



WP 7: Dissemination and Exploitation of Results

D 7.6 – Mid Term Conference & Evaluation

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Introduction

Mid Term Conference & Evaluation is a deliverable characterized by a set of events to be carried out by all ADMIRE project's partners in their own countries.

The main purpose of these events, designed in the scope of ADMIRE Work Package 7 *Dissemination and Exploitation of Results*, is to gather a total of 100 to 200 participants from the project's target groups (which include representative stakeholders from national Additive Manufacturing (AM) supply chain's managers and workers, researchers and teaching staff, students, education specialists, experts, policy and decision makers, and speakers from partners' countries) to present the project and to build links with external organizations to promote ADMIRE.

Focused on presenting and discussing ADMIRE project and its results in terms of importance and impact for both Education and AM Industry, the Mid Term Conferences are also an opportunity to promote the project and to engage different stakeholders on its different activities.

The success of each Mid Term Conference is evaluated by using a specific questionnaire to be filled in by all participants at the end of the respective events. The results collected will help ADMIRE consortium to understand whether the events were fruitful in reaching their purposes.

This Report aims to describe how ADMIRE Mid Term Conferences carried out by the European Welding Federation for Welding, Joining and Cutting (EWF), in Portugal, IREPA Laser, in France, Bremen University, in Germany and Cranfield University, in United Kingdom, were conducted, characterizing its organization and participants and presenting the main results from the questionnaires filled in by the respective participants who attended the events.

Table of Contents

| | |
|--|----|
| Introduction | 3 |
| 1 ADMIRE Mid Term Conference – EWF (30 th October 2019) | 5 |
| 1.1 Invitation for the Event and Agenda | 5 |
| 1.2 ADMIRE project's presentation | 7 |
| 1.3 Mid Term Conference Evaluation | 8 |
| 1.4 Results of the Evaluation questionnaire | 9 |
| 2 ADMIRE Mid Term Conference – IREPA Laser (10 th & 11 th April 2019) | 14 |
| 2.1 Invitation for the Event and Agenda | 14 |
| 2.2 ADMIRE project's presentation | 17 |
| 2.3 Mid Term Conference Evaluation | 17 |
| 2.4 Results of the Evaluation questionnaire | 18 |
| 3 ADMIRE Mid Term Conference – ISEMP, Bremen University (19 th & 20 th September 2018) | 19 |
| 3.1 Invitation for the Event and Agenda | 19 |
| 3.2 ADMIRE project's presentation | 20 |
| 3.3 Mid Term Conference Evaluation | 21 |
| 3.4 Results of the Evaluation questionnaire | 22 |
| 4 ADMIRE Mid Term Conference – Cranfield University (7 th March 2019) | 23 |
| 4.1 Invitation for the Event and Agenda | 23 |
| 4.2 ADMIRE project's presentation | 23 |
| 4.3 Mid Term Conference Evaluation | 25 |
| 4.4 Results of the Evaluation questionnaire | 26 |
| 5 Main conclusions | 32 |
| ANNEX 1 EWF Mid Term Conference Evaluation Questionnaire | 33 |
| ANNEX 2 IREPA Laser Mid Term Conference Evaluation Questionnaire | 36 |
| ANNEX 3 Cranfield University Mid Term Conference Evaluation Questionnaire | 39 |

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1 ADMIRE Mid Term Conference – EWF (30th October 2019)

In the scope of its work to define new industry required professional profiles in Metal Additive Manufacturing (MAM) technology and its interest in gathering Industry and Education stakeholders' points of view on EWF's AM Qualifications (including the European Metal AM Engineer, a qualification in which ADMIRE project is also focused), EWF organized the "International Conference on EWF Qualification System", which took place in Porto Salvo (Portugal), on October 30th, 2019.

This event, that gathered 22 participants belonging not only to EWF's member organizations, but also to other national, European and International organizations from Industry, Education and R&D, was an opportunity to carry out ADMIRE's Mid Term Conference, presenting the project, its objectives and results, as described below.

1.1 Invitation for the Event and Agenda

Before carrying out the "International Conference on EWF Qualification System"/ADMIRE Mid Term Conference, a dedicated email was sent to EWF's member organizations and other entities from its network which have interest and expertise in AM technology and belong to Education, R&D and Industry sectors.

The email explained the objectives of the "International Conference on EWF Qualification System" and the activities to be carried out in its scope, which included the presentation of ADMIRE project, its aims and results and how the project could be an added value to participants' organizations.

The Agenda was also sent with the invitation email so that guests could see the event's schedule and have a clear idea of how its activities were organized: after the Registration, participants would be presented with some of the projects in which EWF is actively involved: projects related to the development of professional profiles in the Welding sector and projects that address the development of new professional profiles/qualifications in AM, including ADMIRE project. Therefore, ADMIRE Mid-Term Conference was carried out in the scope of a collaborative event, where several projects were addressed.

By the end of the event, participants would have the opportunity to evaluate ADMIRE Mid Term Conference success by filling in a questionnaire with specific questions about the project, and to network/further discuss the results from the projects' presentation.

ADMIRE turned out to be one of the most debated projects among the event's attendees.



AGENDA - 30th October 2019

International Conference on EWF Qualification Systems

| | Agenda |
|-------|---|
| 8:30 | Registration and welcome coffee |
| 9:00 | Opening (EWF) |
| 9:05 | <p>EWF Qualification System – Welding</p> <p>Apprenticeship in the EWF System - How to foster the adoption of WBL Quality Assurance System and its tools to other EWF members? <i>*Presentation of WOW project outputs: Guideline for Quality Assurance, Arrangements for WBL, WOW Platform; Tutorials and Recommendations</i> Adelaide Almeida (EWF) WOW consortium</p> <p>FSW European Qualifications - How to implement European training within Friction and Stir Welding Technology? <i>* FSW TECH project results: EFSW Operator, Specialist and Engineers training Guidelines, Training and assessment tools, Recommendations</i> Peter Durik (VUZ) FSW-Tech Consortium</p> |
| 10:30 | Coffee break |
| 10:40 | <p>EWF Qualification System – Additive Manufacturing</p> <p>New Professional Profiles/Qualifications in AM National and European Implementation and Recognition <i>* CLLAIM & ADMIRE projects results</i> Francisco Barros (EWF)</p> |
| 12:30 | Networking Lunch |

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Fig. 1 – Agenda of the “International Conference on EWF Qualifications System”

1.2 ADMIRE project's presentation

The second part of the “International Conference on EWF Qualification System” session began with ADMIRE Mid Term Conference. Rute Ferraz (Director of EWF) presented ADMIRE project to all participants, explaining the scope of the project, its objectives and the results to be achieved by the end of its lifecycle.

Rute Ferraz also explained how the ADMIRE European Metal AM Engineer MSc Modules were being piloted by the consortium to help participants understand how it can be applied to other European Universities and what its benefits were both for AM Industry and Education.



Fig. 2 – ADMIRE Mid Term Conference | ADMIRE project's presentation

After ADMIRE project's presentation, the Mid Term Conference participants were invited to ask questions about the work that has been carried out by ADMIRE consortium towards the development and implementation of the European Metal AM Engineer MSc.

Attendees were very interested in the project's results and were impressed with the achievements reached so far by ADMIRE, commenting on the project's impact on AM Industry and its need for qualified personnel.

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1.3 Mid Term Conference Evaluation

Because it was a collaborative event where several Erasmus+ projects in which EWF is involved were presented, a specific assessment Questionnaire was delivered to participants of the “International Conference on EWF Qualification System” to be completed. This Questionnaire (see Annex 1) focused on three aspects of the event:

1. General Aspects of the International Conference Organization

Participants were asked to indicate their industrial field of activity (i.e. Additive Manufacturing, Welding or other), the sector they belonged to (e.g. Vocational Education and Training organization, Higher Education organization, Industry, etc.), the reasons behind their participation on the event (e.g. to share ideas/learn about EWF’s AM Qualification System and new Professional Profiles/Qualifications, to make new contacts (networking purpose), etc.) and how they came to hear about the Conference (e.g. by invitation, through the projects’ websites, etc.).

