

## TRINITY DIH: Connecting, Educating, and Facilitating European SMEs for Agile Production

### Summary of TRINITY Co-Creation Workshop at the European Robotics Forum ERF2020 Malaga, Spain.

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The first TRINITY workshops interested a large crowd at ERF2019, where project partners collected positive feedback and ideas to further develop the project. Gathering the vision of the European robotics community has been key to target the most critical agile manufacturing technical challenge that we need to start solving first. With this information, we can build the TRINITY network of DIHs, which are meant to be the most comprehensive source for all *Robotics*, *Industrial IoT* and *Cyber Security* solutions that the European manufacturing industry might have. Everything was also shared in our public workshop report to benefit the community.

In this year's ERF2020 TRINITY workshops, we therefore focused particularly on the *Agile Production* through the setting up of one workshop, and on the heavily cross-cutting *Cyber Security* through the organization of two workshops. All these activities are presented in the following sections.



TRINITY is tackling the agile manufacturing challenges of European companies with its main target on SMEs. This workshop was a continuum to the successful first TRINITY workshop arranged at ERF2019. At first, the organizers presented the output of that workshop and the conclusions. In this 2020 workshop, an update was given on how TRINITY has progressed. The organizers presented the findings from the European wide TRINITY survey to learn what the companies are looking for in terms of robotics, IoT and cyber security - the three main thematic areas of TRINITY. Afterwards, TRINITY stakeholders presented some latest technological solutions that can help SMEs in transitioning towards agile production. For SMEs to reap the benefit from these technological solutions, TRINITY provides a pan-European portal. In the interactive part of this Workshop, deeper insights have been gathered on how this portal can assist the SMEs and how it can benefit them. The main focus was on *training*, *education* and *connecting* to the right partner. The workshop concluded with company's inputs and discussion of how to cooperate with TRINITY.

### TRINITY's first year and sneak peaks

The workshop started with a reflection on TRINITY's first year of action. Prof. Minna Lanz, project coordinator from the Tampere University, presented the general approach of the project and gave insights into the first-year activities. The Agile Production workshop at the ERF 2019 in Bucharest, the official opening and, the first TRINITY conference at the EMO Fair 2019 have been highlighted. Those events brought together people from research and industry and opened valuable discussions regarding current and actual limitations of SMEs to apply and introduce



solutions to make their production more agile. The three main thematic areas *Robotics*, *Cyber Security* and *Industrial IoT* were the main context of discussions, since TRINITY's motivation is to strengthen manufacturing SMEs in those areas. Two technology sneak peaks gave impressions about hot solutions from industry.

### Main findings from the survey

A survey has been conducted to better quantify the specific needs of European SMEs for agile production. The intention was to find out what is the status quo in Europe when it comes to end users, technology providers and integrators of different technologies. We also asked for SMEs' requirements to implement their own Advanced Robotics, Cyber Security and IoT solutions. The survey is available in the following European languages: German, English, Finnish, French, Latvia, Lithuanian, Norwegian (Bokmal), Polish, Swedish, Slovenian, Spanish. English version is accessible online via this [link](#).

The survey covered different aspects, starting from requesting general information of the respondent before conducting a self-assessment. After that, the subjective perception of required qualification for employees is requested, as well as the motivation and foreseen obstacles for applying solutions within the TRINITY's three thematic areas (Robotics, Cyber Security and IoT) to make production more agile. Deeper insights are then generated in the domains of Robotics and Cyber Security.

Unfortunately, the response rate from the survey was quite poor: only 41 participants out of more than 1800 completed the survey. The countries of origin can be seen in figure 2. Therefore, the following results must be considered as trends upon which first conclusions should be drawn. This fact also initiated a process of reflection inside TRINITY in order to improve the outreach and how to contact potential participants. Nevertheless, it has to be considered that the results presented and discussed in this workshop are a snapshot from month 12 of the first year of TRINITY.

