WoodProps

Report “Survey: The Use of Timber in Construction”

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1 Introduction

Wood Properties for Ireland (WoodProps) is a joint programme between the Timber Engineering Research Group at NUI Galway (NUIG) and the Centre for Wood Science and Technology, Edinburgh Napier University (ENU). WoodProps is focused on contributing to the development of timber knowledge through experimental testing and dissemination of expert knowledge to support and the increased and sustainable use of wood and engineered wood products in the built environment.

In line with these objectives, the WoodProps team developed an online survey aimed at all stakeholders within the construction industry (architects, building professionals, clients, engineers, etc.) to examine the perception of timber as a construction material and the requirements of the industry to promote its use in construction. The online survey was carried out between the 12/4/19 and 23/08/19 with a total of 81 responses from 17 different countries. The survey was disseminated through social media platforms and the WoodProps mailing lists. The survey is largely split into three sections: Participant details, the perception of timber in construction and the educational/training requirements. This report presents the results of the survey and discusses its implications.

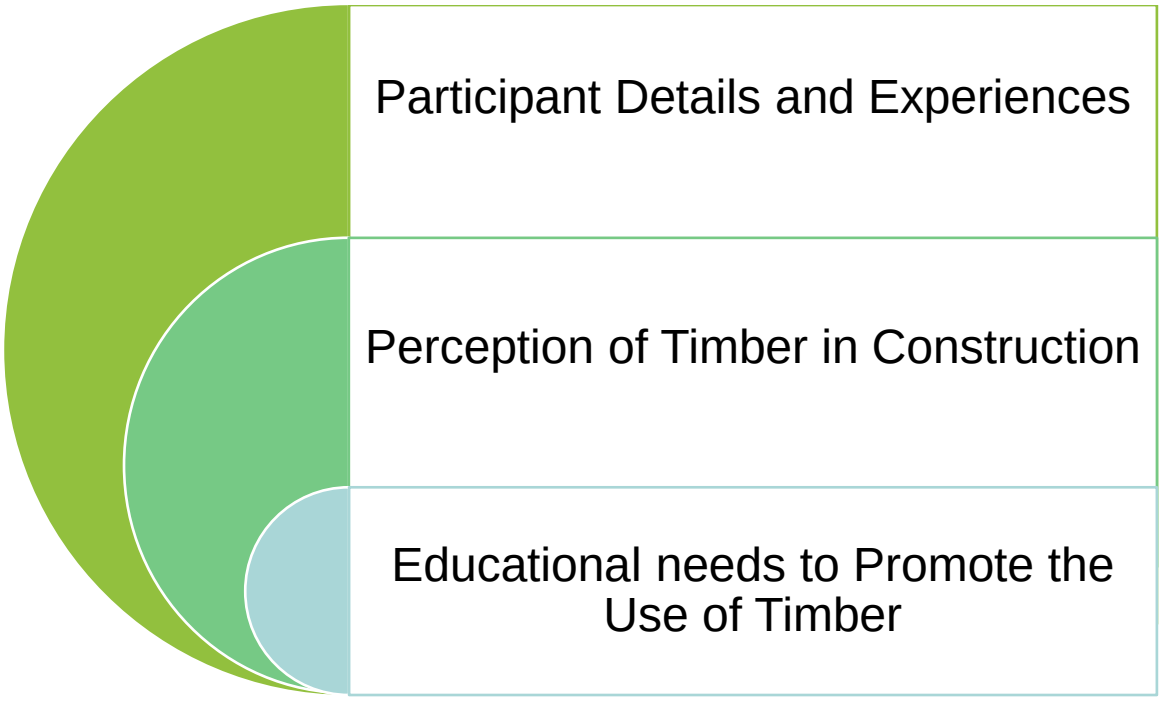


Fig. 1: The Survey: The Use of Timber in Construction

2 Objectives

The WoodProps Programme at NUI Galway conducted this survey to examine the perception of timber as a construction material and the requirements of the industry to understand the barriers impeding the

use of timber in modern construction projects. The survey was aimed at clients, architects, building professionals, engineers, etc. When analysing the results, the total number of participants are considered. A distinction has also been made between participants from Ireland, the United Kingdom, other European countries and countries outside of Europe to examine the differences in the perception of timber in these regions.

3 Participants

Each participant of the survey provided basic information about their experience with timber in construction, the number of years' experience they have in their role, the size of the company for which they work and the country in which they are employed.

The majority of participants were from Ireland at 47.6% of the total responses followed by 23.2% from the United Kingdom (UK) and 22.0% from other countries within Europe. The remaining 7.3% were from participants outside of Europe (Australia, Canada, USA, etc.). While the primary focus of the WoodProps Programme is to examine the perception of timber in construction within Ireland, it is important to understand the different perceptions and experiences of timber in other countries and particularly neighbouring countries such as the UK where the use of timber in construction is becoming more and more common.

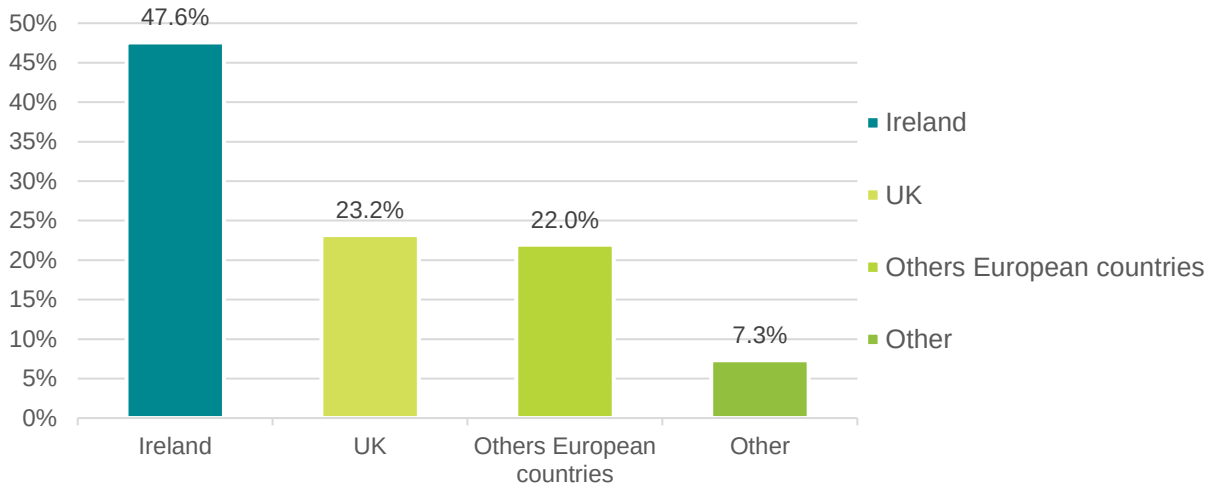


Fig. 2: Percentage of responses from Ireland, the United Kingdom, Other European countries and other countries outside of Ireland.