The first part of the questionnaire also asked participants to rate their level of satisfaction regarding the general organization of the Conference (e.g. practical arrangements, relevance of the presentations, etc.) and other questions about their experience and impact of the event on they organizations’ strategies.

2. Detailed features of the International Conference

This part of the questionnaire was more focused on the projects presented during the event, including ADMIRE project.

Thus, participants were asked to rate the probability of implementing ADMIRE’s outcomes within their professional activity and/or organization using a scale that ranged between 1 (Impossible) and 4 (Certain) in terms of:

- a. Using cooperation strategies with HE institutions and Companies,
- b. Implementing AM Qualification Guidelines in the future,
- c. Sharing/using the provided information in a professional context.

3. EWF Qualification System – Additive Manufacturing (AM)

In addition to questions related to EWF Qualification System dedicated to the Welding sector, also addressed during the event, this questionnaire also focused on EWF AM Qualification System. Thus, participants were requested to rate each of the provided items in relation to their level of agreement for specific questions about ADMIRE project’s methodology and results presented in a dedicated session of EWF’s International Conference. Using a scale ranging between 1 (Strongly disagree) and 4 (Strongly agree), participants rated their level of agreement in terms of:

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- a. Adequacy of ADMIRE project's Methodology and Results for the implementation of the AM harmonised Qualification System in Europe,
- b. Development of the methodology and results in a way that ensures cooperation between Industry and Education.

The results from the Questionnaire allowed ADMIRE project's consortium to assess the Mid Term Conference's success and the project's impact on participants.

1.4 Results of the Evaluation questionnaire

From 22 participants, EWF was able to collect 19 replies to the Evaluation Questionnaire delivered to participants of the ADMIRE Mid Term Conference.

Even though the questionnaire focused not only on the project, but also on the general aspects of EWF's International Conference as a whole as previously mentioned, this Report addresses only the results from the questions about ADMIRE project once only those allow the partnership to assess the Mid Term Conference's success and the impact of the project on participants organizations' activities.

Nevertheless, it is important to refer that, overall, 18 of the respondent participants reported to be "Highly Satisfied" with the relevancy of the projects' presentations, including ADMIRE.

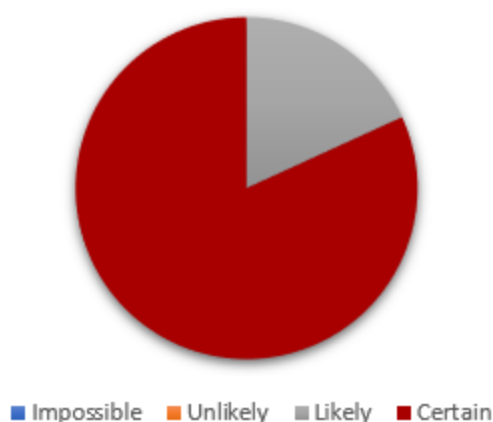
1.4.1 Detailed features of the International Conference

Regarding the *Detailed features of the International Conference* (second part of the Questionnaire, described above), the results show that participants found ADMIRE project's outcomes suitable to be implemented to their professional activity and/or organization.

Proof of that is the fact that the most highly rated item of this part of the questionnaire was "**Share/use the provided information in a professional context**", to which 18 participants replied as "Certain" as seen on the graphic below:



Share/use the provided information in a professional context

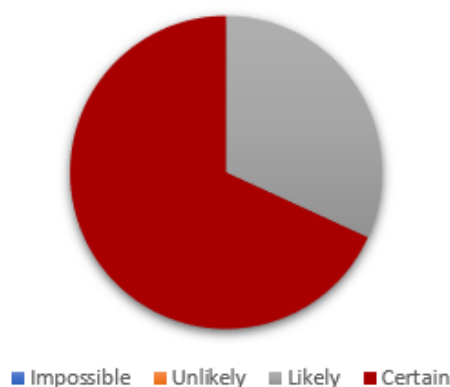


Graph. 1 – Results collected for the item “Share/use the provided information in a professional context”

Almost the same result was achieved with the item “Implement AM Qualification Guidelines in the future” given the fact that 15 respondents indicated as “Certain” the possibility to do so, as showed by the graphic below:



Implement AM Qualification Guidelines in the future



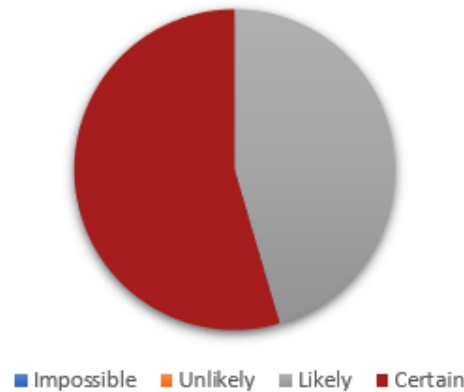
Graph. 2 – Results collected for the item “Implement AM Qualification Guidelines in the future”

“Use cooperation strategies with HE institutions and Companies” was the item from this second part of the evaluation questionnaire that gathered more balance between “Certain” and “Likely”. Nevertheless, the results show that there is a high probability that ADMIRE Mid Term Conference will result in cooperation strategies with HE institutions and Companies within participants’ professional activity based on their participation on the event:

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Use cooperation strategies with HE institutions and Companies



Graph. 3 – Results collected for the item “Use cooperation strategies with HE institutions and Companies”

Overall, the options “Impossible” and “Unlikely” were never selected as a reply to this part of the questionnaire related to ADMIRE project.

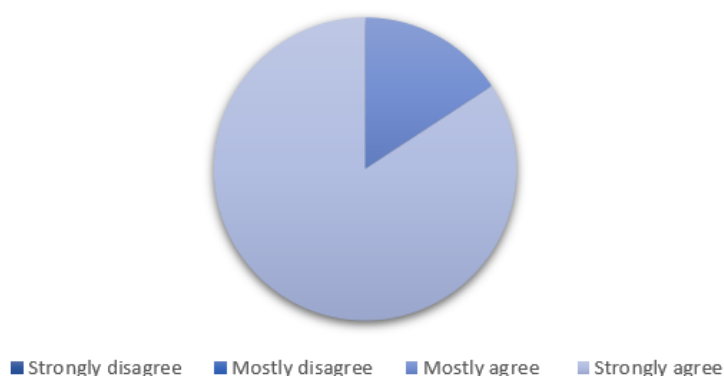
1.4.2 EWF Qualification System – Additive Manufacturing (AM)

This part of the Assessment Questionnaire had a general question, applicable to all the presented projects that address AM Qualifications.