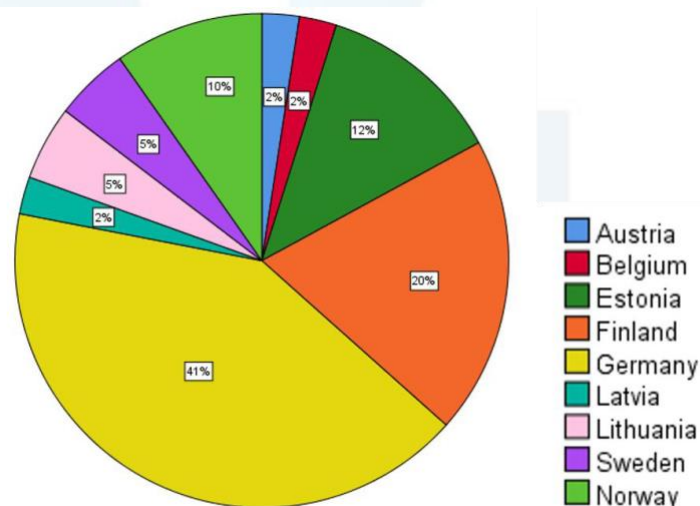


Figure 2: Survey's countries of origin

One of the main findings was that 44% are in a state of observing and analyzing, as it can be seen in Figure 3 below. This is the main reason for the low maturity levels of agility in manufacturing SMEs. It also shows that projects as TRINITY are essential in order to foster the improvement of agility.



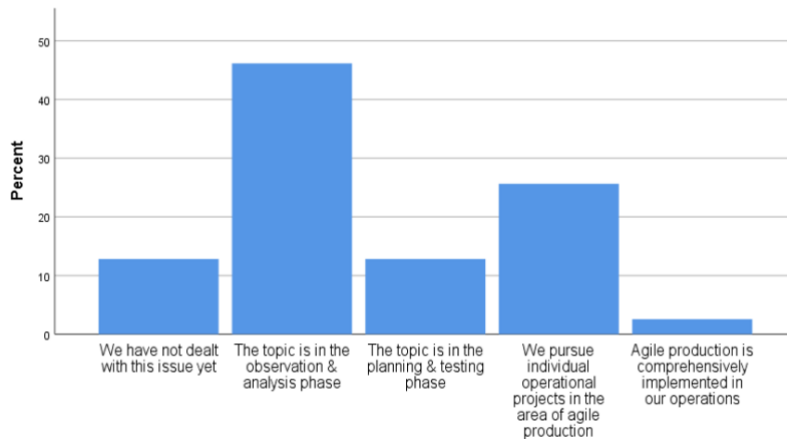


Figure 3: "How far has agile production developed in your company?"

We also tried to reveal particular correlations between the answers of different categories. The matrix shown below in Table 1 emphasizes the correlations which can be found in the gathered data. The light-grey numbers denote either a correlation between a property and itself or a relation between properties having low significance, which means they are not correlated. The emphasized correlations have been analysed further.

		Phase	Robotics	IoT	Cyber security	Overall agility
<b>Phase</b>	Correlation coefficient	1.000				
	significance	.				
<b>Robotics</b>	Correlation coefficient	.074	1.000			
	significance	.602	.			
<b>IoT</b>	Correlation coefficient	.192	<b>.467</b>	1.000		
	significance	.183	<b>.001</b>			
<b>Cyber Security</b>	Correlation coefficient	.099	-.039	.042	1.000	
	significance	.493	.791	.770		
<b>Overall agility</b>	Correlation coefficient	<b>.304</b>	<b>.401</b>	<b>.411</b>	.244	1.000
	significance	<b>.033</b>	<b>.006</b>	<b>.005</b>	.093	

Table 1: Correlation matrix

The previous table shows, for instance, that there is a correlation between the perceived overall agility of the companies and robotics. Contrary to this finding, the first chart below (Figure 4) shows that the perceived overall agility assessed is rather high ( $\geq 3$  on the x-axis), although robotics is not at all or hardly developed in companies (the red and blue bars on values  $\geq 3$  on the x-axis). This fact can be interpreted in the sense that the survey's participants do not associate a mature level of robotics inside their companies with a high level of agility in general. This can be considered one of the main tasks of TRINITY addressed to the public, as demonstrating that robotics can increase agility is actually one of the objectives of the TRINITY use case demonstrators described here: <https://trinityrobotics.eu/demonstrators/>.

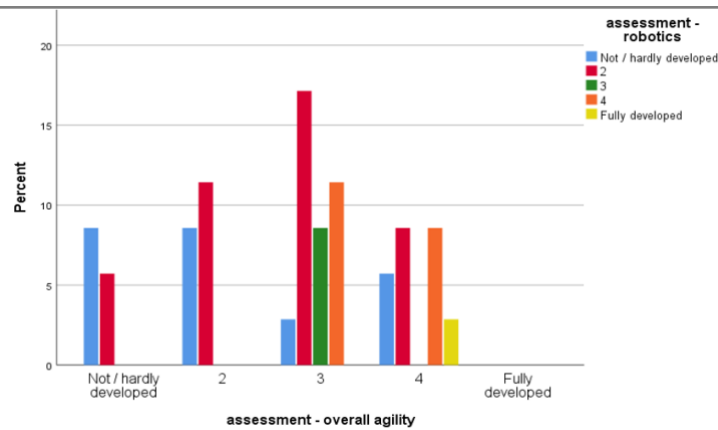


Figure 4: Assessment on overall agility

The second chart below (Figure 5) does both, answering the question “What are the biggest obstacles perceived regarding employee empowerment in the course of agile production?”, and explaining some of the reasons why most of the participating companies are still in an observing and analyzing phase. The highlighted responses show

