



# Intellectual Output 1

## Report

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## 1. Introduction

The AdTech project, which began in September of 2015, has the objective of creating a high quality work-based VET (Vocational Educational Training) in the field of adhesive bonding. It considers 3 professional profiles (Adhesive Bonder, Specialist and Engineer) that cover the market needs identified by the companies using adhesive technologies in their products.

Due to the high importance of the mobility of labour and cross-border cooperation within Europe, the AdTech project is currently devoting a lot of work to the creation of a harmonized toolkit, to ensure that personnel is trained in a uniform way, independently of the country where the course takes place.

This report intends to be a common EU state of the art on the methodology and market requirements, namely the requirements in terms of qualified personnel and it is the final product of the intellectual output 1 (IO1). The main tool used to evaluate this state of the art was a survey, sent by the various project partners to companies of their respective countries.

The main objective of the survey is to understand and identify the most critical points and skills gaps in terms of education and training in the area of adhesive bonding in each country. An additional goal of the survey was to identify the market needs in terms of available training courses in adhesive bonding.

The survey consists on a total of 25 questions covering different topics, including:

- Characterization of companies
- Application of the adhesive bonding technology in companies
- Adhesive bonding courses
- Specific questions for VET organisations

The questions that constitute this survey were created to allow the AdTech project's partners to assess the opinion of the industry in what concerns the previous topics and also to evaluate their opinions about the most appropriate teaching methodologies and materials to apply in training courses. To verify the existence of a demand for specific training in this field and the origin of that demand is also important information. Overall, the data gathered by the survey can be considered as very valuable for the different outputs of AdTech project.

The entire survey is available in Appendix.

A total of 129 companies answered this survey.

The number of answers per country is shown in Figure 1 (as a percentage). These results show a very large disparity of answers among the different partners' countries of AdTech project. More than 77% of answers were collected by two countries (Germany and Portugal). The results from other partners are almost negligible. This disparity can preclude the comparison between the different countries, which is one of the objectives of IO1.