Participants were asked to indicate their level of agreement regarding the item “**The development of a European Qualification Standard in the scope of AM is very important**”. Using a scale ranging from 1 (Strongly disagree) to 4 (Strongly agree), 16 participants replied using the highest rate, showing that they strongly agree that it is important to have a European Qualification Standard in the scope of AM. The graphic below illustrates the replies collected to this particular item:

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The development of a European Qualification Standard in the scope of AM is very important



Graph. 4 – Results collected for the item “The development of a European Qualification Standard in the scope of AM is very important”

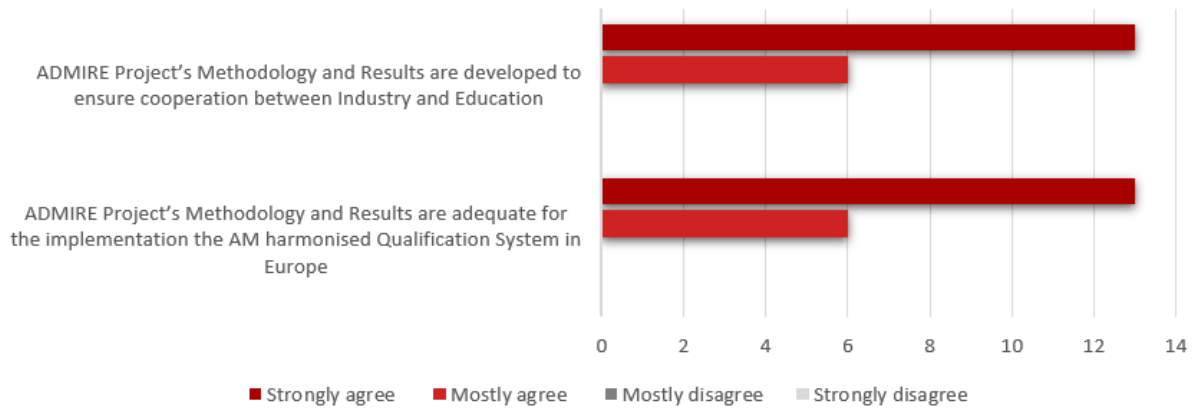
In addition to this general item, the questionnaire also had two specific items dedicated to the pertinence of ADMIRE Mid Term Conference, focusing on participants’ level of agreement regarding the adequacy of the project’s methodology and results towards the implementation of an AM harmonized qualification system in Europe and their pertinence on ensuring cooperation between Industry and Education.

Using the same rating scale, participants indicated their level of agreement regarding each of the above-mentioned items.

For the first item “**ADMIRE Project’s Methodology and Results are adequate for the implementation the AM harmonised Qualification System in Europe**”, 13 participants replied using the highest score (“Strongly Agree”), followed by 6 participants who replied “Mostly agree”.

The same results were collected in the second item “**ADMIRE Project’s Methodology and Results are developed to ensure cooperation between Industry and Education**”.

Pertinence of the ADMIRE Mid Term Conference Contents



Graph. 5 – Results collected for the questionnaire's items related to ADMIRE Mid Term Conference (Pertinence)

Less positive options such as “Mostly disagree” and “Strongly Disagree” were never selected by ADMIRE Mid Term Conference participants to reply to these items related to the project's methodology and results pertinence, which indicates the positive impact of ADMIRE on participants and the success of the event.

2 ADMIRE Mid Term Conference – IREPA Laser (10th & 11th April 2019)

2.1 Invitation for the Event and Agenda

In the framework of the project ADLIRE, IREPA LASER held a two days conference on the specific topics of Additive Manufacturing (AM), focusing on numerical modelization, simulation and recruiting issues and education in the field of AM. By involving its network, IREPA LASER was able to gather scientists, teachers, students, centres of technology transfer and manufacturers on this event. They were invited by email with attachments about the conference's agenda (see Fig.s 3 & 4, below) and venue's information.

Attendees were invited to discuss about education in the field of AM and a questionnaire has been delivered to all conference participants to collect their opinion about this specific feature during the two days conference.

A special focus was made to ADMIRE project during “Recrutement et formation en FA: projet ADMIRE” (in English: “Recruitment and training in AF: ADMIRE project”), a session conducted by Damien Choron (IREPA) on April 10th (see Fig. 3, below).

madAMdays | **WORKSHOP**
Modelling and design for AM | 10 & 11 avril
Strasbourg

Savoir maîtriser les outils de la chaîne numérique dans la fabrication additive

PROGRAMME DU MERCREDI 10 AVRIL 2019
Modélisation et simulation thermomécanique
de la fabrication additive

| | |
|-------|---|
| 8h45 | Accueil des participants |
| 9h10 | Introduction par Jean-Paul Gauffillet, Directeur d'IREPA LASER |
| 9h30 | Contexte et enjeux de la simulation numérique des procédés de fabrication additive chez ArianeGroup <i>Loïc DEBEUGNY, Ingénieur R&D chaîne numérique fabrication additive, ArianeGroup</i> |
| 10h15 | Simulations thermomécaniques et thermohydrauliques en fabrication additive : des outils intéressants pour prédire les défauts <i>Muriel CARIN, Maître de conférences, UMR CNRS 6027, Université de Bretagne Sud</i> |
| 10h45 | Pause |
| 11h15 | Nouvelle stratégie pour la simulation numérique des procédés thermomécaniques avec une approche couplant l'écoulement du fluide et la déformation du solide : application au soudage laser et à la fusion d'un lit de poudre. <i>Yassine SAADLAOUI, Doctorant LTDS, ENISE</i> |
| 11h45 | Approche thermomécanique de la construction de grandes pièces par DED-CLAD® <i>Vaibhav Nain, Doctorant, IREPA LASER</i> |
| 12h15 | Déjeuner et visite d'IREPA LASER |
| 14h00 | Démonstrateur de solutions de réparation et d'ajout de fonction par fabrication additive sur pièce aéronautique. Simulation et réalisation. <i>Jean Paul COMIN, Président, STYX Technologies</i> |
| 14h30 | Modélisation numérique thermomécanique en fabrication additive <i>Michel BELLET, Professeur, Mines ParisTech, CEMEF</i> |
| 15h00 | Pause |
| 15H30 | Tribune des offreurs de solutions : (20 minutes de présentation par chaque offreur) <ul style="list-style-type: none">• SIEMENS : Fabien FOURCADE, Ingénieur simulation Siemens : Simulation du procédé intégrée à la chaîne numérique de la conception pour la fabrication additive• DASSAULT SYSTEMES : Daniel PYZAK, Director, CATIA Engineering Centre of Excellence EMEAR : La fabrication additive accélérée grâce au numérique• ESI Group : Slaheddine Frikha, Director Industry Business Development• MSC Software-SIMUFACT : Mathieu PERENNOU, Directeur commercial EMEA : Simufact Additive, une approche pragmatique résolument orientée métier de la simulation de process AM |
| 16h45 | Recrutement et formation dans le monde de la FA : le projet européen ADMIRE <i>Damien CHORON, Ingénieur R&D Fabrication additive, IREPA LASER</i> |
| 17h00 | Clôture de la première journée Modélisation – Simulation et départ pour la visite |
| 17h45 | Visite de la société BeAM |

IREPA LASER
INSTITUT CARNOT MICA

CIRTES
recherche & développement



PROGRAMME DU JEUDI 11 AVRIL 2019

Conception pour la fabrication additive

| | |
|-------|--|
| 8h45 | Accueil des participants |
| 9h15 | Introduction par Cyril PELAINGRE, Responsable R&D Procédé au CIRTES |
| 9h30 | Fabrication Additive, les 7 procédés normalisés, la chaîne numérique. Applications industrielles pour maquettes, outillages et pièces directes. <i>Cyril PELAINGRE, Responsable R&D Procédé, CIRTES</i> |
| 10h00 | Conception et Optimisation topologique pour la FA. <i>Arnaud DELAMEZIERE, Directeur Institut Supérieur d'Ingénierie de la Conception - LEM3 UMR 7239.</i> |
| 10h30 | Pause |
| 11h00 | Exemples industriels d'optimisation topologique en FA pour les PMI <i>Frank BRAYMAND, BRODEX - Société d'ingénierie en simulation numérique et Haroun MOKDAD, Directeur commercial d'Altair France</i> |
| 11h30 | Témoignage Grand Groupe SNCF : Fabrication Additive et Supply-chain industrielle agile pour la maintenance ferroviaire <i>Louis-Romain JOLY, Chef de Projet, Equipe Systèmes Mécaniques et Interactions, SNCF – Direction Innovation et recherche, Paris.</i> |
| 12h00 | Déjeuner et visite d'IREPA LASER |
| 14h00 | Témoignage Grand Groupe THALES : Concevoir pour la Fabrication Additive, remettre l'ouvrage sur le métier. <i>Philippe BAUER, Coach expert Fabrication Additive et conception mécanique, Thales Global Services, Site Helios.</i> |
| 14h30 | Intégration de la FA en natif CAO, le logiciel TopSolid'Strato <i>Benoît DELEBECQUE, Responsable R&D logiciel, CIRTES, et Patrice TIBERI, Directeur MISSLER Services.</i> |
| 15h00 | Conception pour la fabrication additive : 3DEXPERIENCE CATIA en action <i>Daniel PIZAK, Directeur CATIA Engineering centre of Excellence EMEAR, Dassault Systèmes</i> |
| 15h30 | Pause |
| 16h00 | Creative thinking & Fabrication additive <i>Anne-Lise RIAS, Responsable offre services CRÉADDITIVE, AddUp</i> |

