buildoffsite
promoting construction *offsite*

Offsite Construction Industry Survey 2006

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1. Executive Summary

Buildoffsite is the UK's industry-wide campaigning organisation promoting the greater uptake of offsite techniques within construction. The supply base for the offsite industry comprises a highly diverse and disparate range of technologies and systems producers, and many of these suppliers do not necessarily see themselves as part of this wider offsite supply chain community.

Buildoffsite recognised that, in order to achieve its aim of growing the offsite sector, it was imperative that the offsite industry could measure itself in terms of its overall contribution to the UK's GDP, and to better understand the depth and breadth of this highly fragmented supply base.

Based on this need, *Buildoffsite* commissioned Mtech Group and Loughborough University, to research the supply side of the offsite marketplace to identify in a structured manner the overall size and make up of offsite activity in the UK.

As a result of this study a report has been prepared showing, possibly for the first time, the size and diversity of the offsite sector. The report categorises the offsite sector into different technology and system typologies, and identifies the estimated UK turnover for each of these categories and estimates for growth.

The report also seeks to provide a better understanding of the shape and complexity of this 'new' industry, with a detailed directory of all of the known offsite manufacturers and importers into the UK. One major hurdle for the investigation team was to define the boundaries for the sector, and to establish a clear basis for measurement. As a result a new "definitions" of offsite solutions has been applied, which will also be used as the basis for future analysis and measurement of this offsite sector. This definition considers part of the offsite sector as mature, in that many of the technologies have been in use in some form for many years and are in regular use throughout the UK. Conversely there are other offsite techniques that are less well established as common construction practice, and many of these technologies have only readily become available in the last few years. This latter grouping of offsite systems has been termed '**innovative offsite**' to distinguish them from those offsite technologies that are the norm for the UK construction business. This does not imply that mature applications are any less important or less effective in realising benefits.

Research findings
The total offsite sector including innovative, mature and the specific project (unique) offsite, could be as high as £6bn in 2006 based on the data available to the research team.

The research shows that the overall size of the '**innovative offsite sector**' in the UK, based on this definition, was in the region of £1.53bn in 2006. This innovative offsite figure is recognised as somewhat conservative. As the report concludes, there is a substantial element of offsite activity within many large construction projects, particularly in some civil engineering developments, that remain unrecorded.

The remainder of this report provides information relating to innovative offsite solutions.

The offsite sector is typified by a highly diverse range of businesses supplying a host of different forms of offsite construction products. The research identified over 346 companies, including some 60 importers bringing offsite products into the UK. A directory has been created identifying relevant company details

together with the type and range of offsite products they offer. For many of these organisations the offsite business is a relatively small part of their overall manufacturing activity, which tends to increase the fragmentation of the sector as a whole.

While the report recognises there is a risk, within a rapidly developing supply chain, of trying to 'pigeon hole' offsite systems and products into pre-defined categories, see *Buildoffsite* Glossary of Terms [4], overall the report argues there is a need to create some structure to define the overall make up of the offsite sector, to better inform those less familiar with the offsite business.

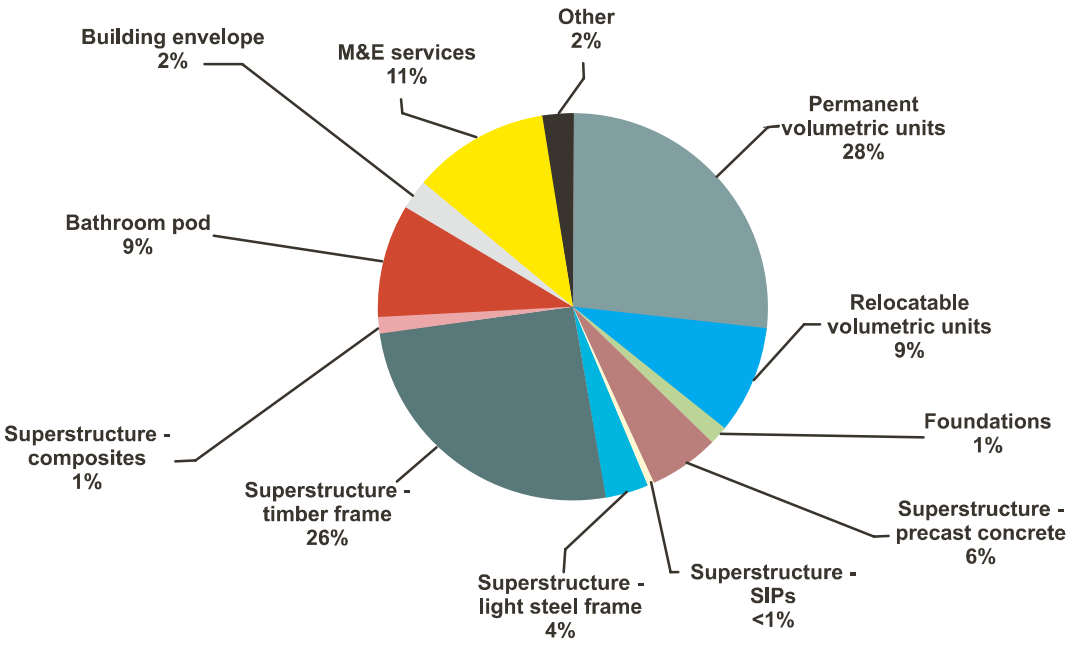

Fig.1: Innovative offsite construction split by technologies
See Table 1 for definitions of sub-categories.

This high-level breakdown of the innovative offsite sector identifies some interesting results. For instance volumetric appears to be the largest innovative offsite sector, with timber frame a close second. This is a slightly misleading in that for the volumetric business a significant proportion of the value is in fit-out of the modules and contract works, both of which are generally carried out on site. Precast concrete for the purposes of this report includes only those systems and products that are included within the innovative definition of offsite, and hence not in routine use within construction in the UK.

Perhaps not surprisingly for an industry that brings together a wide range of both existing and new industries, offsite manufacturers do not generally see themselves as part of the offsite sector, and therefore the need for a single body to represent the interests and growth of this fledgling sector is all the more important.

The offsite supply chain is a dynamic and fast developing market. Typical of a growing and relatively immature market of this nature, suppliers are constantly entering (and in some cases leaving) the market place, and it will therefore be necessary to refresh the directory and the database on a regular basis, to ensure that *Buildoffsite* and the wider construction community can be kept up to date. The key underlying message is that the market for innovative offsite solutions is

growing rapidly with almost all sub-sectors reporting double digit growth.

There is clearly an element of offsite activity that goes unrecognised within construction at the project team level. This has been termed 'unique' offsite to distinguish this activity from the more readily visible offsite activity. This form of offsite could equate to as much as 1% to 2% of turnover for major constructors.

2. Acknowledgements

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- Alistair Gibb, Dept of Civil & Building Engineering, Loughborough University
- Graham Raven, Steel Construction Institute
- Martin Clarke, British Precast Concrete Federation
- Brian Woodley, UK Timber Frame Association

3. Introduction

As the UK's centre for the offsite construction industry, *Buildoffsite* has recognised the importance of identifying the size and the make-up of the offsite construction sector. The main objective of this survey is to collate an industry-wide database of businesses that manufacture or supply innovative offsite products and systems to the construction industry. The intention is to establish the overall size of the offsite construction sector by value on a technology-by-technology basis. The company database is intended to provide *Buildoffsite* with the initial contact details of relevant suppliers.

The company survey is also intended to provide the basis for measuring the future growth of the offsite sector as a whole, as well as defining the different trends of the various sub-sectors that make up the highly diverse offsite construction industry.

Buildoffsite originally commissioned a top-down survey of the offsite sector in 2004 to provide an indicative overview of the potential size of the total offsite activity in the UK. This original market survey, see Ref. [1], prepared for *Buildoffsite* by Loughborough University estimated the offsite market size in the UK at approximately £2.2bn. This original top-down survey reviewed the data published by a number of recognised market research organisations on the size and make up of the offsite sector, in an attempt to arrive at a consensus view of the overall size of the offsite sector based on the various publications.

Market research into the offsite sector is relatively new, and the fragmentation and diversity of the businesses that make up the offsite sector has meant that the research activity for this new piece of market research did not have the experience of previous models or research history to draw comparisons or use as the basis for creating the research methodologies. Consequently the research team had to develop research plans and methods from first principles.

As a result there has been considerable learning both in terms of how to conduct industry surveys in this particular sector and about the sector as a whole. This report does not seek to inform the reader about these specific learning points as this market research report is fundamentally a summary of the findings of the research and the data base itself, the latter is intended to be an electronic tool that can be interrogated.

4. Definition

The offsite sector is not a single industry sector in the traditional sense, but is in fact a coming together of many different industry groups and businesses with a common ambition; the creation of elements of the built environment within a factory environment, rather than on site in what is perceived as the traditional construction manner. A key starting point for the offsite market survey was to establish an agreed definition for the offsite market sector, i.e. define the boundaries and scope of the offsite market in order to then establish its potential 'membership' and from this the overall business size.

For the purposes of this investigation offsite construction is defined as follows, in line with the definition issued by *Buildoffsite*

"Offsite construction is that part of the construction process that is carried out away from the building site (such as in a factory), and which would normally be carried out on site."

(Mtech Group definition)

The key to this definition is the *'normally carried out on site'*.This twist to the offsite definition means that it is essentially a transitional definition; the products and systems it includes changing with time as offsite techniques are adopted as routine and become mainstream construction methods. A typical example of this view of offsite is timber roof trusses. Factory assembled roof trusses for pitched roof construction for the domestic housing sector have been mainstream for the last 25 years or more, replacing the more traditional site assembled methods of constructing a pitched timber roof. The use of timber roof trusses is so embedded into mainstream construction that this technology is considered 'normal construction' and in reality needs no further encouragement to widen the uptake within the construction industry. For this reason the timber roof truss business along with other established technologies have not been included within this innovative offsite market survey.

What has been included in the survey are new innovations within, for example, the truss roofing market to offer pre-assembled roof trusses to create a volumetric element, or where fire protection and insulation etc. is introduced into the roof truss to form a spandrel panel product to increase its added value, and thus the amount of offsite construction it can offer.

Similar analogies can be applied to windows, which are now routinely delivered to the construction site pre-glazed and in many cases pre-finished ready to be incorporated into the works. There are many other examples of these 'mature uses' of factory assembled or pre-finished elements of the built environment, including factory fabricated structural steelwork, precast concrete floor planks and insulated composite steel cladding panel systems.

This view of the boundary definition of offsite construction does generate debate and in many cases it will be the perspective of the user which determines whether the definition should include all pre-assembly, irrespective of whether it is common practice or not. Furthermore, sectors such as precast concrete, structural steel and timber roof trusses are generally well understood and very effectively represented by their membership and research organisations such as British Precast Concrete Federation (BPCF), Steel Construction Institute (SCI) and the Timber Roof Truss Association.

The mission for *Buildoffsite* is to act as a catalyst to grow the use and uptake of offsite within the UK as well as continuing to enhance and grow new applications of offsite construction technologies.The organisation is thus essentially concerned with moving the wider construction industry forward to adopt these new offsite techniques and processes. In pursuing its agenda *Buildoffsite* is working closely with those representative organisations who have been so effective in helping to establish their sector products as main stream products within the UK construction industry.