3.1 Profession, years of experience and company size

Each participant was asked about the profession, the number of years of experience they have in their role and the size of the company for which they work. Regarding profession or role, Structural Engineers were the highest percentage of participants with 27.2% of the total responses as seen in Fig. 3 followed by Civil Engineers (17.3%), Academic Researchers (12.4%), Architects (11.1%), Products Manufacturers (11.0%), Building Contractors (6.2%) and the remaining 14.8% comprising Project Managers, Fire Officers, Building Inspectors, Foresters, Regulatory personnel, and Health and Safety personnel.

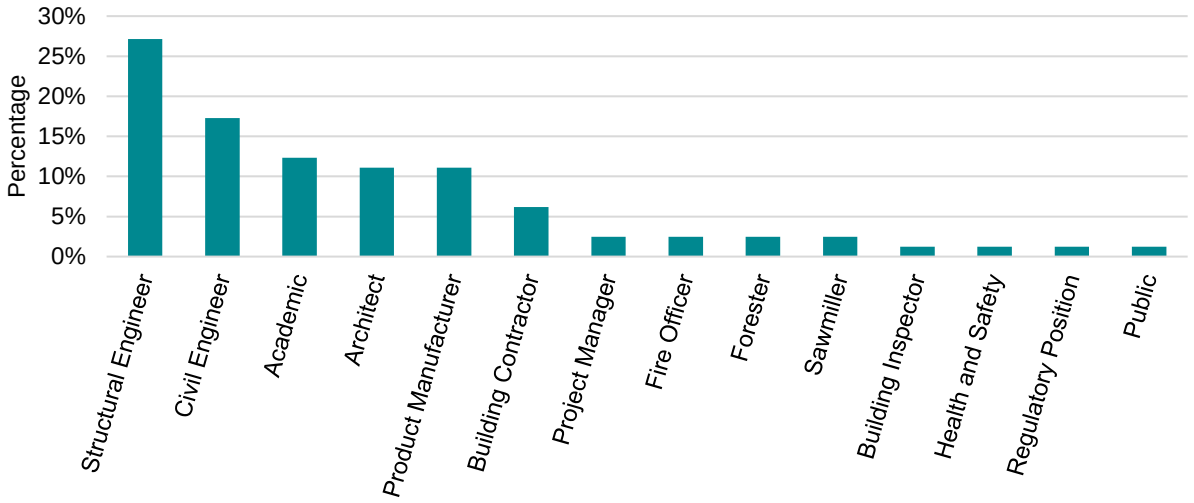
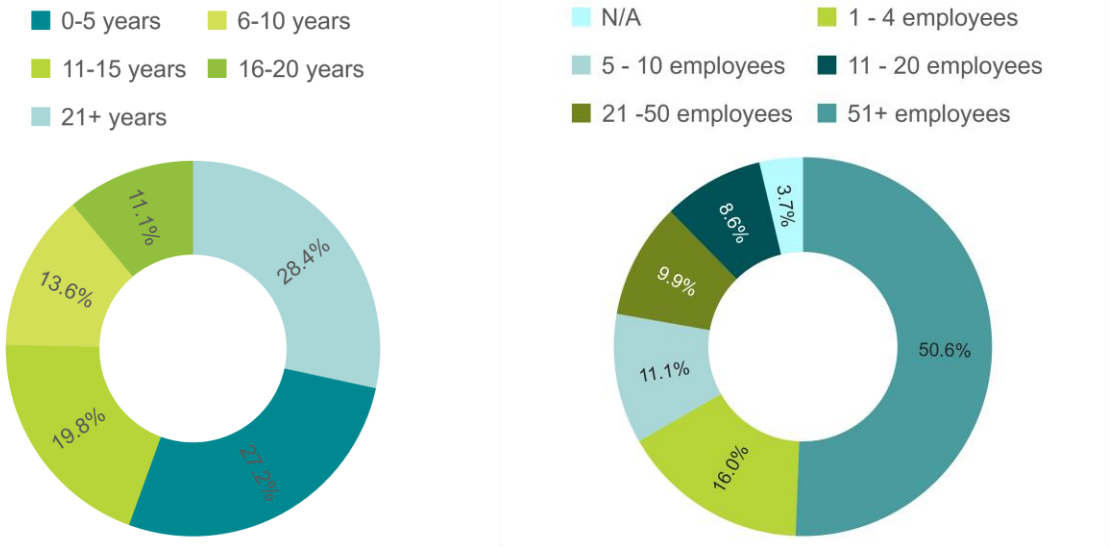


Fig. 3: Percentage participation of specific professions

In addition to the role of the participants, the number of years of experience in that role was also collected. The experience of the participants is well distributed between the categories ranging from 0-5 years to 21+ years' experience with timber in construction as seen in Fig. 4a. Just over 28% of respondents have 21+ years' experience, 11% have 16-20 years' experience, 19% have 11-15 years' experience, 13% have 6-10 years' experience and 27% have 0-5 years' experience. The average of all respondents was found to be 11-15 years' experience. Similar results were found when examining responses solely from Ireland, the United Kingdom, other European countries and countries outside of Europe.



(a) (b)

Fig. 4: Participant details: (a) years of experience (b) number of employees in the company

Each participant was also asked to provide the number of employees of their respective companies. Over 50% of respondents were employed in large companies with 51+ employees. This was followed by small companies with 1-4 employees for 16% of respondents. The N/A term was used to represent self-build projects, members of the public and clients of timber projects. The average value was found to be between 11-50 employees for all respondents. When examining responses solely from Ireland, and Other European countries, the average value was also found to be between 11-50 employees. For countries outside of Europe, the average was 11-20 employees and for the United Kingdom, the average was found to be 21-50 employees.

4 Experiences and Perception of Timber

A series of questions of the survey focused on the knowledge and experiences of the participants and their perception of timber as a construction material.

4.1 Knowledge of timber in construction

Participants were asked to rate their knowledge level with timber (as a structural and non-structural material) in construction on a scale from very low to very high. The average value for all participants lies between medium and high on the scale. The same result is achieved when examining responses solely from Ireland, the United Kingdom, other European countries and countries outside of Europe. The knowledge level based on responses from particular roles can be seen in Fig. 5. It should be noted that the sample size of each role is different and should be considered when making comparisons. For example, the role of Project Manager and Building Inspector had a low experience level, but the percentage of respondents only represent a small amount of the total number of respondents with 2.5% and 1.2%, respectively. Product manufacturers, which represent 11.0% of responses, were shown to have a high to a very high level of experience with timber in construction. This result is high as the majority of product manufacturer responses were largely involved with the production of timber products or the production of ancillary components such as fasteners or insulation.