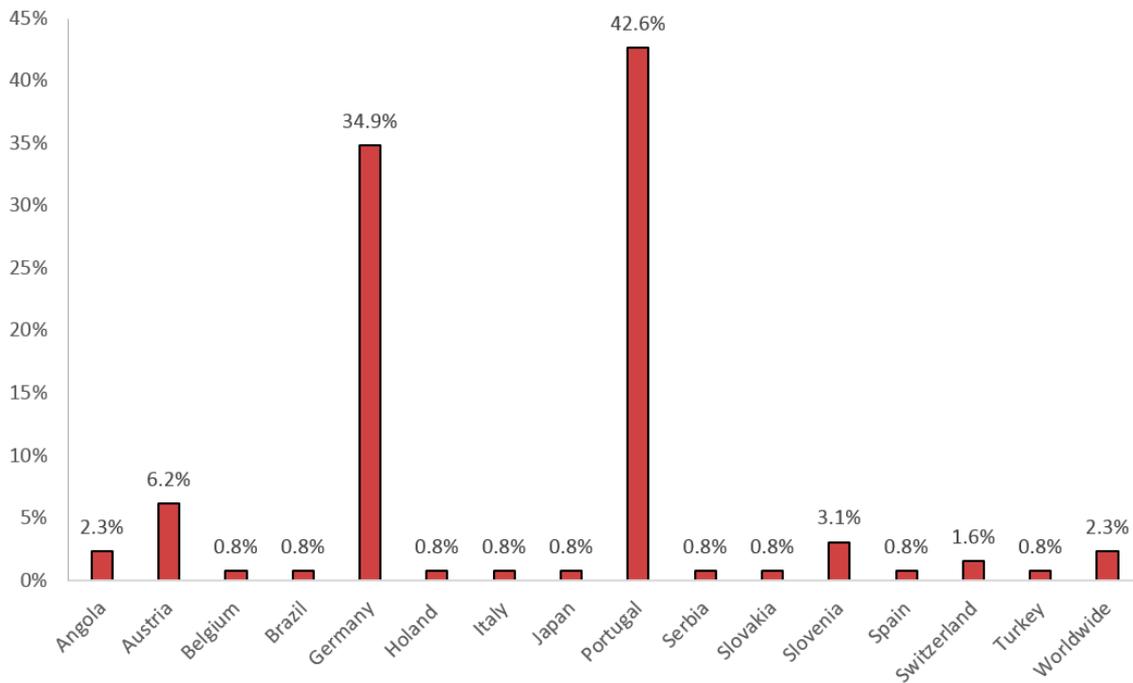


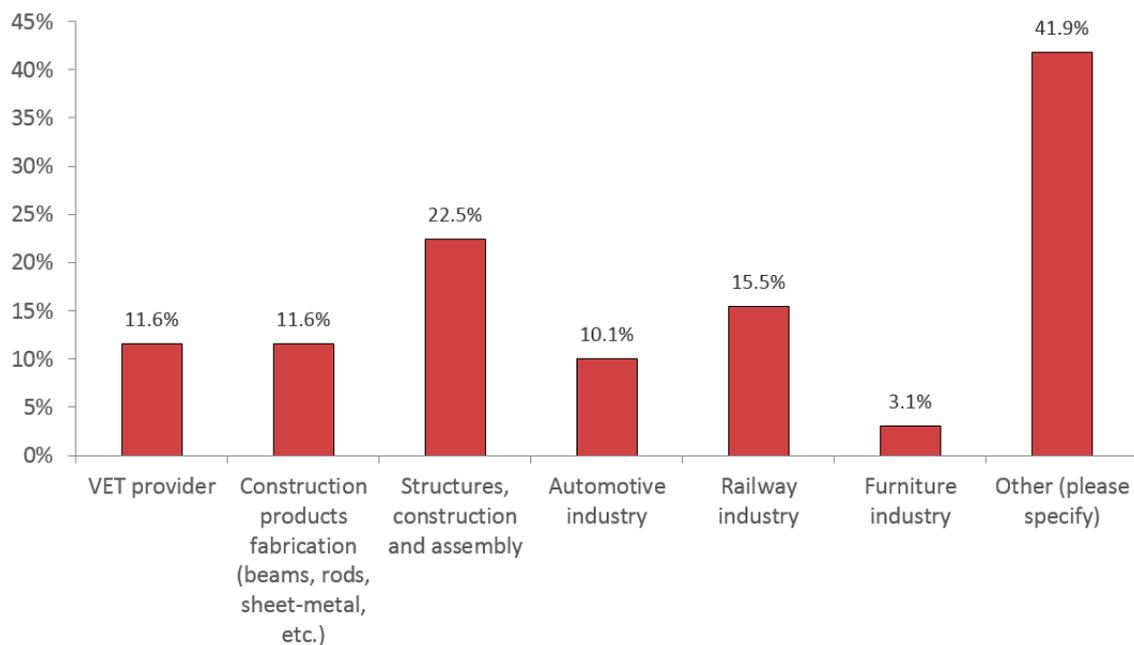
Figure 1 - Country of origin of the survey answers.

## 2. Survey results

In this section the answers of the survey are studied and statistically analysed. The most important results derived from this analysis are listed and discussed.

### 2.1. Characterization of companies

Starting with a brief characterization of the participating companies and considering the category which best fits them, it can be observed that the participating companies belong to a wide range of business areas (Figure 2). While many of the companies come from common industry types (such as construction, automotive and railway), as many as 41.9% of the companies come from other diverse industries, which illustrates how widely dispersed the use of adhesive bonding is.



*Figure 2 - Company categories.*

According to the information obtained from Questions 3 and 4, it is possible to say that more than 74.4 % of the enquired entities are private companies and about 42.6 % of them have more than 1000 employees.

It is important to note that the analysis of Questions 6 up to 22 was performed excluding the companies which belong to “VET provider” category, in order to get a more accurate characterization of the industry and its use of adhesive bonding.

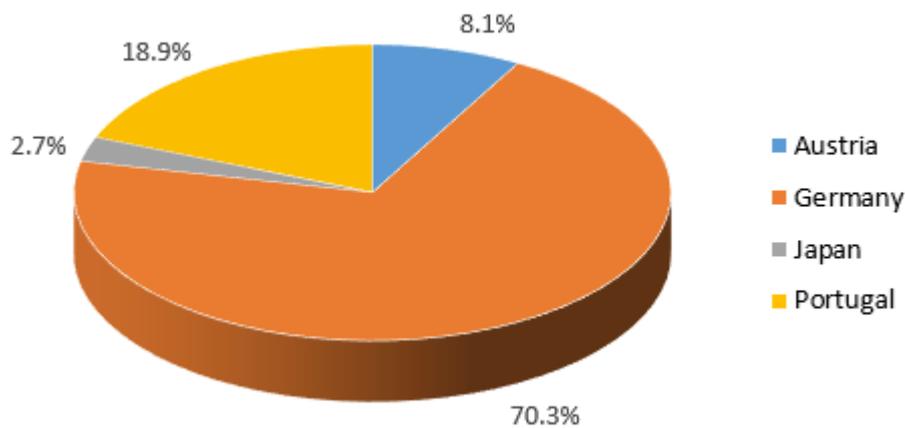
## 2.2. Application of the adhesive bonding technology in companies

The next topic under study is related to the application of the adhesive bonding technology in companies. Using the data gathered in this section of the survey, it was found that 56.1 % of the companies that answered Question 6 apply adhesives in the products/services developed by themselves (Table 1).

*Table 1 - Application of adhesive bonding technology on the development of products / services.*

	Frequency	Percentage
No	29	43.9 %
Yes	37	56.1 %
<b>Total</b>	<b>66</b>	<b>100.0 %</b>

Of all the companies which apply adhesives in the development of their products and/or services 70.3 % are from Germany and 18.9 % are from Portugal (Figure 3).