specifically that there is a huge lack of education in that domain. Complementing this observation, the third chart (Figure 6) demonstrates what kind of support the participants request. These findings justify explicitly and legitimize two of the main TRINITY's building blocks: establish and foster networking activities of existing stakeholders and delivering means for educating and training them in terms of a *Training Cockpit*. As a first conclusion we can draw that participants have a strong motivation to become more agile in their production. They see the increase of internal efficiency, the reduction of costs and an advantage in the international competition. Current obstacles which are perceived are the high investment costs, e.g. for introducing robots or implementing cyber security solutions across the whole architecture, lack of competences amongst the employees, and a lack of existing technical solutions. Consequently, participating companies strive for exchange of experience, common development projects, and exchanging use cases & sharing best practices.

All of the afore-mentioned requests will be satisfied by TRINITY. Our building blocks of *Networking, Training & Education* and *Demonstrators* are targeting at the exchange and transfer of knowledge and experience, the education of stakeholders by the means of an education portal, and also the communication of use case demonstrators and their application in funded projects through the open calls.

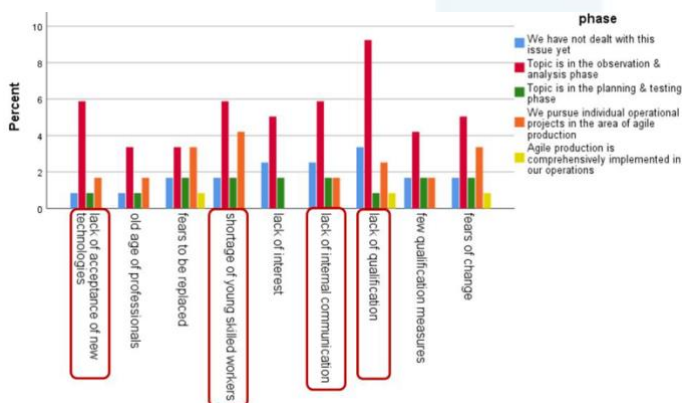


Figure 5: “What are the biggest obstacles perceived regarding employee empowerment in the course of agile production?”

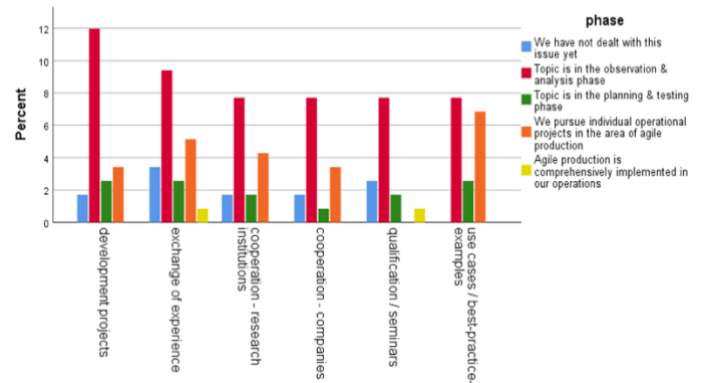


Figure 6: Type of support requested



## Interactive Session

The interactive session engaged the audience in feedback and suggestions for the TRINITY's Digital Access Point (DAP) and Education & Training cockpit. DAP is the key instrument to ensure the sustainability of the DIHs network in the field of agile robotics. The website will develop a two-way channel for both the network to inform the prospective partners about the opportunities and services within the top European experts, and for the prospective partners to establish connections with the network and to address their needs in robotics and business enhancement. From the interested stakeholders, TRINITY has identified several training needs, which will be used together with the competences provided by each partner to implement an innovative education and training methodology as a so-called *Training Cockpit*. It is important that the expectations of the users that will potentially benefit from the TRINITY's DAP & Training Cockpit are taken into account for a targeted approach. Hence, the interactive session objectified an opportunity for feedback, suggestions, and remarks from the audience for the different aspects of TRINITY's features above mentioned.