To help resolve this debate on what should and should not be included within the definition of offsite, the research team (supported by Alistair Gibb from Loughborough University) proposed an alternative explanation of the offsite supply chain that considered the offsite sector as a dynamic supply base that was continually evolving over time. Those building technologies that were considered innovative and offsite at one point in time would, if adopted by the construction sector as normal practice, become mature offsite methods of construction at some future point in the history of construction methods.

This change process could in fact be no more than the normal industrialisation of the construction sector that has been occurring for many centuries. The issue may be that for the construction sector, the pace of industrialisation has occurred much more slowly than in other sectors such as automotive or in computing. It is nevertheless likely that the move towards factory manufacture of elements of construction and away from totally site based techniques is a natural 'industrialisation' phenomenon. The offsite movement could thus be described as an agenda to accelerate and formalise what is a natural progression of the industrialised age and the exploitation of mass manufacturing and mass customisation to improve the efficiency of the construction process.

The graph in Figure 2 is intended to illustrate this position, where mature and established offsite techniques coexist with emerging, innovative offsite

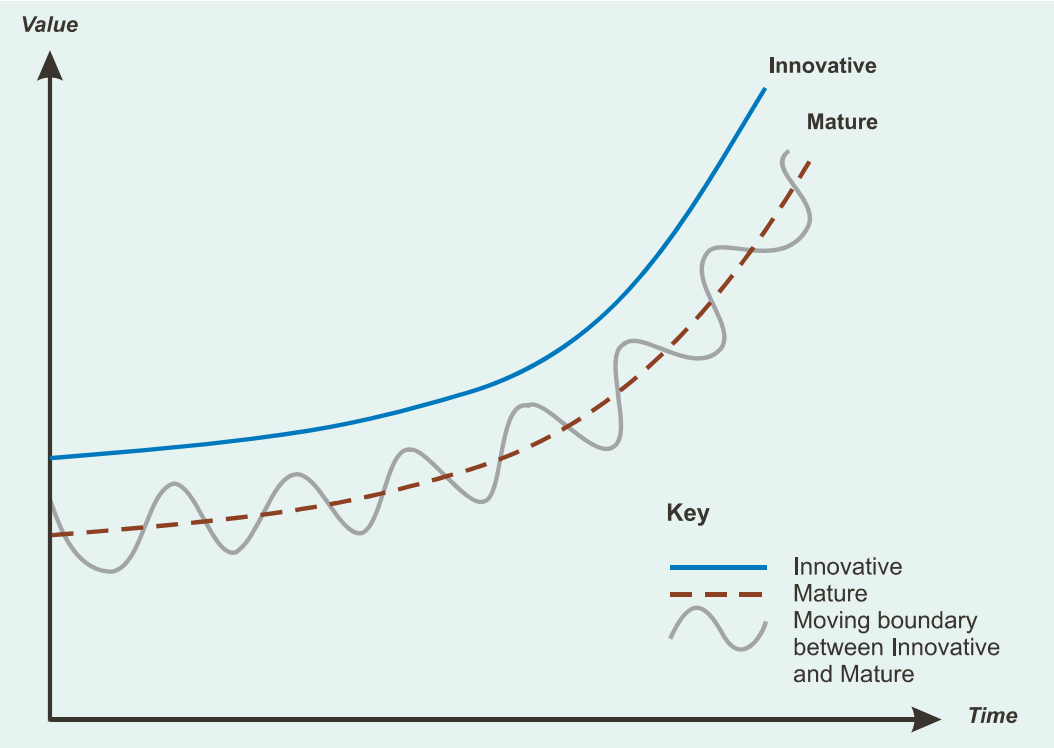

Fig 2: Development of Offsite technologies with time

technologies. While this graph does not attempt to portray an exact timeline or the likely rate of change of either mature or innovative offsite construction, it does indicate that the size of the mature offsite market is quite substantial and thus possibly belies the 'modern' or 'new' label that offsite is regularly attributed with. The graph also introduces a third offsite definition as 'transitional' offsite technologies. While there has been no attempt at sizing this particular category, the reason for its introduction is to recognise that technologies will not move from innovative to mature in a single step, rather there will be a gradual transition from being innovative and less commonly used in normal construction to being the normal method of building. Depending on their position and experience within the construction marketplace, each reader may well have a different perspective on whether a particular methodology is innovative or mature. It is likely that the transitional phase will cover many offsite technologies that are starting to become the norm for construction, such as open cell timber frame or precast concrete cross wall construction.

This market research investigation has, for good reason, concentrated on the innovative offsite marketplace as this is less well defined and by definition is not in common use across the UK construction industry. The research has however attempted to suggest a potential size for the mature offsite marketplace based on discussions with the key trade associations and organisations that support this established sector of the UK construction industry. The value of this market is estimated at £4.5bn.

5. Methodology

As this type of market investigation activity had not been undertaken in this detail previously, it was essential to determine an adequate level of rigour in the approach and establish a means of assessing whether the research was exhaustive.

A research plan was developed by the research team to bring together the existing knowledge and experience of the offsite sector from each of the key stakeholders, *Buildoffsite*, Mtech Group and Loughborough University. The resulting research activity plan is shown in full in Appendix A. The flow chart below indicates the key steps that were undertaken to deliver the research output.

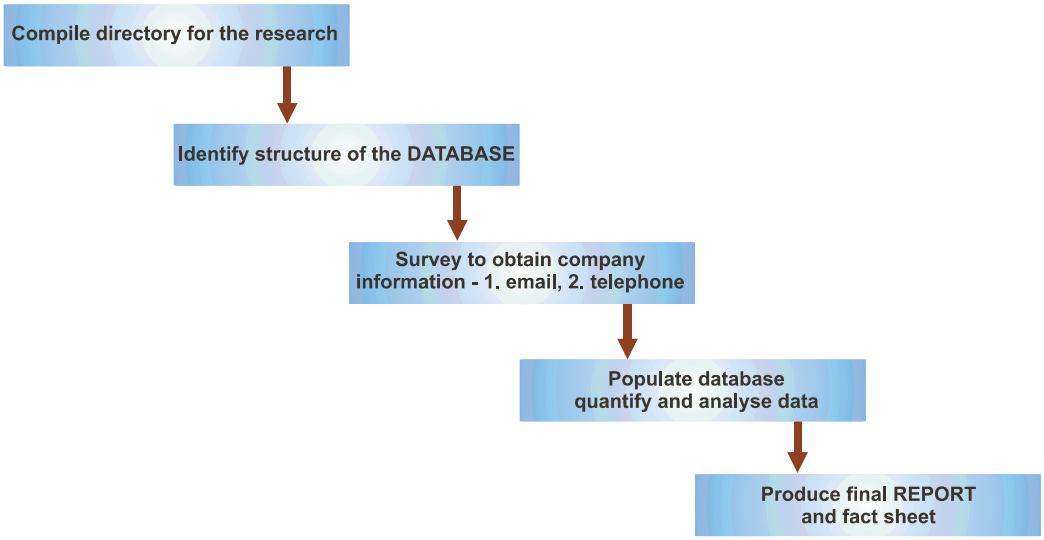

Fig 3. Schematic of processes within the research project

The research plan was approved by the key stakeholders before the research activity commenced. A fundamental first step for the research was to compile an exhaustive directory of businesses that were considered by the research team to be manufacturers or suppliers of innovative offsite products or systems. A number of existing databases [2] provided by the stakeholders were analysed and complied into a single electronic database. This was to form the basis of the database for the output of the market research, and provide the means of interrogation that Buildoffsite might require in the future. Details of the format and fields of this database are included in **Appendix B.**

6. Offsite Sub-Sectors

As an innovative form of construction, new techniques and processes are regularly being developed and introduced into the market. As a result the overall shape and appearance of the offsite sector is difficult to define accurately as it is continually changing shape and size. Furthermore, there is currently no accepted or recognised definition of the make up of the offsite industry or the sub-sectors that necessarily comprise the overall offsite sector.

In order to give some structure to the research it was necessary to establish the range of sub-sectors or offsite product categories that would be used to appropriately apportion the offsite sector into its constituent parts. While the offsite sector is considered in the singular it is in fact highly diverse and made up from a number of different supply groups and product systems, each with differing history, drivers and objectives.

For the purposes of this market research the following offsite sub-categories have been used as the basis for categorising the industry into its key constituent parts (see table 1). As this has not been considered before, there is clearly more debate needed by *Buildoffsite* and the industry as a whole to verify these sub-sectors as a n appropriate reflection of the offsite industry. For the reasons given above these sub-sectors are likely to change, with new products and processes possibly requiring additional categories.

These sub-sectors ideally need to be reviewed by *Buildoffsite* on a regular basis, and certainly if future updates of the survey are planned, to assess the validity and usefulness of each category to the wider construction community. These sub-sectors are a development of the market breakdown used in the original *Buildoffsite* survey [1], and reflect the greater awareness the industry now has of its make up and activity

1.0 - Complete structures		
1.1	**Relocatable volumetric units**	
1.2	**Permanent volumetric units**	
2.0 - Structural Elements and Systems		
2.1	**Foundation**	
	2.1.1	Steel or precast piling, ringbeam, and foundation systems
2.2	**Substructure**	
	2.2.1	Pre-assembled substructures
	2.2.2	Precast or pre-assembled below-ground services distribution
2.3	**Superstructure**	
	2.3.1	Precast concrete elements
	2.3.2	SIPS
	2.3.3	Light steel frames
	2.3.4	Timber frames
	2.3.5	Composite elements (e.g. GRP)
2.4	**Building envelope**	
	2.4.1	Pre-assembled façade systems
	2.4.2	Pre-assembled roof systems
2.5	**Building services**	
	2.5.1	Bathroom and kitchen pods
	2.5.2	Pre-assembled mechanical and electrical services distribution
	2.5.3	Pre-assembled mechanical and electrical products and systems
	2.5.4	Pre-assembled plantrooms & packaged plants
3.0 - Civil engineering		
3.1	**Pre-assembled civil engineering structures**	
4.0 - Special		
4.1	**Special structures (e.g. stadia)**	
4.2	**Unique (project-specific) offsite construction**	

Table.1: Offsite Construction Categories, see Appendix E for links to Buildoffsite's Glossary

7. Survey process description

Once the directory of offsite manufacturers and suppliers was compiled and verified, an email covering letter and a survey questionnaire were prepared and sent out to the personalised contacts of the companies identified in the directory, (the covering letter and questionnaire are shown in Appendix C).

A two-week period was allowed for responses before the telephone research commenced. The telephone research and expediting of the questionnaires was carried out by consultants from Mtech Group with direct experience of the offsite construction sector.

