

PERCEPTION AND USE OF TIMBER IN CONSTRUCTION: A CASE STUDY OF IRELAND AND THE UK

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ABSTRACT: A survey was carried out to examine the perception of timber in construction among industry stakeholders within northwest Europe. The survey received responses from 17 countries in total. The total results of all respondents are presented along with results specifically from Ireland and the United Kingdom to examine differences in these regions in relation to the perception of timber as a construction material, the barriers impeding its use, and the educational needs and requirements of industry stakeholders. The use of timber in construction in these regions has arguably lagged behind the rest of Europe. A large proportion of participants (97.3%) expressed an interest in learning more about the benefits of timber in construction and highlighted topics of interest to them in their respective professions. The key findings from the survey have identified the educational needs and requirements of the industry and will inform future training courses/material to support the increased use of timber in construction.

KEYWORDS: Architects, Engineers, Timber, Survey, Educational Requirements.

1 INTRODUCTION

In recent years there has been a significant movement within the construction industry to more sustainable and environmentally friendly products with the aim to create environmentally conscious structures. In parallel with this movement, innovation within the construction products industry has never been greater and has resulted in significant improvements in the embodied carbon and energy performance of many construction products. This is also true for the wood products sector which has seen recent advances in Engineered Wood Products (EWPs) which has allowed timber to rival steel and concrete in medium to high-rise buildings [1,2]. While recent advances in EWP products has resulted in increased use of this material in structural applications, some regions appear to have adopted this new technology while other regions have lagged behind. There may be many reasons for such trends in different regions and so a survey was carried out 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 12/04/19 and 23/08/19 with a total of 81 responses from 17 different countries. Surveys can be used to great effect across the world to understand the needs of the industry and to identify barriers faced by the industry in different regions [3–8]. This survey was conducted by the WoodProps Programme in Ireland to examine the perception of timber as a construction material and the requirements of the industry with a view to understanding the barriers impeding the use of timber in modern construction. The survey was aimed at all

stakeholders within the construction industry (clients, architects, building professionals, engineers, etc.) and previous experience of using timber in construction was not a requirement for participation in the survey. When analysing the results, the total number of participants were considered with a distinction made between participants from Ireland and the United Kingdom (UK).

2 SURVEY

2.1 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 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 characterise the mechanical behaviour of Irish timber [9–11] and 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. Regarding profession or role, Structural Engineers were the highest percentage of participants with 27.2% of the total responses, as seen in Figure 1, followed by Civil

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Engineers (17.3%), Academic Researchers (12.4%), Architects (11.1%), Products Manufacturers (11.1%), Building Contractors (6.2%) and the remaining 14.8% comprising Project Managers, Fire Officers, Building Inspectors, Foresters, Regulatory personnel, Health and Safety personnel and the general public.

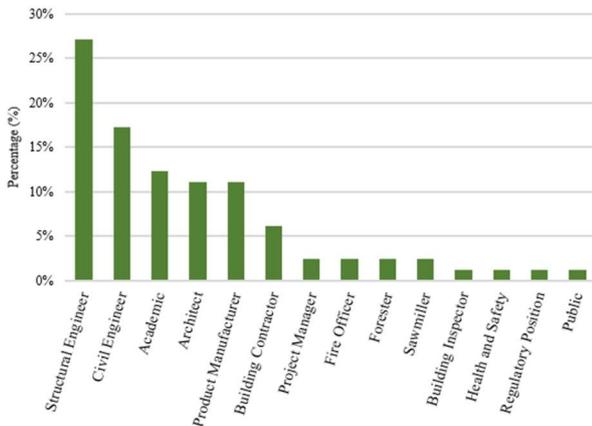


Figure 1: Percentage participation of specific professions

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. 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 mean of all respondents was 11-15 years' experience. Similar results were found when examining responses solely from Ireland and the UK.

3 SURVEY RESULTS

3.1 KNOWLEDGE OF TIMBER IN CONSTRUCTION

Participants of the survey 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 and the UK.

