MODERN METHODS OF CONSTRUCTION (MMC) 
FOR THE PROVISION OF HOUSING 

Barker 33 Review – Recommendations 

TECHNICAL REPORT COVERING THE BARRIERS TO 
THE GREATER USE OF MODERN METHODS OF 
CONSTRUCTION AND THE MECHANISMS TO 
OVERCOME THEM 

February 2006
Foreword

The report of the Barker 33 Cross Industry Group represents an industry response to the challenges laid out in the final report of the Barker Review of Housing Supply Delivering stability: securing our future housing needs.

Our report concentrates on recommendation 33:

*The House Builders Federation (now Home Builders Federation), in conjunction with NHBC, Construction Skills and other interested parties should develop a strategy to address barriers to modern methods of construction. This strategy should be developed to fit alongside existing initiatives, working closely with government to identify further measures that can be taken. A range of approaches should be explored, in particular actions by industry, and changes to NHBC policy and practice, as well as representations to government on areas such as changes to building regulations.*

Our report represents a cross-industry view of the challenges laid down by modern methods of construction. Our view has developed through wide ranging and open debate within our Group. We have recognised that innovation in housebuilding is dependent on the business case for its adoption and have suggested opportunities for both suppliers and regulators to enhance the business case for modern methods of construction. There remains, however, much work to be done. We strongly recommend that our *Breakthrough Solutions* should be adopted and implemented but our report also forms a source document for identifying more general further action.

Finally, I would like to express my sincere thanks to all those who have in any way contributed to the creation of this report and to their organisations for supporting us throughout this project. I am especially grateful to the Chairmen of the Working Groups for their leadership and for reporting on the work done by their respective groups.

I further wish to thank our sponsors whose contributions have enabled the production and publication of this report.

Ashley Lane
Chairman
February 2006
# Table of Contents

1. Executive summary .......................................................... 4
2. Introduction ................................................................. 10
3. Business context and philosophy ...................................... 11
4. Significant outcomes from 2\textsuperscript{nd} phase work ............... 12
   4.1. Issues and influences .................................................. 12
   4.1.1. Understanding ...................................................... 12
   4.1.2. Enabling business environment .................................. 12
   4.1.3. Fragmentation of the housebuilding industry ................. 13
   4.1.4. The skills issue .................................................... 13
   4.1.5. The cost of using MMC for housebuilding ..................... 13
   4.1.6. Regulatory framework for housebuilding ....................... 13
   4.1.7. Design and build .................................................. 13
4.2. Interim conclusions ...................................................... 14
   4.2.1. Communication ..................................................... 14
   4.2.2. Central forum ..................................................... 14
   4.2.3. Cost ............................................................... 14
   4.2.4. Business environment ........................................... 14
   4.2.5. Regulatory framework .......................................... 14
   4.2.6. Skills ............................................................ 15
   4.2.7. Design and build .................................................. 15
4.3. Agenda for phase 3 ..................................................... 15
5. Modern methods of construction: The Cross-Industry Group perspective ......................................................... 15
6. The barriers to MMC ....................................................... 17
7. Areas covered during phase 3 ........................................... 18
   7.1. Communication, education and training ......................... 24
   7.2. Culture change ....................................................... 26
   7.3. Cross-Industry Forum ............................................... 30
   7.4. Whole project costing .............................................. 35
   7.5. Regulation .......................................................... 38
   7.6. Warranty and certification ........................................ 41
8. Summary and final recommendations .................................. 41
   8.1. Overview of the barriers ............................................ 42
   8.2. Communication, education and training .......................... 42
   8.3. Culture change ...................................................... 43
   8.4. Cross-Industry Forum .............................................. 43
   8.5. Whole project costing ............................................. 43
   8.6. Regulation .......................................................... 43
   8.7. Warranty and certification ........................................ 43
9. Breakthrough solutions .................................................. 44
10. Implementation ............................................................ 46
11. Glossary ......................................................................... 47
12. Organisations involved ................................................... 48
13. Contributors ................................................................... 49
14. Appendices index .......................................................... 49
1. Executive Summary