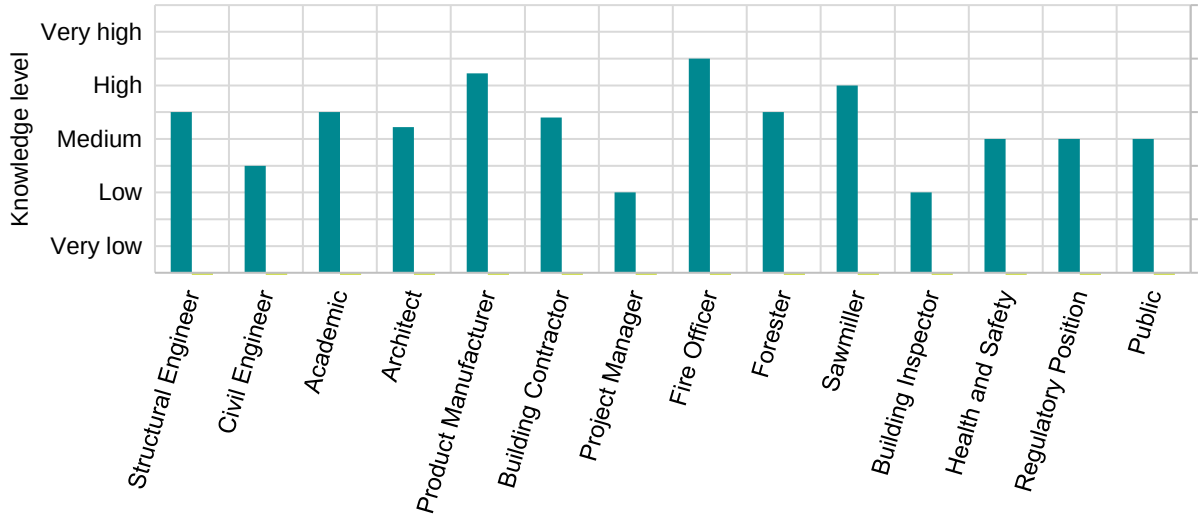


Fig. 5: Experience with timber in construction for different roles

Architects, Structural Engineers and civil engineer professions were all well represented within the survey with a percentage of respondents in excess of 11%. Structural Engineers and Architects were both shown to have medium to high knowledge with timber in construction while Civil Engineers were shown to have low to medium knowledge levels. Building Contractors, which represent 6.2% of responses, were shown to have medium to high knowledge on timber in construction. Academic researchers were also well represented in the survey with 12.4% of responses and were shown to have a medium to high knowledge level on the use of timber in construction.

The knowledge level with timber in construction has been examined against the years of experience for each respondent. The mean and standard deviation of each category ranging from 0-5 years' to 21+ years' experience with timber in construction are presented in Fig. 6. As one might expect, there is a positive increase in the experience level of respondents with increased years of experience in their respective roles. Respondents with 0-5 years' experience resulted in a mean low to medium experience level with timber in construction. The knowledge level increased to a maximum mean experience level close to high for respondents with 21+ years' experience.

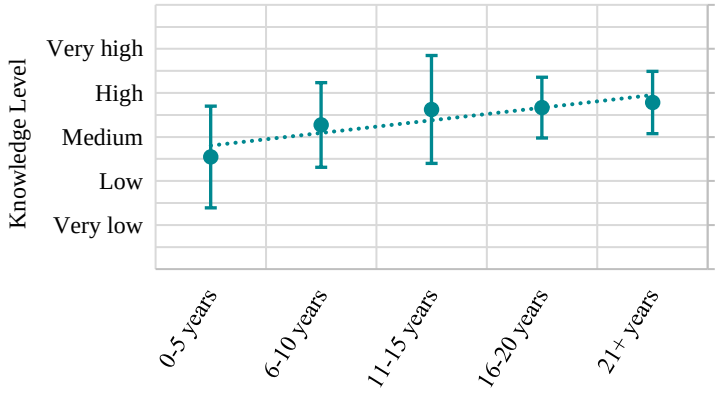


Fig. 6: Experience level with timber in construction vs. Participants years of experience in their role

The knowledge level of timber in construction for each respondent has also been examined against the number of employees in their respective companies. The mean knowledge level lies between medium to high regardless of company size as seen in Fig. 7. The highest knowledge levels were found to be in small companies of 1-4 employees or in the N/A category which represents self-build projects, members of the public and clients of construction projects. There is a slight downward trend in knowledge level for companies with an increasing number of employees. This indicates that smaller companies have a slightly higher knowledge level than larger companies and are perhaps more likely to gain knowledge of utilising timber in construction and specialise in this material.

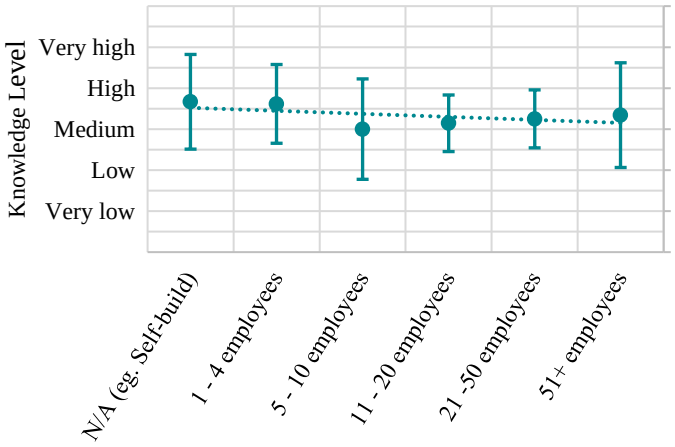


Fig. 7: Experience with timber in construction vs. the number of employees at the company

4.2 What are the most common types of Timber Construction Products?

Each participant was asked to examine if a timber product was commonly used in their respective countries. The scale ranged from not common to very common. The mean and standard deviation, based on the total number of responses, of each timber product, can be seen in Fig. 8. Timber trusses were found the be the most commonly used timber construction product followed by solid/sawn timber, timber frame, Oriented Strand Board (OSB) and I-joists. These particular timber products are commonly used in all types of construction projects from small- to large scale.