*Figure 3 - Companies which apply adhesives in their products/services.*

As previously mentioned in the Introduction, the low number of answers coming from countries other than Germany and Portugal limits the usefulness of the acquired data. Another major contributing factor is the large fraction of missing answers in many of the submitted surveys.

When looking at the process types used by the companies to create their products, most of the companies (more than 60%) answered that they employ both manual and automatic processes. This shows that any training in this field should not only be focused in manual application methods but also prepare the user for automated application techniques.

To quantify the importance level that the surveyed companies attribute to adhesive bonding technology, the distribution of this classification and the respective average values are presented for four different cases (Figure 4 and Figure 5).

The cases under consideration are:

- case1 - All companies which are not VET provider
- case2 - Companies not VET provider which apply adhesives in their production
- case3 - German companies not VET provider which apply adhesives in their production
- case4 - Portuguese companies not VET provider which apply adhesives in their production

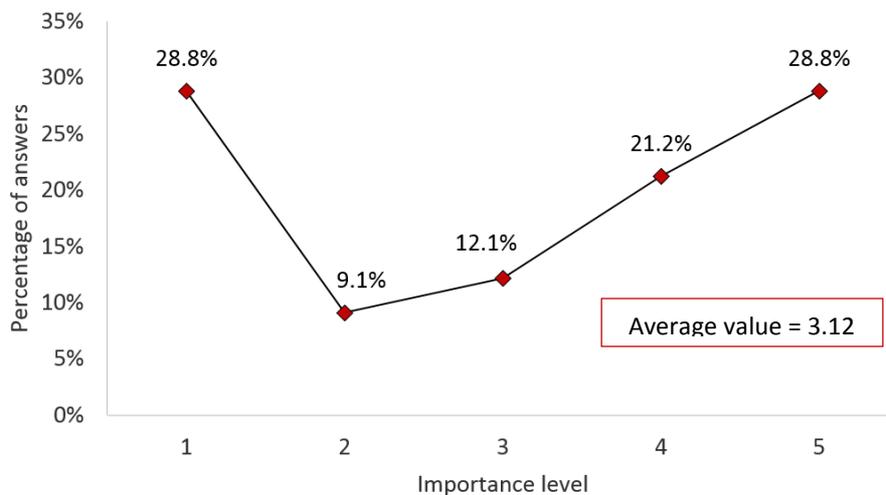


Figure 4 - Importance level of adhesive bonding technology in companies which are not VET provider.

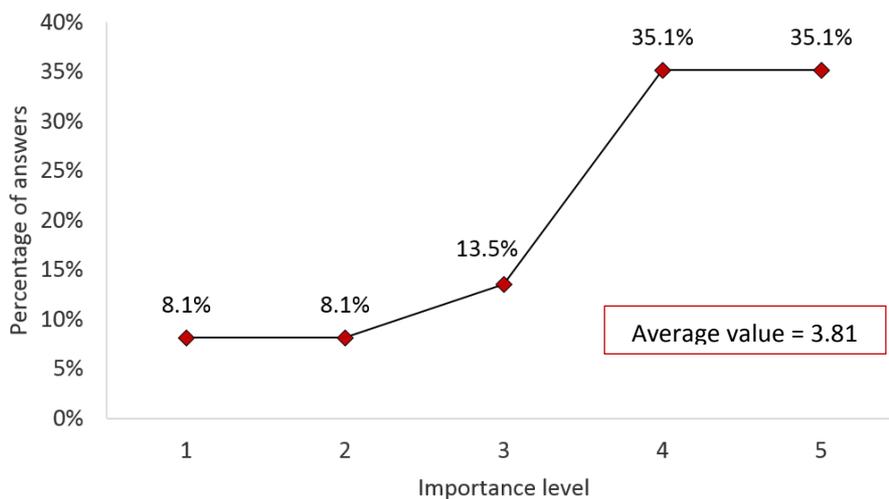


Figure 5 - Importance level of adhesive bonding technology in companies, not VET provider, which apply adhesives in their production.

For the two most representative countries, Germany (with 70.3% of answers) and Portugal (with 18.9% of answers) the average values found were 3.84 and 3.57 respectively.

An increase of the average values of the importance level assigned to the application of the adhesive bonding technology can be noticed (from 3.12 to 3.81). This is a result of considering only the companies which confirmed the utilization of adhesives in the development of their products. For Germany and Portugal, it can be seen that only the average value for Germany is higher than the general value.

It is important to note that many of the companies which declared that they do not use adhesive bonding in their production process still rate the importance level of adhesive bonding, which might be synonymous with the use of components which are bonded by outsourced suppliers.

### 2.3. Adhesive bonding courses

This section describes the results related to the importance of the training courses and the evaluation of the existent EWF courses done by the participating companies.

The analysis of the added value of adhesive bonding courses to companies is done taking into account the same four different cases (case 1 to case 4 from “2.2 Application of the adhesive bonding technology in companies” section) specified for the analysis of importance level of adhesive bonding technology (Figure 6 and Figure 7).