The research team experienced a disappointingly low rate of response in both phases of the research, i.e. email and telephone. Figures are indicated in the table below:

Item	Original research April 2006		Updated research September 2006	
	No.	Ratio	No.	Ratio
Questionnaires sent	346	-		
Questionnaires reaching the target	331	-		
Amended database of offsite manufacturers	**338**	**100%**	**346**	**100%**
Responses received	81	24.0%	107	30.9%
- of which responses received – email survey	15	(4.4%)	15	4.3%
- of which responses received – telephone survey	66	(19.5%)	66	19.1%
- additional responses received			26	7.5%
Offsite manufacturers data from company accounts	117	34.6%	104	30.1%
Stakeholder qualified offsite manufacturing output	78	23.1%	81	23.4%
Unqualified contribution to the offsite sector	62	18.3%	54	15.6%

Table.2: Survey characteristics

There was generally a low willingness and occasionally a strong resistance, to providing the requested information, especially regarding details involving company turnover. Many companies have quite strict policies in this area and they are not willing to participate in any research that requires divulging what is regarded as commercially sensitive data of this kind. Assurances that the data would only be summarised and individual details discarded on completion of the research did not change this view. Interestingly those organisations that resisted releasing this information included many manufacturers who are currently members of *Buildoffsite*

Where the research team were unable to obtain the necessary information from any of the three preferred methods (i.e. email response, telephone research, or company accounts data), the team applied the specialist knowledge of recognised expertise within the particular sub-sector. This expertise was sourced from both within Mtech Group and other stakeholders and, where appropriate individuals from within the offsite manufacturing sector itself. These expert assessments were reconciled with the known industry data for that

particular sector to provide a degree of verification. In general the telephone research concentrated on the major manufacturers within each sub-sector to ensure that the most significant contributions were verified, in preference to the numerically larger proportion of smaller producers.

While this approach to determining the total size of the innovative offsite sector is clearly not preferred, it does make use of recognised set theory, where the companies that make up the set are known with a good level of confidence and their existence can be corroborated (e.g. Companies House). Additionally, in this particular case the accuracy of the set theory is enhanced by the use of the industry experts used to apply the set theory predictions for those companies who were not able to divulge their turnover performance within offsite.

It should be noted however, that this approach is limited in situations where there is believed to be a considerable 'tail' of smaller organisations. In such cases, the theory is likely to underestimate the overall population of the sub-sector.

It is also acknowledged that project-specific offsite technologies, especially for large projects have not been included in this survey (see section 8.3) Such applications may be of a significant value, but it has not been feasible to access the data. Considerable further work would be necessary to establish the size of this 'sub-sector' and it is unlikely to be comparable year on year due to the unique nature of such large, one-off projects.

The veracity of this approach to qualifying the overall size of the innovative offsite industry has been demonstrated by the findings gathered from the latest research (September 2006), where the outputs of a further 26 companies were confirmed directly by the supplier/manufacturer. Interestingly, as identified in Tables 3 & 4, the corroboration between the estimated value of turnover and the actual turnover is within 5.5% error bandwidth, which the research team consider is acceptable for this type of market research. On this basis it would seem reasonable to assume that the overall accuracy of the innovative offsite marketplace should be within similar boundaries.

8. Research Investigation Output

8.1. The dBase

A key part of the project output is the offsite supplier database of companies. It includes a comprehensive list of the 346 companies that the research team consider to be offsite suppliers within the definition outlined in Section 2 of this report. The database includes address, telephone and web contact details together with the sub-categorisation of their offsite product or system.

The electronic version of the database has been set up to provide a search interface to enable Buildoffsite to locate particular businesses that supply or manufacture specific offsite products by category and location.

A hardcopy version of this database is included in Appendix D as a list of companies only, for general information. It should be noted that the database is up to date to September 2006, and it will need a regular maintenance and update revisions to be useful in future.

8.2. Size of innovative offsite construction sector

The overall size of the innovative offsite construction sector has been derived from the summation of the values of factory output identified in the methods described in Section 5 above and the research methodology detailed in Appendix A1 and A2. This value is intended to be a measure of the total ex-factory gate value of all of the offsite products or systems used in the UK in 2005. This offsite output is thus intended to exclude all the site based activity, transport and craneage, etc. (and hence value), that is routinely involved to greater or lesser extent with all offsite technologies.

Where suppliers have provided factory output data for earlier periods or across different fiscal years, the research team has attempted to 'normalise' the output based on average industry inflation rates. Additionally some suppliers have found it difficult to discriminate between factory and site based activities, or between offsite products and systems that they produce and those products that do not fit the *Buildoffsite* definition of innovative offsite construction.

In both cases the research team has attempted to reconcile the data to an equivalent factory output value by adjusting the given output based on known industry ratios for the particular sector. Generally these ratios have been derived from validated data from manufacturers within the same sector.

The overall size of the innovative offsite sector for the UK, normalised to 2005 and based on the research completed in March 2006, is assessed from a summation of all the factory outputs to be as shown in Table 3:

Total factory turnover - all innovative offsite sectors - £		
Researched contributors	682,984,000	47%
Assessed value for non-contributors	768,100,000	53%
Total	**1,451,084,000**	**100%**

Table 3 March 2006 research findings for the Innovative Offsite Sector

This earlier research has now been updated with further information gathered from the offsite manufacturing sector, confirming the actual factory turnover for a number of companies that hitherto had been 'assessed' by the expert panel to apportion a factory turnover, see Section 7 for details.

This latest research (completed in September 2006) indicates that the overall size of the innovative offsite sector is as shown in Table 4:

Total factory turnover – all offsite sectors - £		
Researched contributors	946,813,000	62%
Assessed value for non-contributors	583,100,000	38%
Total	**1,529,084,000**	**100%**

Table 4: Sept 2006 research findings for the Innovative Offsite Sector

The above value includes imports into the UK of offsite products and systems, (this is true for all turnover tables for the sub-categories listed below), and by default export from the UK. It has generally proved impossible to separate true value of exported offsite product from UK manufacturers.However, from discussions with many of the major UK offsite producers the research team believe that the value of innovative offsite products and systems exported from the UK is very small, and any errors introduced by ignoring this value would be within the current error bandwidth identified earlier, in Section 7.

Clearly the value of exported innovative offsite product is unlikely to remain insignificant, particularly if the offsite sector in the UK continues to grow at the rate identified in this report. Future studies of the offsite sector (both innovative and mature) will need to consider how to identify and measure the exported value of this business to the UK GDP.

As explained earlier, project specific, one off applications of offsite are not included in these figures, neither are the mature offsite sectors.

The following sections identify the sub-sector breakdown of the total innovative offsite output for the UK. This breakdown mirrors the sector categories proposed in Section 4, however there are instances where manufacturers have been unable to provide any level of discrimination between their different systems and the research team has had no option but to aggregate the factory output across a range of sub-categories. This has normally only occurred within the less well defined sub-sectors such as M&E and precast concrete businesses where unravelling the different systems and determining whether the product is strictly within the *Buildoffsite* definition has proved too inaccurate to provide adequate discrimination.

8.2.1. Complete volumetric modules

This sub-category is one of the largest categories in the whole of the innovative offsite construction industry. This sub-sector has traditionally been measured by including jack-leg cabins, storage containers and other temporary use volumetric units. While this product is not strictly offsite in the spirit of the definition derived for this survey, it has not proved feasible to discriminate between true building/construction applications and those, such as site office accommodation, which are not strictly novel or innovative offsite.

Fig 4: Volumetric units. Source: Yorkon and Cartwright Pickard Architects

However the research team has attempted to segregate out, and did not include, the hire or rental income for this particular sector, which is very significant being in the order of £500m to £550m per annum. The rental income has generally skewed the view of both the output and the profitability of this particular sector.

Volumetric building systems are characterised by the incorporation of the building superstructure within the volumetric module, distinguishing this sub-sector from other 3-Dimensional elements of construction that require a separate superstructure to support them. This categorisation is discussed further in glossary [4]. A range of material types are in use, though most volumetric modules use hot rolled steel as the main structural medium.

This sub-sector has been in existence for over 30 years in its present form, though was generally better known for the manufacture of volumetric construction site offices and other temporary applications. This sub-sector is therefore relatively stable with a limited number of well known manufacturers.

Major market players in 2005 were the following; listed alphabetically:

- Britspace Modular Buildings
- Caledonian Building Systems
- Elliott Group
- Portakabin
- Rollalong
- Terrapin
- Thurston Building Group
- Unite
- Waco
- Wernick
- Yorkon

Imports are marginal in this sector, estimated at less than 2% and exports even lower at less than 1%. In terms of future trends for this subcategory, manufacturers expect to grow relatively modestly next year, which the research team found surprising given the growth pressures on the sector as a whole. Manufacturers also expect imports to grow, though the basis for this view is not clear. The level of added value achieved within the factory produced element appears to vary significantly between the manufacturers, with some producers delivering up to 85% of the finished building value in the factory.

The overall size of the volumetric product business within the UK is indicated as follows:

Table 5 *Relocatable volumetric units*

1.1 Volumetric relocateable units – factory value £		
Researched contributors	102,922,000	76%
Assessed value for non-contributors	33,000,000	24%
Total	**135,922,000**	**100%**
Growth expectations (aggregated)	**8% pa**	

Table 6 *Permanent volumetric units*

1.2 Volumetric permanent units / Turnover £		
Researched contributors	332,540,000	80%
Assessed value for non-contributors	81,000,000	20%
Total	**413,540,000**	**100%**
Growth expectations (aggregated)	**25% pa**	

The growth forecasts for 2006 and beyond are positive for this sector, with a very substantial annual growth predicted for the permanent volumetric supply chain. While this appears very substantial, it needs to be viewed against the size of the potential market that this sector now finds itself supporting. The demand for affordable housing, student accommodation, retirement and keyworker homes and custodial needs is having a significant effect on this sector.

8.2.2. Foundation and Substructure

This category includes all factory manufactured foundation systems and below ground substructures such as basement systems, pre-assembled foundation systems, precast or steel ring beams, below-ground service distribution systems and other pre-assembled substructures. Precast concrete is the dominant material type in this sub-sector, though some systems are based on steel.

Fig 5: Precast foundation system. Source: Van Elle

Major market players in 2005 were:

- Roger Bullivant
- Van Elle
- Buchan

Discrimination between non-offsite and offsite products and systems (in line with the *Buildoffsite* definition) is difficult for manufacturer and user alike. Factory produced grey precast concrete has been in use for many years as piling systems, precast flooring slabs, etc. It is anticipated therefore that both the measured contributions and estimated contributions are relatively less precise than is the case for other categories. Both exports and imports are very low, estimated at less than 1% to 3%, however this is not surprising given the commercial reality of relatively low product added value and high transport cost.

Table 7 *Turnover £ Foundation and Substructure*

2.1 & 2.2 Foundation and Substructure / Turnover £		
Researched contributors	16,576,000	87%
Assessed value for non-contributors	2,500,000	13%
Total	**19,076,000**	**100%**
Growth expectations (aggregated)	**up to 75% pa**	

The growth forecasts for 2006 and beyond were only made formally available from the one supplier. This forecast is very substantial and again almost certainly reflects the growth in demand from the housing sector throughout the UK. While other suppliers in this sector were not willing to share their expectations for this sub-sector there was nevertheless a general view that demand would grow quite dramatically, albeit from current low annual turnovers.

8.2.3. Superstructure – Precast Concrete

This category includes above ground precast concrete elements that are typically not being used in mainstream construction in the UK, i.e. innovative offsite. Thus this category includes factory pre-finished wall panel systems usually incorporating windows and cladding finishes, but the category does not include precast hollow core floor planks or precast lintels for the same reasons stated previously, these particular examples are now mainstream construction and therefore considered mature offsite within the *Buildoffsite* definition.

Fig 6: Precast concrete elements. Source: CV Buchan

For the same reasons identified for below ground substructures, the measurement of offsite in this category is relatively imprecise as this precast concrete sub-sector has a long tradition in the UK, and manufacturers find it difficult to discriminate between innovative technologies and mature mainstream offsite applications.

