2
Peter Wierach (DLR)
- 13:00 – 14:00 Lunch
- 14:00 – 15:00 Smart materials in action
Peter Wierach (DLR)
- 15:00 – 16:00 Visit to FIDAMC facilities
- 16:00 – 17:30 ESRs: Networking
Supervisors: Supervisory board meeting
- 20:45 Supervisory Dinner at the restaurant “Fismuler”, C/ Sagasta, 29, Madrid.



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Wednesday 17/11

- 09:00 – 11:00 Practical session 1 – part I: Thermoset composite panel manufacturing (hand lay-up)
FIDAMC
- 11:00 – 11:30 Coffee break
- 11:30 – 13:00 Practical session 1 – part II: Vacuum bag preparation
FIDAMC
- 13:00 – 14:00 Lunch
- 14:00 – 15:00 Characterization of composite materials
María Rodríguez (FIDAMC)
- 15:00 – 17:00 Networking/ Video interviews/Pictures

Thursday 18/11

- 09:00 – 11:00 Practical session 2 – part I: Bonding, wiring and connections
Maria Moix-Bonet (DLR)
- 11:00 – 11:30 Coffee break
- 11:30 – 13:00 Practical session 2 – part II: Damage evaluation
Maria Moix-Bonet (DLR)
- 13:00 – 14:00 Lunch
- 14:00 – 15:00 Poster session
- 15:00 – 17:00 Networking

Friday 19/11

- 09:00 – 13:00 Leisure activity: Visit to Museo del Prado, Madrid
- 13:00 – 15:00 Closing lunch



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A4. Programme of the Training Week 4: “ Understanding the fatigue damage in engineering materials “ at TUDelft, Netherlands

ENHANCE TRAINING WEEK, 28th February to 4th of March 2022, TUDelft (Netherlands)

PROGRAMME:

DAY	TIME	LECTURE / ACTIVITY
Monday 28-Feb-22	10:00 – 10:30	Welcome
	10:30 – 12:30	Dr. John-Alan Pascoe: Fatigue of composites: what we do know and what we don't (Lecture room C)
	12:30 – 13:30	Lunch and meet the lecturer session
	13:30 – 15:00	Tour at the Delft Aerospace Structures and Materials Laboratory (DASML)
	15:00 – 16:30	Dr. Dimitrios Zarouchas: Fatigue of composites: How to test and what to measure (Lecture room C)
Tuesday 01-March-22	10:00 – 12:00	Dr. Nan Yue: Practicalities of guided wave based SHM for aircraft composite structures: Part I: Instrumentation, environmental effects and upscaling Part II: Uncertainty quantification, diagnosis and prognosis (Computer room 7)
	12:00 – 13:00	Lunch
	13:00 – 16:00	Delft Aerospace Structures and Materials Laboratory (DASML); Task I
	16:00 – 17:00	Supervisory board meeting
Wednesday 02-March-22	10:00 – 12:00	Nathan Eskue: “The Vision and Path to Intelligent Manufacturing” (Fellowship instruction room 8)
	12:00 – 13:00	Lunch and meet the lecturer session
	13:00 – 14:00	Tour at SAM(XL) (Smart Advanced Manufacturing XL)
	14:00 – 16:30	Delft Aerospace Structures and Materials Laboratory (DASML); Task II
Thursday 03-March-22	10:00 – 12:00	Dr. Christos Nastos: A wavelet domain numerical method for the simulation of wave propagation in composite structures (Lecture room E)
	12:00 – 13:00	Lunch
	13:00 – 18:30	Leisure activity in Rotterdam
Friday 03-March-22	10:00 – 12:00	Delft Aerospace Structures and Materials Laboratory (DASML); Task III
	12:00 – 13:00	Lunch
	13:00 – 15:00	Delft Aerospace Structures and Materials Laboratory (DASML); Task IV



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A5. Programme of the Training Week 5: “SHM methods using GWs and AE in composites“ at CEA List, France

At CEA Saclay (France), from 20th June 2022 to 24th June 2022

When?	Mon. 20th June	Tues. 21st June	Weds. 22nd June	Thurs. 23rd June	Fri. 24th June
Where?	Nano-Innov			Digitéo	Digitéo
08:30	Coffee	Coffee			Coffee
09:00	Install posters		Coffee		
09:30	M. Mahe (CEA) - Welcome and Introduction	B. Chapuis & O. Mesnil (CEA) - Rail monitoring and its environmental impact	J. Moll (Goethe Univ.) - The influence of ROC on SW-based SHM systems	Coffee	F. Le Bourdais (CEA) - Additive manufacturing monitoring
10:00	N. Manzini (Stres) - SHM for civil engineering applications and projects		A. Djalilov (CEA) - Use of reciprocity principle in the development of hybrid models for NDE/SHM	A. Imperiale (CEA) - Behind CIVA SHM	
10:30	Break	ESR Session 2			Break
11:00	A. Recoquilley & B. Chapuis (CEA) - Passive tomography and applications with optical fibres	Poster 2	A-S. Sornette Ben Dalia (ENSTA) - An overview of numerical methods for elastic wave modeling	Break	P. Moreau (BRSA) - Inverse problems using observers for wave like problems
11:30				A. Recoquilley (CEA) - CIVA SHM applications	P. Calmon (CEA) - Conclusion
12:00	Lunch				
13:00					
13:30					
14:00	R. Miccilli (CEA) - Towards artificial intelligence in SHM	P. Calmon (CEA) - Reliability assessment, POD and MAPOD	V. Baronian (CEA) - Modeling tools for the inspection of waveguide structures in harmonic regime	F. Foucher (Extende) - CIVA SHM	End
14:30					Centre d'Integration Nano-INNOV 2 Boulevard Thomas Gobert 91120 PALAISEAU Tel : + 33 (0)1 69 08 05 14 GPS N 48.712808° E 02.194447°
15:00	ESR Session 1	ESR Session 3	J. Moll (Goethe Univ.) - Open Guided Waves: Benchmarks Datasets for Guided Wave Inspections		
15:30	Poster 1	Poster 3	Remove posters	Break	
16:00			Bus		CEA SACLAY DIGITEO LAES Bat. 565 91191 GIF-SUR-YVETTE CEDEX Tel : +33 (0)1 69 08 08 00 GPS N 48.727849° E 02.150150°
16:30					
17:00	End	End		CEA lab tour (starts 16:15)	
17:30		Music festival	Social event		
Evening				End	



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A6. Programme of the Training Week 6: “Numerical Methods for virtual laboratory engineering” at CENAERO, Belgium

ENHANCE TRAINING WEEK, 10th to 14th of October 2022, Charleroi (Belgium)

PROGRAMME:

DAY	TIME	LECTURE / ACTIVITY
Monday 10-Oct-22	12:00 – 13:00	Check-in
	13:00 – 14:00	Lunch
	14:00 – 14:30	Welcome and Introduction. David Dumas
	14:30 – 15:30	Virtual laboratories for engineering. David Dumas
	15:30 – 16:30	Composite process. Olivier Pierard
	16:30 – 17:30	ESR Session - 1
Tuesday 11-Oct-22	9:00 – 10:00	Morfeo, Thermo-mechanical kernel. Olivier Pierard
	10:00 – 11:00	ESR Session - 2
	11:00 – 12:00	Opti-Minamo theory, Surrogate – assisted optimization and data mining. Charlotte Beauthier
	12:00 – 13:00	Lunch
	13:00 – 14:00	Opti-Structural applications. David Dumas
	14:00 – 16:00	Practical session / workshop
Wednesday 12-Oct-22	16:00 – 19:00	Evening in Brussels
	9:00 – 10:00	Visit to the Supercomputer in A6K
	10:00 – 11:00	Modelisation of cure-induced deformations in Thermoset resin-based composite parts. Arnaud Parmentier
	11:00 – 12:00	Metallic manufacturing process modeling and simulation. Arnaud Francoise
	12:00 – 13:00	Lunch
Thursday 13-Oct-22	13:00 – 17:00	Visit to SONACA
	9:00 – 10:30	Virtual Laboratory on the Application of GW for SHM, Theoretical session. Mohammad Ali Fakh
	10:30 – 12:00	Virtual Laboratory on the Application of GW for SHM, Practical session-1. Mohammad Ali Fakh
	12:00 – 13:00	Lunch
	13:00 – 14:30	Career talk: Are you ready for the next steps in your career? Rafael Muñoz, Tutor Mentor
	14:30 – 16:00	Aero-mechanical optimization. Lieven Baert
Friday 14-Oct-22	16:00 – 17:00	Deliverables think-tank
	9:00 – 10:00	Advanced CFD in relation with experimental aerodynamics. Thomas Toulorge
	10:00 – 12:00	Supervisory board meeting
	12:00 – 13:00	Lunch
	13:00	End



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A7. Programme of the Training Week 7: “Latest trends in prognostics algorithm architecture” at the Politecnico di Milano, Italy.