Figs. 3 & 4 – Agenda of the “International Conference on IREPA LASER - Design for AM”
(10th and 11th April 2019, respectively)

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2.2 ADMIRE project's presentation

After a welcoming coffee break, Jean-Paul Gauffillet, IREPA LASER 's Director, welcomed all 44 attendees and open the conference. A series of conferences and parallel sessions were scheduled in order to inform attendees about the two hot topics in AM addressed by the event (as seen by the speakers) and to discuss issues and solutions related to those topics. A specific point was made about how recruiting well educated and trained professionals should become a major point of attention in AM.

ADMIRE project's program was explained by Damien Choron, ADMIRE's project manager for IREPA LASER, as a way to connect Education and Industry to reply to Industry's needs for qualified personnel. His speech was focused on exposing the lack of qualified workforce facing the increasing needs in AM industry.



Fig. 5 & 6 – ADMIRE Mid Term Conference | ADMIRE Mid-Term Conference's presentation

2.3 Mid Term Conference Evaluation

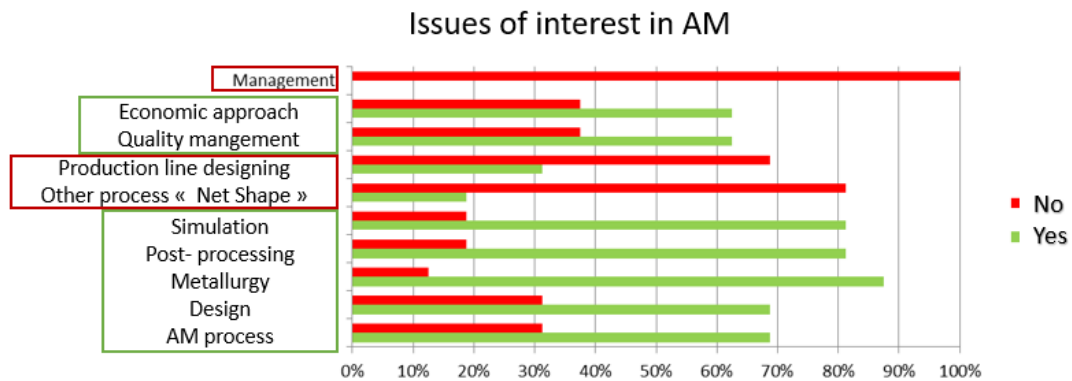
A specific questionnaire was distributed all along the two days conference so that attendees could provide their feedback about the event (see Annex 2)

The questionnaire revealed that economical approaches and Additive Manufacturing processes' quality were the two main issues of interest to the event's participants, after metallurgy and post processing.

On the other hand, the questionnaire's results showed a low interest level on Management, Production line designing and Other process "Net shape" issues.

The audience pointed out that AM is still a very technical process and that industry needs high level technicians.

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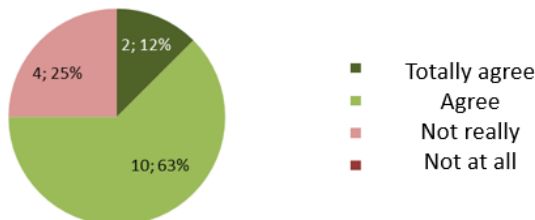


Graph.6 – Results collected for the questionnaire's items related to ADMIRE Mid Term Conference specific point on recruitment - matter of interest

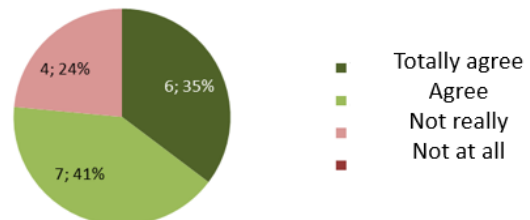
Another information revealed by this session is the fact that, for the French attendees, AM development is considered as a local competence. The audience regretted that no French university was involved on ADMIRE project.

Distance learning also stands for a solution for delivering the knowledge for 40% of attendees.

No french university in the project is a problem



Distance learning is a good point for AM industry



Graph.7 – Results collected for the questionnaire's items related to ADMIRE Mid Term Conference specific point on recruitment – education

2.4 Results of the Evaluation questionnaire

From the 44 participants of the conference, only 5 answers to the evaluation questionnaire were collected. Nevertheless, they pointed out a total overall satisfaction towards the session and its organisation. Regarding the content, only one participant wished had learnt more. The presentations were of very high level and everybody noticed it. Nevertheless, attendees are willing to learn more. Half of the answers collected pointed that features such as Metallurgy, DED and WAAM and simulation in inert atmosphere and under vacuum should have been considered during the two days conference.

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3 ADMIRE Mid Term Conference – ISEMP, Bremen University (19th & 20th September 2018)

3.1 Invitation for the Event and Agenda

ADMIRE Mid Term Conference in Bremen University was held in the scope of “Additive Manufacturing in Aerospace 2018” conference (AMA-2018).

The formal invitation and call for abstract for this event was sent to internal as well as external network for the outreach of the event. The targeted audience was comprised of Education, Research institutes, R&D centres and Industries in the aerospace sector. The invitation included topics, venue, deadline for abstract submission and website for more information.

The Agenda was also sent with the invitation email so that guests could see the event's schedule and have a clear idea of how its activities were organized. The conference programme was organised into five sessions addressing the process chain for AM serial production, AM-related lightweight design, part testing and quality assurance, high-production rate AM technologies, and data handling and simulation-driven solutions.

The objective of the conference was set as cutting-edge forum representing the newest developments in the field of Additive Manufacturing (AM). Focusing on the aircraft industry the symposium also intended to promote the exchange of experience between different industries (automotive, power, etc.) and practically oriented research institutes.

Special focus of AMA-2018 was on challenges in serial production of metallic AM parts. The presentations were organised to address the well-established manufacturing methods like powder-bed ones and emerging methods like direct metal deposition.



Fig. 7 – Information about the “Additive Manufacturing in Aerospace (AMA)-2018” Conference

The AMA-2018 conference had a total of 122 participants who also attended ADMIRE Mid Term Conference.

3.2 ADMIRE project’s presentation

ADMIRE Mid Term Conference consisted of a poster presentation by Dr. Olga Zinovieva, ISEMP, University of Bremen (see Fig. 8, below). Dr. Zinovieva explained the scope of the project, its objectives and the results to be achieved by the end of its lifecycle. How ADMIRE MSc’s Modules were being piloted by the consortium to help participants understand how ADMIRE European Metal AM Engineer MSc’s modules can be applied and what its benefits are both for Industry and Education was also explained by Dr. Zinovieva to the conference attendees.

Along with the poster presentation, the handy ADMIRE leaflets were exhibited and distributed among the audience (see Fig. 9, below).

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Fig. 8 – AMA-2018 Conference | ADMIRE project's presentation



Fig. 9 – AMA-2018 Conference | ADMIRE project's pamphlets

After ADMIRE project's presentation, the conference participants were invited to ask questions about the work that has been carried out by ADMIRE consortium towards the development and implementation of the European Metal AM Engineer MSc's.