Major market players in 2005 were:

- Bell & Webster
- Bison Concrete Products
- Buchan Concrete
- Hanson Building Products
- Tarmac Precast
- Techrete UK Ltd
- Trent Concrete

Exports and imports are somewhat limited for the same reasons identified for below ground precast substructures. However where the finished product has a relatively high value, such as an externally pre-finished wall panel systems, import (and export) become potentially commercially viable. Most manufacturers are expecting recent growth trends to continue for the foreseeable future.

Overall precast products manufacturing (including mature offsite products such as pre-cast concrete floor planks, beam and block flooring, etc.) is considerably greater than the volume of just the innovative offsite precast concrete products identified in this survey.
GRC (Glass Reinforced Concrete & its variants) are a version (possibly) of precast concrete. While not mainstream for most constructors the product has

been available in the UK for some time. UK manufacturers of this technology are few and far between and the transfer of learning from one project team to the next is very limited. The value of GRC (and its cousins FRC – Fibre reinforced concrete) has very little impact on the overall picture of the sector.

Table 8 *Turnover £ Pre-cast concrete systems*

2.3.1 Precast Concrete Systems / Turnover £		
Researched contributors	43,652,000	48%
Assessed value for non-contributors	46,500,000	52%
Total	**90,152,000**	**100%**
Growth expectations (aggregated)	**up to 72% pa**	

The growth forecasts for 2006 and beyond were only made formally available from three suppliers. This forecast is very substantial and again almost certainly reflects the growth in demand from the housing sector for apartments, as well as growth in schools and to a lesser extent to the demand in the healthcare sector. This anticipated growth in the marketplace is reflected in the considerable investment in new production facilities that is currently taking place within this sector.

8.2.4. Superstructure - SIPs

This structural insulated panel systems category is fairly straightforward to define, as this sub-sector is relatively new to the UK and thus there are few manufacturers or suppliers serving the UK market. Within the definition of innovative offsite, the full factory output is offsite, though as with all panelised systems there is an element of on-site activity involved in the transport, erection and finishing of the panelised superstructure at the project site.

As there is a very limited number of companies active in this sub-category, both the contributory and assessed contributors' data are relatively precise compared with other categories.

The predominant market player in 2005 is:

- Kingspan TEK (imported panels from Germany)

Other systems include:

- Excel Industries
- Hemsec (Siptec)
- SIPS Industries (Bpac)
- Vencel Resil

Overall, the market size for this sector is small compared with say open cell timber frame. Since there are very few SIPs manufacturers in the UK, it is believed that no SIPs were exported, and 'imports' are in the order of 80%, mostly from continental Europe (Kingspan TEK and Vencel Resil etc.). However, strictly speaking, this is not a true imported product as there is an element of manufacturing (panel machining) required in the UK for these imported large panels. Therefore, for the purposes of this survey they are defined it as UK produced products. A number of existing suppliers are considering the case for setting up a complete manufacturing capability within the UK and there are some potential new entrants in this sector too.

Fig 7: SIP's - Source: Kingspan Insulation Limited

Table 9 *Turnover £ SIPs*

2.3.2 SIPs / Turnover £		
Researched contributors	830,000	21%
Assessed value for non-contributors	3,100,000	79%
Total	**3,930,000**	**100%**
Growth expectations (aggregated)	**33% pa**	

Note the reason for the rather high proportion of assessed to researched contributions in this sub-sector is due to the simple fact that this sector is currently dominated by one major manufacturer, and for reasons of commercial sensitivity this particular supplier was unable to verify their overall turnover of SIPs products. However knowledge of this supplier's contribution to the total UK turnover of SIPs is well reported within this small supply chain and has thus been included within the assessed value of factory turnover.

The growth forecasts for 2006 and beyond were only made formally available from the 'minor' suppliers in this sub-sector, and thus reflect their expectations of growth from generally limited annual turnovers. All suppliers believed they would benefit from recent changes in the Building Regulations and the general trend towards better thermal performance, as they consider such aspects to be distinguishing characteristics for their products.

8.2.5. Superstructure – Light Steel Frame

This category includes light steel framing (LSF) systems that are manufactured as a frame or panel within a factory environment. On site assembled stick-built light steel structures are excluded from the survey as this method is not considered to incorporate sufficient offsite activity, i.e. they are components rather than pre-assembled products. Hot rolled steel superstructures are also specifically excluded from this sub-sector unless preassembled into frames or unusually large format panels within the factory environment. Volumetric steel units constructed from light steel framing are already included in sub-category 1.0 & 1.1, and are thus not included within this category. Light steel framing sections are frequently roll-formed by one supplier (usually a large manufacturer), and then offered to framing system panel assemblers and erectors. This survey attempts to provide a measure of the final stage in the supply chain to the contractor (panel supply), rather than the section roll-formers, who traditionally supply to a wide range of other end users. Thus the research team has attempted to avoid the 'double-counting' that is typically involved in the assessment of this particular sub-sector.

Major market players in LSF in 2005 were:

- Bourne Steel
- Framing Solutions
- Fusion Building Systems
- Metek Building Systems
- Terrapin International

Exports are almost non-existent in this sub-sector that is still in the process of defining a standard offering and approach to the marketplace. Imports exist, mainly from continental Europe, but are not considered significant and generally involve the supply of sections only, which would be already accounted for within this survey as they are assembled by UK organisations.

Fig. 8: Light steel frame. Source: Ward Building Components Limited

Table 10 *Turnover £ Light steel frame*

2.3.3 Light Steel Frame / Turnover £		
Researched contributors	38,275,000	62%
Assessed value for non-contributors	23,000,000	38%
Total	**61,275,000**	**100%**
Growth expectations (aggregated)	**16% pa**	

The growth forecasts for 2006 and beyond are certainly plausible for this sector, given that the sector is currently enjoying considerable demand from the housing sector, particularly in apartments. The desire for RSL's (Registered Social Landlords) to meet the Housing Corporation's requirement to adopt greater levels of MMC (Modern Methods of Construction) within the sector is cited by many suppliers as one of their reasons for anticipating this annual growth in demand.

8.2.6. Superstructure – Timber Frame

This category covers timber framing systems including both open and closed cell timber panel systems. Post and beams systems are generally excluded from this category as well as roof trusses and other component joinery works.

There could be an argument to consider open-panel systems as part of the mature sector because of the length of time that they have been available. But, for this survey, they have been included as part of the innovative offsite category.

This category is quite different to the light steel framing sector, offering a well defined and standardised scope of service within a reasonably mature, if not always sophisticated supply chain. The sector has a substantial number of suppliers and a robust trade association and lobby group in UKTFA (UK Timber Frame Association). The sector includes large and small format panel systems, and various levels of added value (i.e. from open cell to closed cell complete with windows, doors, insulation and first fix building services etc.). Some systems such as Space4's high profile product are considered by Major market players in 2005 were:

- Century Homes
- Kingspan
- Prestoplan Purpose Built
- Robertson Timber Frame
- Scotframe
- Space4
- Stewart Milne
- Taylor Lane

Exports of timber frame systems are marginal, which is related to the relatively low value and the current high demand for timber frame in the UK. This demand is creating opportunities for importers who currently account for some 10% to 15% of UK factory value, though generally oriented towards the higher value end of the domestic housing market. These import figures are included in the table below.

Most UK manufacturers are predicting continuing growth in demand, with many manufacturers taking the opportunity to invest in new production plant or additional production capacity. This growth has generally been triggered by the demand in affordable housing, where the sustainability benefits of timber frame are perceived to be of significance to the end customer.

Table 11 *Turnover £ Timber frame*

2.3.4 Timber Frame / Turnover £		
Researched contributors	242,416,000	62%
Assessed value for non-contributors	149,000,000	38%
Total	**391,416,000**	**100%**
Growth expectations (aggregated)	**28% pa**	

Overall timber products manufacturing (including panels, trusses, posts, beams, and other sections) is estimated to be in the order of £625 million, however some of these products are clearly either mature offsite or construction components and have not been included in the total innovative offsite value. some to be akin to a SIPs product, however the research team believe it is more correct to categorise it as advanced timber frame and has thus been included within this sub-sector.

The growth forecasts for 2006 and beyond are consistent with the UKTFA's expectations for the future of timber frame within the UK. This is all the more admirable given the significant market share that timber frame already enjoys. Many suppliers cite the affordable housing sector and the need for RSL's to meet the Housing Corporation's requirement to adopt greater levels of MMC as a key driver for the sector's recent and anticipated growth.

8.2.7. Superstructure – Composites (GRP, others)

This category includes any composite material variants of superstructure elements, e.g. Glassfibre reinforced products (GRP) and other plastic composites, such as composite wall panel systems, prefabricated composite dormers, GRP canopies and pre-clad chimney products, etc; though it does exclude composite bathroom pods (included in the specific "Pods" category 2.5.1).

This sector is beginning to emerge with new materials appearing such as Glassfibre reinforced gypsum (GRG), plastic foam composites, etc. So far these materials have been used by other industries such as aeronautics and automotive. As far as the construction sector is concerned these materials tend only to be used in pilot projects or one-off building projects. However a substantial growth is being experienced currently, and is expected to continue to grow significantly over next few years.

Fig. 9: Composite products and elements. Source: Panel projects & Euroform products

Major market players in 2005 were:

- Euroform products
- Panel projects

Table 12 *Turnover £ Composites*

2.3.6 Composites / Turnover £		
Researched contributors	16,500,000	80%
Assessed value for non-contributors	4,000,000	20%
Total	**20,500,000**	**100%**
Growth expectations (aggregated)	**11%**	

The growth expectations for this sector need to be viewed against the relative immaturity and diversity of this particular sub-sector, as it covers many different market sectors and offsite techniques and products. This growth forecast is not unexpected given the increased demand in housing for awkward elements of the construction process to be completed offsite, such as dormers, chimneys etc.

8.2.8. Building Envelope – roof and façade pre-assemblies

This category includes all material variants of panellised or pre-assembled roof and façade elements. Typically, it includes pre-assembled roof structures, façade frames, factory panellised curtain or infill walling systems, roof panel systems and other building envelope solutions, which fit the innovative offsite definition. Since some building systems (e.g. precast concrete wall panel systems or advanced timber frame products) may include the external wall cladding as a part of the superstructure frame kit, it is likely that this sub-sector is slightly under estimated in size, though this 'cladding' value should be incorporated within the relevant panel sub-sector.

This market segment is very broad with a very substantial number of cladding companies offering some element of offsite or pre-assembly to reduce the time on site, and thus nominally qualify for inclusion as innovative offsite systems. The sector is characterised by a high proportion of imported product from continental Europe, where non-masonry finishes are more common, supporting the use of unitised and sophisticated cladding solutions.

Cladding systems with significant offsite applications have been in use for some time in the commercial building sector, particularly for high-rise buildings. Such systems are beginning to be considered for other building types.

Taken across all building types, no market player appears to be significantly predominant. The following list includes some of the major pre-assembled cladding and roofing manufacturers:

- Hi-Point (Corus Kalzip)
- Kawneer (Alcoa)
- Kingspan Offsite
- Marble Mosaic Company
- Permasteelisa
- Prater
- Powerwall Systems
- Siac Construction UK

This sector is expected to grow dramatically over the next few years as clients and designers continue to demand more sophisticated cladding treatments and façade finish options, which will in turn require factory pre-assembly techniques, particularly for non-commercial buildings.