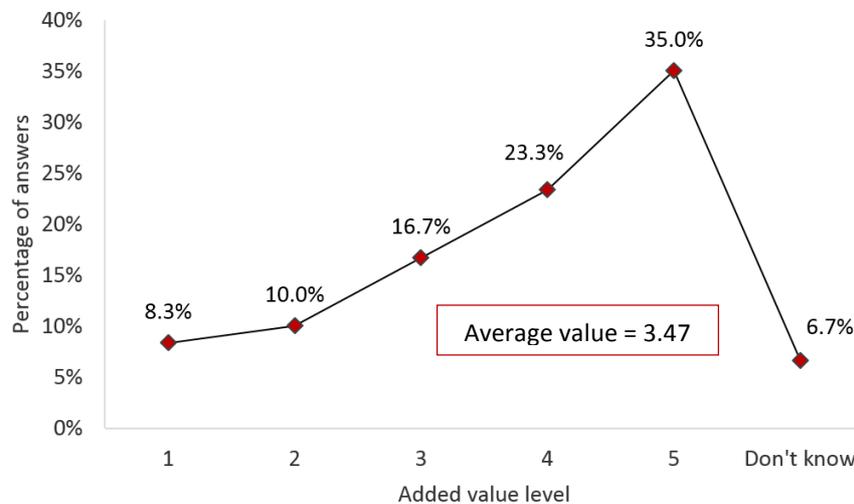
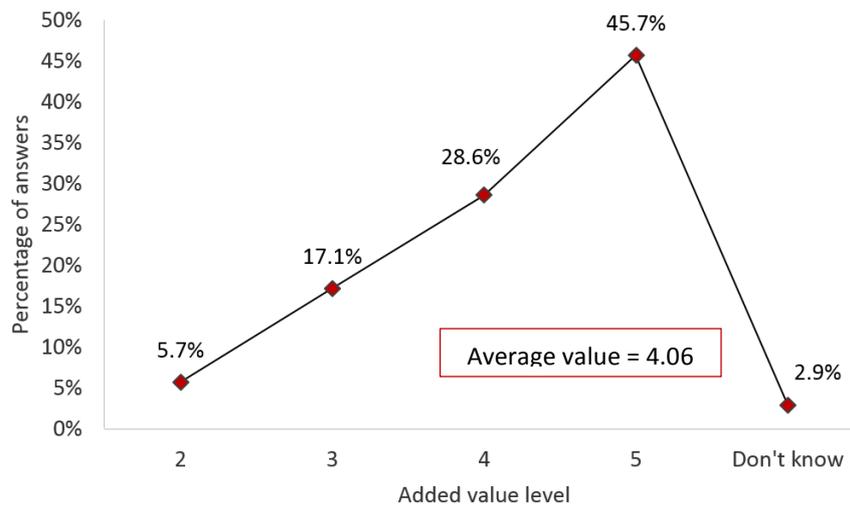


Figure 6 - Added value of adhesive bonding courses to companies which are not VET provider.



*Figure 7 - Added value of adhesive bonding courses to companies, not VET provider, which apply adhesives in their production.*

Again, Germany and Portugal were the two most represented countries with 70.3% and 18.9% of the total answers respectively. The average values determined for these two countries were 4.16 for Germany and 3.50 for Portugal.

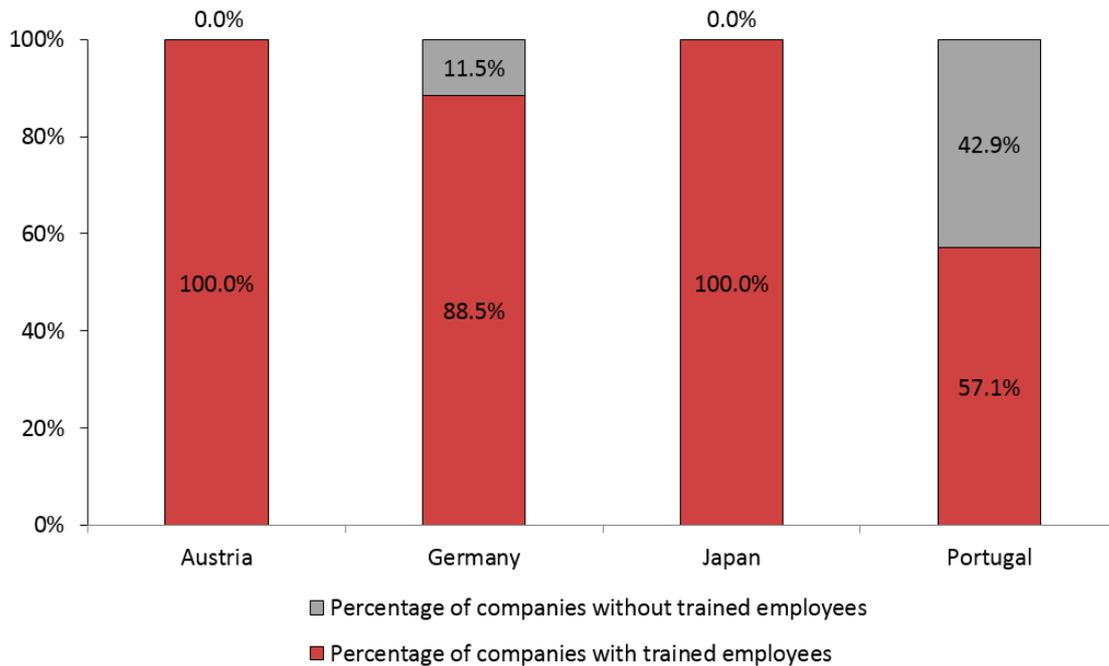
If only companies which confirmed the utilization of adhesives in the development of their products are considered, an increase in the average value is found (from 3.47 to 4.06), which is consistent with the previous results. Also, and in accordance with previously shown results, only the average value for German companies is higher than the general value.