Attendees were very interested in the project's results and were impressed with the achievements reached so far by ADMIRE, commenting on the project's impact on Industry and its need for qualified personnel.

3.3 Mid Term Conference Evaluation

The AMA-2018 had a conclusion with an assessment of the conference. Participants were told to thumbs-up as a gesture of positive feedback, a non-traditional way to assess the event, to match the innovativeness of Additive Manufacturing.

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3.4 Results of the Evaluation questionnaire

Fig. 10 shows the pictorial form of feedback. It can be seen that most of the participants were satisfied with the event.



Fig. 10 – AMA-2018 Conference | Feedback

The takeaway from the conference was that we have barely scratched the surface in terms of our understanding of the full potential for AM in aerospace and space. Beyond the technology's major advantages such as light-weighting, the integration of functionality into a single part - significantly reducing manufacturing steps is proving to be one of the great advantages of AM. This alone has the potential to drive innovation across the aerospace industry.

The fact that this event took place in the scope of a broader Conference organized by ISEMP, University of Bremen was an advantage for the promotion of ADMIRE project at national, European and International levels and for the participants' engagement with the project's outcomes.

The probability that ADMIRE's results will be disseminated outside the countries to which the project's consortium belongs increased due to the multi-national participants.

In conclusion, the Mid Term Conference carried out by ISEMP, University of Bremen in Germany was very fruitful for Additive Manufacturing in aerospace industry as well as ADMIRE project's promotion.

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4 ADMIRE Mid Term Conference – Cranfield University (7th March 2019)

This conference was organised by Cranfield University on the 7th of March, 2019. Because the event was scheduled towards the beginning of the project, it was more focused towards the planning of the new European Metal AM MSc course. Additionally, to increase the event's exposure and impact, the conference event was also extended to participants from another AM programme/project that had an event as well.

Initially, a presentation was made to share the results of the work carried out by the ADMIRE consortium. There was also a tour to the Welding Engineering and Laser Processing Centre facilities to show the practical equipment available to the prospective students in the course. Finally, an evaluation questionnaire was circulated amongst the participants with the data collected being used to gain valuable insights about the conference in specific and the project in general.

4.1 Invitation for the Event and Agenda

The prospective participants for the event were initially contacted by email. The message contained the time and place of the presentation and the recipients were asked to confirm their attendance with any specific requirements they may have had on that day.

On the day of the event, Dr Filomeno Martina initially presented a brief overview of ADMIRE, followed by a lab tour for all the participants. Details of the presentation are given in the following section. The lab tour that followed aimed to show the facilities that would be available to the students in the European Metal AM MSc course.

4.2 ADMIRE project's presentation

A presentation detailing ADMIRE's work was made by Dr Filomeno Martina (who was a senior lecturer and course director of the new course) to the participants of the event (a total of 38 participants from Education and Industry sectors). As mentioned previously, this was primarily focused on the design and preparation for the new European Metal AM MSc course which was developed as part of ADMIRE (Fig. 11).



New Metal AM MSc

Filomeno Martina

7th March 2019

www.cranfield.ac.uk

1

Fig. 11 - ADMIRE Presentation

The presentation was approximately 30mins long and started with an introduction to the project and its partners. This was followed by a description of ADMIRE objectives. One of these objectives (the reduction of the skills gap between industry and academia) was further elaborated and the new European Metal AM MSc course was presented as a possible solution to the problem. The course, containing 8 modules along with two types of projects, would be delivered in Cranfield University as shown in Fig. 12.



New Metal AM course



Course structure

- Entirely delivered on Cranfield University's campus
- **8 modules**
 - Metal AM processes
 - AM metallurgy
 - Finite element analysis
 - Management of manufacturing quality
 - General management
 - Net-shape manufacturing (supported by Uni of Birmingham)
 - Post-processing for AM (supported by Uni of Birmingham)
 - AM system/line design
- **Group project** – on site or at industry
- **Individual thesis project** – on site or at industry

5

Fig. 12 - Course structure slide

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The presentation then moved onto the different course options i.e., MSc, PgDip or PgCert that would be available and how each of these were structured. The idea of “piloting” each module as a short course was also covered and other aspects of the project such as the Problem Based Learning (PBL) database, AM resources database and the AM council were also presented. The presentation was then concluded by stating how this course has been started to shape the future workforce and how everyone could get involved in making this endeavour constantly better.

After the presentation of the project, the participants were shown around the facilities of the Welding Engineering and Laser Processing Centre (Fig. 13). This tour, as stated previously, showed the facilities available to the students during their studies. It included explanations of how different hardware were used during the AM process and their relative advantages and limitations.



Fig. 13 - Lab tour

4.3 Mid Term Conference Evaluation

Once the conference was concluded, participants were invited to fill in a satisfaction questionnaire that was sent to them over email. The questionnaire primarily focused on the quality of the conference and the presentation. Initially, there was a thematic question that asked the participants if they were satisfied with the conference in general.

Then, participants were asked about the quality of the facilities and breaks provided to them. This was followed by questions on the presentation and if they were satisfied with the speaker(s) and the topics presented. After this, the questionnaire moved onto the duration of the conference and if the participants were happy with the length of the event. Finally,

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participants were able to provide any additional information about the topics they would have liked to be covered and optional information i.e., name, organisation and their reason for attending the event. The thematic representation of the questionnaire is shown below:

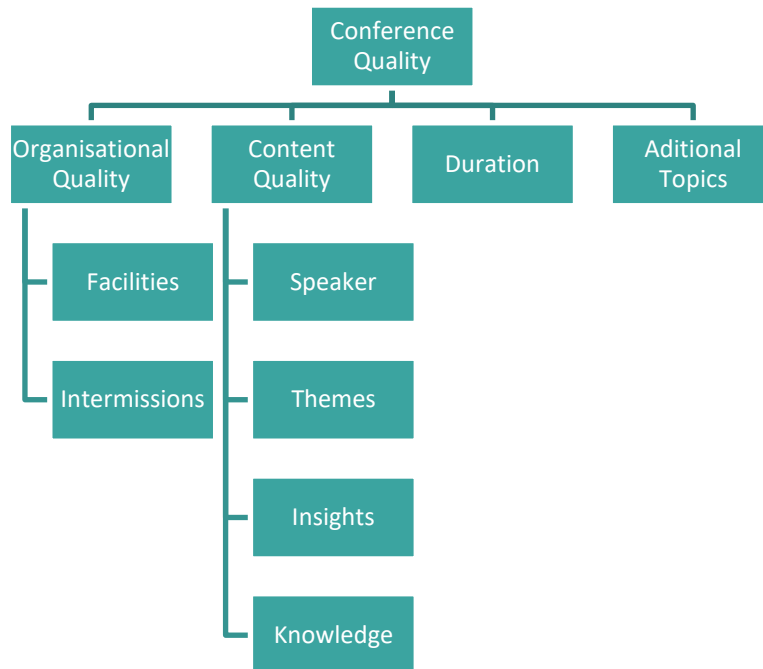


Fig. 14 - Questionnaire Themes

It was also believed that the split into its thematic components would further help with the analysis of the results (discussed in the subsequent section).