Table 13 *Turnover £ Building envelope*

2.4 1 and 2.4.2 Building Envelope / Turnover £		
Researched contributors	17,637,000	
Assessed value for non-contributors	23,000,000	
Total	**40,637,000**	**100%**
Growth expectations (aggregated)	**49% pa**	

8.2.9. Building services – Bathroom & Kitchen Pods

Bathroom pods have been in use in small numbers in the UK for some time, with some of the earliest examples dating back over 20 years ago. However, their use, surprisingly, is still not mainstream, even though the commercial benefits for applications such as hotels and student accommodation are well known. Kitchen pods are less well known and really only have a market within the residential sector.

This sub-sector also includes panellised versions of bathroom pods and integrated plumbing systems, as well the perhaps more well known 3-Dimensional pod systems. To some extent the panelised pod system is relatively new in that it is only in the past year or so that new product solutions based on a fully factory finished panel system have appeared on the market. However, it should be recognised that Integrated Plumbing Systems (IPS) and other similar plumbed backboard type products, in some form, have been available for quite a number of years. The uptake of these panellised internal fit-out systems has been quite limited, the whole sector seemingly dominated by the use of trade skills operating in a traditional construction environment, and thus a difficult work environment in which to plan and coordinate innovative offsite products or techniques.

Fig. 11a Integrated plumbing systems.
Source: Armitage Venesta

Fig. 11b Conventional Bathroom pod.
Source: Gateway/Britspace

Major market players in 2005 were:

- EJ Badekabiner UK
- Gateway Fabrications
- Off Site Solutions
- RB Farquhar
- Swift Horsman
- Armitage Venesta

The market is now fairly mature and thus the current manufacturers are not expecting any dramatic changes in demand patterns or growth. The market in the UK has traditionally been well served with imports from continental Europe (mainly Germany, France and Italy), where the use of pods has better acceptance. Recent new importers to the UK include companies from the new EU member States.

Table 14 *Turnover £ Bathroom pods*

2.5.1 Bathroom Pods / Turnover £		
Researched contributors	60,815,000	43%
Assessed value for non-contributors	82,000,000	57%
Total	**142,815,000**	**100%**
Growth expectations (aggregated)	**39% pa**	

The growth expectations for this sector reflect the continuing increase in demand for accommodation in the UK and the anticipated up turn in the hotel business. This growth forecast is not unexpected and is reflected in the number of new entrants into the supply chain that has occurred in the last 12 months.

8.2.10. Building services – M & E & Plant room Pre-assemblies

This sector is possibly one of the most difficult mainstream innovative offsite sectors to assess. This sector offers products and systems that are highly diverse from a supply chain that is typically very project orientated. As a consequence, many innovative offsite products and solutions are developed for a specific project and sometimes 'die' with the project.

Fig. 12: Pre-assembled boiler room. Source: Bailey offsite

Some companies, such as Armstrong Integrated Systems, Bailey Prefabrication, Crownhouse Technologies etc. have bucked this trend by establishing the capability to offer M&E pre-assembled products on a repeat basis within a recognised factory environment. However the market is still considered a long way from being mature and the supply chain fully resourced.

This sector should experience significant growth over the next few years, not least because of the predicted increase in the number of PFI hospitals and schools that have government commitment to build. Historically however, this very traditional construction sector has proved quite resilient to change and to the adoption of new installation techniques. Recent events with projects like T5 and Ascot have reversed this trend. This sub-sector includes a diverse range of innovative offsite techniques, from volumetric factory finished plant rooms, through to pre-assembled service risers & pipe racks or cassettes, sometimes referred to as PAM's (pre-assembled modules).

Also included in this sub sector are modular wiring systems and pre-assembled service wirings) to modular wiring systems and pre-assembled room terminal units such as chiller beam assemblies. As this sector grows in size it may prove prudent to the sector in its constituent parts to measure the relative uptake and trends of the different sub-categories. In future,this sector is likely to experience many new innovations. These new innovations will only be identified after a detailed study of the sector specific requirements.

The Building Services Research & Information Association (BSRIA) has undertaken extensive research into the building services sector within the UK, and in June 2003 produced a report into offsite fabrication, see ref. (3)

Table 15 *Turnover £ M&E*

2.5.2, 2.5.3 & 2.5.4 M&E All / Turnover £		
Researched contributors	66,650,000	38%
Assessed value for non-contributors	108,000,000	62%
Total	**174,650,000**	**100%**
Growth expectations (aggregated)	**13% pa**	

The growth expectations for this sector need to be viewed against the diversity of this particular sub-sector, as it covers many different market sectors and offsite techniques and products. This growth forecast is surprisingly low, as the generally held view for this particular innovative offsite sector is that it has the greatest opportunity within the construction industry to radically change the way building services are procured and installed on site.

8.2.11. Pre-assembled Civil Engineering

This sub-sector does not have a high profile for its exploitation of offsite construction, though there are notable recent exceptions such as BAA's London Heathrow Control tower and Gatwick Airport's Pier 6 project. However these well publicised offsite initiatives tend to be one-off and do not replicate particularly well across the wider civil engineering and infrastructure sector. This sector is particularly broad, encompassing roads, bridges, rail networks, utilities, airports, docks etc.

Bridge building is possibly the one area of civil engineering that has routinely used offsite production techniques, including manufacturing large elements of the construction local to the site in 'field factory' type format. The reasons for this are obvious, given the fairly hostile and difficult working conditions on site. However it has been very difficult to obtain any reliable figures on the amount of offsite within the bridge building industry, though Corus (the UK's largest steel producer) do estimate that some 40,000 tonnes of steel are used in bridge building in the UK equating to some £60m in factory value assuming that it is all used as shop produced fabricated steelwork.

Other than bridge construction, there appears to have been very little sector-wide pressure to introduce new offsite based construction or pre-assembly techniques. Civil engineering projects tend to be large, disparate and relatively insular to the potential process opportunities available in the other construction sectors. Thus there appear to be few offsite products or systems tailored to the specific needs of this sector, though it is uncertain whether this is as a result of the lack of demand from constructors, or simply a lack of awareness of the potential of this sector by manufacturers.

Suppliers of civil engineering offsite solutions are very often companies out of the normal innovative offsite construction sector, providing a special solution tailored for a specific project or structure. It would need a detailed project-by-project research to identify what portion, if any, is really offsite within each particular infrastructure project.

An example of the variability of such civil and infrastructure projects in terms of their use of offsite is BAA's Terminal 5 project, where the value of offsite for the main terminal building roof alone is said to be in excess of £315m, out of a total project cost of around £4.2b. However there is no evidence to suggest that this ration of innovative offsite to on site can be considered as replicable across the civil engineering sector as a whole.

However given the potential pent up demand for this sector, water utilities being just one example, then it must be concluded that, as difficult as this sector is to service with offsite products, the future opportunities for this sector could be very substantial.

8.2.12. Special Structures & others

This sector is the 'catch-all' for construction activities that do not fit into any of the sectors identified above. Typically this might include stadia, nuclear power installations, undersea structures etc. This sector is included for good order rather than for its influence on the offsite market. Clearly as the offsite sector grows it is likely that this 'special projects' sector will grow, and could in future spurn 'new' offsite sub-sectors.

Table 16 *Turnover £ Other special structures*

4.1 Other special structures Turnover £	
Researched contributors	£8,000,000
Assessed value for non-contributors	£28,000,000
Total	**£36,000,000**

8.3. Unique (Project Specific) Offsite Construction

From discussions with a number of major construction organisations it is clear, as might be expected, that there is a substantial element of offsite activity that is undertaken within individual construction projects and is generally unrecorded or recognised out with the local project delivery team.

This 'unrecorded' offsite activity is typically undertaken by suppliers that may only manufacture the offsite elements for the one project or possibly for particular projects say for just one main contractor. For this reason this 'manufacturer' and others like them will not currently sit on the radar screen as recognised offsite manufacturers, and will thus miss the bottom-up study undertaken in this market research.

To better understand this 'project specific' offsite activity, a number of major UK constructors were targeted to establish some typical example projects of where offsite had been used purely for the specific project or projects.

From these discussions it was clear that few, if any, of the major constructors in the UK recorded this information in any centralised manner. What information was recorded tended to be because the particular project had a major PR impact for the business, or where the client wished to benefit from the exposure. It was also clear that these same contractors could not readily differentiate between the 'conventional' innovative offsite that might be adopted on a particular project (by

this we mean that element of offsite that was supplied by one or more of the recognised offsite suppliers and therefore already accounted for within one of the sub-sectors in this report), and the one-off project specific offsite.
However a few major UK constructors were able to estimate at the Group / Construction Director level what they believed was the case for their UK operation. Interestingly, while the information was by and large anecdotal, there does seem to be a surprising level of similarity between the companies interviewed.
The following table shows the aggregated view of these interviewed major UK contractors. It was the intention of the research team to apply this ratio in proportion to their turnover as an average across the UK construction sector to derive an estimation of this potentially invisible offsite activity. However at this stage the research team consider that the information is too anecdotal to use in this manner. Also it is clear that the major constructors who did have a view of the likely extent to which their UK construction teams were using offsite, were generally quite progressive and were relatively switched onto the potential benefits. Thus any sector ratio's based on this evidence is likely to over estimate the use of unique offsite, potentially by a considerable margin.

Table 17 *Project specific offsite solutions*

Specific Projects/Percentage of project by £value	
Estimated total value of all 'mature', 'innovative' and 'unique' offsite for the project, as a proportion of the overall project value	5% to 10 %
Estimated total value of 'unique' offsite for the project, as a proportion of the overall project value	1% to 2 %

9. Conclusions

- Not unsurprisingly, the offsite construction sector does not see itself as a single sector. However, it is clear that the supply side would benefit substantially from collective advocacy and promotion. There is a pressing need for the services that *Buildoffsite* has been set up to deliver.

- The overall market value offsite construction solutions is estimated at approximately £6 billion. Of this the estimated value of the innovative portion of the offsite sector is estimated at £1.53 billion.

- Each of the sub-sectors involved in innovative offsite solutions are reporting strong annual growth.

- There is clearly an element of offsite activity that goes unrecognised within construction at the project team level. This has been termed 'unique' offsite to distinguish this activity from the recognised offsite business that is supplied directly by the known mature and innovative offsite supply base. From interviews with a number of major constructors in the UK it is clear that this form of offsite could equate to as much as 1% to 2% of turnover for these major constructors. It is not considered appropriate, without further investigation, to apportion this ratio across the construction sector as a whole.

- The definition the research team has used for this survey was necessary in order to provide a structured framework within which to establish market boundaries and hence size and common attributes such as growth and trends. However it does prompt the question that a better definition may exist for the longer term assessment of the offsite business. A definition that is based on value generated offsite, which is less about individual products and systems and more to do with processes, may be more appropriate for the sector.This approach may also encourage the industry to avoid polarising on a single decision 'to do' or 'not to do' offsite, but rather consider offsite as a holistic activity.

- The offsite supply chain is clearly a fast moving and rapidly expanding market place.Typical of a dynamic market of this nature, suppliers are constantly entering and leaving the market place, or simply re-inventing themselves as they learn about this new business. As a consequence the database generated by the research team will need to be regularly refreshed.