The knowledge level based on responses from particular roles can be seen in Figure 2. 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.

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 found to have medium to high knowledge of 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 of timber in construction.

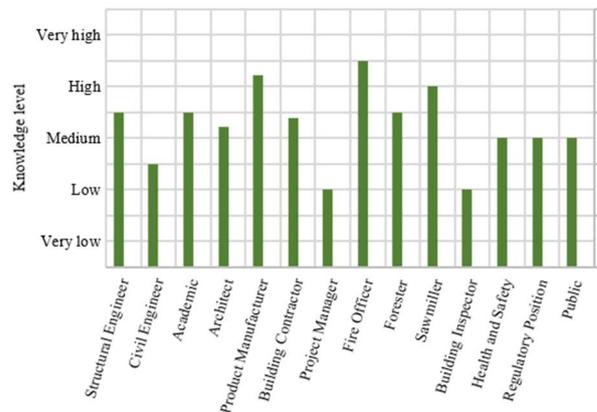


Figure 2: Experience with timber in construction for different roles

The knowledge level with timber in construction has been examined against the years of experience for each respondent and 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 were found to have a low to medium experience level with timber in construction and the knowledge level increased linearly with experience to a maximum mean experience level close to high for respondents with 21+ years' experience. The knowledge level of timber in construction for each respondent has also been examined against the number of employees in their respective companies. Interestingly, the mean knowledge level lies between medium to high regardless of company size as seen in Figure 3.

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.

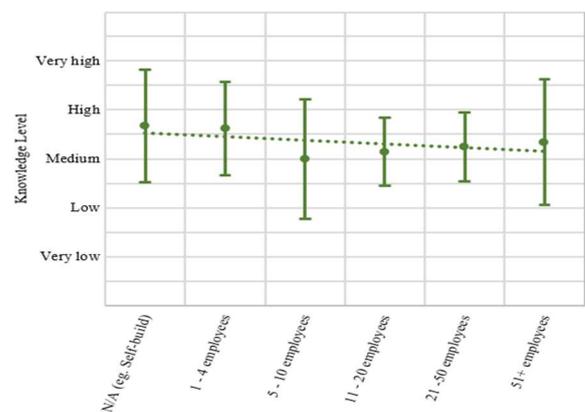


Figure 3: Experience with timber in construction vs. the number of employees at the company

3.2 TIMBER CONSTRUCTION PRODUCTS

Each participant was asked to examine if a timber product was commonly used in their respective countries. The familiarity scale ranged from not common to very common. Timber trusses were found to be the most commonly used timber construction product followed by solid/sawn timber, timber frame, Oriented Strand Board (OSB) and I-joists as seen in Figure 4.

When examining engineered wood products, such as 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), the UK demonstrates many of the same trends as Ireland with the exception of 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 constructed in the UK in recent years.

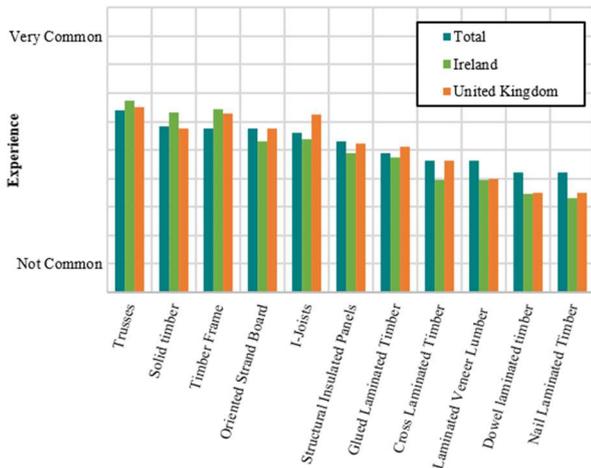


Figure 4: What are the most common types of timber products based on different regions?