4.4 Results of the Evaluation questionnaire

Because the number of responses was quite low (i.e., 7), quantitative methods were not preferred. In fact, as shown in Table 1, the Pearson's product moment correlation values (using IBM SPSS Statistics 26) between the subthemes shown in Fig. 14 and the overall conference quality did not show any statistically significant results. Therefore, the responses to each question were analysed individually and qualitatively.

| | | Facilities | Intermissions | Speaker | Themes | Insights | Knowledge | Duration | Overall |
|---------|---------------------|------------|---------------|---------|--------|----------|-----------|----------|---------|
| Overall | Pearson Correlation | -.167 | .750 | -.548 | -.167 | -.167 | .548 | .548 | 1 |
| | Sig. (2-tailed) | .721 | .052 | .203 | .721 | .721 | .203 | .203 | |
| | N | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |

** . Correlation is significant at the 0.01 level (2-tailed).

Table 1 - Pearson's product moment correlation

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Before proceeding, it must be noted that although the pie charts were directly imported from Google Docs (platform used to implement the satisfaction questionnaire), the mean and standard deviation (σ) scores were calculated using the IBM SPSS Statistics 26 software. To input the data into the software and subsequently run tests on them, the answers were converted to their numerically equivalent values shown in Table 2.

| Answers | Values |
|-------------------|--------|
| Very satisfied | 4 |
| Satisfied | 3 |
| Dissatisfied | 2 |
| Very Dissatisfied | 1 |

Table 2 - Answers to Numerical Value

Once this was done, the mean and σ values for all the subthemes were determined and shown in Table 3:

| | Mean | Std. Deviation | N |
|---------------|--------|----------------|---|
| Facilities | 3.5714 | .53452 | 7 |
| Intermissions | 3.4286 | .53452 | 7 |
| Speaker | 3.7143 | .48795 | 7 |
| Themes | 3.5714 | .53452 | 7 |
| Insights | 3.5714 | .53452 | 7 |
| Knowledge | 3.2857 | .48795 | 7 |
| Duration | 3.2857 | .48795 | 7 |
| Overall | 3.5714 | .53452 | 7 |

Table 3 - Mean and σ values for the subthemes

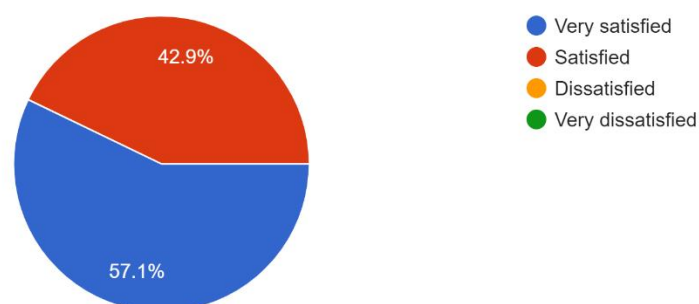
4.4.1 Overall Conference Quality

The responses for the overall quality are shown in graphic 8 below and it is seen that all the respondents were either “Satisfied” or “Very satisfied” with the conference with 57.1% being “Very satisfied” and 42.9% being “Satisfied”. This is further supported by the mean and σ values in Table 3 that have the values of 3.57 and 0.53 respectively. This shows that the conference was pretty well received with the audience and that there were no major concerns associated with it.

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Overall, are you satisfied with the Conference?

7 responses

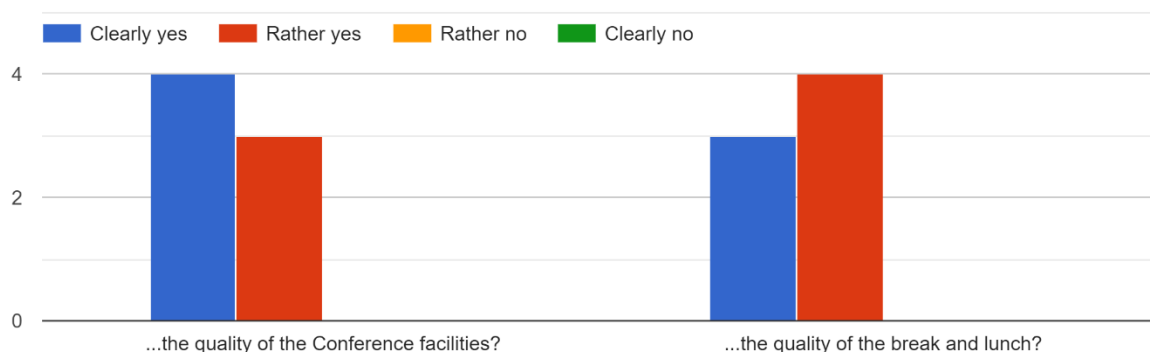


Graph. 8 - Overall conference quality responses

4.4.2 Organisational Quality

This theme was divided into two subthemes (i.e., Facilities and Intermissions). The results for both questions concerning these subthemes are shown in graphic 9:

How are you satisfied with...



Graph. 9 - Organisational quality results

When considering the facilities first, 4 respondents were clearly satisfied with quality of the facilities and the remaining 3 were satisfied. Once again (from Table 3), a mean of 3.57 ($\sigma = 0.53$) suggested that it was in between the two answers thereby proving that the respondents were satisfied with the facilities provided during the proceedings.

The quality of the breaks (including lunch) during the conference was determined next. Here, it was seen that 3 participants were clearly satisfied, and 4 participants were satisfied with the

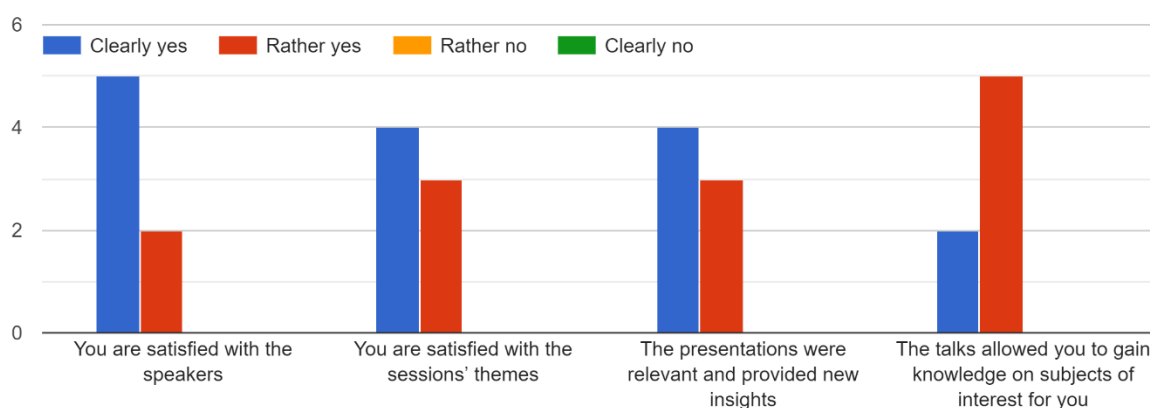
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quality of intermissions during the sessions. The mean from Table 3, 3.43 (σ value of 0.53) is slightly lower than that of the quality of the facilities due to more respondents being “satisfied” rather than “clearly satisfied” with the intermissions. However, it is still seen that the respondents, in general, were still happy with this aspect of the session.

4.4.3 Content Quality

The quality of content during the event was further split into four subcategories as shown in Fig. 14: speaker, themes, insights and knowledge. The results from the survey for each of these subthemes are shown in the graphic below:

Do you agree with the following statements?



Graph. 10 - Content quality results

For the first subtheme (the speaker quality), the respondents agreed that the speaker was good with 5 answers stating that they were clearly satisfied and 2 stating that they were satisfied. This was further evidenced by the mean (Table 3) that had a score of 3.71 (σ value of 0.49) which, was the highest amongst all the subthemes investigated.

The answers for the session's themes were also fairly positive with 4 respondents being clearly satisfied and 3 being satisfied with this feature of the event. Once again, the mean of 3.57 (σ value of 0.53) score from Table 3 reflected this trend that suggested the quality of themes within the session was satisfactory to the respondents.

The quality of insights provided were rated similarly to the quality of themes within the session with 4 participants being clearly satisfied and 3 being satisfied with the quality. The mean and σ values from Table 3 were also similar to that of theme quality.