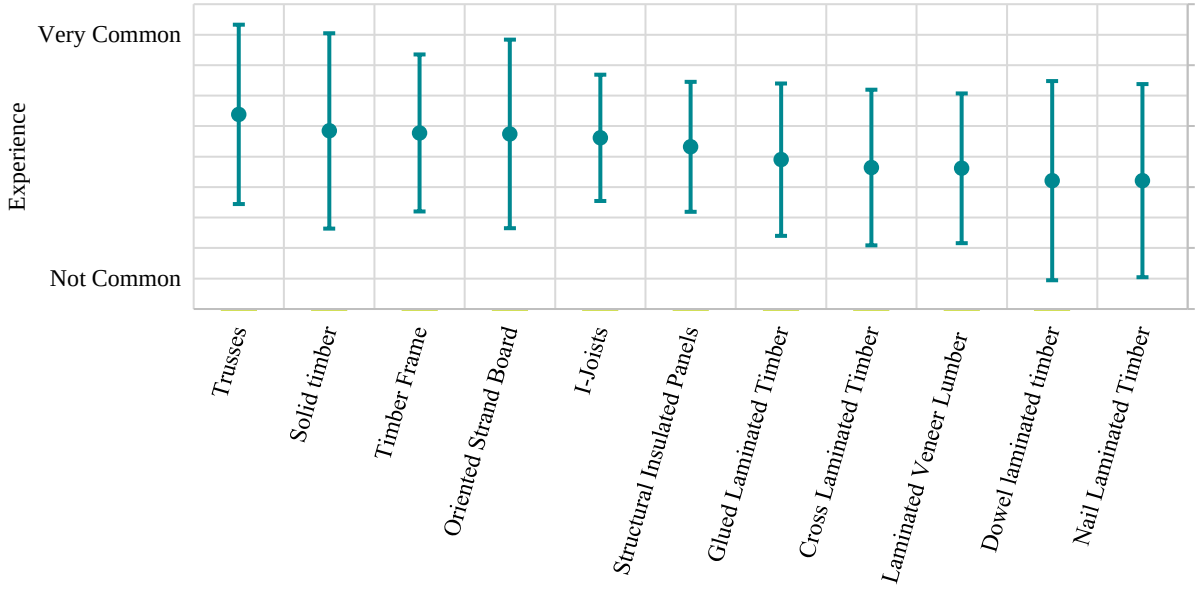


Fig. 8: What are the most common types of timber products used as a structural element in your country? the total respondents

The remaining products were seen to be less commonly used in construction. In descending order, these are Structural Insulated Panels (SIPs), Glued laminated timber (Glulam), Cross Laminated Timber (CLT), Laminated Veneer Lumber (LVL), Dowel Laminated Timber (DLT) and Nail Laminated Timber (NLT). These findings are not surprising as these timber products are often highly engineered and primarily utilised in large-scale construction projects. Many of these Engineered Wood Products (EWP) are growing in popularity in recent years due to a need to build with environmentally sustainable materials coupled with advances in production quality and construction processes related with such products. On further examination of the results, the familiarity with such products changes depending on the region examined. The familiarity with each product in different regions can be seen in Fig. 9.

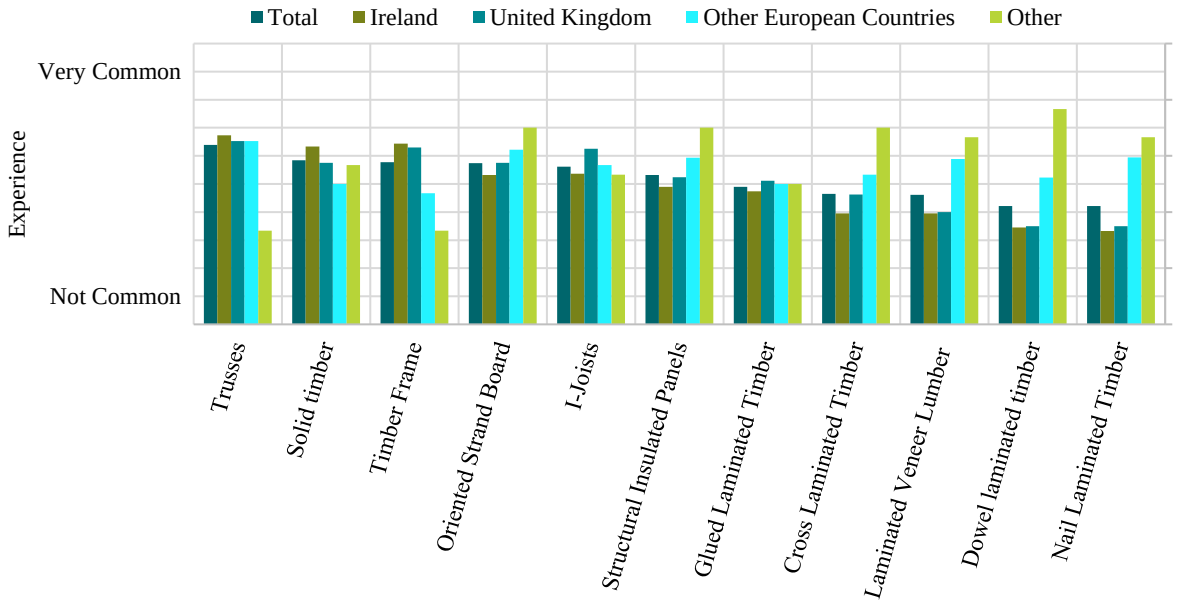


Fig. 9: What are the most common types of timber products based on the different regions

The results from respondents from Ireland and the UK follow the same trend as the total population. Respondents from other European countries and from countries outside of Europe display some different trends with increased familiarity with EWP such as CLT, LVL, DLT, SIPs and NLT. The results for Glulam are very similar for all regions studied. When examining CLT, Ireland reports the lowest value. This is also true for LVL, DLT and NLT. The UK demonstrates many of the same trends as Ireland except for CLT which was shown to be more commonly used in the UK. The difference for CLT was found to be the largest absolute difference in familiarity for timber products studied between the regions. This is not surprising as many large-scale CLT structures have been produced in the UK in recent years. Other products mentioned were metal webbed joists, Parallam, Accoya, Hardwood timber and composite materials.

4.3 Who Specifies Timber in Construction Projects?

Building professionals play an important role in the construction of a building together with the client determine suitable materials for construction of a particular project. The participants were asked to provide their opinion on who specifies the use of timber in construction. The results of the survey can be seen in Fig. 10. When examining the total population, Architects (39.8%) were perceived as being heavily influential in determining the use of timber in construction followed by the Client (23.6%) and Engineer (21.7%). This was closely followed by the Contractors (11.1%) and with Regulatory Policy and Quantity Surveyors being shown to have very little influence overall with percentages of 2.3% and 1.2%, respectively.