10. References

[1] *Buildoffsite*,The value of the UK market for offsite (2004). UK:*Buildoffsite*

[2] Mtech Group Internal Offsite Construction Database
Relevant Trade Associations Databases and Lists of members
- Modular and Prefabricated Building Association (MPBA)
- Steel Construction Institute (SCI)
- UK Timber Frame Association (UKTFA)
- British Precast Concrete Federation (BPCF)
- Building Services Research and Information Association (BSRIA)
- Centre for Window and Cladding Technology (CWCT)

Additional telephone and Internet research

[3] BSRIA, Off-site fabrication – UK attitudes and potential (June 2003). UK: BSRIA

[4] *Buildoffsite* Glossary of Terms

In addition:

- Companies websites
- Responses from the industry – the survey
- AMA Research, *Prefabricated Buildings Market – UK 2004* (2004). UK: AMA
- MSI Data Report, *Modular and Portable Buildings UK* (November 2004). UK: MSI
- Venables,T., Barlow,J., Gann,D., *Manufacturing Excellence – UK capacity in offsite manufacturing* (January 2004). UK: The Housing Forum

11. Appendices

Appendix A1 - Planned Research Methodology

Appendix A2 - Actual Research Methodology

Appendix B - Database Structure

Appendix C - Research Documents (covering letter and survey questionnaire)

Appendix D - List of Innovative Offsite Construction Companies

Appendix E - Offsite categories linked to Buildoffsite's Glossary

Research Methodology and Protocol (approved)

1.Introduction

The main objective of this methodology is to define processes and procedures required to complete the **Offsite construction market research** project for Buildoffsite.

The aim of this project is to establish the overall size of the UK offsite construction sector for 2005 and to compile a database of companies that manufacture offsite construction products and systems. The methodology of the whole survey is described below.

Offsite construction is defined as follows:

"Offsite construction is that part of the construction process, which is carried out away from the building site (such as in a factory) and which would normally be carried out on site."

(Mtech definition)

This definition will be used throughout the research process to describe the type of companies and products relevant to this investigation.

2.Process Map

The following chart identifies the key processes required to complete the research project. The subsequent sections provide a more detailed description of the methodology at each stage.

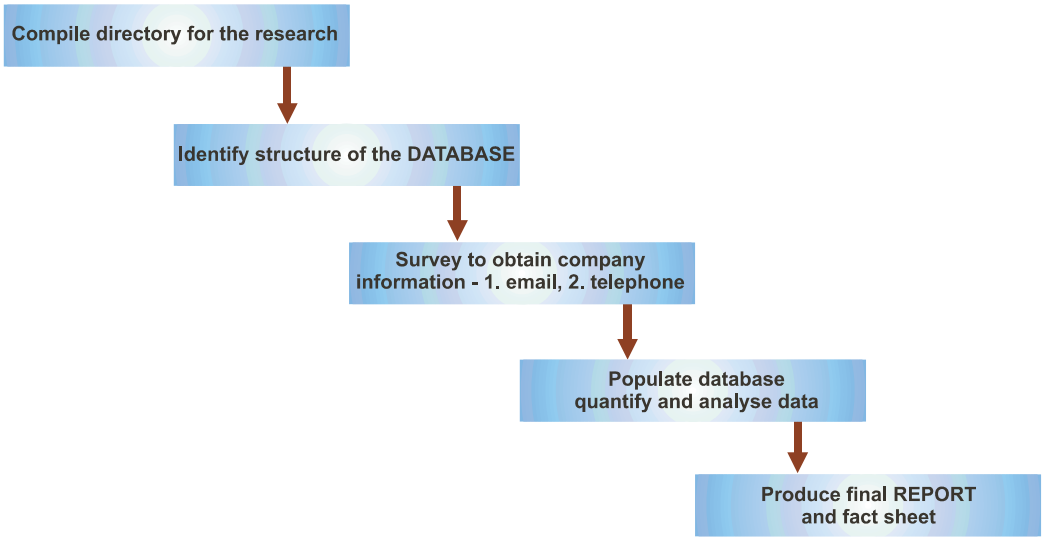

Fig. 1: Schematic of processes within the research project

3.Company Directory

A full and comprehensive directory of companies that provide offsite manufacture capability willbe collated from the following sources:

i) Mtech Group Internal Offsite Construction Database

ii) Relevant Trade Associations Databases

i. Modular and Prefabricated Building Association (MPBA)
ii. Steel Construction Institute (SCI)
iii. UK Timber Frame Association (UKTFA)
iv. British Precast Concrete Federation (BPCF)
v. Building Services Research and Information Association (BSRIA)
vi. Centre for Window and Cladding Technology (CWCT)

This will be reviewed and supplemented with additional telephone, Internet, and recent market studies (e.g. Constructing Excellence, MSI, and AMA) research to grow the directory. It will include the company's location and contact information, and it will form the base of company contacts, on which the investigation and final database will be constructed. It is believed that these sources provide the most robust and up-to-date information on companies within the offsite construction sector at the current time.

4.Categorisation

Categories and sub-categories of the database will be developed to classify the different segments of the offsite construction sector. These will be based on two key criteria (see attached table below):

i) Type of Structure and Technology
These categories follow the fundamental structure categorisation defined by Buildoffsite. The sub-categories identify type of technology and were developed based on the Buildoffsite categorisation of structures, Glossary of Terms and onMtech's best knowledge of the offsite industry and its expected development.
They are also related to Buildoffsite's categories of pre-assembly.

ii) Market Sector
These categories will include the different target markets e.g. Education, Residential, and Healthcare (see details appended to the dBase table below).

These criteriareflect current offsite market and technology. Some flexibility has been built intothe categorisation to allow any additional modifications if required, based on the future trends and changes in the sector. -

Struct. Type / Item	Sub-category/by technology		Category by sector									
			A - Res ntial – d'	B - Res – Ir	C - Cor l	D - F	E - E	F - ⊦	G - ⊬	H - ⅂	I - ᒐ	J - ᑕ
1.0 - Complete structures		ati										
	Portable volumetric units											
	Permanent volumetric units											
2.0 - Structural elements and systems												
2.1 - Foundation												
	Steel or precast piling, ringbeam, and foundation systems											
2.2 - Substructure												
	Pre-assembled substructures											
	Precast or pre-assembled below-ground services distribution											
2.3 - Superstructure												
	Precast concrete elements											
	SIPS											
	Light steel frames											
	Timber frames											
	Floor cassettes and roof panels											
	Composite elements (e.g. GRP)											
2.4 - Building envelope												
	Pre-assembled façade systems											
	Pre-assembled roof systems											
2.5 - Building services												
	Bathroom and kitchen pods											
	Pre-assembled mechanical and electrical services distribution	Cc										
	Pre-assembled mechanical and electrical products and systems											
	Pre-assembled plantrooms & packaged plants											
2.6 - Building fit out												
	Pre-assembled partitions											
	Panellised plumbing systems											
3.0 - Civil engineering												
	Pre-assembled civil engineering structures											
4.0 - Special												
	Special structures (e.g. stadium)											
	Others											

The sector categories are defined as follows:

A. Residential – dwelling (housing and flats + apartments for permanent living)
B. Residential – institutional (student + key-worker accommodation; hotels; nursing homes, elderly care homes, and holiday homes)
C. Commercial, Industrial, and Offices (public and private sectors' buildings; offices; commercial and industrial buildings; storage; warehousing)
D. Retail (retail outlets)
E. Education (schools and universities)
F. Healthcare (hospitals; health centres)
G. Armed forces (custodial and police objects; MOD accommodation; portable units)
H. Transport (airports; highways; railways; ports)
I. Utility Distribution (electricity; gas; water; sewage)
J. Others (special structures, e.g. stadia)

5.Data Collection

Data will be collected in two main stages:

i) **Initial Contact:**
Email Questionnaires will be sent out to all companies within the compiled database. This questionnairewill seek to obtain all relevant information related to this study (i.e. company full name, telephone and website contact, location of the main manufacturing facility, turnover
figures from last two years (2004 and2005), split of the 2005 turnover by sector, and complementary information regarding size of the company and the projects it undertakes)

ii) **Follow up telephone calls:**
If information has not already been provided through stage (i), the companies ofeach particular sub-category will be contacted by telephone in sequence by their importance to the market (The decision on the ranking of the companies will be based on Mtech Group's market knowledge and validation by peer reviews).

In the event that the company will not provide the information, Mtech best experts' will make an estimate based on the knowledge of the industry, size of the company and accessible data about the company's production output. If an estimate has been made it will be highlighted within the database. The final database output figures will be given showing the proportion of estimated against actual data.

Commercially sensitive figures will be used only for purpose of this research and then discarded. Hopefully this commitment will make it acceptable to the individual companies providing the data.

6.Import and Export Products

This report will include, where possible, manufacturing companies belonging to one or more of the following definitions:

i) **Manufacture within the UK and supply to the UK market.**
ii) **Manufacture within the UK but supply to markets outside the UK.**
iii) **Manufacture outside of the UK but supply to the UK market.**

Non-manufacturing import companies will be cross-referenced against non-UK manufacturers to prevent duplication of records.

7.Data Validation

Data validation will be conducted in two main stages:

i) **Individual:**
Company turnover data will be checked against Companies House records and other reputable credit rating agencies.

ii) **The final output:**
The analysis will be verified against existing known data from Mtech Group and Loughborough University.

8.Output – Database

An interactive database will be designed and constructed using MS-Access. This will provide user query forms to interrogate the database for relevant information.

The main outputs of the database will include:

i) **Overall size of the offsite construction industry**
ii) **Category specific analysis**
iii) **Sector specific analysis**
iv) **Individual Record Display**

All data collected during the research process will be input into this database except specificcompany confidential information.

9.Output – Report

The final report will provide an overview of the offsite construction sector, potential growth trends, and the relative size of each particular segment.

It will also provide full analysis and breakdown of the offsite construction by turnover figures per sector and categories.

10.Research Methodology Justification

This methodology is to be approved by Loughborough University as well as the database structure.

Appendix B

The offsite manufacturer and supplier information gathered as part of this investigation has been assembled as an MSExcel database. The database incorporates the relevant details for each of the manufacturers included in theresearch, and has their explicit approval to use by Buildoffsite.

The database includes a total of 347 No. separate offsite manufacturing or offsite supplier companies, and is correct at the time of completion (September 2006).

It should be noted that the offsite industry is a fast moving and volatile sector, and the supply chain picture is likely to change relatively quickly. It is therefore imperative that Buildoffsite consider how this database is to be maintained and kept current.

The database has been set up to allow searching on all fields, with the autofilter switched on for all fields.

The relevant search fields are as detailed in Table B1

Field		
1	Company	
2	Address	
3	Postcode	
4	Website	
5	Contact (First Name)	
6	Contact (Surname)	
7	Contact Telephone No.	
8	Email	
9	Manufacturing Location	
10	Product	
11	1.0 - Complete structures	
12	1.1	Portable volumetric units
13	1.2	Permanent volumetric units
14	2.0 - Structural Elements and Systems	
15	2.1 - Foundation	
16	2.1.1	Steel or precast piling, ringbeam, and
17	2.2 - Substructure	
18	2.2.1	Pre-assembled substructures
19	2.2.2	Precast or pre-assembled below-ground
20	2.3 - Superstructure	
21	2.3.1	Precast concrete elements
22	2.3.2	SIPS
23	2.3.3	Light steel frames
24	2.3.4	Timber frames
25	2.3.5	Floor cassettes
26	2.3.6	Composite elements (e.g. GRP)
27	2.4 - Building envelope	
28	2.4.1	Pre-assembled façade systems
29	2.4.2	Pre-assembled roof systems
30	2.5 - Building services	
31	2.5.1	Bathroom and kitchen pods
32	2.5.2	Pre-assembled mechanical and electrical
33	2.5.3	Pre-assembled mechanical and electrical
34	2.5.4	Pre-assembled plantrooms & packaged
35	2.6 - Building fit out	
36	2.6.1	Pre-assembled partitions
37	2.6.2	Panellised plumbing systems
38	3.0 - Civil engineering	
39	3.1	Pre-assembled civil engineering structures
40	4.0 - Special	
41	4.1	Special structures (e.g. stadium)
42	4.2	Others

Table B1 Database Fields

The Covering Letter

buildoffsite supported by dti

Dear [name] [surname],

Re: Buildoffsite UK Market Survey www.buildoffsite.co.uk

Buildoffsite is an independent, industry-wide campaigning organisation that promotes the greater use of offsite techniques by UK construction. Buildoffsite's mission is to achieve a tenfold increase in the uptake of offsite technology, and the organisation is supported by the DTI.