Introduction
Recommendation 33 of the Barker Review of Housing Supply stated that: “The House Builders Federation, in conjunction with NHBC, Construction Skills and other interested parties, should develop a strategy to address barriers to Modern Methods of Construction (MMC). This strategy should be developed to fit alongside existing initiatives, working closely with Government to identify further measures that can be taken. A range of approaches should be explored, in particular actions by industry plus changes to policy / practice, as well as representations to Government on areas such as changes to Building Regulations.”

It quickly became clear that “other interested parties” were extensive and wide ranging in interest and representation. As a consequence the stakeholder discussions of the Barker 33 Cross-Industry Group summarised in this report have involved over 50 separate organisations. Therefore, the ground covered by this report’s recommendations is more extensive in its range than that originally envisaged by the Barker Review and its recommendations should be seen in the longer rather than shorter term.

Background to the work
The Barker 33 Cross-Industry Group was established in October 2004 and this report summarises the work undertaken since then.

Initially the Group’s work concentrated on issues concerned with:
• Communications and the Customer
• Education/Training
• Certification and Warranty
• Design and Build
• Whole Project Costing

From discussions within the Group on these issues the major issues taken forward to the final phase of the work included:
• The need to improve understanding of MMC
• Definition of MMC as wider than product innovation
• Recognition that MMC was often a process-pull not product-push mechanism for innovation
• The heightened process discipline required by MMC
• The need to develop skills and professional training in the context of MMC
• The enabling of MMC by matching the regulatory environment to the business environment
• Improvements in the understanding of MMC costs and benefits
• Recognition that cultural issues within the industry, its suppliers and regulators alike can significantly affect the climate for decisions on MMC

It was agreed that this concluding phase of the work would be the detailed examination of six potential breakthrough initiatives addressing the key areas identified above to the adoption of new, innovative and business beneficial ways of working

• Communication, education and training
• Culture change
• The formation of a Cross-Industry Forum (the Central Forum) to take forward the work of the Cross-Industry Group
• Whole project costing (drawing on current work by the National Audit Office)
• Regulation
• Warranty and certification

The recommended actions and breakthrough solutions for each of these reviews follow. The Cross-Industry Group has recommended actions and breakthrough solutions to be pursued without identifying the precise means. Instead, it has recommended that a legacy body (the Central Forum) be formed to take these forward by providing a mechanism for the wide range of interests involved to come together to discuss and develop relevant matters and pursue the solutions.

Definition of MMC
The Group has taken a deliberately wide view of the definition seeking to embrace innovation in process, people and product/component issues as well as systems. Therefore, the Cross-Industry Group defines MMC as follows:

*Modern Methods of Construction are about better products and processes. They aim to improve business efficiency, quality, customer satisfaction, environmental performance, sustainability and the predictability of delivery timescales. Modern Methods of Construction are, therefore, more broadly based than a particular focus on product. They engage people to seek improvement, through better processes, in the delivery and performance of construction.*

This definition is relevant to the whole of the construction industry, but in the context of this report is confined only to residential development.

The business context and philosophy of this report
The recommendations in this final report have been informed by an understanding of the business context within which residential development operates for both open market and affordable homes.

Innovation in housebuilding has occurred over the years. On occasions it has been product-led (adoption of trussed rafters for example), on others it has been led by regulation (e.g. increasing thermal insulation requirements) and has often been an incremental process. Today a number of residential developers and Registered Social Landlords are embracing product-driven MMC. These existing examples of innovation are testimony to the fact that where it has been seen as viable to invest in innovation companies have done so. So the key question the Cross-Industry Group has had to consider is what factors and issues may have weakened or undermined the business case for MMC and helped prevent innovation and process improvement that might otherwise have been viable. MMC must be seen not as an end in itself, but as a means to achieving:
• Greater business efficiency
• Enhanced design and quality
• Improved customer satisfaction
• Enhanced building performance
• Increased housing supply meeting the aspirations of the market as a whole (open market, social and affordable)
• Enhanced environmental performance with reduced impact

These are the ultimate objectives of the Group’s work and its recommendations are designed to further the achievement of these objectives.