Table 2 contains the results of the Question 13 and shows that 88.6% of companies which apply adhesives to develop their products have employees trained in a course within the adhesive bonding area. If all companies are considered, excluding VET providers and including even those that do not apply adhesives in their production, the percentage of companies which have trained employees in the adhesive bonding area decreases from 88.6% to 68.3%.

*Table 2 - Existence of employees trained in a course within the adhesive bonding technology area.*

	Frequency	Percentage
No	4	11.4 %
Yes	31	88.6 %
<b>Total</b>	<b>35</b>	<b>100.0 %</b>

The percentage of companies which apply adhesives and have trained employees was analysed for each country. This data is shown in Figure 8.



*Figure 8 - Companies which apply adhesives and have trained employees.*

Although for Austria and Japan the percentage of companies which apply adhesives and have trained employees is 100%, it should be noticed that the number of answers was very limited (3 answers for Austria and 1 answer for Japan). Excluding the cases of Austria and Japan, German companies are those with a higher percentage of trained employees (88.5%) while Portugal is significantly behind with only 57.1%.

The type of training courses attended by the professionals of the inquired companies was also studied. According to the answers of the companies which declared that their employees have training in adhesive bonding, more than 48% of them had their training performed only by external organizations while about 36% of them had both internal and external training (Table 3).

*Table 3 - Type of courses attended by trained employees.*

	Frequency	Percentage
Internal course	5	16.1 %
Course organized by an external training institution	15	48.4 %
Both	11	35.5 %
<b>Total</b>	<b>31</b>	<b>100.0 %</b>

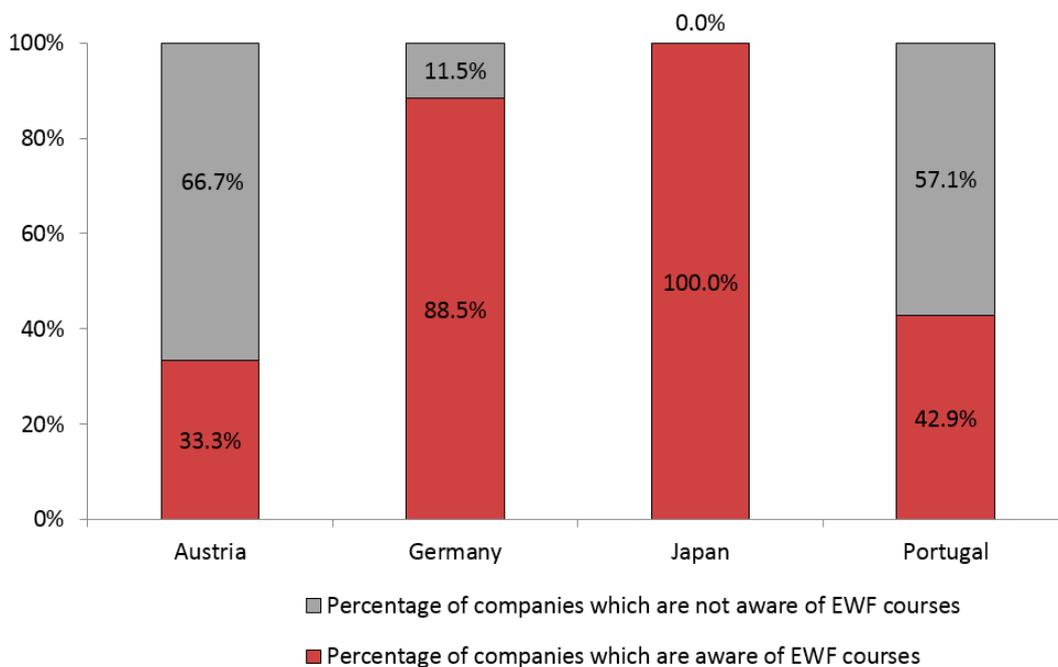
The results of the survey can also be analysed to study the impact and the awareness of the existing EWF courses.