**ENHANCE TRAINING WEEK, 23rd to 27th of January 2023, Milano
(Italy)**

PROGRAMME:

DAY	TIME	LECTURE / ACTIVITY
Monday 23-Jan-2023	9:15 – 10:15	Intro + Bayesian Inference – Prof. Claudio Sbarufatti
	10:15 – 11:15	Bayesian Inference – Prof. Claudio Sbarufatti
	11:15 – 11:30	Break
	11:30 – 12:15	Bayesian Inference – Prof. Claudio Sbarufatti
	12:15 – 13:15	Lunch
	13:15 – 14:15	Monte Carlo sampling for definite integrals – Prof. Claudio Sbarufatti
	14:15 – 15:15	Monte Carlo sampling for definite integrals – Prof. Claudio Sbarufatti
	15:15 – 16:15	Self Practice (ESRs)
Tuesday 24-Jan-2023	9:15 – 10:15	Particle filters - Prof. Francesco Cadini
	10:15 – 11:15	Particle filters - Prof. Francesco Cadini
	11:15 – 11:30	Break
	11:30 – 12:15	Particle filters - Prof. Francesco Cadini
	12:15 – 13:15	Lunch
	13:15 – 14:15	Artificial neural networks for regression - Prof. Francesco Cadini
	14:15 – 15:15	Artificial neural networks for regression - Prof. Francesco Cadini
	15:15 – 16:15	Self Practice (ESRs)
Wednesday 25-Jan-2023	9:15 – 10:15	Experimental activities: Intro on impacts on composites – Prof. Andrea Manes
	10:15 – 11:15	Deep Learning for SHMPHM: Convolutional neural networks – Luca Lomazzi
	11:15 – 11:30	Break
	11:30 – 12:15	Deep Learning for SHMPHM: Physics informed neural networks – Luca Lomazzi
	12:15 – 13:15	Lunch
	13:15 – 14:15	Deep Learning for SHMPHM: Recurrent neural networks – Dario Poloni
	14:15 – 15:15	Deep Learning for SHMPHM: Recurrent neural networks – Dario Poloni
	15:15 – 19:00	Social event: Visit to the Duomo cathedral (Milano)
Thursday 26-Jan-2023	9:15 – 10:15	Experimental activities: acquisition systems
	10:15 – 11:15	Experimental activities: acquisition systems
	11:15 – 11:30	Break
	11:30 – 12:15	Experimental activities: acquisition systems
	12:15 – 13:15	Lunch
	13:15 – 14:15	Experimental activities: baseline acquisition, impacts, post-impact acquisition, etc.
	14:15 – 15:15	Experimental activities: baseline acquisition, impacts, post-impact acquisition, etc.
	15:15 – 16:15	Experimental activities: baseline acquisition, impacts, post-impact acquisition, etc.
	16:15 – 19:00	Experimental activities: baseline acquisition, impacts, post-impact acquisition, etc.
	19:30	Social Dinner
Friday 27-Jan-2023	9:15 – 10:15	Acquired signals post-processing - Luca Lomazzi + Dario Poloni
	10:15 – 11:15	Acquired signals post-processing - Luca Lomazzi + Dario Poloni
	11:15 – 11:30	Break
	11:30 – 12:15	Visit to MeccEng Polimi Laboratories
	12:15 – 13:15	Lunch
	13:15	End



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A8. Programme of the Training Week 8 (joint event): “Asset management and Maintenance modelling” from the University of Nottingham & “Turbine blades design and Technology” from the University of Strathclyde, held at the University of Nottingham, U.K.

ENHANCE TRAINING WEEK, 27th to 31st of March 2023, Nottingham (UK)

PROGRAMME:

DAY	TIME	LECTURE / ACTIVITY
	12:00 – 14:00	Lunch
	14:00 – 15:00	Introduction to asset management and maintenance modelling (I) - Dr Rasa Remenyte-Prescott and Dr Darren Prescott, University of Nottingham
	15:00 – 15:30	Break
	15:30 – 17:00	Introduction to asset management and maintenance modelling (II) - Dr Rasa Remenyte-Prescott and Dr Darren Prescott, University of Nottingham
Tuesday 28- March -2023	9:00 – 10:30	Petri net modelling in maintenance (I) - Dr Darren Prescott and Prof John Andrews, University of Nottingham
	10:30 – 11:00	Break
	11:00 – 12:00	Petri net modelling in maintenance (II) - Dr Darren Prescott and Prof John Andrews, University of Nottingham
	12:00 – 14:00	Lunch
	14:00 – 15:00	Inspection and maintenance of wind turbines (I) - Prof Athanasios Kolios, University of Strathclyde
	15:00 – 15:30	Break
	15:30 – 17:00	Inspection and maintenance of wind turbines (II) - Prof Athanasios Kolios, University of Strathclyde
Wednesday 29- March - 2023	9:00 – 10:30	Composites (I) - Prof Nick Warrior, University of Nottingham
	10:30 – 11:00	Break
	11:00 – 12:00	Composites (II) - Prof Nick Warrior, University of Nottingham
	12:00 – 14:00	Lunch
	14:00 – 15:00	ESR networking
	15:00 – 15:30	Break
	15:30 – 17:00	Social activity and dinner
Thursday 30- March - 2023	9:00 – 10:30	Inspection and maintenance of wind turbines (III) - Prof Athanasios Kolios, University of Strathclyde
	10:30 – 11:00	Break
	11:00 – 12:00	Inspection and maintenance of wind turbines (IV) - Prof Athanasios Kolios, University of Strathclyde
	12:00 – 14:00	Lunch
	14:00 – 15:00	Communication skills session - Andy Smith, Careers Consultant, University of Nottingham
	15:00 – 15:30	Break
	15:30 – 17:00	Preparing for an interview - Andy Smith, Careers Consultant, University of Nottingham
Friday 31- March -2023	9:00 – 10:30	Strategic life cycle modelling to maximise value for Network Rail's stakeholders - Dr Gareth Calvert, Whole Lifecycle Costing Manager, Network Rail
	10:30 – 11:00	Break
	11:00 – 12:00	Generalising analytic methods to real-world scenarios in wind turbine health assessment - Joshua Greenslade, Machine Learning Engineer, Onyx Insight
	12:00 – 14:00	Lunch



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A9. Programme of the Training Week 9: “Pathways to Commercial End-Product Impact and Final ENHAnCE Results”, University of Granada. Spain.

ENHANCE TRAINING WEEK, 22nd to 26th of May 2023, Granada (Spain)

PROGRAMME:

DAY	TIME	LECTURE / ACTIVITY
Monday 22nd- May -2023	9:30 - 10:30	Enhance Global view and results (MCR)
	10:30 – 11:00	Enhance: past, present and future within the European program (JCR)
	11:00 – 12:00	Break
	12:00 – 12:45	Thesis preparation and dissertation tutorial (MCR)
	12:45 – 13:30	Lunch
	13:30 – 15:00	Deploying leadership (RMB)
	15:00 – 15:30	Break
	15:30 – 17:00	3 Minutes Thesis contest
	17:00	Cultural activities
Tuesday 23th- May -2023	9:30 - 10:30	Thinking out-of-the-box (I): Bayesian model updating of complex structures (JCR)
	10:30 – 11:00	Break
	11:00 – 12:00	Thinking out-of-the-box (II): Structures subjected to explosions (AAP)
	12:00 – 12:45	(Tutorial) Pathways to commercial end-product: how to create a bussines plan (RMB)
	12:45 – 13:30	Lunch
	13:30 – 15:00	Workshop about ENHAnCE Demonstrator I (ESRs)
	15:00 – 15:30	Break
	15:30 – 17:00	Workshop about ENHAnCE Demonstrator II (ESRs)
	17:00	Cultural activities
Wednesday 24th- May - 2023	9:30 - 10:30	Machine Learning: Basics and Applications to Ultrasonic NDE (SCC)
	10:30 – 11:00	Break
	11:00 – 12:00	Thinking out-of-the-box (III): Practicing ML/DL for multiple SHM/NDT applications and sensing techniques (MAF)
	12:00 – 12:45	Industry tendencies and market oportunities in the Asset Management (CUN)
	12:45 – 13:30	Lunch
	13:30 – 14:30	Sandpit I: PhD work to the market (ESRs assisted by CUN, RBM)
	14:30 – 15:00	Break
	15:00 – 16:00	Sandpit II: PhD work to the market (ESRs assisted by CUN, RBM)
	16:00	Cultural activities
Thursday 25th- May - 2023	9:30 - 10:30	Digital twin technology in structural engineering (MMC)
	10:30 – 11:00	Break
	11:00 – 12:00	Active Learning for decision-making in Structural Digital Twins (AH)
	12:00 – 12:45	From data classification to data generation in SHM (ED)
	12:45 – 13:30	Lunch
	13:30 – 15:00	Sandpit continuation: PhD work to the market (ESRs)
	15:00 – 15:30	Break
	15:30 – 17:00	Sandpit continuation: PhD work to the market (ESRs)
	17:00	Cultural activities
Friday 31- March -2023	9:30 - 10:30	Showcase and discussion of ENHAnCE Bussiness plan WP 1 & 2 (ESRs)
	10:30 – 11:00	Break
	11:00 – 12:00	Showcase and discussion of ENHAnCE Bussiness plan WP 3 & 4 (ESRs)
	12:00 – 12:45	Showcase of ENHAnCE Demonstrator (ESRs)
	12:45 – 13:30	Lunch
	13:30 – 15:00	ENHAnCE conclusions and final message (MCR)
	17:00	Cultural activities



A10. Questionnaire of self-assessment on soft skills

A.1 Sheet of questions

How do you feel is your level of mastery in these skills?	Low/Weak/Few			High/Strong/Much		
Analysis capacity						
Synthesis capacity						
Habit of inquiry about why and what for						
Habit of chasing responses until the end						
Habit of comparison goals-performance						
Your balance what you should do, what you like						
How much important is what other's think						
Tendency to pursue goal closing						
Self-organization of your time						
Tendency to show a habit of decision delay						
Working intensity						
Serving others intensity						
Goal orientations						
Tendency to actively participate						
Tendency to exceed other's expectations						
Self-awareness of your emotions						
Awareness of the impact of your emotions on you						
Awareness of the impact of your emotions on others						
Ability to rapidly downshift intense emotions						
Tendency to force arguments						
Tendency to avoid recognition you are wrong						
Ability to change your opinions						
Ability to understand emotions of others						
Ability to feel pain for others						
Ability to feel joy for others						
Impulse to speak in conversations, rather than being quiet						
Time dedicated to listen to others						
I master the way to make critics						
I master the way to make a difficult demand						
I master the way to say NO when I am committed						
I refer to our values to generate intense emotions						
I introduce questions in my speech to drive others' thinking						
I continuously compare what we do with the goals						
I tell people long term visions to make them understand						
I am curious, and insist deeply on it						
My mind creates many ideas I quickly discard. Few are useful						