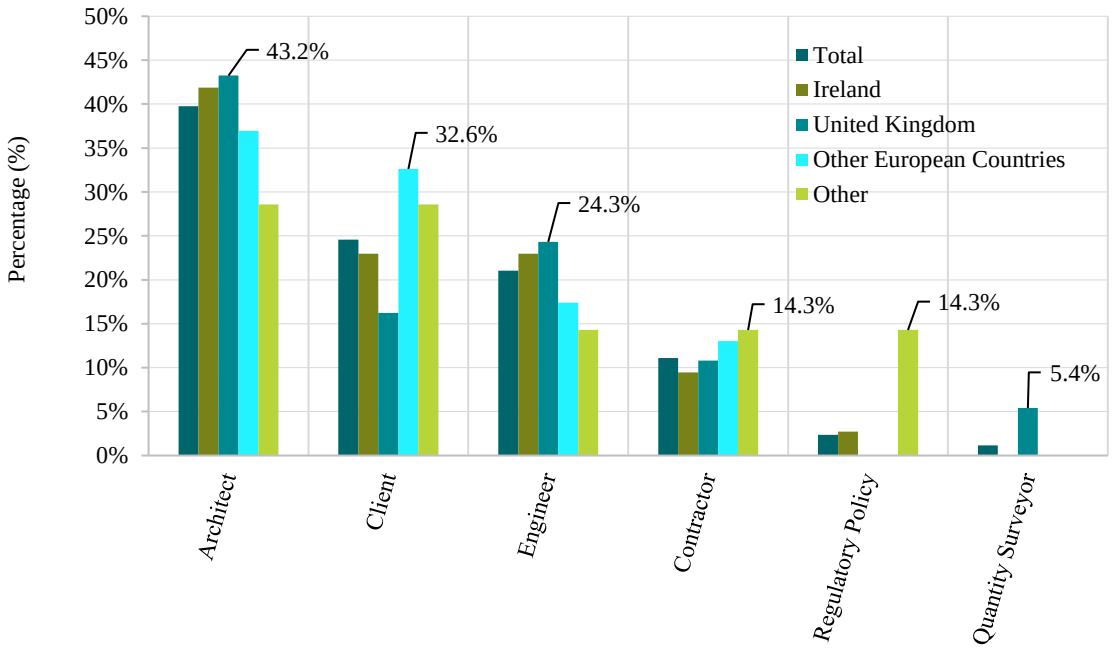


Fig. 10: Who specifies the use of timber in construction projects?

The trend observed for the total population was generally observed when examining the individual results from Ireland, the UK, Other European Countries and Other countries outside of Ireland.

4.4 Building Types

To investigate the perception of timber for particular building types, each participant was asked to indicate which building types are most suitable for timber construction. When examining the total number of responses, Residential buildings (47.7%) and Educational buildings (22.6%) were deemed to be the most suitable structures to use timber as a structural material followed by Office buildings (9.0%), Mixed-use buildings (8.4%), Commercial buildings (7.7%), Industrial buildings (3.2%) and Medical buildings (1.3%) as seen in Fig. 11. The results of responses from Ireland differed from the total responses with 64.3% stating that timber is most suited for residential construction with other building types categories receiving a lower percentage compared to the results for the total number of responses. In relation to educational buildings, 19.6% of the responses from Ireland deemed Educational buildings as a suitable building type for timber construction. This is slightly less than responses from the UK (26.1%) and far less

than responses from the Other (37.5%) category. In fact, the Other category, which included countries like the USA, Canada and Australia deemed timber to be more suitable for Educational buildings rather than Residential buildings. Ireland seems to be associate timber primarily with residential construction.

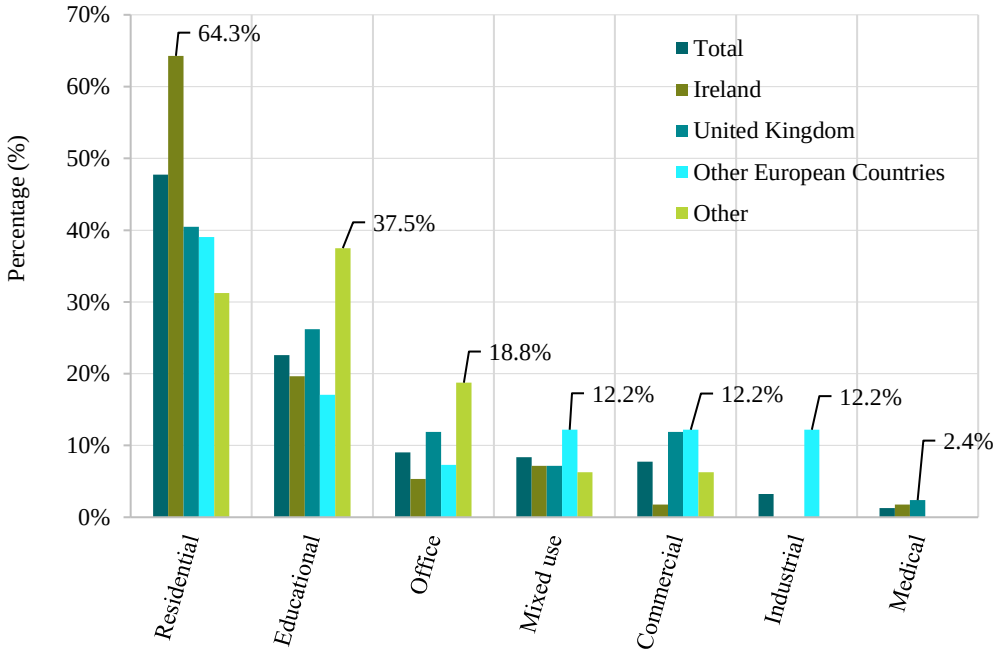


Fig. 11: What type of building is most suitable when constructing in timber?

The suitability of timber as a structural material in offices buildings is relatively low from responses provided in Ireland (5.3%). The UK has seen many timber structures constructed in recent years, many of which are office buildings. The responses from the UK (11.9%) are greater than the total number of responses and only second to the responses from the Other category where 18.8% of responses said Office builds were suitable when constructing with timber. Arguably, while the different regions are mostly in agreement on the most suitable building types, the UK, other European countries and Other countries outside Europe appear to utilise or deem it more suitable, to use timber in a wider range of building types, whereas Ireland primarily deems timber most suitable for residential construction.