The final subtheme (i.e., knowledge) showed more respondents (5) being satisfied and the remaining (2) being clearly satisfied. Because more participants were only satisfied and not clearly satisfied, the mean (Table 3) was lower than the other subthemes having a value of 3.29 (σ value of 0.49); in fact this was the lowest mean score of all the areas explored with the survey. However, although this subtheme had the joint lowest mean score, the results still

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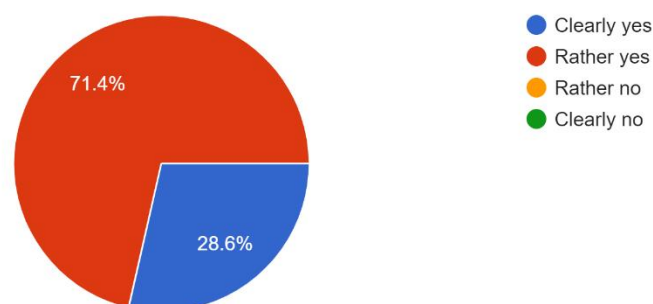
showed that no respondent had a negative experience since they were all either clearly satisfied or satisfied with the knowledge gained.

4.4.4 Duration

When participants were asked if they were satisfied with the duration of the event, the answers were, once again, between clearly yes or rather yes. No response was recorded for rather no or clearly no. However, when looking at the results in the graphic below, it is seen that 71.4% of the responses were rather yes and 28.6% were clearly yes. The mean score (3.29; σ value of 0.49), which was the joint lowest, also corroborated the fact that its satisfaction was lower than the other explored topics. It is believed that this could be because certain participants thought the event was a bit short as seen in Graphic 12, which was a follow up question to why they weren't satisfied with the duration of the event.

Are you satisfied with the Conference duration?

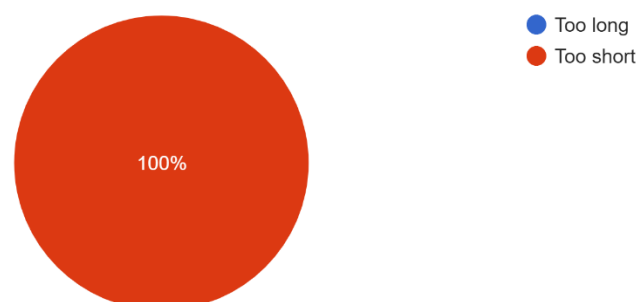
7 responses



Graph. 11 - *Duration results- I*

If no, was it:

3 responses



Graph. 12 - *Duration results- II*

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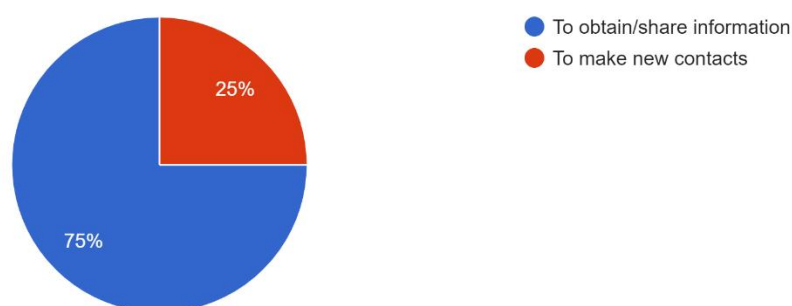
4.4.5 Additional Topics

When asked if they would have liked any other topics to be covered during the event, 71.4% of the respondents replied negatively. Of the 28.6% (2 respondents) that said they would have liked to see additional topics, one of them, when asked which ones, replied that they would have liked to see examples of exams sheet.

For the other auxiliary questions, 4 participants responded to the optional question of why they attended the event; as seen Graphic 13, 75% (3 respondents) stated that they wanted to obtain/share information and 1 respondent (25%) was there to make new contacts. Two participants also stated that they first heard about this particular event through an invitation.

Main reason for attending the event?

4 responses



Graph. 13 - *Reasons for event attendance*

Therefore, from the all survey results collected, it is seen that they were no negative responses from any of the survey respondents for any of the subthemes explored i.e., all the answers were either clearly satisfactory or satisfactory. This suggest that the event was in general pretty well received with no major drawback, although it must be noted that the length of the event could have been slightly longer to perhaps capture more themes which could have also assisted with imparting further knowledge on different themes of the project. However, these responses were still generally satisfactory and only minor revisions are required to make the overall experience even better.

Finally, it is believed that for more conclusive insights from the survey, quantitative methods must be applied which requires a higher number of responses for statistically significant results.

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5 Main conclusions

In face of all the results obtained from the satisfaction questionnaires filled in by the total 226 participants (from Education, Research and Industry) of the four ADMIRE Mid Term Conferences, it is safe to conclude all events were successful not only in terms of contents but also in terms of engaging participants with ADMIRE results.

In the case of EWF's International Conference in which ADMIRE Mid Term Conference took place, it was an advantage for the promotion of ADMIRE project at national, European and International levels and for the participants' engagement with the project's outcomes. The probability that ADMIRE's results will be disseminated outside the countries to which the project's consortium belongs increased due to the event participants' nationalities, which included Turkey and United States, for example. Also, the results obtained from the evaluation questionnaire applied to this event's participants indicate that the probability that ADMIRE project's outcomes will be implemented within their professional activities and organizations is very high due to the replies provided to the items related to the implementation of cooperation strategies with HE institutions and companies and to the implementation of AM Qualification Guidelines in the future, both rated by the majority of participants as "Certain", the highest score. In conclusion, the Mid Term Conference carried out by EWF in Portugal was very fruitful for ADMIRE project's dissemination and potential implementation and success among the event's participants and their organizations.

As for the participants of the Mid Term Conference held by IREPA, they showed interest on economical approaches and on AM processes' quality once, in France, AM is still a very technical process that requires high level technicians. According to the results, the presentations made during the Mid Term Conference were considered as high level presentations, even though participants would like to know more about the processed in place on AM. Another information to take in consideration is that most participants would like French Universities to be part of the partnership or being able to pilot the European Metal AM MSc, which is prove of its pertinence to Education and to Industry.

In Bremen University, participants considered the Mid Term Conference a success. They were very impressed by ADMIRE and its potential impact both in Education and in Industry in terms of qualifying personnel in AM. Due to participants' multinational backgrounds, there is a good possibility that ADMIRE outcomes can be disseminated outside the countries of the partnership, which could ultimately have a big impact on their exploitation and sustainability.

Finally, the description made by Cranfield University regarding the results from the satisfaction questionnaire applied to their Mid Term Conference participants is self-explanatory: participants were very satisfied with the event and only wished it was longer. They were pleased with the quality of the speaker, the themes addressed during the event and they found the presentations and insights provided of relevance.

Overall, the total number of participants on Mid Term Conferences was achieved (226) and the Evaluation results allows ADMIRE consortium to conclude these events were very successful not only in terms of contents but also in terms of the possibility to see ADMIRE results implemented by some of those participants in their own field of activities.

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ANNEX 1 | EWF Mid Term Conference Evaluation Questionnaire



International Conference | Porto Salvo (Portugal) - 30 October 2019

SATISFACTION QUESTIONNAIRE

This questionnaire aims at gathering participants feedback about the activities carried out.
Please collaborate with us by filling in the form and return it before leaving. Thank you!