Other products mentioned were metal webbed joists, Parallam, Accoya, Hardwood timber and composite materials.

3.3 TIMBER SPECIFIERS

Building professionals play an important role in the construction of a building and together with the client determine suitable materials for the construction of a particular project. The participants were asked to provide their opinion on who specifies the use of timber in construction. The results can be seen in Figure 5.

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 (24.6%) and the 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. The trend observed for the total

population was generally observed when examining the individual results from Ireland and the UK.

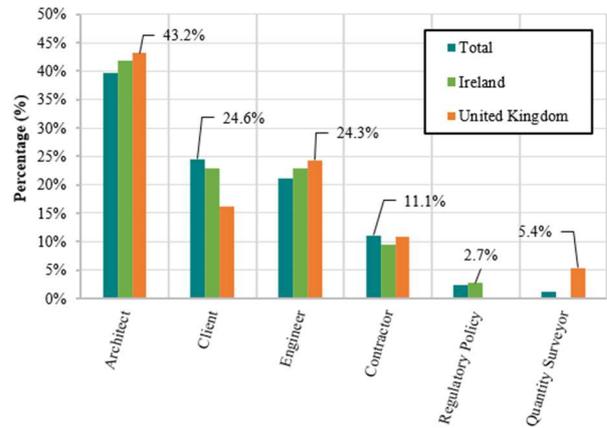


Figure 5: Who specifies the use of timber in construction projects?

3.4 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 Figure 6.

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 type 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%). The results would indicate that Ireland seems to associate timber primarily with residential construction.

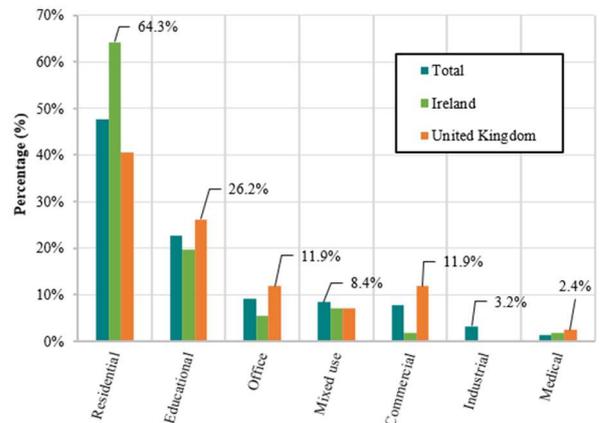


Figure 6: What type of building is most suitable when construction in timber?

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. Arguably, while the different regions are mostly in agreement on the most suitable building types, the UK appears 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.

3.5 ADVANTAGES AND DISADVANTAGES

The respondents were asked to identify the most common advantages and disadvantages of timber in construction based on their experiences in their own country. Speed of Construction was found to be the most common advantage of timber construction with 17.4% of all responses. This was closely followed by Carbon Sequestration/Storage capacity (15.1%), Aesthetics (13.3%), Strength-to-weight ratio (11.5%) and 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%). The trends within Ireland and the UK are largely in agreement with the total population.

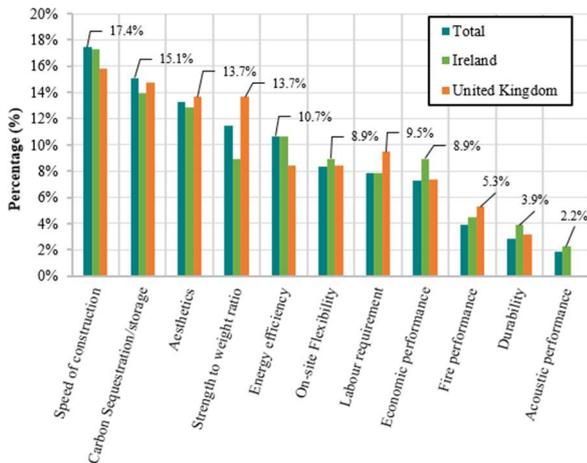


Figure 7: What are the most common advantages of timber construction?