4.5 Advantages and disadvantages of timber

The respondents were asked to first determine the most common advantages to timber in construction based on their experiences in their own country. They were then asked to determine the most common issues or disadvantages impeding the use of timber in construction in their country. The most common advantages can be seen in Fig. 12. When considering the total number of responses, Speed of Construction was found to be the most common advantage of timber construction with 17.4%. This was followed by Carbon Sequestration/Storage capacity (15.1%), Aesthetics (13.3%), Strength-to-weight ratio (11.5%), energy efficiency (10.7%), on-site flexibility (8.3%), labour requirement (7.8%), economic performance (7.3%), fire performance (3.9%), durability (2.9%) and acoustic performance (1.8%).

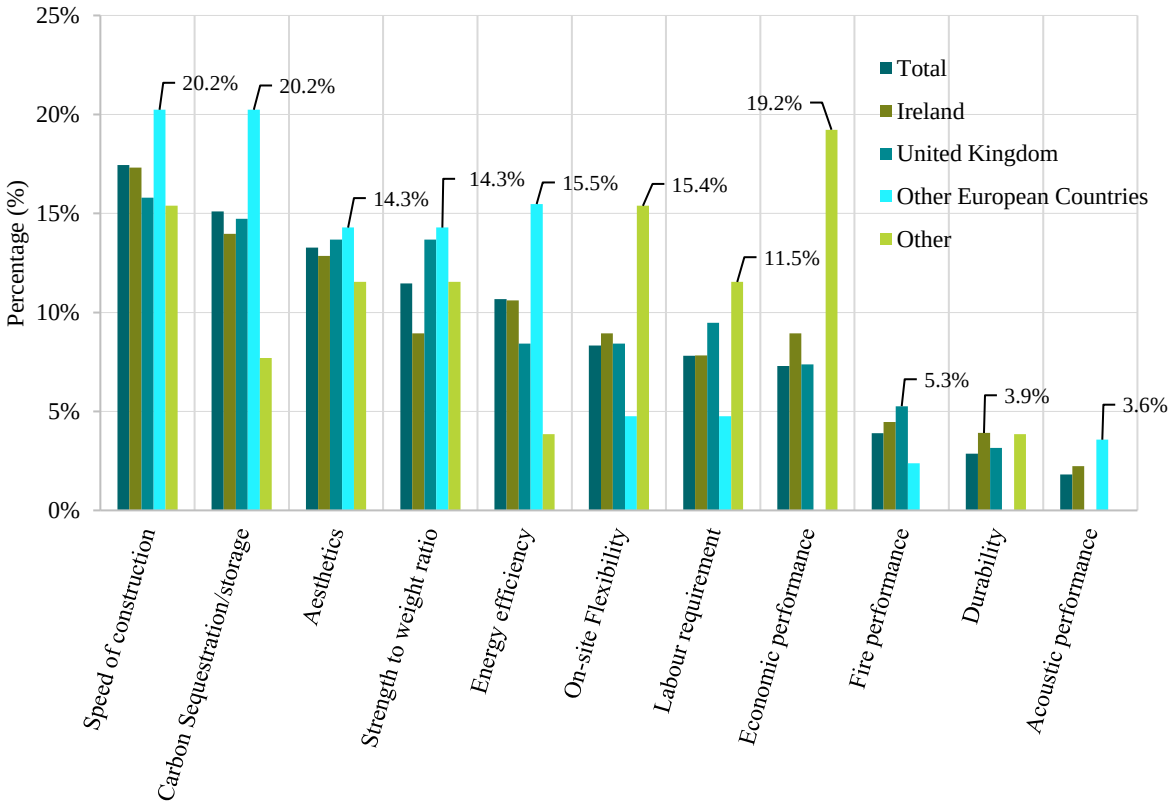


Fig. 12: What are the most common advantages of timber in construction?

The most common issues or advantages can be seen in Fig. 13. When considering the total number of responses, “Poor knowledge of timber among designers” and “Lack of wood culture among designers and clients” were found to be the two largest issues impeding the use of timber in construction projects with 19.7% of responses each. This was followed by “Poor knowledge of timber among construction companies” with 17.9%. It is clear to see that some of the issues impeding the use of timber are a lack of knowledge, experience and skill among design professionals. Other issues were Durability or Moisture problems (9.5%), Fire performance (8.7%), Building regulations (8.1%), Structural performance (4.9%), Acoustic performance (4.3%), Economic performance (3.2%), Connection design (3.2%) and Labour requirement (0.9%).