Are you interested in improving any specific skill or capacity? Describe what you would like. (Open question)

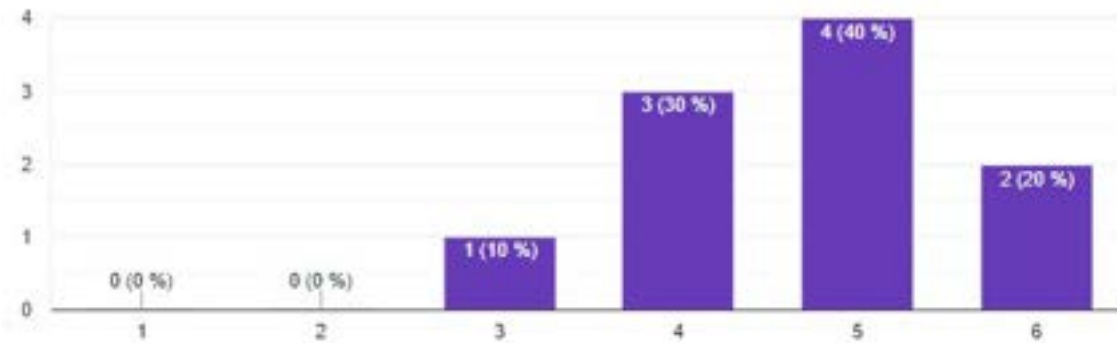
Interested in having a personal session about it? (Yes/Not/Not sure)



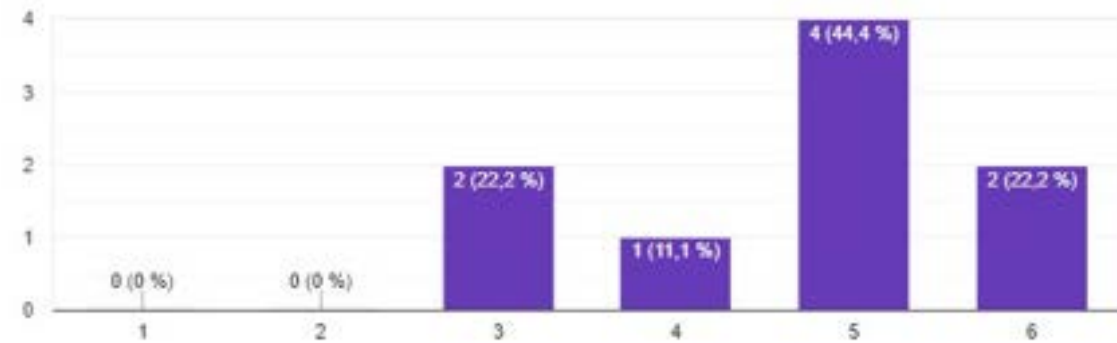
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A.2 Anonymous results of the questionnaire

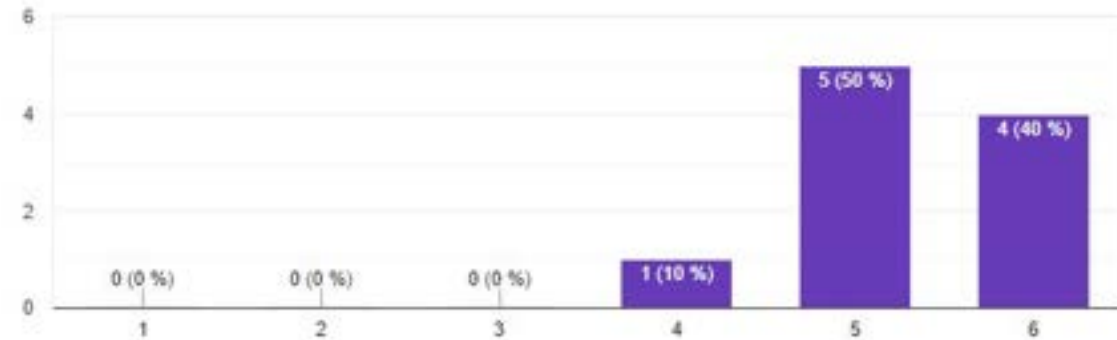
Analysis capacity



Synthesis capacity



Habit of inquiring why and what for



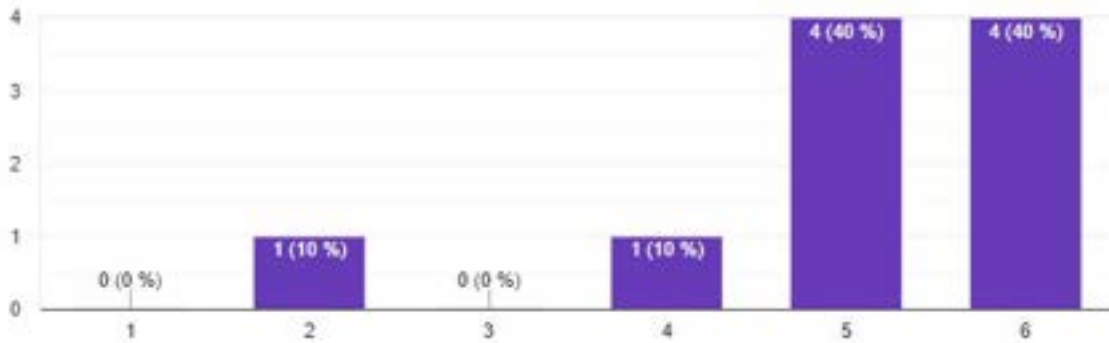
Habit of chasing responses until the end



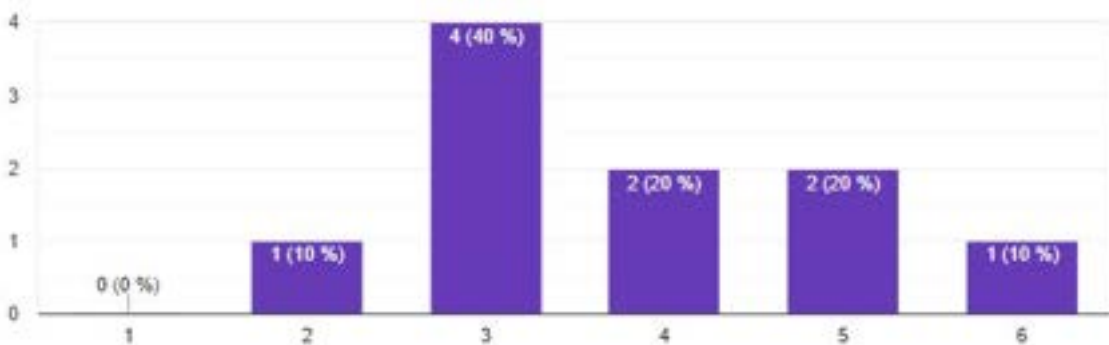


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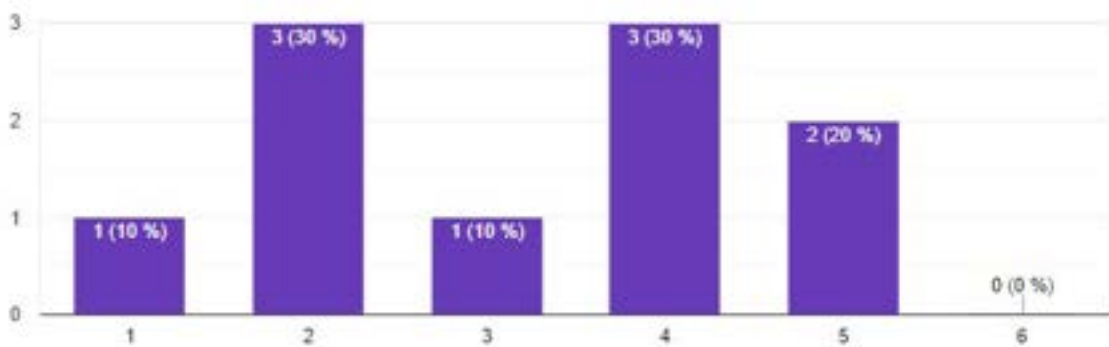
Habit of continuously compare goals-performance



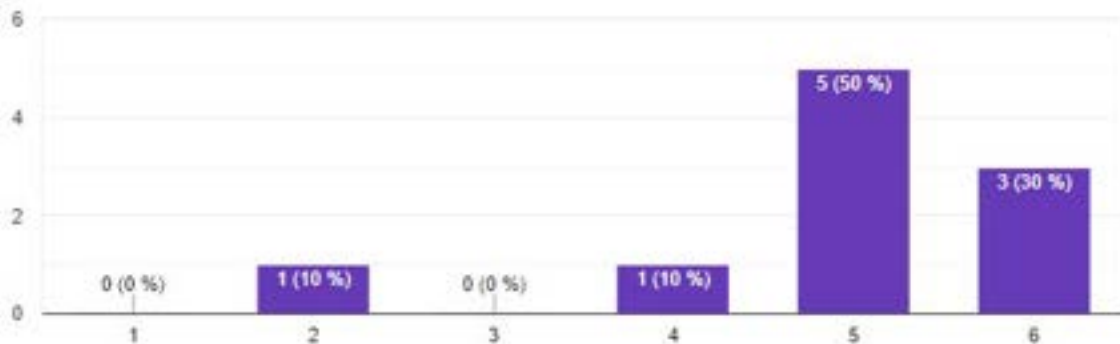
Your balance on what you should do (high), what you like (low)