The interactive session was conducted using *Mentimeter* software, which allowed showing interactive presentation with real-time voting and feedback methods. Separate sessions for DAP & Training Cockpit were conducted, whereas questions were posed to the audience and the real-time voting was done engaging audience for their feedback. Multiple-Choice Questions mainly focused on the expectations of the audience about the DAP & Training Cockpit and, once the voting was completed, discussion over the results were made to get deeper insights on such expectations. The questions posed and the data collected from the answers are shown in Figures from 7 to 14 after this report conclusions.

## Results and Conclusion

The workshop has contributed in providing inputs for the prioritization of the further development of functions of TRINITY's DAP. The audience was mostly represented by academia and research (68% of the total, 17 people out of 25). Two main avenues of immediate development have been identified:

- presentation and structuring of listed robotics modules and industrial use cases;
- finding funding opportunities both within and outside the project.

The rest of the expected functions focus on the project's sustainability development: provision of contacts, learning materials, service catalog and dissemination of relevant events. Regarding sustainability of TRINITY network, the audience expressed demand for direct and technical-need-based-submission reaching out to DIHs options. Last but not least, the audience suggested the dissemination of TRINITY success stories through the DAP in the coming period.

The feedback also suggested that the preference for the Training Cockpit is through interactive learning - training by demonstration - methods with quick FAQs available. Education services through workshops, webinars, and video tutorials are mostly expected from TRINITY with preference towards knowledge of Robot Programming including AGVs/AMRs, Robot Safety and HRC Technology. Ease of access and topics of education were voted to be the motivating factors for using the TRINITY education services. More than 50% of the audience voted for 'Maybe' option when asked if they would pay for fees. This indicates that the audience is more interested on the content and services available on the TRINITY's education platform and most likely willing to pay if the services are relevant. TRINITY project will continue its workshop series at ERF2021 in Rotterdam.





Questions posed for the DAP (Figure 7-8-9):

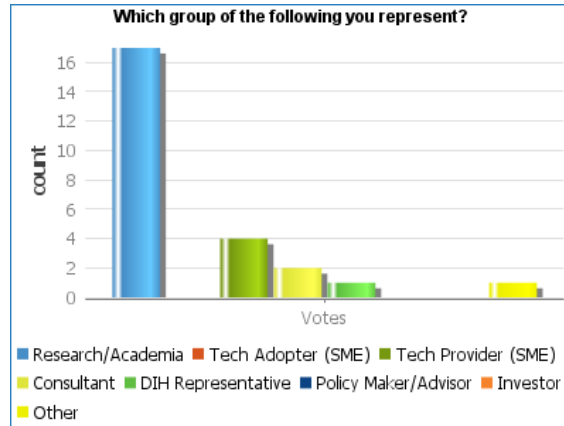


Figure 7: Question n.1

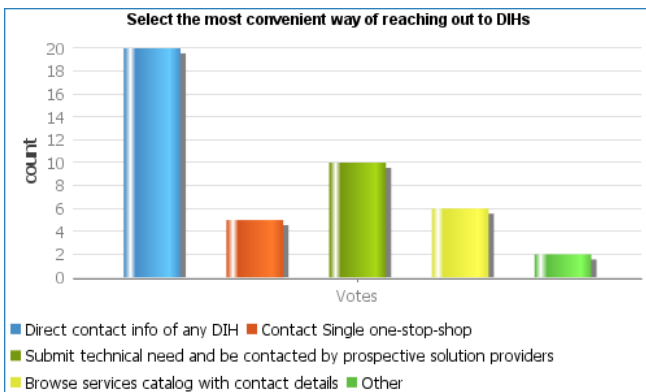


Figure 8: Question n.2

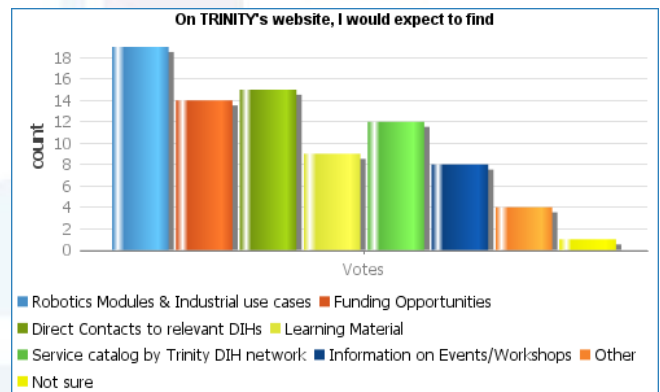


Figure 9: Question n.3

Questions posed for the Training Cockpit (Figure 10-11-12-13-14):