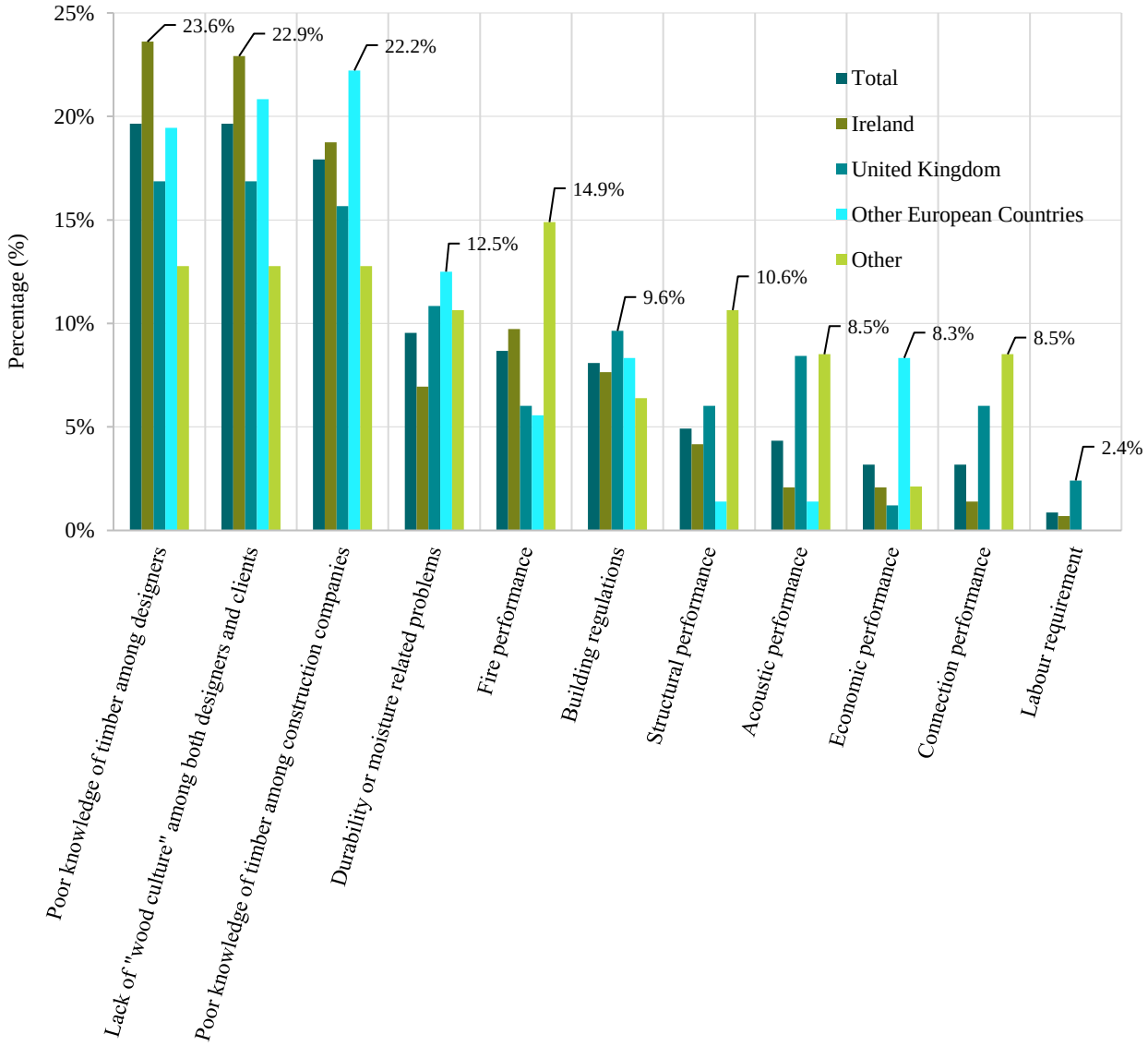


Fig. 13: What issues commonly impede the use of timber in construction?

5 Educational requirements

The educational needs of the participants were assessed and a large proportion (97.3%) of participants were interested in learning more about timber in construction. Further questions related to the format which they would like to receive additional information was asked to those who were interested in learning more about timber in construction.

Each participant was asked to indicate important requirements necessary to promote the use of timber in construction. The education of future practitioners was shown to be the most important requirement. Training courses were shown to be an important factor. Training courses focused on the design of timber structures was shown to be more important than training courses focused on fire design.

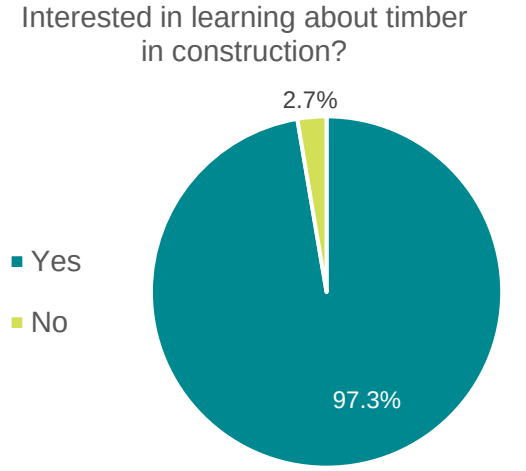


Fig. 14 Percenatge of particpants interested in learning more about timber in construction

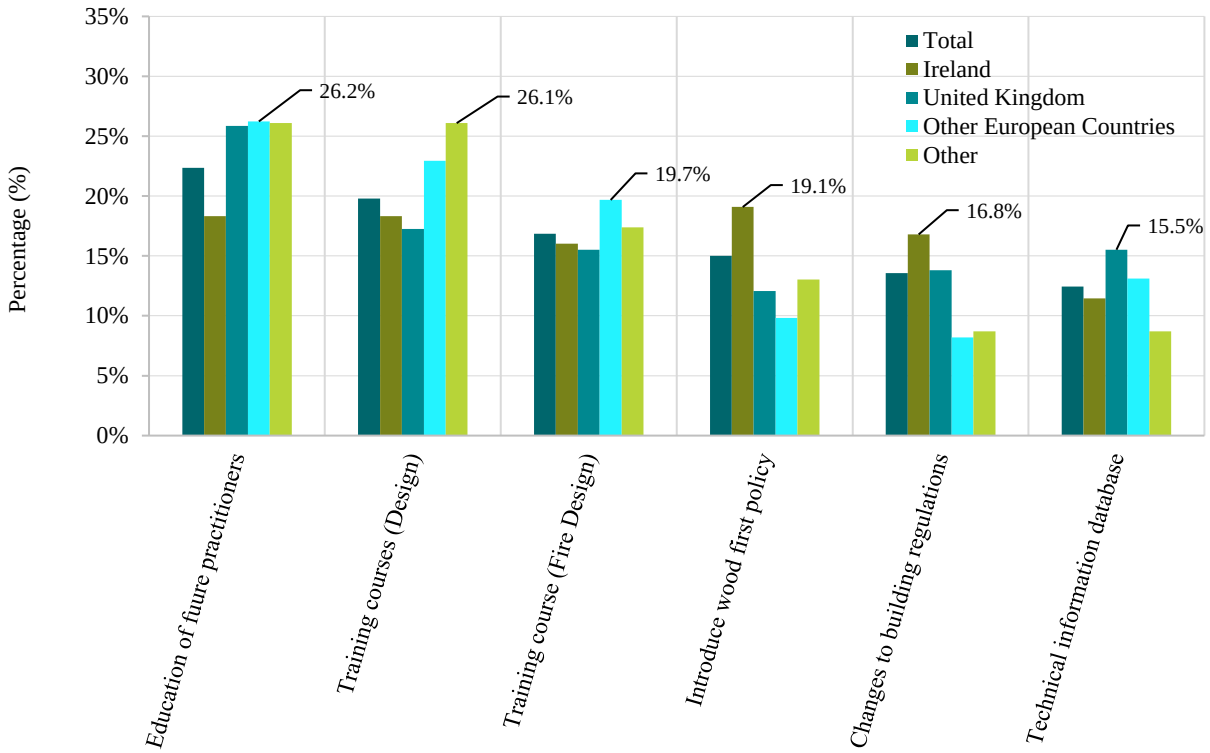


Fig. 15:What are the important requirements to promote the use of timber in construction?