Importance to you about what others think



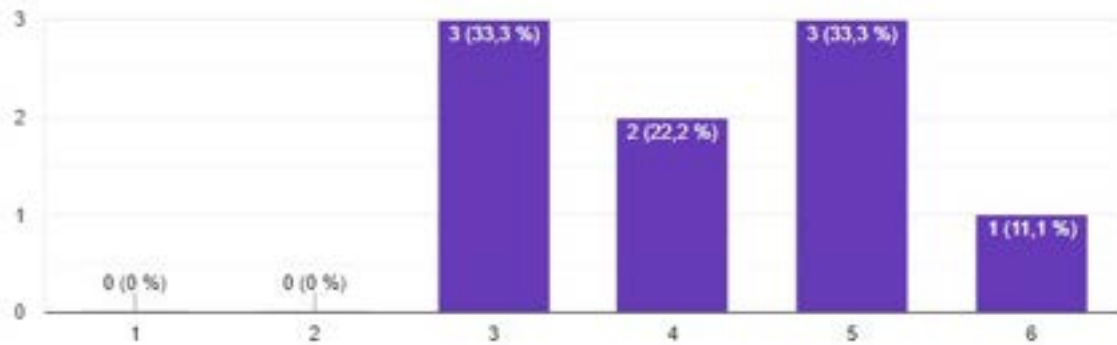
Intensity of your tendency to pursue goal's closing



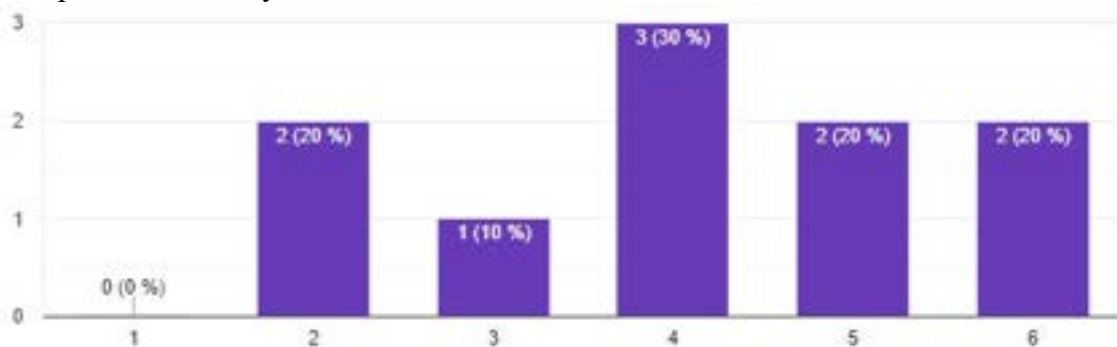


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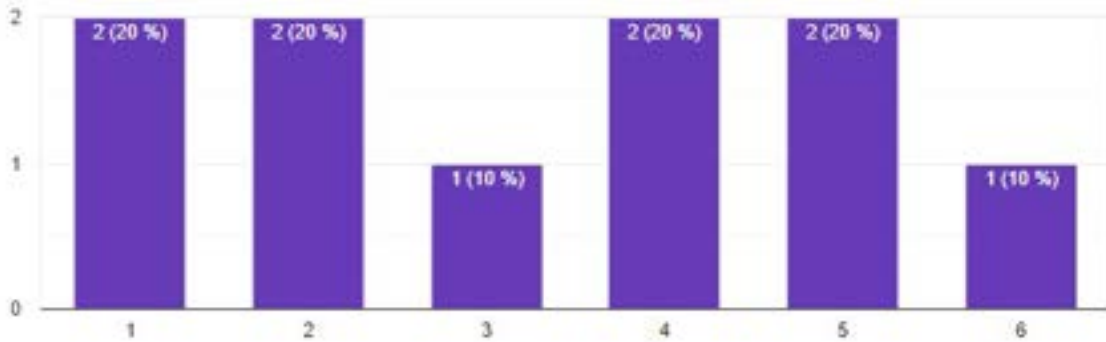
Self-organization of your time



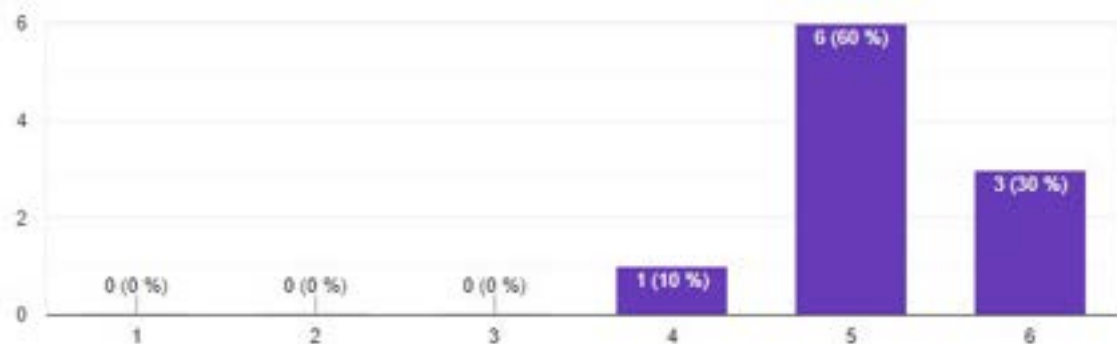
Self-performance of your time



Tendency to show a habit of decision delay (procrastination)



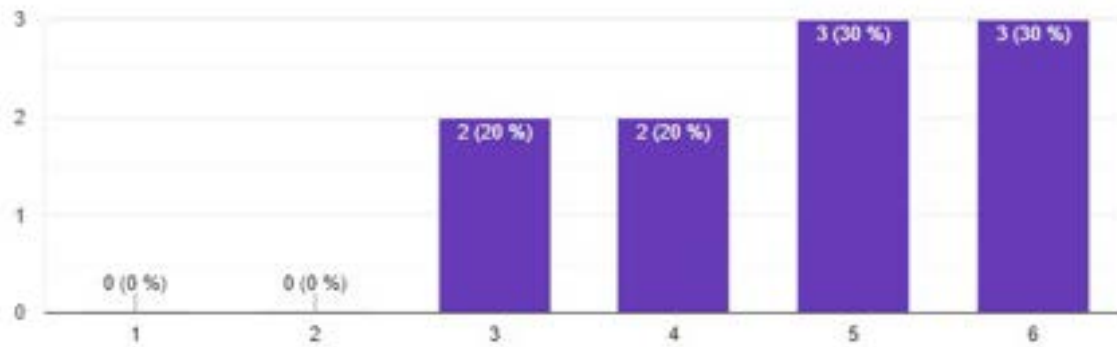
Your working intensity



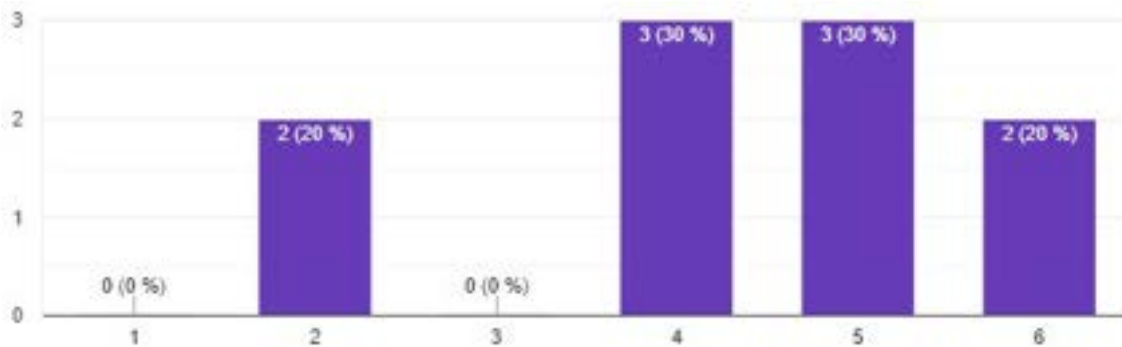


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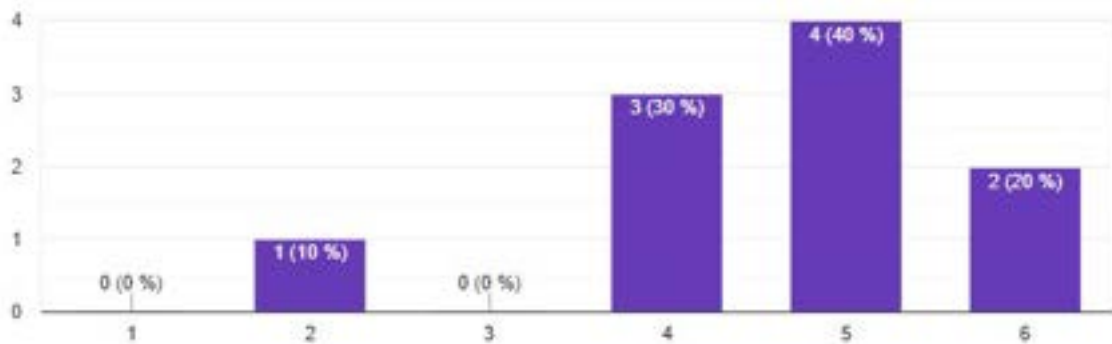
Your eagerness to serve others