**Barriers to MMC**
In pursuing its work the Cross-Industry Group has spent much time and effort in identifying barriers to adoption of MMC.

Current business models require the flexibility to cope with the wide range of conditions at the project level. They cope well with the differences and vagaries of site conditions, demand patterns, construction approval processes and design requirements. That present models work so well is because they have been optimised for current conditions. But it is these very vagaries that can create a barrier to the adoption of the new processes that MMC demands. In particular approval delays, regulatory complexity and change, together with inadequate certification can create barriers to improvement. The training needs (of site and professional staff) that MMC entails adds a further layer of complexity.

If the business case for particular applications of MMC is to be seen in its best light, all sectors of the industry will need a better overall business climate. This needs to address the training and education challenges and consider appropriate new perspectives through culture change as well as improvements in product and process. The Cross-Industry Group outlines these new perspectives through the reports of the six Working Groups in the Final Report.

**Importance of the regulatory climate**
While the supply side of the housing industry has made and continues to make great strides in improving the way in which it operates, opportunities, as outlined in our definition of MMC, exist for further improvement to the benefit of the ultimate product and the commercial case for its construction.

In particular, improving product and process can lead to the goals we have already outlined. However, this cannot be achieved by the supply side alone. In an industry dominated by regulation of both product and the land on which that product is constructed, the regulatory climate and its local application have significant influence. Therefore, suppliers and regulators have to match improvement in order to maximise the benefits from MMC.

The wider recommendations of the Barker Review propose many measures for ensuring the planning system functions in a more efficient, market responsive and market informed way. It is recognised that addressing the issues raised by Barker on the planning regime is vital if housing supply is to be improved in line with requirements. This work has a major bearing on the context within which the Barker 33 Group’s own recommendations must be viewed.

The implications of current planning and approval delays, uncertainties (including differences between local policies) and the supply of land with planning permission necessarily affect the climate for development. They adversely affect both the risks
associated with investment in innovation and the ease with which economies of scale for product-based methods of construction can be achieved.

There are similar issues associated with the operation of Building Regulations. Frequent changes to different sections of the Building Regulations, tensions between the objectives of different parts of the regulations and sometimes prescriptive rather than performance-based regulatory approaches can all affect the business case for investing in innovation. Again the ultimate issue is one of the additional business risks that can arise and the ability to achieve economies of scale necessary to support new processes and products.

The current discussions on the Code for Sustainable Buildings potentially present an opportunity to make improvements to the longer-term regulatory climate affecting innovation in respect of some of the key business performance goals summarised above. It is important therefore that the Code adopt a philosophy and approach that is aligned with the Barker 33 Group’s recommendations if the business climate for MMC and innovation is to be optimised.

**Recommendations**

Within the context of our discussions and research, the Barker 33 Cross-Industry Group makes the following recommendations to break down the barriers and encourage the uptake of Modern Methods of Construction:

**Communication, education and training:**
- Establish an industry-wide understanding of MMC
- Encourage the professional institutions to recognise and promote understanding of MMC through an appropriate syllabus
- Identify and establish training for specific site skills required for full implementation of MMC
- Certification bodies etc. to provide best practice guidance to support education and training
- HBF to facilitate and support stakeholders in the provision of education and training for innovation and new technologies