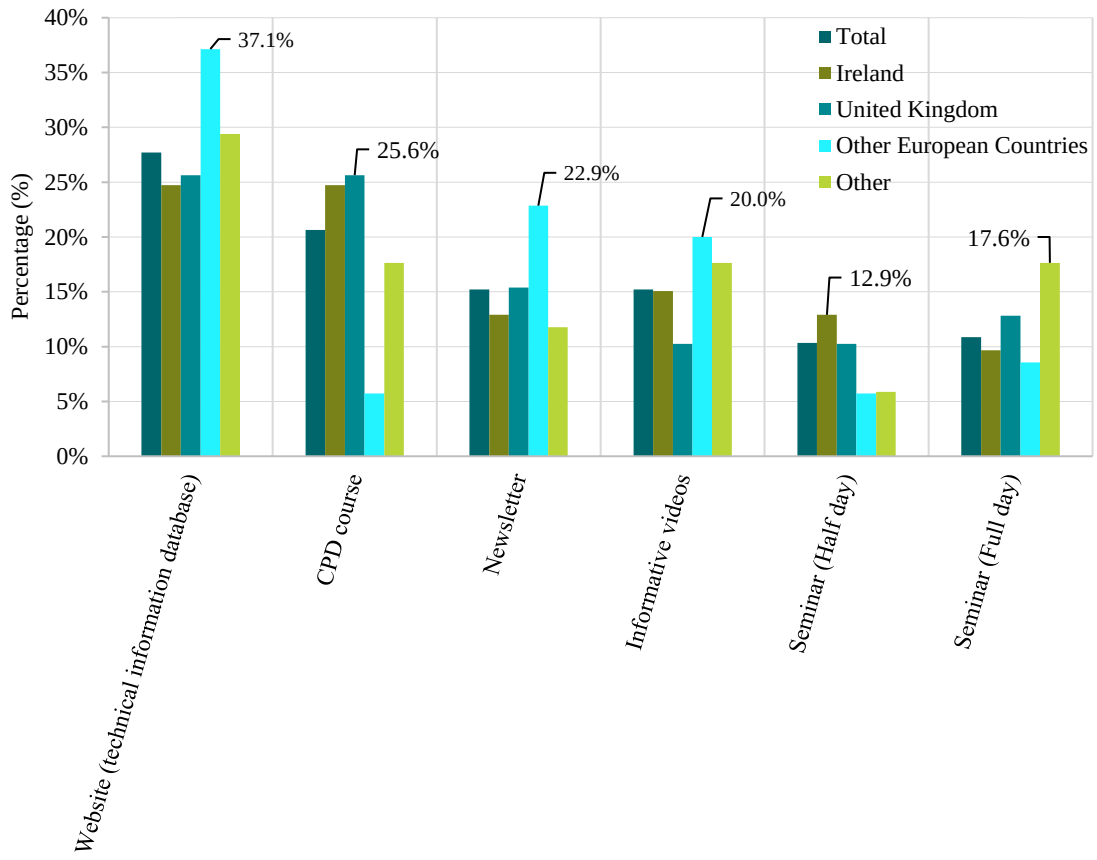


Fig. 16: What is the preferred format to receive information/training related to the use of timber in construction?

5.1 Topics of Interest

Each participant of the survey was asked to present and discuss topics of interest to them and their respective professions. Many respondents identified areas that require further attention. The topics were analysed, and the prominent keywords are identified in the following image where text size indicates the number of mentions. Above all, Fire was identified as the most prominent topic identified by numerous respondents from all professions.

6 Summary

The WoodProps team developed an online survey aimed at all stakeholders within the construction industry (architects, building professionals, clients, engineers, etc.) to examine the perception of timber as a construction material and the requirements of the industry to promote its use in construction. The online survey was carried out between the 12/4/19 and 23/08/19 with a total of 81 responses from 17 different countries. The majority of participants were from Ireland with 47.6% of the total responses followed by 23.2% from the United Kingdom (UK) and 22.0% from other countries within Europe. The remaining 7.3% were from participants outside of Europe (Australia, Canada, USA, etc.). While the primary focus of the WoodProps Programme is to examine the perception of timber in construction within Ireland, it is important to understand the different perceptions and experiences of timber in other countries and particularly neighbouring countries such as the UK where the use of timber in construction is becoming more and more common.

Respondents from European countries and from countries outside of Europe displayed greater familiarity with EWP such as CLT, LVL, DLT, SIPs and NLT when compared to Ireland and the UK. The results for Glulam are very similar for all regions studied. When examining CLT, Ireland reports the lowest value. This is also true for LVL, DLT and NLT. The UK demonstrates many of the same trends as Ireland except CLT which was shown to be more commonly used in the UK. The difference for CLT was found to be the largest absolute difference in familiarity for timber products studied between the regions.

When examining the selection of timber as a structural material, Architects (39.8%) are shown to be significant contributors to the specification of timber in construction projects even more influential than the client (23.6%) in many cases. Engineers (21.7%) and building contractors (11.1%) were shown to be less influential when it came to specifying timber as the structural material. It is clear that the increased use of this material may be achieved through increased engagement with the stakeholders discussed above.

Important information related to the perceived advantages and disadvantages of timber among the respondents was also collected. It is not surprising that Speed of Construction (17.4%) was found to be the most common advantage of timber construction. This was followed by Carbon Sequestration/Storage capacity (15.1%), Aesthetics (13.3%), Strength-to-weight ratio (11.5%), energy efficiency (10.7%), on-site flexibility (8.3%), labour requirement (7.8%), economic performance (7.3%), fire performance (3.9%), durability (2.9%) and acoustic performance (1.8%). A significant finding was that “Poor knowledge of timber among designers” and “Lack of wood culture among designers and clients” were found to be the two largest issues impeding the use of timber in construction projects with 19.7% of the total responses each. Understandably there is a need to increase the knowledge of timber design among designers.

The different regions examined are mostly in agreement on the most suitable building types to utilise timber. The UK, other European countries and Other countries outside Europe appear to utilise or deem in more suitable, to use timber in a wider range of building types, whereas Ireland primarily deems timber to be most suitable for residential construction. While this is the case, a high proportion of participants from Ireland (97.3%) were interested in learning more about the use of timber in construction and interest in learning more about advances in engineered wood products based on the topics of interest suggested. A technical information database was deemed to be the preferred format to receive information on the use of timber in construction. As a result, the WoodProps team have continued to developed a source of scholarly and technical documents to inform architects, developers, engineers, product manufacturers, regulatory professionals and other industry stakeholders on all aspects of wood

products and design. This technical database is known as the "Timber Information Resource Centre" (https://www.nuigalway.ie/terg/knowledge/). The database provides the most up-to-date academic research and informative technical documents under several important topics that have been identified by industry stakeholders. Topics include Design Guidance, Engineered Wood Products, Connection Design, Building Information Modelling (BIM), Fire Performance of timber structures and Case Studies of engineered timber buildings. This database is designed to be a living database updated frequently to keep pace with a fast-moving and innovative industry and is available to anyone interested in learning more about timber and its uses in construction.