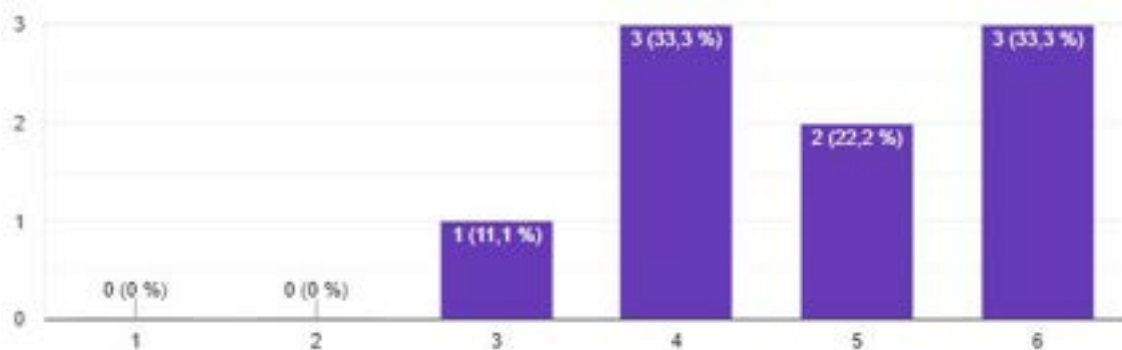
Goal orientation



Tendency to actively participate



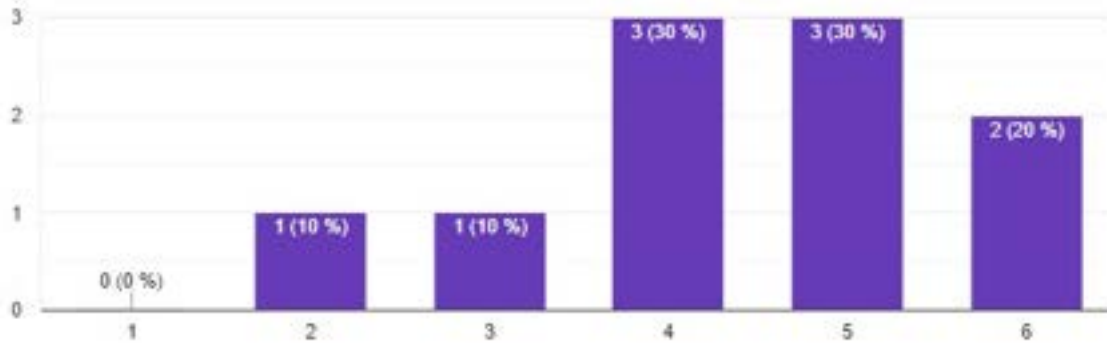
Tendency to exceed other's expectations



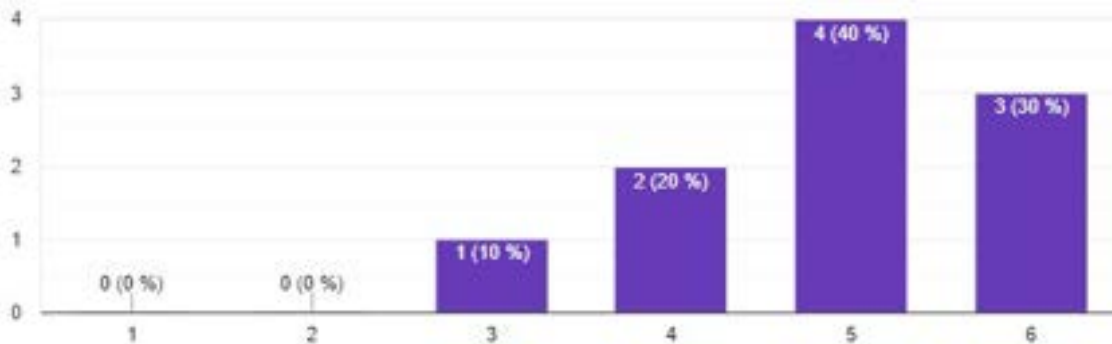


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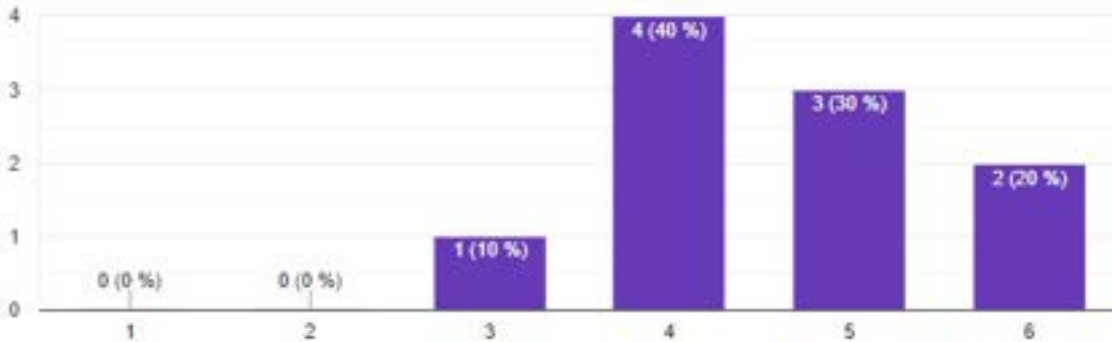
Self-awareness of your emotions



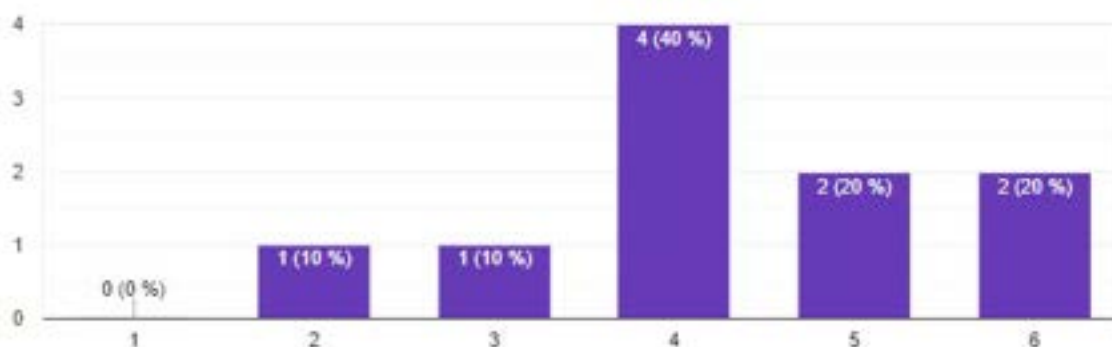
Awareness of the impact of your emotions on you



Awareness of the impact of your emotions on others



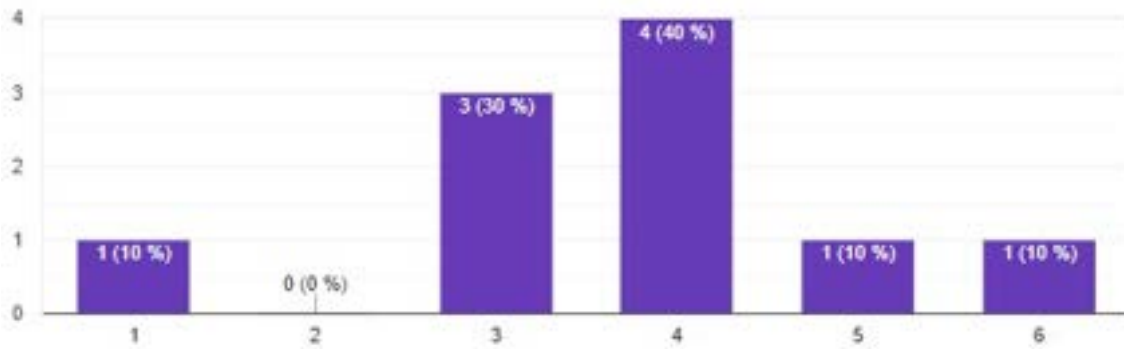
Ability to quickly bring down intense emotions, when a response from you is expected



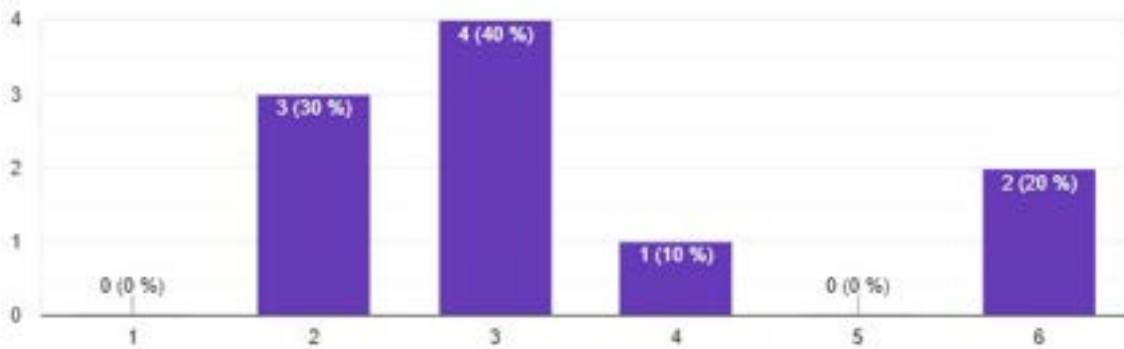


This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 859957.