**Culture change:**
- Create more favourable climate in the City for development of MMC through exemplifying benefits and showing willingness to address key City concerns
- Develop a more pro-active strategy towards regulatory environment emphasising the partnership between regulators and suppliers necessary to release best value from MMC
- Strengthen supply chains through developing partnerships with appropriately skilled suppliers
- Initiate objective assessment of the business case for MMC relevant to housebuilders
- Engage media more actively
- Invest in training and education of professional and traditional craft operatives

**Whole project costing:**
- Recognise that MMC can be cost competitive (See National Audit Office report – Using modern methods of construction to build homes more quickly and efficiently November 2005)
- Understand that savings in process efficiency can put MMC costs on a par with traditional construction approaches
• Appreciate that process and product improvement are the core mechanisms for cost reduction

Regulation:
• Encourage stronger discipline and structure in the regulatory processes
• Establish structured process for regulatory decision making
• Ensure dialogue between regulators and regulated
• Develop increased flexibility of design within structured process
• Seek consistency through planning guidance to structure the local planning process

Warranty and certification:
• Develop appropriate standards and accompanying certification schemes that command stakeholder and industry confidence addressing the issues of resilience, reparability, adaptability, whole life costs and on-site quality
• Establish mechanisms to assess and quantify risks
• Develop the use of quality assurance and audit schemes to minimise the risk of MMC failure due to poor design specification and/or poor practices on site
• Influence Government to ensure that Home Information Packs (HIPs) contain information about property construction types as well as details on any relevant accreditation/certification.

Breakthrough solutions
Having made the recommendations above, the Barker 33 Group sees these embodied in the following set of Breakthrough Solutions to be implemented by the industry at large with guidance and direction from the Central Forum:

Communication, education and training:
Guidance and training should be prepared to increase awareness of the potential benefits and advantages of adopting MMC and the skills needed to implement MMC solutions within the context of developing industry-wide understanding. (Key players: CITB, HBF)

Culture change:
To improve the business/investment climate the benefits (both of process and product) of MMC needs developing, testing and promoting as best practice. From this an objective assessment of the business case should arise. (Key player: Central Forum)

Whole project costing:
Establish a mechanism for whole project costing which provides a basis for cost and performance benchmarking across the range of construction methodologies to expose the best in class for housebuilding. (Key players: Central Forum, BCIS)

Regulation:
Acceptable structured processes, within which the regulatory system operates, need to be established through dialogue and collaboration of all parties. Guidance on the implementation and administration of these processes is also required. (Key players: Government, Professional Institutions, HBF, and NHF)
Warranty and certification:
Establish mechanisms to assess and quantify risks, develop appropriate standards with accompanying certification and strengthen quality assurance and audit schemes. (Key players: ABI, CML, Certification Bodies)

[Note: Within the overall framework of the Central Forum, key players will need to develop and implement action plans to deliver quick wins]

Implementation
Throughout its work, the Barker 33 Cross-Industry Group has sought to improve the climate for, and confidence in, MMC. It sees this implemented through three goals:
1. Improve regulatory discipline
2. Inspire product and process confidence through relevant and appropriate certification
3. Exemplify benefits through practical (best practice) examples.
We have provided details in the full report on how all stakeholders should address these goals. The areas we feel need emphasis in this summary, the ‘Breakthrough Solutions’, are mainly the short-term actions required to make a measurable difference within a three-year period. These are the ones we wish to emphasise to build momentum from the current position. However, it is possible that longer-term issues will also demand solutions that will need a deeper understanding. Here collaboration between all parties will be necessary to achieve success.
In order to deliver these change processes and build this momentum we need to manage a concerted set of activities. This requires the establishment of a Central Forum to take forward the recommendations contained in the Barker 33 Report.