Table 4 shows that 80.0% of the companies which apply adhesives in their products demonstrate awareness of the existent EWF courses. If the companies which do not apply adhesives are also considered, the percentage decreases to 66.7%.

*Table 4 - Awareness of EWF courses.*

	Frequency	Percentage
No	7	20.0 %
Yes	28	80.0 %
<b>Total</b>	<b>35</b>	<b>100.0 %</b>

The percentage of companies which apply adhesives and are aware of the EWF courses was analysed for each country and the data is shown in Figure 9.



*Figure 9 - Companies that apply adhesives in their production and are aware of the EWF courses.*

Again, it should be noticed that the number of answers for Austria and Japan was very limited (3 answers for Austria and 1 answer for Japan), but in this study only for Japan the percentage of companies which apply adhesives and are aware of the EWF courses is 100%. Following the same methodology and excluding the cases of Austria and Japan, German companies are also those which are most aware of the EWF courses (88.5%) while Portugal is behind with only 42.9%.

Going deep into the evaluation of the existent EWF courses, the results of Question 17 were analysed and are presented in Table 5. These results will help the AdTech project's partners to find if there are aspects of the EWF courses that should be reviewed.

Table 5 shows the average value for each evaluated item considering the answers of companies which declared to be aware of the EWF courses and that are not VET provider. To answer to this question a scale from 1 to 5 was used, where 1 means total disagreement and 5 means total agreement. To avoid this evaluation being rendered meaningless by the answers of the companies that do not know the EWF courses, "Don't know" was made available as a possible answer.

*Table 5 - Evaluation of the existent EWF courses.*

<b>Item</b>	<b>Average value</b>
Do you think the EWF courses for Adhesive Bonding Engineer, Adhesive Bonding Specialist and Adhesive Bonder have an added value?	4.52
The course content provides all the necessary competencies	3.86
It has the right duration	4.04
They are too long	2.12
Course content is not sufficient	1.96
Course content could be more comprehensive	2.62

The results presented in Table 5 indicate that the current EWF courses have a positive overall assessment. The companies recognise that these courses add significant value to the trainees' capabilities and that the actual contents provide all the necessary competencies to them. One item that probably should be reconsidered is the content complexity because the average value given to this item is 2.62.

Another goal of AdTech project is to review contents and teaching methodology of the EWF courses in the adhesive bonding field. Questions 19 to 21 intend to evaluate the market view. The participant companies were invited to give their opinion about what would be the best solution in terms of how the theoretical education should be carried out for adhesive bonding and about what would be the most appropriate teaching materials.

The values presented in Table 6 indicate that 57.7% of the companies which are not VET providers choose the traditional classroom learning as the best solution to carry out the theoretical education. This value increases slightly (to 61.7%) if just the companies that have employees trained in a course within the adhesive bonding technology field are included in the analysis.

Table 6 – The best solution to carry out the theoretical education in adhesive bonding.

	Frequency	Percentage
Traditional classroom learning	30	57.7 %
With ICT support (computers, internet connections)	8	13.4 %
50% at school, 50% at home (distance/blended learning)	11	21.1 %
Through other means	3	5.8 %
<b>Total</b>	<b>52</b>	<b>100.0 %</b>

The inquired companies also were found to prefer the use of traditional teaching materials rather than e-materials or didactic/pedagogical software (Table 7). This indicates that no significant changes have to be made to the actual methodology and teaching materials used.

Table 7 – Appropriate teaching materials.

	Frequency	Percentage
Traditional (books, teacher textbooks, brochures)	30	57.7 %
e-materials: online platforms and resources, websites	15	28.8 %
Didactic/pedagogical software	7	13.5 %
<b>Total</b>	<b>52</b>	<b>100.0 %</b>

## 2.4. Specific questions for VET organisations

The last section of the survey included three questions specific for VET organisations. These questions try to identify if there is a demand for training courses, who are those looking for training and the market's perception for creating an educational offer in the adhesive bonding area.

Only a total of 6 VET organizations answered these questions, which makes the results not as significant as those presented in the previous sections of this work. However, due to the importance of this specific information, they were still analysed and are presented below.

A relevant study that can be performed using the VET organization data is to compare their point of views to those from the industry. A comparison between the answers of the VET providers and all the other companies is presented in Table 8.

Table 8 - Demand for training in adhesive bonding technology.

	Companies not VET provider		VET provider companies	
	Frequency	Percentage	Frequency	Percentage
No	13	34.2 %	4	66.7 %
Yes	25	65.8 %	2	33.3 %
<b>Total</b>	<b>38</b>	<b>100.0 %</b>	<b>6</b>	<b>100.0 %</b>

Table 8 shows that VET provider companies and the industry do not agree in terms of the existence of a demand for training in the adhesive bonding field. A total of 66.7% of the VET provider companies which answered Question 23 indicate that there is not a demand for this type of training while 65.8% of the industry recognises the existence of this demand.