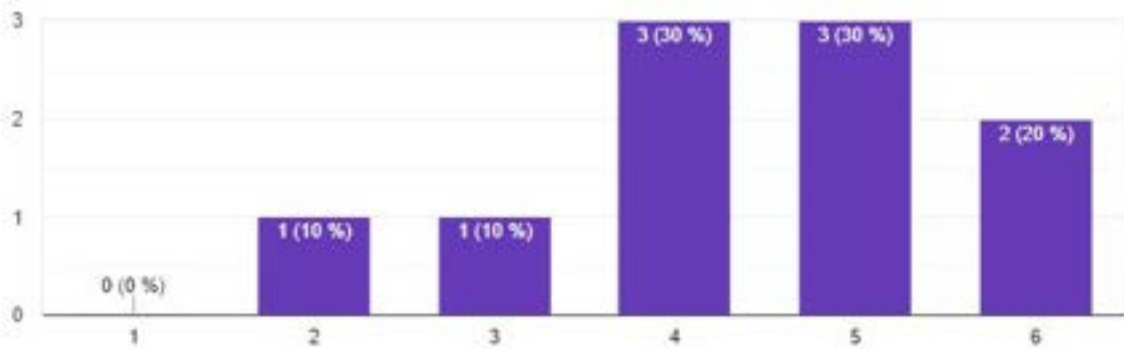
Tendency to force arguments



Tendency to avoid acceptance that you are wrong



Ability to change your opinions



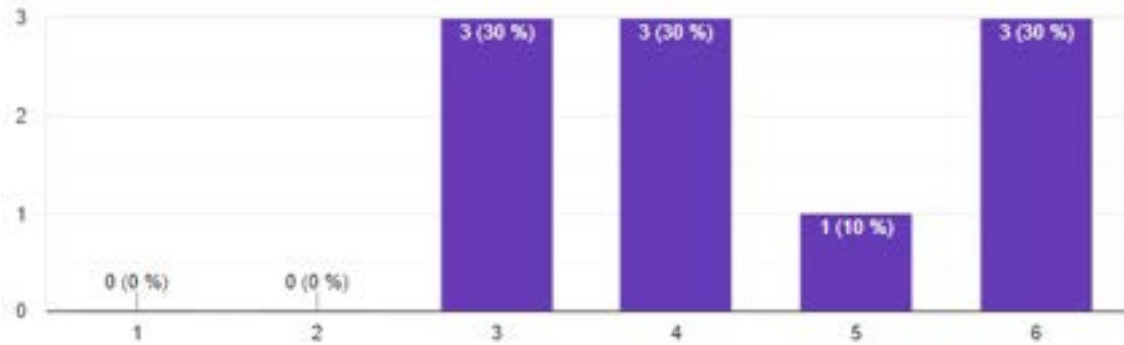
Ability to understand others emotions



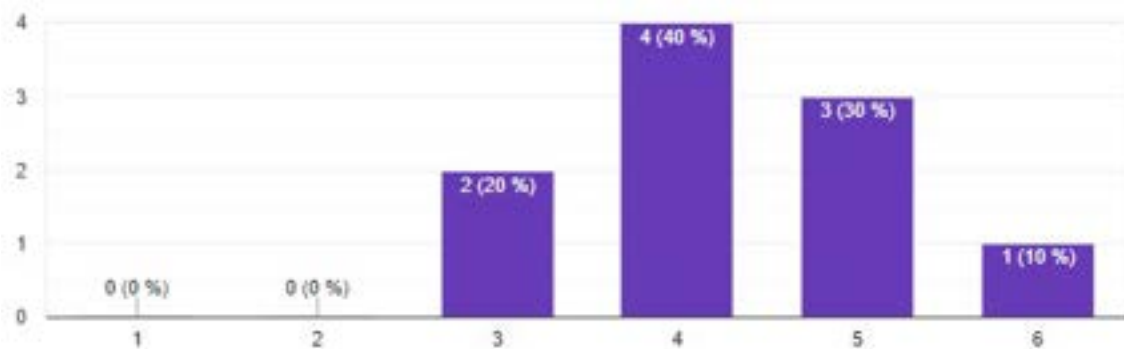


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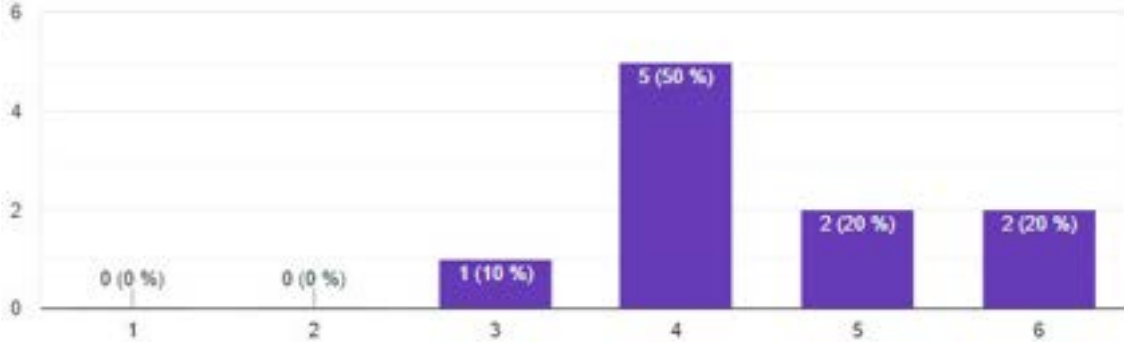
Ability to quickly understand emotions of others



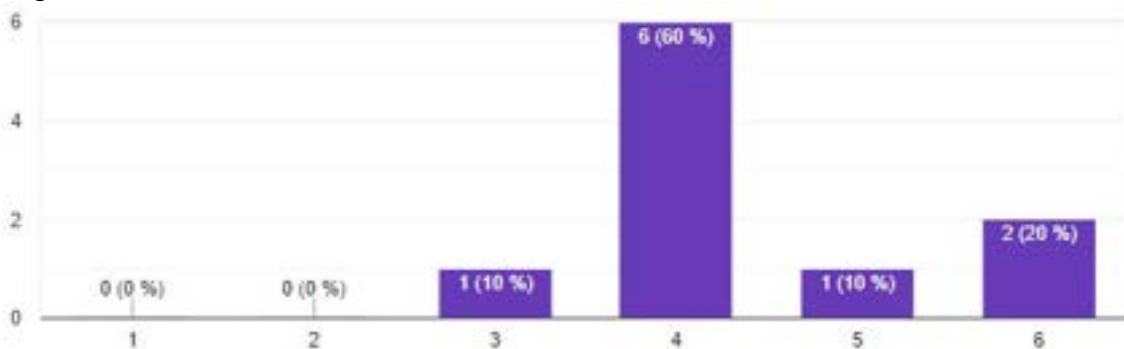
Ability to feel pain for others



Ability to feel joy for others



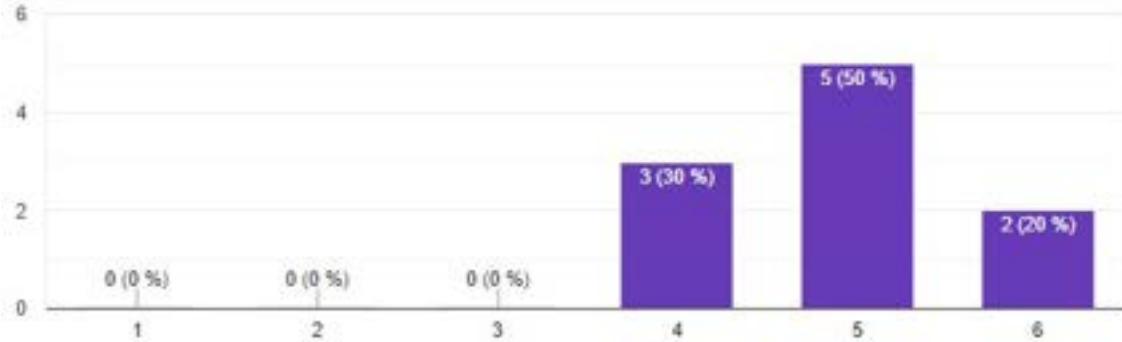
Impulse to talk in conversations



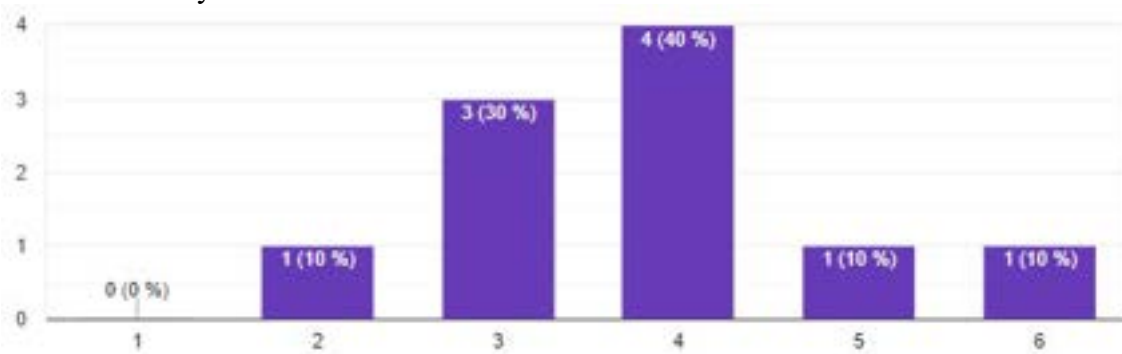


This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 859957.

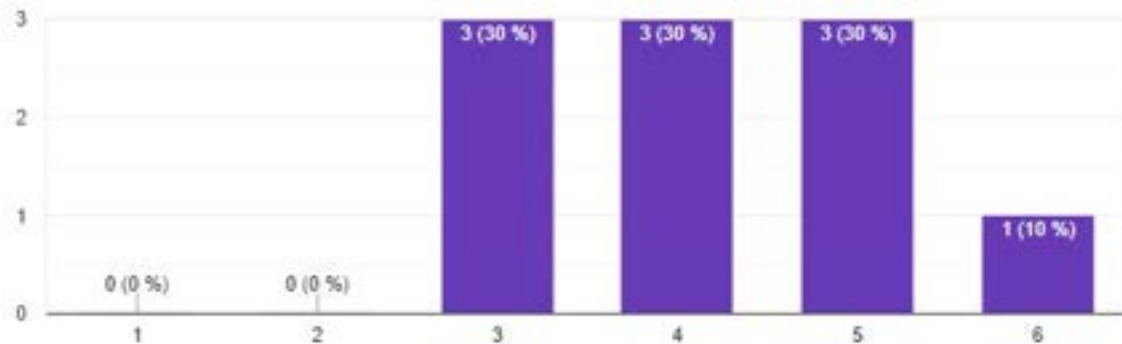
Spending time listening to others, rather than talking to others