Buildoffsite believe it is crucial to gain a sound knowledge of the offsite manufacturing base, both in terms of overall size (output) and technology type, to enable the offsite sector to meet this challenge.

Buildoffsite has commissioned Mtech Group and Loughborough University to undertake a nationwide survey of the offsite sector and create a directory of manufacturers and technologies available to potential users.

To deliver an accurate survey of the offsite sector we need your help to provide us with commercial information about your business activity within this sector, and categorise the products and systems you have available.

We have prepared an attached questionnaire that we would like you to answer as accurately as possible, and return to us in order to complete the industry wide picture.

We do accept that you may traditionally consider the information we need to be commercially sensitive and outside the bounds of normal surveys. However, to fully define this sector and to provide a clear basis for growth it is necessary to obtain this data. The commercially sensitive information you provide will be treated with the strictest confidence, and once summarised within the categories all sensitive details will be deleted.

With your agreement, Buildoffsite would like to use the promotional information (such as company name & location, website & telephone contact, and products information) to form an industry-wide active database to help them respond and inform prospective offsite customers. It therefore goes without saying that there could be immediate benefits to your business.

We look forward to receiving your response (in electronic or fax form), ideally within the next few days. If you have any queries regarding the survey questionnaire please do not hesitate to contact me, or a member of the survey team.

Yours sincerely
Martin Hezl
For and on behalf of Buildoffsite

Contact:
Martin Hezl or Pete Blunt ofMtech Group Ltd
Email:buildoffsite@mtech-consult.com
Website: www.mtech-group.com
Phone: +44 (0) 1743 357377
Fax: +44 (0) 1743 357367

mtech GROUP Loughborough University

Loughborough University buildoffsite supported by dti mtech

OFFSITE CONSTRUCTION INDUSTRY SURVEY

THANK YOU FOR YOUR TIME AND EFFORT IN COMPLETING THIS SURVEY.
PLEASE, SEND IT BACK VIA EMAIL OR FAX

Email: buildoffsite@mtech-consult.com
Fax: +44 (0) 1743 357367

1) Company Name:	
2) Address:	
3) Postcode:	
4) Website:	
5) Contact Name:	
6) Contact Telephone number:	
7) Location of your main manufacturing facility:	--- Select your location ---
8) Please state the Offsite products and related services of your company:	
9) Would you like your company to be presented through the Buildoffsite industry database? (related to questions 1-8)	--- Please select ---
10) Average company project value in the UK market:	
11) Number of employees (in offsite manufacturing):	
12) The year your company became active in Offsite manufacturing:	
13) Do you import any offsite construction products into the UK? (Detailed in the table below)	--- Please select ---
Please specify the import suppliers company name:	
14) Do you export any offsite construction products out of the UK? (Detailed in the table below)	--- Please select ---

15) Please Indicate your company's offsite manufacturing turnover in the table below:

*"**Offsite** is that part of the construction process, which is carried out away from the building site (such as in a factory) and which would normally be carried out on site."*

- To be based on 2005 financial figures.
- Please split your total turnover into the relevant market sectors (columns provided).
- If you do not have exact figures, please, provide an estimate according to your best knowledge.
- Please include only figures related to pure offsite manufacturing in the UK Market (do not include on-site labour, hiring, other services, etc).
- Areas not believed to be associated to your company have been 'grayed' out, if this is not correct please fill in appropriate sections.

Structural Category / Item	Sub-category / by technology	2005 Total Turnover £	Offsite manufacturing Turnover By sector										Imports into the UK Market (% of Turnover)	Exports out of the UK Market (% of Turnover)
			A - Residential - dwelling	B - Residential - Institutional	C - Commercial, Industrial, Offices	D - Retail	E - Education	F - Healthcare	G - Armed forces	H - Transport	I - Utility Distribution	J - Other (special)		
1.0 - Complete structures														
1.1	Portable volumetric units													
1.2	Permanent volumetric units													
2.0 - Structural Elements and Systems														
2.1 - Foundation														
2.1.1	Steel or precast piling, ringbeam, and foundation systems													
2.2 - Substructure														
2.2.1	Pre-assembled substructures													
2.2.2	Precast or pre-assembled below-ground services distribution													
2.3 - Superstructure														
2.3.1	Precast concrete elements													
2.3.2	SIPS													
2.3.3	Light steel frames													
2.3.4	Timber frames													
2.3.5	Floor cassettes													
2.3.6	Composite elements (e.g. GRP)													
2.4 - Building envelope														
2.4.1	Pre-assembled façade systems													
2.4.2	Pre-assembled roof systems													
2.5 - Building services														
2.5.1	Bathroom and kitchen pods													
2.5.2	Pre-assembled mechanical and electrical services distribution													
2.5.3	Pre-assembled mechanical and electrical products and systems													
2.5.4	Pre-assembled plantrooms & packaged plants													
2.6 - Building fit out														
2.6.1	Pre-assembled partitions													
2.6.2	Panellised plumbing systems													
3.0 - Civil engineering														
3.1	Pre-assembled civil engineering structures													
4.0 - Special														
4.1	Special structures (e.g. stadium)													
4.2	Others													

16) Please indicate your company's overall offsite manufacturing turnover in the year 2004: £

17) Please indicate the expected percentage turnover growth for 2006: %

18) Any other comments?

List of Offsite Construction Companies

1 3DM
2 A W Framing
3 Ability Projects Ltd
4 Acacia Timber Construction Ltd
5 Accomodex
6 Actaccom
7 Adaptaflex Ltd
8 AdroitGroup
9 Advance Housing Ltd
10 Advanced Panel Systems
11 Advanced Timber Craft
12 ALARational System
13 Alcover UK Ltd
14 Algeco
15 Alho Systembau GMBH
16 Allspace
17 Allwood Buildings Limited
18 AlouetteHomes
19 AltorIndustrie
20 Alumasc Exterior Building Products
21 AlumetSystems
22 Amisk Building Systems
23 ApexWiring Solutions
24 Ardmore Contracting
25 ARMBuildings
26 ArmitageVenesta
27 Armstrong Integrated Systems
28 Armstrong Timberframe
29 Ash & Lacy Building Products
30 AstracomPortable Accommodation
31 Atco Structures UK Limited
32 Atkin Trade Specialist Ltd
33 AV Group Limited
34 Avonhill Timber Frame
35 AyrshireMetal Products
36 Babcock Engineered Products
37 Bailey Off-Site
38 BanagherConcrete
39 Bankside Patterson
40 Banro Sections
41 Bastable & Co Limited
42 Bath Systems SRL
43 Baudet Composites
44 Bell& Webster
45 Benfield ATT
46 Bespoke Timber Homes
47 Betonelement
48 Bison Concrete Products
49 Bolton Buildings Limited
50 Bonus
51 Bourne Steel
52 Boyton-BRJ System Building
53 Britspace Modular Buildings
54 Buchan Concrete Solutions
55 Build it Green
56 Bullock & Driffill
57 Buma Systems SA
58 Butler Building Systems
59 BW Industries
60 Cadolto UK Limited
61 Caledonian Buiding Systems
62 Century Homes
63 Chartway
64 Christian Torsten
65 Coltman Precast Concrete
66 Composite Limited
67 Compton Buildings Ltd
68 Concargo
69 Concast Group
70 Concept Timber Frame
71 Concrete Flooring Systems
72 Constant Air Systems Ltd
73 Corus Living Solutions
74 Cougnaud Yves SA
75 Cover Structure
76 Covers Timber Structures
77 Creagh Concrete Products
78 Creative Estates
79 Creative Modular Solutions
80 Crendon Timber Engineering
81 Crocodile Timber Frames
82 Crown House Technologies
83 Custom Homes
84 Daikin Europe
85 Dalair Ltd
86 Dan Wood
87 Datatray Systems Ltd
88 De Meeuw Oirschot BV
89 Deba SystemtechnnikGMBH

90 Deeside Homes Timberframe
91 Dekra Development
92 Delta Off-Site Solutions
93 Dempsey Timber Engineering
94 Dibsa Structures
95 Diffusion Refrigeration & Distribution Ltd
96 Donaldson Timber
97 Drumbow Timber Frame
98 Dryform
99 DryvitUK
100 Dunham Bush Ltd
101 Earthcare Products Ltd
102 ECLContracts
103 EcoHomes
104 EcolodgeLimited
105 Eden Precast
106 EJBadekabinerUK
107 Eldapoint
108 Eleco Group Plc
109 ElementsEurope
110 ELK-Fertighaus AG
111 ElliottGroup
112 Ellison Engineering Services
113 ElvetStructures
114 Emcor Drake & Skull
115 Ensuite Solutions Limited
116 Eurobrick Systems Ltd
117 Euroclad
118 Euroform Products
119 European Building Technologies
120 European Ensuites
121 European Timber Systems
122 Europod Bathrooms
123 Excel Industries Ltd
124 ExtraSpace
125 FergusonSeacabs
126 Fforest Timber Engineering
127 FISystems
128 Fibrecon Cladding Systems
129 Finlay Concrete Products
130 FinnforestUK
131 Finnhause
132 Fleming Buildings
133 Fleming Homes
134 FlightTimber
135 FloodFlooring
136 Fort Uni Bouw BV
137 Frame Homes UK
138 Frame Wise
139 Framework CDM Limited
140 Framing Solutions Plc
141 Frenger Systems ltd
142 Fusion Building Solutions
143 Gateway Fabrications
144 GEA Comfortair Ltd
145 Geberit
146 Genesis TP Inc
147 Glafiba Aps
148 Glennon Bros Timber
149 Goodwins Timber Frame
150 Gradient Insulations
151 Grant Westfield
152 Griffner Coillte
153 Grinbold GmBH Co
154 Groundhog UK
155 Guardian Timber Frame
156 Guildford Timber Frame
157 Guildway
158 H & H Celcon
159 H & S Timber Systems
160 Haden Young
161 Halton Products Ltd
162 Hanson Building Products
163 Harrington Precast Concrete
164 Hattersley Newman Hender Ltd
165 Hedalm Anebyhus
166 Heijmans Ind & Production
167 Hellweg Badsysteme Gmbh
168 Hemsec (Siptec)
169 Highpoint
170 Histon Concrete
171 Homelodge Buildings Ltd
172 Howarth Timber Group
173 Huf Haus
174 Hughes Precast Products
175 Ideal Building Systems
176 IJM Timber Engineering
177 ING Bertwin Thumfort
178 Innovare Systems
179 Integra Buildings
180 Interhabs
181 Interlink Building Systems
182 IPPEC Systems Limited