I - General aspects of the International Conference organisation

Select with a cross (x) the option(s) that apply to you best:

| | x | Participants' background |
|--|--------------------------|---|
| Industrial field of Activity | <input type="checkbox"/> | Additive Manufacturing |
| | <input type="checkbox"/> | Welding |
| | <input type="checkbox"/> | Other _____ |
| You are / belong to a: | <input type="checkbox"/> | Vocational Education and Training organization |
| | <input type="checkbox"/> | Higher Education organization |
| | <input type="checkbox"/> | Welding Institute or Association |
| | <input type="checkbox"/> | Industry (large company / SME) |
| | <input type="checkbox"/> | Other _____ |
| What are the reasons for you to attend this event? | <input type="checkbox"/> | Share ideas/team about tools and strategies for delivering EWF Training Courses |
| | <input type="checkbox"/> | Share ideas/team how to foster WBL in the welding sector |
| | <input type="checkbox"/> | Share ideas/team about how to implement European Training within FSM Technology |
| | <input type="checkbox"/> | Share ideas/team about EWF's AM Qualification System and new Professional Profiles/Qualifications |
| | <input type="checkbox"/> | Make new contacts (networking purpose) |
| | <input type="checkbox"/> | Other _____ |
| How did you first hear about the Conference? | <input type="checkbox"/> | Invitation |
| | <input type="checkbox"/> | Projects' website |
| | <input type="checkbox"/> | Social media (Facebook, Yammer, Twitter, LinkedIn, Eventbrite) |
| | <input type="checkbox"/> | Other _____ |

Please, rate the given items in relation to your level of satisfaction from 1 to 4, where: 1 = Highly dissatisfied, 2 = Dissatisfied, 3 = Satisfied and 4 = Highly satisfied:

| General organisation of the Conference | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Practical arrangements (e.g. venue, facilities and logistics) | | | | |
| Amount of relevant information about the Event received in advance | | | | |
| Agenda and duration | | | | |
| Support provided by EWF (e.g. speakers and facilitators, supporting documents provided) | | | | |
| Clarity of Conference's overall objectives | | | | |
| Relevancy of presentations (e.g. new insights) | | | | |
| Time provided for questions and discussion | | | | |
| Overall Event organisation | | | | |



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International Conference | Porto Salvo (Portugal) - 30 October 2019

Select with a cross (x) the option(s) that best apply to your experience in this Conference

| Your experience in the Conference ? | Yes | No |
|--|-----|----|
| Did this event meet your expectations? | | |
| Do you consider this event had a positive impact on your organization's vision/strategy? | | |
| Did you <u>use</u> this opportunity for networking? | | |
| Will we see you next year? | | |

| What have you learned today? |
|------------------------------|
| |

| Is there anything else we could have done to improve your experience in this Conference? |
|--|
| |

II - Detailed features of the International Conference

Please rate the given items in relation to the probability of implementing Projects' outcomes within your professional activity and/or organization from 1 to 4, where 1= Impossible, 2= Unlikely, 3= Likely to 4= Certain.

| Projects | Outcomes | 1 | 2 | 3 | 4 |
|----------|---|---|---|---|---|
| WDAW | Implement WDAW (Project's WBL Model) in the future | | | | |
| | Cooperate in WBL Apprenticeships experiences | | | | |
| | Share/use the provided information in your professional context | | | | |
| FSW Tech | Implement FSW Tech Training Courses in the future | | | | |
| | Use FSW Tech Training and Assessment materials in the future | | | | |
| | Share/use the provided information in your professional context | | | | |
| CLLAIM | Implement AM Qualification Guidelines in the future | | | | |
| | Share/use the provided information in your professional context | | | | |
| ADMIRE | Use cooperation strategies with HE institutions and Companies | | | | |
| | Implement AM Qualification Guidelines in the future | | | | |
| | Share/use the provided information in a professional context | | | | |

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International Conference | Porto Salvo (Portugal) - 30 October 2019

II. EWF Qualification System - Welding

In the scope of the Conference sessions dedicated to **Apprenticeship** and **PSW European Qualifications**, please rate the given items in relation to your level of agreement from 1 to 4, where: 1 = Strongly disagree, 2= Mostly disagree, 3= Mostly agree and 4= Strongly agree

| About the pertinence of the contents | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| WQW I Project's Methodology and Results are adequate for the implementation of WBL in EWF Training and Qualification System (i.e. other Qualifications, other countries) | | | | |
| WQW I Project's Methodology and Results are developed to ensure cooperation between Industry and Education | | | | |
| WQW I Project's Methodology and Results are suitable to be benchmarked to other sectors | | | | |
| PSW Tech Project's Methodology and Results are innovative and useful for training | | | | |
| PSW Tech Project's results are adequate for the implementation of an PSW harmonized Qualification System in Europe | | | | |
| PSW Tech Guidelines will allow to foster and increase the number of qualified personnel in the PSW field | | | | |

II. II EWF Qualification System - Additive Manufacturing (AM)

In the scope of the Conference sessions dedicated to the AM Qualification System presented in the framework **CLAIM** and **ADMIRE** projects, please rate the given items in relation to your level of agreement from 1 to 4, where: 1 = Strongly disagree, 2= Mostly disagree, 3= Mostly agree and 4= Strongly agree

| About the pertinence of the contents | 1 | 2 | 3 | 4 |
|--|---|---|---|---|
| The development of a European Qualification Standard in the scope of AM is very important | | | | |
| CLAIM Project's Methodology and Results are adequate for the implementation the AM harmonised Qualification System in Europe | | | | |
| CLAIM Project's Qualification Guidelines will allow to promote the number of qualified personnel in AM | | | | |
| ADMIRE Project's Methodology and Results are adequate for the implementation the AM harmonised Qualification System in Europe | | | | |
| ADMIRE Project's Methodology and Results are developed to ensure cooperation between Industry and Education | | | | |



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ANNEX 2 | IREPA Laser Mid Term Conference Evaluation Questionnaire

MadAM Days Satisfaction Questionnaire

10th-11th April 2019
IGBMC, Illkirch, France

Overall, are you satisfied with the Conference? *

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

Any comment?

Réponse longue

Conference organisation

Description (facultative)

How are you satisfied with... *

| | Clearly yes | Rather yes | Rather no | Clearly no |
|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| ...the quality of the ... | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ...the quality of the ... | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

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| | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| Any comments? | | | | |
| Réponse longue | | | | |
| Conference content | | | | |
| Description (facultative) | | | | |
| Do you agree with the following statements? * | | | | |
| | Clearly yes | Rather yes | Rather no | Clearly no |
| You are satisfied wi... | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| You are satisfied wi... | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The presentations ... | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The talks allowed y... | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Any comments? | | | | |
| Réponse longue | | | | |

Optional information

Description (facultative)

Name

Réponse courte

Organisation and position

Réponse longue

Main reason for attending the event?

- ☐ To obtain/share information
- ☐ To make new contacts
- ☐ Autre...

How did you first hear about the event?

Réponse longue

ANNEX 3 | Cranfield University Mid Term Conference Evaluation Questionnaire

ADMIRE Conference Satisfaction Questionnaire

7th March 2019
Cranfield University

* Required

Overall, are you satisfied with the Conference? *

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

Any comment?

Your answer

Conference organisation

How are you satisfied with... *

Clearly yes

Rather yes

Rather no

Clearly no

...the quality of
the Conference
facilities?

☐☐☐☐

...the quality of
the break and
lunch?

☐☐☐☐

Any comments?

Your answer

Conference content

Do you agree with the following statements? *

| | Clearly yes | Rather yes | Rather no | Clearly no |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| You are satisfied with the speakers | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| You are satisfied with the sessions' themes | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The presentations were relevant and provided new insights | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The talks allowed you to gain knowledge on subjects of interest for you | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Any comments?

Your answer

Are you satisfied with the Conference duration? *

- ☐ Clearly yes
- ☐ Rather yes
- ☐ Rather no
- ☐ Clearly no

If no, was it:

- ☐ Too long
- ☐ Too short

Any comment?

Your answer

Are there any other topics that you would have liked to be covered? *

- ☐ Yes
- ☐ No

If yes, which ones:

Your answer

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Optional information

Name

Your answer

Organisation and position

Your answer

Main reason for attending the event?

☐ To obtain/share information

☐ To make new contacts

☐ Other: _____

How did you first hear about the event?

Your answer

Submit