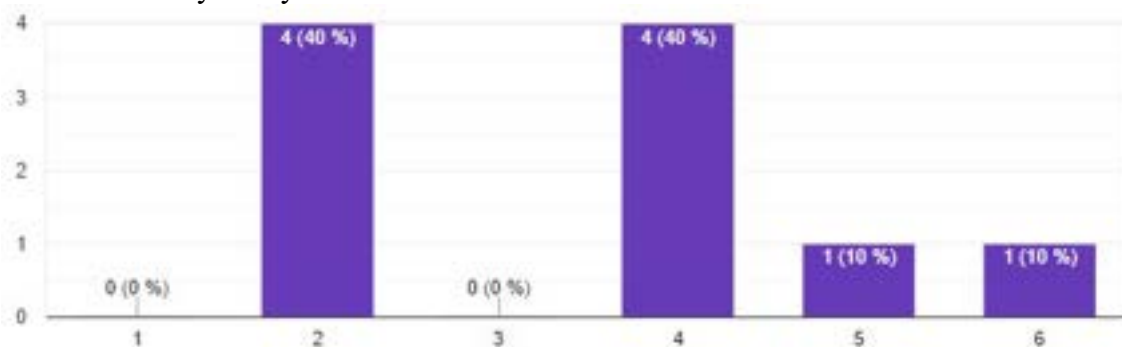
I master the way to make critics



I master the way to make a complicated demand

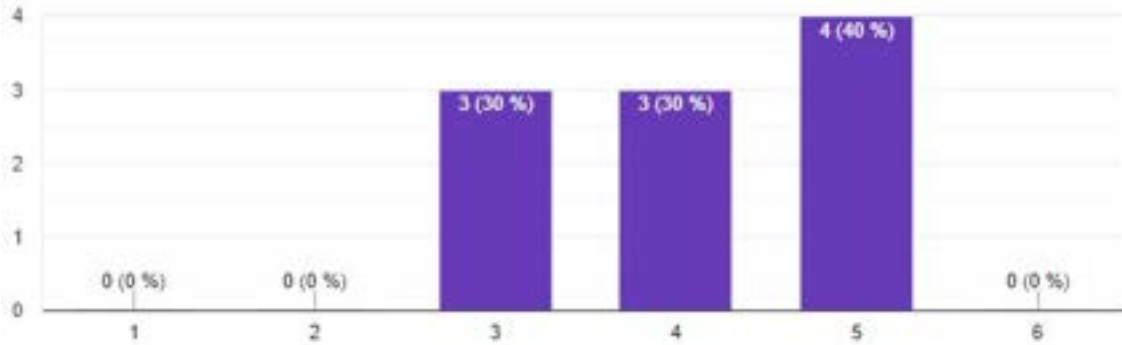


I master the way to say NO

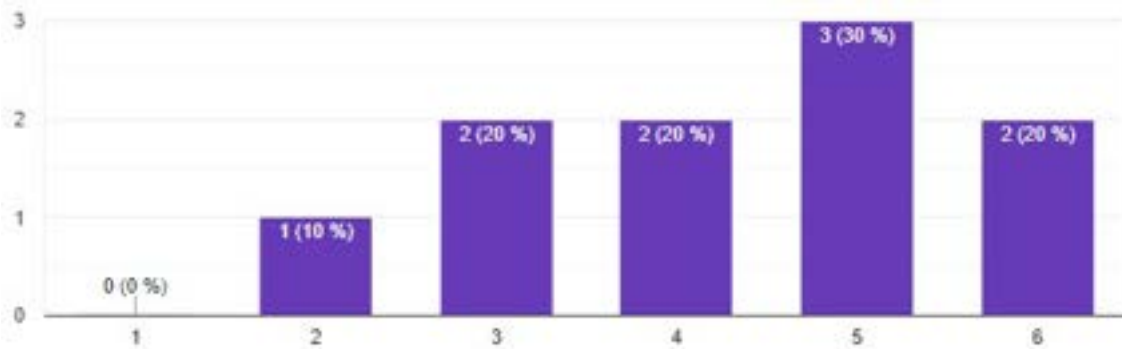




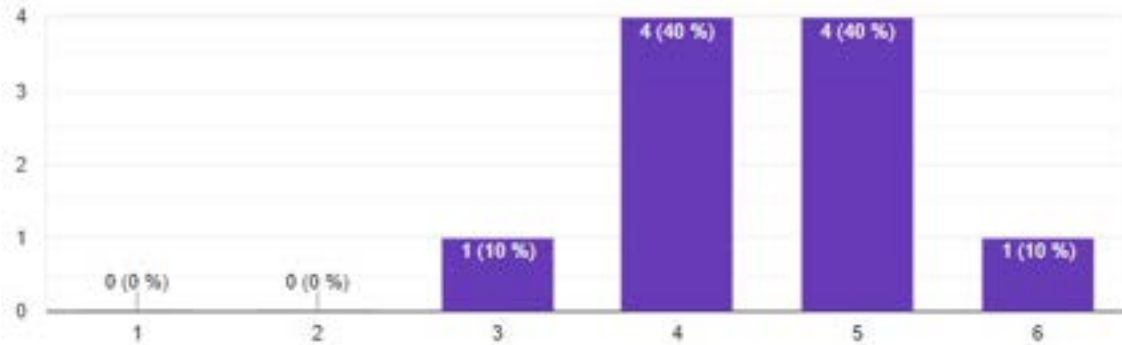
I refer to our values to generate intense emotions



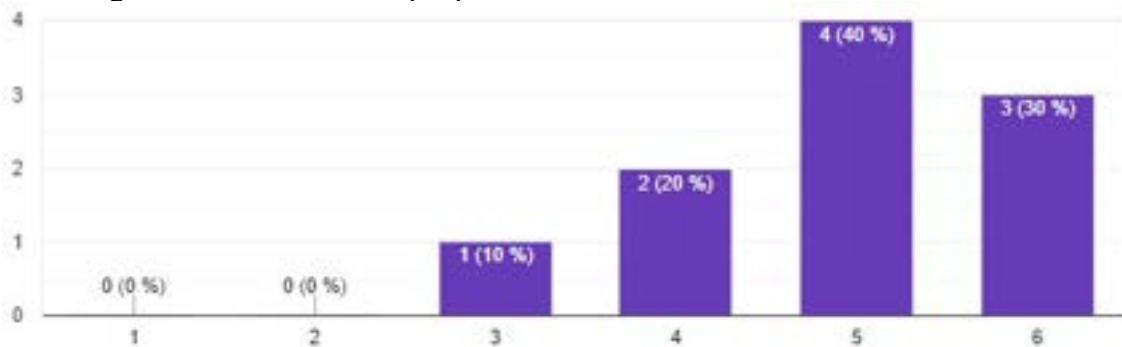
I introduce questions in my speech to drive others thinking



I continuously compare what my group is doing and my group's goals



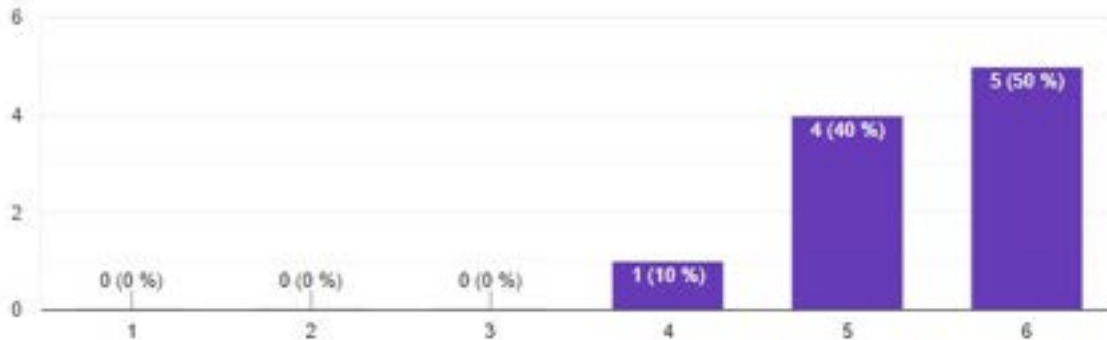
I tell long term visions to make people understand



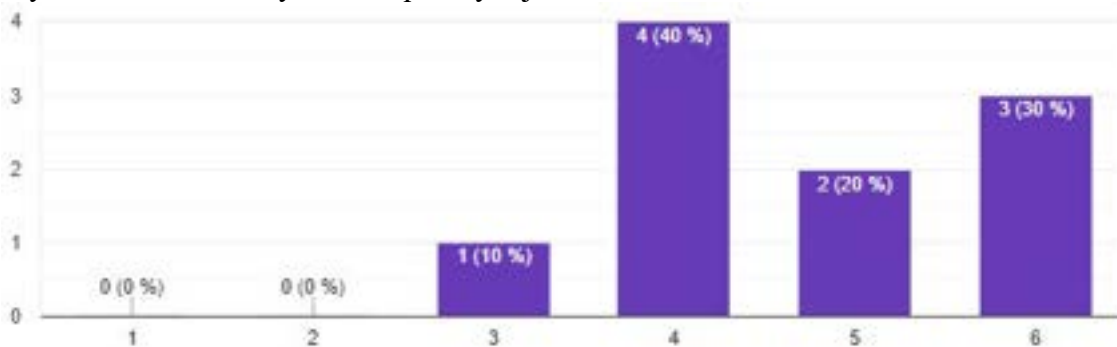


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I am curious, and deeply insist on it



My mind creates many ideas I quickly reject. Few are useful.



Are you interested in improving any specific skill or capacity? Describe what you would like.

- More critical thinking; more self-control
- I believe my weakest point is to express confronting ideas/points when in a group discussion or to express new ideas because of the fear of them not being good enough, or having critical issues. I believe I tend to judge myself before expressing ideas/opinions and have the fear of saying not accurate things.
- I would like to develop business skills, and more project management with all the steps
- How companies are born, and what their first steps are
- I want to improve the way to stay focused on my goals, and make a balance between what I like and what I have to do.
- I would like improve the following: organization and management skills, communication and negotiation skills.



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Interested in having a personal session about it?





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A11. Fellow feedback Questionnaire

https://docs.google.com/forms/u/1/d/1uj0mRvq06JhxckSaOq8z9_Z3qc9m0AtdwJZk_7u0nxA/edit

CURRENT STATUS

What is your current status?