183 Jipe SA
184 JTD Timber Frame
185 Kawneer UK
186 Kelly Timber Frame
187 Kilbroney Homes
188 Kileshal Precast Concrete
189 Kingspan Metlcon
190 Kingspan TEK
191 Kitpac Buildings
192 Kondor
193 Kyoob Space
194 Lindab
195 Livein Quarters
196 Lloyds Timber Frames
197 LomondHomes
198 Loobicle
199 Lorne Stewart plc
200 Manchester Cabins
201 MantlePanel
202 Maple Timber Frame
203 Marble Mosaic Company
204 Marchant Walker Ltd
205 Maritime Homes
206 Marlow Integrated Designs Lighting Ltd
207 Marlows Timber Engineering
208 Marshall SV
209 Masterframe UKLtd
210 Mayfield Engineering Ltd
211 MercuryClimatic Ltd
212 MBC Timber Frame
213 McAvoyGroup
214 MCCI
215 Meister Controls Ltd
216 Merronbrook
217 Metek Building Systems
218 Metnor GroupPlc
219 Metsec Plc
220 MilbankDanilith
221 MKElectric
222 MMC Modular Systems
223 Modular Construction Solutions (Folio Omar)
224 Modular Wiring Systems Europe
225 ModularUK
226 Moelven Byggmodul AB
227 MPH Building Systems
228 Neatwood Homes
229 NewEurocomponents SRL
230 Norscot Joinery Limited
231 Norwegian Log Chalets Ltd
232 OEPRaterad
233 OffsiteSolutions
234 OFP
235 OfraGeneralbau GMBH
236 Oregon Timber Frame
237 Ormandy Ltd
238 Pace Timber Systems
239 PanelProjects
240 Parmarine
241 Partab
242 Piarco Structures Limited
243 PiikkioWorks
244 Pinewood Structures
245 PKLHealthcare
246 Plant Energy Systems Ltd
247 Portakabin
248 Potton
249 POW Ltd
250 Powerwall Systems
251 Prater
252 Precast Concrete Structures
253 Premier Homes
254 Prestoplan Purpose Built
255 Protektor Profil Limited
256 Qpods Ireland
257 Rasselstein Raumsysteme GMBH & Co
258 RB Farquhar
259 Richter Systems
260 Roankabin
261 Rob Roy Homes
262 Robertson Timber Products
263 Roe
264 Roger Bullivant
265 Roll Formed Fabrications
266 Rollalong Limited
267 Ruskinar Management Ltd
268 Ruukki (UK)
269 Sadef N.V.
270 Saniflex UK Limited
271 SBS Timber Frame
272 Schneider Electric
273 SchwörerHaus GmbH
274 Scotframe

275 Scotia Kabins
276 Screwfast Foundations
277 Servaccomm Redhall
278 Setanta
279 Shepherd Engineering Services
280 Siac Construction UK
281 Sibcas
282 Sip Building Systems
283 SIP Homes
284 SIPS Industries (Bpac)
285 Sips Scotland
286 Smartroof
287 Space4
288 Spaceover Group
289 Springvale Eps
290 Stanta
291 Stent Foundations
292 Sterchele
293 Stewart Milne Group
294 Strathclyde TimberSystems
295 Structherm
296 Structural Sections Ltd (Hadley)
297 Swift Horsman Limited
298 Swift Timber Homes
299 Sydenhams Timber Engineering
300 SylvanStuart Ltd
301 Tabs Technicom (UK) plc
302 TaplanesLtd
303 Tarmac Precast
304 Taylor Lane Timber Frame
305 Taylor Maxwell Cladding
306 Techrete UK Limited
307 Tecnobath srl
308 TerrapinInternational
309 The Timber Frame Company
310 Thermastructure Europe
311 ThermatechTimber
312 ThermoneX
313 Thomas Armstrong
314 Thomas Mitchel Homes
315 Thurston Building Systems
316 Timber Frame Homes
317 Timber Frame Solutions Ltd
318 Timber Frameworks
319 Timberframe Wales
320 Torwood Timber Systems
321 Trent Concrete
322 Trox UK Ltd
323 Tru Homes Limited
324 Tulloch Timber Systems
325 Twyford Bushboard
326 Unidek
327 UnilinSystems
328 UNITE Modular Solutions
329 Unitek Structural Build Products
330 Ursem Bouwgroep B V
331 VanElle Holdings
332 Vencel Resil
333 W S Britland and Co Ltd
334 WABrowne
335 WacoUK
336 WagoLtd.
337 Walker Timber
338 WAVEHomes
339 Waycon Precast
340 WeberHaus
341 Wernick Group
342 Western Building Systems
343 Wieland Electric Ltd
344 WyckhamBlackwell
345 Yorkon

Offsite System Description	Offsite Category	Offsite System Status*				Offiste System Level**					Notes
	See Table 1 for details	Mature Offsite	Transitional Offsite	Innovative Offsite	Unique Offsite	L1	L2	L3	L4	NA	
Advanced Panel Timber Frame	2.3.4			X			X				
Air Handling Unit (Pre-wired) (AHU)	2.5.4			X			X				
Bathroom Pod	2.5.1			X				X			
Beam and Block Floor		X	X				X				
Beam and Column Frame			X		X						Depends on material
Brick Slips	2.4.1			X		X				X	
Building Module	1.2			X					X	X	
Building Services Offsite Applications	2.5.1			X	X					X	
Building System	N/A									X	
Cable Containment (Preassembled)	2.5.2			X			X				
Ceiling Void Modules	2.5.2			X			X				
Chiller Beam Assembly	2.5.3			X			X				
Chimney (Prefabricated)	2.4.2			X			X				
Closed Panel Systems	2.3.3			X			X				
Combined Pod	2.5.1			X				X			
Combined and Single Service Horizontal Rack (also called Ceiling Void Module)	2.5.2			X			X				
Component	N/A					X					
Composite Construction	2.5.3			X						X	
Concrete Tunnel Form			X								
Condensing Unit (Preassembled)	2.5.3			X			X				
Configuration	N/A									X	

Offsite System Description	Offsite Category	Offsite System Status*				Offiste System Level**					Notes
	See Table 1 for details	Mature Offsite	Transitional Offsite	Innovative Offsite	Unique Offsite	L1	L2	L3	L4	NA	
Advanced Panel Timber Frame	2.3.4			X			X				
Air Handling Unit (Pre-wired) (AHU)	2.5.4			X			X				
Bathroom Pod	2.5.1			X				X			
Beam and Block Floor		X	X				X				
Beam and Column Frame			X		X						Depends on material
Brick Slips	2.4.1			X		X				X	
Building Module	1.2			X					X	X	
Building Services Offsite Applications	2.5.1			X	X					X	
Building System	N/A									X	
Cable Containment (Preassembled)	2.5.2			X			X				
Ceiling Void Modules	2.5.2			X			X				
Chiller Beam Assembly	2.5.3			X			X				
Chimney (Prefabricated)	2.4.2			X			X				
Closed Panel Systems	2.3.3			X			X				
Combined Pod	2.5.1			X				X			
Combined and Single Service Horizontal Rack (also called Ceiling Void Module)	2.5.2			X			X				
Component	N/A					X					
Composite Construction	2.5.3			X						X	
Concrete Tunnel Form			X								
Condensing Unit (Preassembled)	2.5.3			X			X				
Configuration	N/A									X	

Appendix E Link with Buildoffsite Glossary terms for market survey.xls

Offsite System Description	Offsite Category	Offsite System Status*				Offiste System Level**					Notes
	See Table 1 for details	Mature Offsite	Transitional Offsite	Innovative Offsite	Unique Offsite	L1	L2	L3	L4	NA	
Cross Wall Construction	2.3.1		X	X						X	If precast
Domestic Energy Centre	2.5.4			X			X				
Dressed Product (Preassembled)	2.5.3		X	X			X				
DFMA / DFM / DFA	N/A									X	
Element	N/A									X	
Elemental Cost Evaluation	N/A									X	
Envelope	2.4.1		X	X			X				
Factory –Engineered Concrete (FEC)	2.3.1	X	X	X			X				
Fast Build Concrete Retaining Wall	N/A	X					X				
Field Factory	N/A				X						
FMEA (Failure Modes and Effect Analysis)	N/A									X	
Flat Pack	N/A			X			X				
Floor Cassette				X			X				
Flat Slab	N/A									X	
Foundation (Fast Track)	2.2.1	X		X			X				
Frame and Framing Systems											
Light Gauge Steel Frame (LGSF) Light Steel Frame (LSF)	2.3.3			X			X				
Open (Cell) Panel Timber Frame	2.3.4	X					X				
Advanced Panel Timber Frame	2.3.4			X			X				
Frame mounted										X	
Precast Concrete Frame	2.3.1	X					X				

Offsite System Description	Offsite Category	Offsite System Status*				Offiste System Level**					Notes
	See Table 1 for details	Mature Offsite	Transitional Offsite	Innovative Offsite	Unique Offsite	L1	L2	L3	L4	NA	
Steel Frame Building Systems		X					X				
Glued Masonry Panels	2.4.1			X			X				
Heating Pod	2.5.4			X				X			
Heavy Duty Services Module	2.5.4			X			X				
Hollowcore Floor		X					X				
Hot Rolled Steel		X				?	X				
Hybrid										X	
Hybrid Building System	2.3.3			X			X	X			
Hybrid Concrete Construction (HCC) HCC combines precast and cast in-situ construction.	2.3.1		X				X				
Industrialised Building										X	
Insulated Concrete Formwork (ICF)										X	
Integrated Plumbing System - IPS	2.5.1			X			X				
Interchangeability	N/A									X	
Interface	N/A									X	
Jack Leg Building	1.1	X							X		
Kitchen Pod	2.5.1			X				X			
Lattice Girder Floor		X					X				
Lift Shaft (Prefabricated)	2.5.4			X							
Light and Air Diffuser (Preassembled)	2.5.3			X				X			
Light Gauge Steel Frame (LGSF) Light Steel Frame (LSF)	2.3.3			X							Depends if pre-assembled
Mass Customisation	N/A									X	

Offsite System Description	Offsite Category	Offsite System Status*				Offiste System Level**					Notes
	See Table 1 for details	Mature Offsite	Transitional Offsite	Innovative Offsite	Unique Offsite	L1	L2	L3	L4	NA	
Mass Production	N/A									X	
Modern Methods of Construction (MMC)	N/A									X	
Housing Corporation MMC Categories Modern Methods of Construction (MMC)											
OSM – Volumetric	1.2			X					X		
OSM – Panellised	2.3.1 to 2.3.4			X			X				
OSM – Hybrid				X			X	X			
OSM – Sub-Assemblies and Components						X				X	
Non-OSM Modern Methods of Construction										X	
Non Applicable										X	
Modular Construction Modular System Modular Volumetric System Modularisation Module										X	
Modular Coordination	N/A									X	
Modular (Electrical) Wiring	2.5.2			X			X				
Multi-Purpose Riser	2.5.2			X			?	X			
Non-Volumetric Preassembly							X			X	
Offsite Construction (OSC) Offsite Manufacturing (OSM) Offsite Production (OSP)										X	
Offsite Process										X	
Open (Cell) Panel Timber Frame	2.3.4		X	X			X				

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