As opposed to the last question, industry and VET provider companies agree about the entities which are interested in this type of training courses. Both of them indicate that companies are those who search most the course (Table 9).

Table 9 - Entities looking for training in adhesive bonding technology.

	Companies not VET provider		VET provider companies	
	Frequency	Percentage	Frequency	Percentage
Companies	28	73.7 %	4	66.7 %
Individual trainees	6	15.8 %	2	33.3 %
Unemployed trainees	4	10.5 %	0	0
<b>Total</b>	<b>38</b>	<b>100.0 %</b>	<b>6</b>	<b>100.0 %</b>

The survey's last question had the objective of assessing the market's perception for creating an educational offer in the adhesive bonding area. The opinion of the same two groups (VET providers and industry) were compared by the average level of added value they attribute to the creation of education courses. It was found that the average value for the VET provider companies is lower than that of the industry (Table 10). This result indicates that although the industry demands more training offers, VET provider companies are not aware of this need.

Table 10 – Market's perception for creating educational offer.

	Companies not VET provider	VET provider companies
<b>Average value</b>	3.4	2.5

### 3. Conclusions

This report is the final product of the intellectual output 1 of the AdTech project. This first output consists in evaluating the state of the art on the requirements in terms of qualified personnel in the adhesive bonding field. The main tool used to carry out the evaluation was a survey sent by the various project partners to companies of their respective countries.

The objectives of the survey were:

- understand and identify the most critical points and skills gaps in terms of education and training in the area of adhesive bonding in each country;
- identify the market needs in terms of available training courses in adhesive bonding.

This survey was answered by 129 companies. There was a very large disparity in the number of answers provided by companies of the different countries, which precluded the comparison between the different partners' countries that was one of the objectives of IO1. More than 77% of answers refer to German and Portuguese companies. Another contributing factor is the number of missing answers in many of the submitted surveys.

The participating companies were found to belong to a wide range of business areas. While 59% of the industries come from fields where the use of adhesives is extensive (automotive, railway, etc.), the remaining 41% come from diverse industries, which illustrates how widely dispersed the use of adhesive bonding is.

A total of 56.1% of the companies that answered Question 6 apply adhesives in the products/services developed by themselves being 70.3% from Germany and 18.9% from Portugal.

The importance attributed by companies to the use of adhesive bonding in their processes was studied, as well as the added value that can be provided by having adhesive bonding courses. The average values for these two parameters were compared under the following four case of study:

- All companies which are not VET provider
- Companies not VET provider which apply adhesives in their production
- German companies not VET provider which apply adhesives in their production
- Portuguese companies not VET provider which apply adhesives in their production

For both studied parameters (importance level of adhesive bonding in their processes and the added value of adhesive bonding courses) the average value is higher if only companies which confirmed the utilization of adhesives on the development of their products are considered.

In what concerns specific training in the adhesive bonding area, the results show that 88.6% of companies which apply adhesives to develop their products have trained employees. More than 74% of these companies are from Germany and about 48% of them had their training performed only by external organizations.

Focusing on the EWF courses, it was found that 80.0% of the companies which apply adhesives in their products demonstrate to be aware of them and that the existent EWF courses have a positive overall assessment. The companies consider that EWF courses have a high added value to trainees and that the current contents provide all the necessary competencies to them. On the other hand, the content complexity should be reconsidered.

In terms of the best way to carry out the theoretical education for the adhesive bonding and about the most appropriate teaching materials, it can be concluded that no significant changes have to be made to the actual methodology and teaching materials. A total of 57.7% of the companies which are not VET providers choose the traditional classroom learning as the best solution to carry out the theoretical education and the majority prefer the use of traditional materials.

The last section of the survey had three questions specific for VET organisations. Due to the low number of answers a comparison between two different groups was made: VET providers companies and all the other companies. While these two groups agree about the fact the companies are the entities who search most the training courses, the same is not true when inquired about the existence of a demand for training in adhesive bonding field. Surprisingly most of the VET providers consider that this demand does not exist while the industry have an opposite view.

The final question aimed to estimate the market's perception regarding the creation of educational offers in the adhesive bonding area. The results show that VET provider companies perceive the need for new courses to be lower than that of the industry. This can reveal the existence of a gap between the industry needs and the services provided by the VET companies.

## 4. Appendix

### AdTech Questionnaire Survey

As part of the Erasmus+ project AdTech – an European project aimed at improving qualifications in the adhesive bonding areas – we ask the support of your organization in replying this questionnaire to help us understand and identify the most critical points and skills gaps in terms of education and training in the area of adhesive bonding in your country.