To do this it is essential that the Central Forum:
• Includes the key organisations responsible for delivering private and public sector housing. (Goals 1,2,3)
• Involves representatives from appropriate Government departments to help co-ordinate Government activities either as promoters of scheme initiatives or as regulators. (Goals 1,3)
• Includes key stakeholders such as NHBC, CML and ABI who control the acceptance of innovative products into the housing sector. (Goal 2)
• Develops a set of firm targets, a timetable for action and reports progress.
2. Introduction

Recommendation 33 in the report by Kate Barker* into housing provision in Britain, published in March 2004, requested the House Builders Federation (HBF) and the National House Builders Council (NHBC) to facilitate a strategic review of modern methods of construction (MMC) in the provision of UK housing. In particular, it should focus on the barriers to MMC and especially the solutions for increasing its use where there is a business case for doing so in the construction of social, affordable and private housing. This builds on and echoes the agenda set by Sir John Egan in ‘Rethinking Construction’.

In late summer of 2004 a Cross-Industry Group involving some 50 organisations was set up under the chairmanship of Ashley Lane of Westbury Partnerships. To ensure robust recommendations membership of the Group was taken from a wide spectrum of experience and knowledge of the housebuilding industry (The full list of the contributor organisations is contained in section 11 of this report.)

The work was undertaken in three phases. An interim report was produced by the Cross-Industry Group at the completion of the first phase in November 2004. This report provided Government with an outline of the barriers to the use of MMC and indicated some early thoughts on solutions.

This first phase report, in addition to giving an initial view of the main issues that were pertinent to the wider adoption of MMC, recommended that further work be undertaken by Working Groups in the following areas:

- Communications and the customer
- Education/training
- Certification and warranty
- Design and build
- Whole project costing

The work, which was undertaken by the five groups during phase two, was reported in April 2005. This report covered the results of the work undertaken, plus the overview thoughts of the Steering Group, and outlined how the third and final phase of the review would be focused.

The following working groups were established for the third phase:

- Communication, education and training
- Culture change
- Cross-industry forum
- Whole project costing (drawing on current work by the National Audit Office)
- Regulation
- Warranty and certification

* Barker Review of Housing Supply Delivering stability: securing our future housing needs, HM Treasury, April 2004
This Final Report details the key findings and recommendations made by the third phase Working Groups and also includes significant extracts of supporting data and commentary from the second interim report.

3. Business context and philosophy

The work of the Barker 33 Cross-Industry Group needs to be put in the context of:

- The need to expand the supply of housing
- Recognition of the constraints to delivery, viz.:
  1. Capacity
  2. Skills supply
  3. Regulatory and certification climate
  4. Other demands on the construction industry (Olympics etc.)
- The characteristics of the housing market
- The risks associated with innovation

The recommendations in this final report have been developed to address these issues through a well-informed understanding of the business context within which residential development, both for the open market and for affordable homes, operates.

A key question the Cross-Industry Group had to consider was;” What factors and issues may have weakened or undermined the business case for MMC and impeded innovation and process improvements that might otherwise have been viable ?”

Since the first house was built innovation in house building has been occurring. Sometimes product led, on others it has been led by regulation. It has often been an incremental process. Currently a number of residential developers and Registered Social Landlords (RSL’s) are embracing product-driven MMC initiatives. Where such innovations have been adopted they are testimony to the fact that they have been seen as a viable investment.

In this context the Group sees MMC not as an end in itself, but rather as a means to an end with the objective being to achieve:

- Greater business efficiency
- Better design and quality
- Improved customer satisfaction
- Enhanced building performance
- An increased housing supply which meets the aspirations of the market as a whole (open, social and affordable)
- Enhanced environmental performance with reduced impact.

Other benefits also include the provision of healthier and safer working conditions and a reduced reliance on the need for highly skilled labour during the construction process.
4. Significant outcomes from the 2nd phase work

The 2nd Interim Report identified the main issues affecting the uptake and increased use of modern methods of construction in house building. It also contained suggested solutions to encourage greater use of MMC and recommended an action programme for further work.