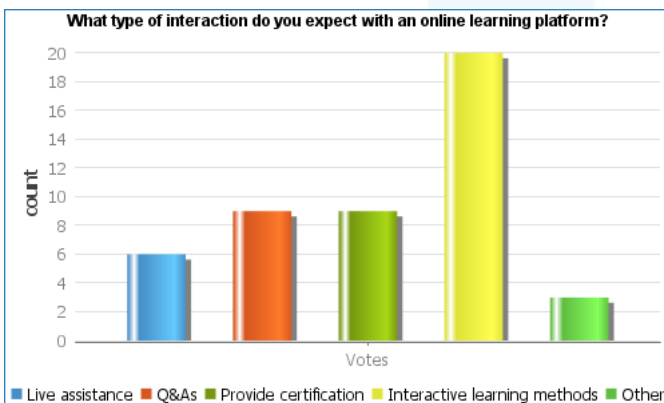


Figure 10: Question n.5

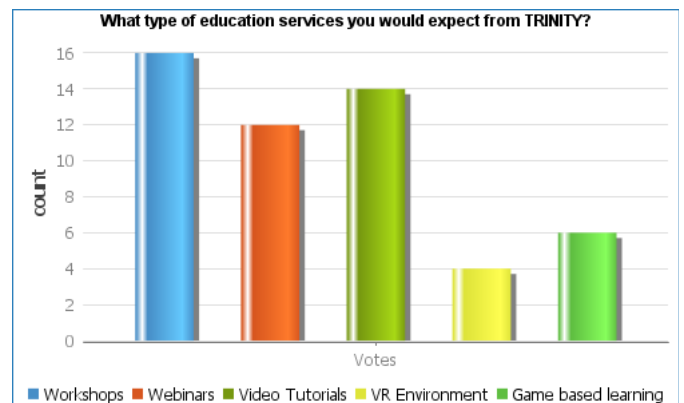


Figure 11: Question n.6



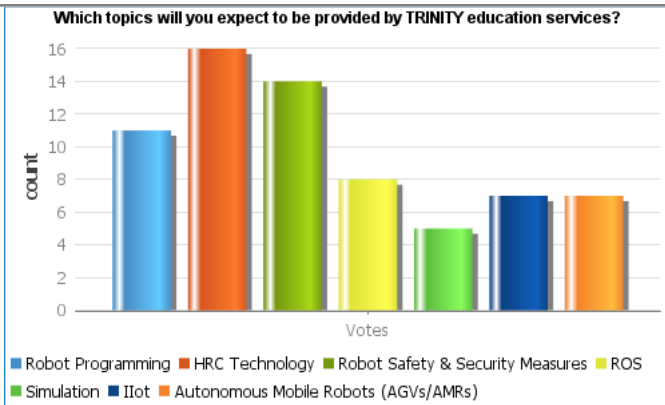


Figure 12: Question n.7

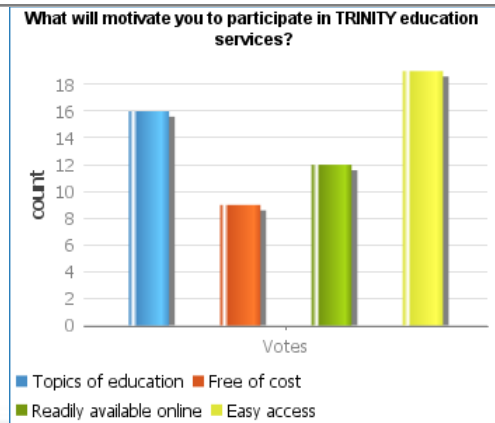


Figure 13: Question n.8

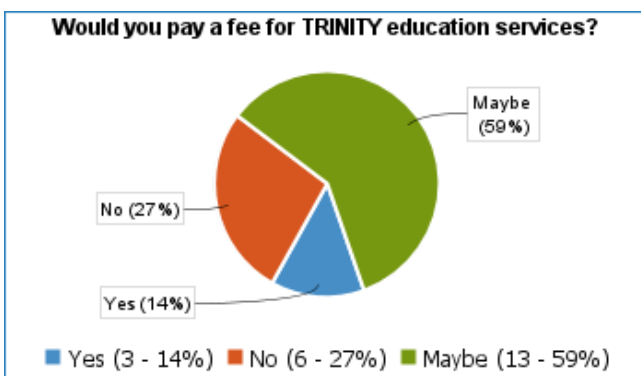


Figure 14: Question n.9

Thanks to the Robotics community for helping us to improve European manufacturing and special thanks to all participants of our workshop!

All information about the Trinity-Project can be found online [www.trinityrobotics.eu](http://www.trinityrobotics.eu)

For further information feel free to reach out to us! [info@trinityrobotics.eu](mailto:info@trinityrobotics.eu)



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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 825196