#### Your feedback is greatly appreciated!

1. Please select the category that best suits your company

- VET provider
- Construction products fabrication (beams, rods, sheet-metal, etc.)
- Structures construction and assembly
- Automotive industry
- Railway Industry
- Furniture Industry
- Other (please specify) \_\_\_\_\_

2. Company Name(not mandatory) \_\_\_\_\_

3. Are you a public or private entity?

- Public
- Private

4. How many employees does your company have?

- 10 to 49
- 50-99
- 100-249
- 250-999
- >1000

5. In which country is your company based?

\_\_\_\_\_

6. Is adhesive bonding technology applied in the products/services developed in your organization?

**YES**

**NO**

If yes, in which kind of products/services: \_\_\_\_\_

7. What kind of techniques does your organization use regarding:

Surface treatment \_\_\_\_\_

Type of adhesive \_\_\_\_\_

Substrates bonded \_\_\_\_\_

8. Does your organization employ manual or automated processes, or both?

Manual processes

Automated processes

Manual and automated processes

Please provide examples of manual or automated processes

\_\_\_\_\_

9. How would you rate the importance of the adhesive bonding in your company?

1 (least important)	2	3	4	5 (most important)

10. What kind of other joining techniques besides bonding does your organization use and how important is it?

<input type="checkbox"/> Welding	1 (least important)	2	3	4	5 (most important)	Don't know

<input type="checkbox"/> Brazing	1 (least important)	2	3	4	5 (most important)	Don't know

<input type="checkbox"/> Rivets	1 (least important)	2	3	4	5 (most important)	Don't know

<input type="checkbox"/> Bolts	1 (least important)	2	3	4	5 (most important)	Don't know

11. How many employees in your organization are involved in adhesive bonding processes?

Purchases \_\_\_\_\_

Sales \_\_\_\_\_

Design \_\_\_\_\_

Production \_\_\_\_\_

Quality control \_\_\_\_\_

12. How would you rate in terms of importance, the added value of participating in an adhesive bonding related course?

1 (least important)	2	3	4	5 (most important)

13. Does your organisation have employee(s) trained in a course within the adhesive bonding technological area?

**YES**

**NO**

14. If you answered yes in question 13, was it a:

- Internal course.  
 Course organized by an external training institution.  
 Please specify the duration of the course(s): \_\_\_\_\_

15. Are you aware of the EWF courses for three levels of specialization for the adhesive bonding area (Adhesive Bonding Engineer; Adhesive Bonding Specialist; Adhesive Bonder)?

**YES**

**NO**

16. Does your company have employees with one of these qualifications – Adhesive Bonding Engineer; Adhesive Bonding Specialist; Adhesive Bonder?

Yes. How many employees from each EWF level?

- Adhesive Bonding Engineer: \_\_\_\_\_  
 Adhesive Bonding Specialist: \_\_\_\_\_  
 Adhesive Bonder: \_\_\_\_\_  
 with no particular qualification: \_\_\_\_\_  
 other type of qualification? \_\_\_\_\_

No. How many employees working with adhesive bonding technology with no EWF qualification?

- Adhesive Bonding Engineer: \_\_\_\_\_  
 Adhesive Bonding Specialist: \_\_\_\_\_  
 Adhesive Bonder: \_\_\_\_\_  
 with no particular qualification: \_\_\_\_\_  
 other type of qualification? \_\_\_\_\_

Please specify the other type of qualification and the number of employees:

\_\_\_\_\_

17. Please rate the following (scale 1 to 5):

Do you think the EWF courses for Adhesive Bonding Engineer, Adhesive Bonding Specialist and Adhesive Bonder have an added value?

1	2	3	4	5	Don't know

The course content provides all the necessary competencies

1	2	3	4	5	Don't know

It has the right duration

1	2	3	4	5	Don't know

They are too long

1	2	3	4	5	Don't know

Course content is not sufficient

1	2	3	4	5	Don't know

Course content could be more comprehensive

1	2	3	4	5	Don't know

Other (please specify): \_\_\_\_\_

18. Do you see a gap in-between the course system for the different three levels?

**YES**

**NO**

If yes, is there a need for another course besides the already known ones?

\_\_\_\_\_

19. What would be the best solution in terms of how the theoretical education is carried out for the adhesive bonding area?

- Traditional classroom learning
- With ICT support (computers, internet connections)
- 50% at school, 50% at home (distance/blended learning)
- Through other means: \_\_\_\_\_

20. What would be the most appropriate teaching materials?

- Traditional (books, textbooks, brochures)
- e-materials: online platforms and resources, websites
- Didactic/pedagogical software

21. Are there any comments or remarks you would like to make, that you feel would be important for this subject? If so, please state them.

\_\_\_\_\_

22. Does your organization provide professional vocational education?

**YES**

**NO**

### Questions specific for Vocational Education Organizations

23. There is demand for training in adhesive bonding technology?

**YES**

**NO**

Please comment: \_\_\_\_\_

24. Who are those looking for such training?

- Companies
- Individual Trainees
- Unemployed Trainees

25. What is the perception of the market for creating educational offer in the area of adhesive bonding technology?

1 (no added value)	2	3	4	5 (clearly an added value)

Please comment: \_\_\_\_\_