The report was written in the context of current housing market drivers to improve products, process and the skills for delivering new homes. The working groups identified the main obstacles to a climate that would encourage additional industry innovation. It is important that the house building industry is enabled to improve its product, in line with market forces, where it is viable so to do. It must also take into account customer preferences, address efficiency, quality and environmental and sustainable performance issues in a supportive business climate. This builds on and echoes the agenda set by Sir John Egan in *Rethinking Construction*.

4.1 Issues and Influences

During this 2nd phase the following were identified as being the prime issues preventing the widespread adoption of MMC:

4.1.1 Understanding.

Within the context of the report, house building using MMC was seen as a means of delivering improvements in quality, timeliness, customer satisfaction, environmental performance and improved sustainability, through optimising and continuously improving the necessary and disciplined construction processes.

To increase understanding, it is vital to set the boundaries around MMC within house building through a focus on Product, Process and People.

Expanding understanding to enable an appreciation of what MMC has to offer house building is essential.

4.1.2 Enabling business environment.

An examination of the business environment highlighted its importance in any consideration of encouraging better ways of working in the industry. The rewards of change have to outweigh the risks, new processes and products must be seamlessly incorporated if innovation is to yield success. With this in mind the house building industry is seen as a whole process for delivering housing into the UK. This starts with acquiring land and continues through the actual construction processes onto the ongoing maintenance of housing. In a fragmented market where land supply and prices dominate decision making, the climate for innovation in the house building industry has not matched that in other production industries which have not been subject to such circumstances. To enable continuing product development, the market needs to be demanding yet stable and offer business advantage through innovation.

The 2nd phase work specifically targeted actions which the construction industry, Government and its agencies could take to improve the business environment.
4.1.3 **Fragmentation of the house building industry.**

The Barker Report recognised that the house building industry is comparatively fragmented. As a result, it can be difficult to focus coherent policy initiatives designed to improve house building performance.

The Cross-Industry Group has acknowledged this and has recommended the establishment of a Central Forum to address issues of fragmentation and foster continued discussion of cross-industry issues by involving all of the key stakeholders. Without such a body, debate about change processes will continue to be difficult to pull together.

4.1.4 **Skills issues**

Skill requirements remain central to introducing MMC. While traditional construction skills continue to be important, MMC in house building demands a new focus on process integration through multi-skilling. Having the necessary skills available at the right time and in the right place are essential to optimise MMC. This applies throughout the construction process, on a site, in a factory, in the design studio, logistics centre and boardroom. So, a holistic viewpoint is needed to address the skills requirements for the house building industry as a whole.

4.1.5 **Cost of using MMC for house building**

High cost of MMC is often given as the primary objection to take-up. There is need to address perceived high costs as well as the concern over lack of capacity within the UK MMC manufacturing sector.

This is necessary to give confidence to investors and commercial decision makers, which, assuming other business conditions are supportive, in turn will deliver supply chain efficiencies and overall process cost effectiveness. Incorrect perceptions must be resolved and better benchmarking introduced to support business decisions on the necessary continuous improvement.

4.1.6 **Regulatory framework for house building.**

Planning and land availability together with building regulations and the Code for Sustainable Homes, must also be factored into take-up of new building techniques. Delivering volume house building can only be achieved where suitable land is available with planning consent, and the regulatory framework is appropriate for this fundamental aspiration to improve house building performance.

For more efficient house building, the regulatory framework must evolve to provide a climate that properly supports and encourages viable, innovatory house building processes.

4.1.7 **Design and Build**

The six barriers identified by the Design and Build Group were considered to fall into two separate categories:

Lack of industry drivers:

- Cost
- Customer value

Lack of business support:
4.2 Interim conclusions

Having considered these barriers, issues and influences the Cross-Industry Group drew the following interim conclusions:

4.2.1 Communication.

There is a need for a clear and agreed understanding of MMC within house building as highlighted by this report. To this end a statement of purpose is proposed based on MMC performance characteristics. Many barriers to introducing MMC into house building will be addressed as the need for change and key benefits are made more widely known to all decision-makers and stakeholders.