When examining the factors that impede greater adoption of timber used in construction, shown in Figure 8, “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 one of the main issues impeding the use of timber is a lack of knowledge, experience and skills among design professionals. These particular factors are classified as high-level priority factors impeding the use of timber in construction. Other medium-level factors were concerns related to Durability or Moisture problems (9.5%), Fire

performance (8.7%), Building regulations (8.1%), Structural performance (4.9%) and the Acoustic performance (4.3%) of timber construction. Economic performance (3.2%), Connection design (3.2%) and Labour requirement (0.9%) were deemed to be low-level factors impeding the use of construction.

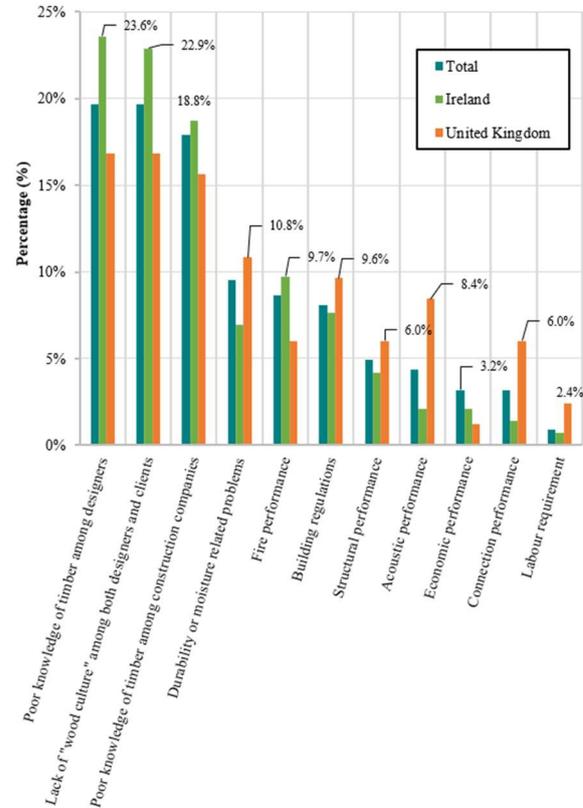


Figure 8: What factors commonly impede the use of timber construction?

3.6 INDUSTRY REQUIREMENTS

The requirements of the industry stakeholders to overcome the current challenges impeding the use of timber and to promote the use of timber in construction was assessed in this survey. The requirements can be largely split into two subcategories, namely, educational requirements and regulatory requirements. In relation to the educational requirements, a large proportion of participants (97.3%) expressed an interest in learning more about the use of timber in construction. Each participant was asked to indicate important requirements necessary to promote the use of timber in construction and topics of interest, specific to each respondent’s profession, were highlighted. Based on the results presented in Figure 8, it can be seen that the Education of future practitioners was shown to be the most important requirement with 22.3% of the total responses. This was followed by training courses (Design) (19.8%), Training courses (Fire Design) (16.8%), and Technical information databases (12.5%). Training courses were shown to be an important factor and training courses focused on the design of timber structures was shown to be more important than training courses focused on fire design.

In relation to the regulatory requirements, the introduction of a wood first policy (15.0%) and Changes to building regulations (13.6%) were shown to receive strong support from the survey participants and particularly from respondents from Ireland.

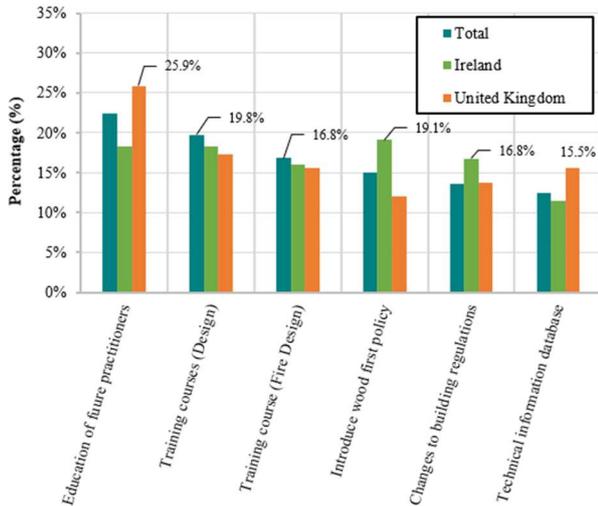


Figure 9: What are the important requirements to promote the use of timber in construction?