10 respuestas

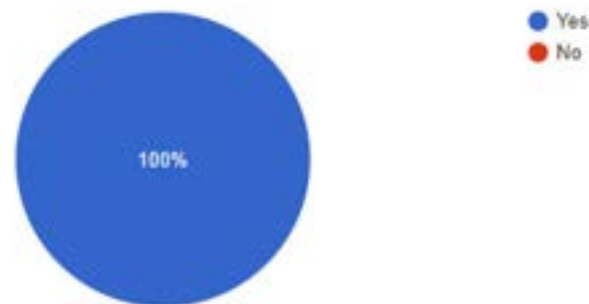
Copiar



If you answered "PhD student": Do you think you will finish your studies before the 30th June 2024?

8 respuestas

Copiar





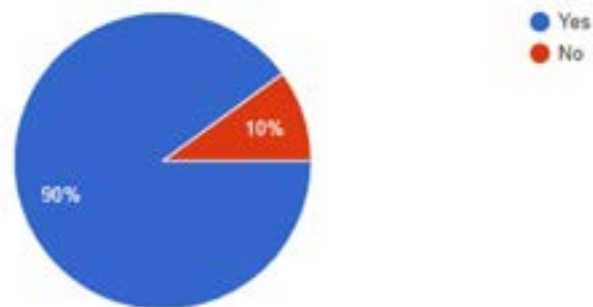
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 859957.

ACADEMIC ASPECTS

In your opinion - have you reached the goals of your Personal Career Development Plan (PCDP)?

 Copiar

10 respuestas



If you answered "no": Why not?

1 respuesta

Still working on it



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If you have attended congresses or courses during this period, please write down the main details (City, Organization, Title, Duration...)

9 respuestas

None

PHM 2022 - Nashville, Tennessee, USA (4 days)
5 Training Weeks - Granada, Madrid, Netherlands, Paris and Granada

WAVES 2022: ENSTA Paris, France
AFPAC 2023: Frejus, France

1. T. Sofi, "Durability of Piezoelectric Transducers in Aeronautical Environmental Conditions Bonded with an Efficient Procedure for SHM of Thermoplastic Composite Structures," presented at the 10th EWHSM, Palermo, Italy, Palermo, Italy, Jul. 05, 2022. <https://www.ewshm2022.com/>

2. Course: The Era of AI and Digitalization for structural applications, Center of Excellence in AI for Structures, TU Delft. 14-16 June, 2022.

ICCM 23, Belfast, 31th of July to 4th of August, 2023 (PREDICTION OF PROCESS-INDUCED DEFORMATIONS USING DEEP LEARNING INTERFACED FINITE ELEMENT CONSTITUTIVE MODELS)
ECCOMAS 22, Trossen, 17th to 18th of September 2022 (ANALYSIS OF FIBRE BEHAVIOUR UNDER UNCERTAINTIES)

PERSONAL ACHIEVEMENTS

What would you say the main achievements of your H2020 MSCA-ITN fellowship have been?

10 respuestas

Getting knowledge I would not have been able to get otherwise.

(1) Acting as the lead author in multidisciplinary and multinational research teams. 2 journal papers published, 3 ready to submit; presented at 5 international conferences. (2) Through my involvement in a three-year EU-funded international project, I have refined my communication and presentation skills. This exposure has prepared me for effective collaboration in diverse settings.

Expanding my research skills, and my knowledge about artificial neural networks trained with Bayesian methods.

The network

Learning knowledge and new skills, team work and personal development.

Integration of machine learning aspects in composites manufacturing and studying the influence of the manufacturing defects on lifetime assessment of composite parts

Broad vision on Research & European culture

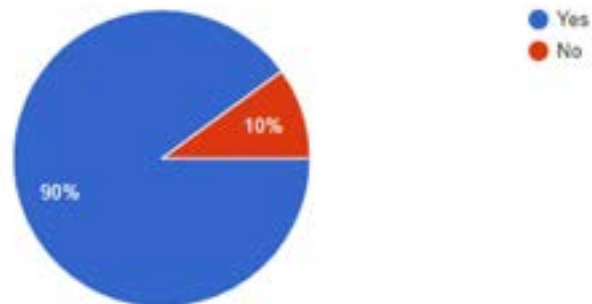


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Did you publish any work?

10 respuestas

Copiar



If you answered "yes": Please, cite here your papers in an academic way (APA, ISO 690, MLA...)

10 respuestas

Lopez, J. C., & Kolios, A. (2022). Risk-based maintenance strategy selection for wind turbine composite blades. *Energy Reports*, 8, 5541-5561.

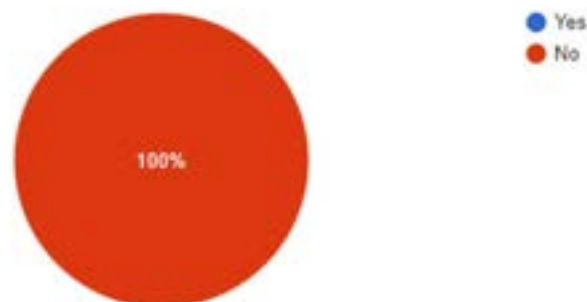
López, J. C., Kolios, A., Wang, L., & Chiachio, M. (2023). A wind turbine blade leading edge rain erosion computational framework. *Renewable Energy*, 203, 131-141.

Contreras Lopez, J., Chiachio, J., Saleh, A., Chiachio, M., & Kolios, A. (2022). A cross-sectoral review of the current and potential maintenance strategies for composite structures. *SN Applied Sciences*, 4(6), 180.

Did you get any patent?

10 respuestas

Copiar



If you answered "yes": Please, cite here your patents (# patent...)

0 respuestas

Aún no hay respuestas para esta pregunta.



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If you submit your PhD thesis, please, cite the title:

5 respuestas

Development of a System Level Post Prognostics Reasoner for FRP turbine blades

Physics-based Guided Wave Structural Health Monitoring, and its Integration in Asset Management Modelling


A probabilistic framework for prognostics with uncertainty quantification based on physics-guided bayesian neural networks.

Foresee to submit by March 2024

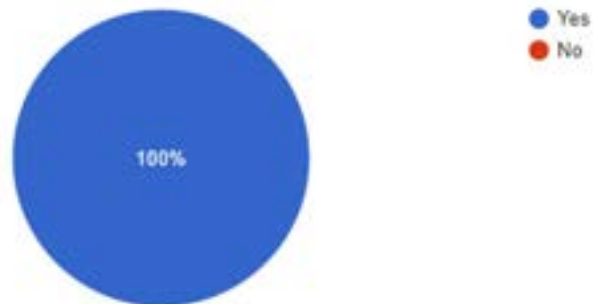
Particle filter-based damage prognosis in engineering structures subjected to fatigue loading

MANAGEMENT ASPECTS

In your opinion - have you received all necessary information concerning the project?

 Copiar

10 respuestas





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If you answered "no": What did you miss?

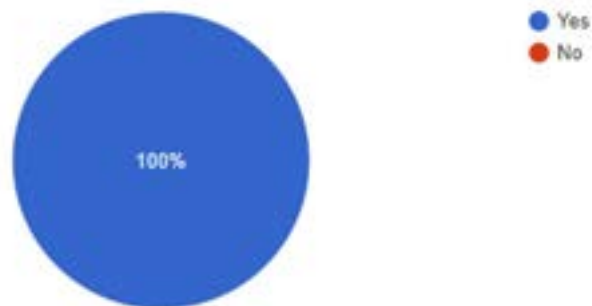
0 respuestas

Aún no hay respuestas para esta pregunta.

Did you perceive as sufficient the support with arising problems concerning the project?

 Copiar

10 respuestas



If you answered "no": Why not?

0 respuestas

Aún no hay respuestas para esta pregunta.



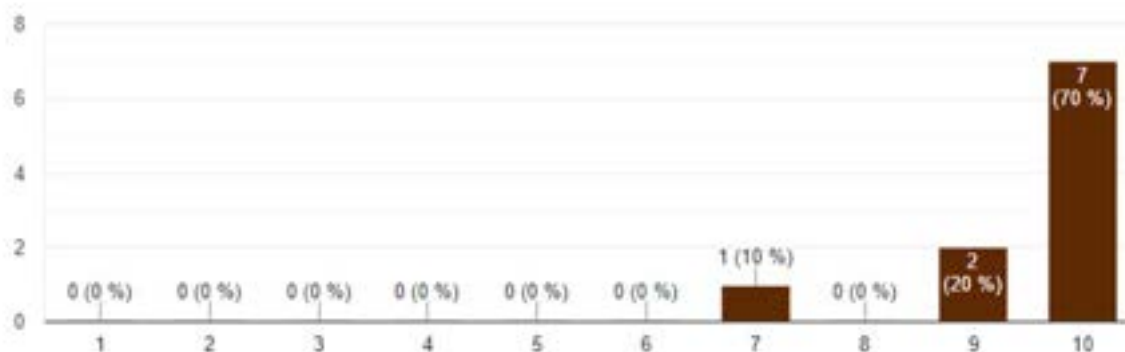
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 859957.

SCORE AND FEEDBACK

Please, could you score the project according to your global degree of satisfaction?



10 respuestas



Kindly share what would you improve in the H2020-MSCA-ITN projects?

10 respuestas

Nothing, it was perfect.

I would like to acknowledge the funding from the European Union's Horizon 2020 research and innovation program, making it an honor to be a Marie Skłodowska-Curie fellow. This project has provided boundless opportunities for exploration and self-improvement. If there is anything to dig deeper, strengthening strong academic collaboration between ESRs is necessary.

More exposure to recruiters and potential employers

The host institution should know deeply the content of the project proposal

- More interaction with the project officer. In three years we had only one.
- The super gross and gross salary should be clearly defined in the MSCA job offer/contract conditions. I have found many researchers confused with this issue.
- More emphasis on transfer of technology developed during the project to market or develop the work further for entrepreneurship. We had one session but more such sessions would be good.

Increase the time frame especially with a lot of traveling involved (Training weeks, secondments etc.,)