The preferred format to receive information and training related to the use of timber in construction was also assessed. The results are presented in Figure 10. A website (technical information database) was shown to be the preferred method to receive information with 27.7% of the total responses. This was followed by Continuous Professional Development (CPD) courses (20.7%), Newsletters (15.2%), Informative videos (15.2%), Seminars (Full day) (10.9%) and Seminars (Half day) (10.3%). This information can be used to inform future training resources/courses/material that will support the needs of building professionals and promote the use of timber in construction.

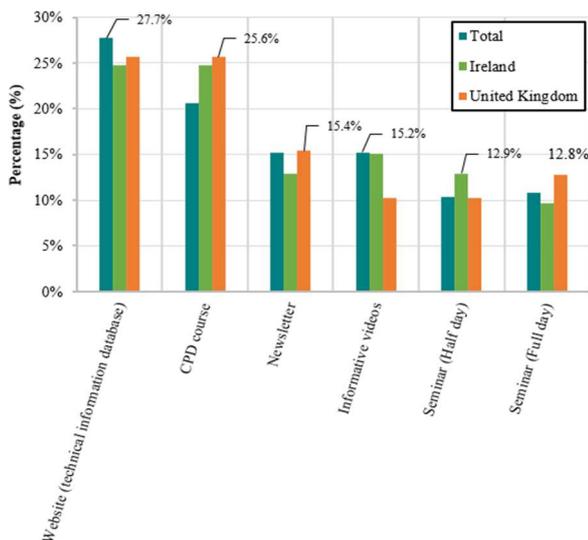


Figure 10: What is the preferred format to receive information/training related to the use of timber in construction?

Each participant of the survey was also asked to present and discuss topics of interest to them and their respective professions. Many respondents identified areas that require further attention and have highlighted areas that have impeded the use of timber in construction. The topics were analysed, and the prominent keywords are identified within a word cloud in Figure 11. The text size indicates the number of mentions. Above all, Fire was identified as the most prominent topic identified by numerous respondents from all professions followed by structural considerations.



Figure 11: Word cloud comprised of topics of interest

4 CONCLUSIONS

The results of the survey have highlighted the perception of timber as a construction material among building professionals in Ireland and the UK. Both regions generally do not have a strong history of building with timber and there are some significant barriers impeding its use in construction. The education of future practitioners was shown to be one of the most important requirements for the industry closely followed by specific training courses. Regarding the specification of timber, Architects have been shown to be significant contributors to the selection of timber in construction projects even more influential than the client in many cases. The survey has also shown that residential construction is deemed the most appropriate building type to utilise timber with lower results for Educational buildings, Office buildings, Mixed-use buildings, Commercial buildings, Industrial buildings and Medical buildings. The educational needs of the industry and particular topics of interest have been examined. The information gathered in this survey will be used by the WoodProps Programme to design targeted educational courses and technical resources that will be used to inform building professionals on all topics related to the use of timber in construction. It is worth noting that the survey was disseminated online via academic and social media platforms, shared among the extended network of the WoodProps Programme and previous experience of using timber in construction was not a requirement for participation in the survey. This allowed building professionals with a mix of positive and negative preconceptions towards timber as a construction material

to participate in the survey. As the preconception of each participant towards timber as a construction material was not assessed, the results should be interpreted with consideration of the possibility that the participants may be a biased sample. It is deemed conservative to assume that the majority of participants were interested in timber construction.

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