4.2.2 Central Forum.

A body is required whose remit includes monitoring developments and co-ordinating discussion on issues about the use of MMC within house building. Through such a body, it is envisaged that, activities can be co-ordinated to bring about accelerated and concentrated action to help the house building industry so that all stakeholders can sign up to proposed changes.

4.2.3 Cost.

Using MMC in house building can be cost competitive with other forms of house building. In addition to creating the volume, design and production conditions to enable this, it is vital for realistic cost comparison to be made to allow good decision making in the boardroom.

4.2.4 Business environment.

Sustained volume demand must be created for any new process such as MMC to be used successfully, efficiently and effectively in house building. Release of ex-public sector land could help enormously in creating the essential encouraging environment.

4.2.5 Regulatory framework.

The establishment of appropriate production process standards will be vital to create the belief and confidence to use MMC for house building. Reform of the planning systems and the introduction of aligned building control / code for sustainable buildings will also greatly aid the effectiveness and efficiency of MMC by avoiding last minute changes which work against supply chain efficiencies.
4.2.6 Skills.

A major programme of skills improvement is under discussion as part of the wider response to Barker. Part of this work will focus on the house building industry for efficient implementation of MMC practices. Concurrently, appropriate skills will be needed by MMC suppliers and throughout the professions for MMC to be effectively employed in house building.

4.2.7 Design and build

As the barriers and suggested solutions that were highlighted by the Design and Build Group were common to those identified by the other working groups it was agreed that they would be passed on to appropriate phase 3 groups (Communication, Education and Training; Whole Project Costing; Regulation) for further review.

4.3 Agenda for Phase 3

To develop these conclusions and take the project to completion a third and final phase of work was agreed where working groups would examine opportunities for breakthrough solutions in the following areas:

- Communication, education and training
- Culture change
- Cross-industry forums
- Whole project costing (drawing on current work by the National Audit Office)
- Regulation
- Warranty and certification

5. Modern Methods of Construction: The Cross-Industry Group Perspective

The 2nd stage interim report put forward the following interpretation of MMC within house building:

The term, MMC is a relatively recent one. Some commentators have adopted it to distinguish between dwellings built by non-conventional means before the 1980s (often referred to as “non-traditional”, “prefabricated” or “system built”), and those dwellings built post the 1980s using modern, non-traditional construction methods. Others have used it to differentiate between on- and off-site fabrication. At the same time brick and block techniques continue to be widely used in the industry, where in some, but not all, cases innovative assembly techniques are operated.

So, there is considerable debate and disagreement as to what constitutes a modern method of construction. Although MMC is a new concept in the UK, many ‘modern methods of construction’ have been used successfully around the world for many years. As a result there is no one single definition with which all parts of the industry are happy.
In this report an interpretation based on the following attributes was developed:

- Reduced labour on site
- Reduced build time on site
- Improved product quality
- Less dependence on current construction skills
- Generation of less waste
- Greater durability
- Easier maintenance
- Improved sustainability

This suggested an interpretation based on performance characteristics was necessary. So, the essential elements of MMC are:

- Adoption of disciplined processes to reduce waste and improve certainty
- Continuous improvement of components, processes and products
- A focus on delivering improved homes to meet growing customer demand for better quality, reduced environmental impact and running costs

Therefore the Cross-Industry Group saw MMC as delivering improvements in quality, customer satisfaction, environmental performance, sustainability and constructing houses to a more certain delivery timescale through optimising and continuously improving the necessary and disciplined construction processes. The Cross Industry Group therefore concluded that the following definition engaged all the attributes of MMC:

*Modern methods of construction are about better products and processes. They aim to improve business efficiency, quality, customer satisfaction, environmental performance, sustainability and the predictability of delivery timescales. MMC is, therefore, more broadly based than a particular focus on product. It engages people and in particular process to seek improvement in the delivery and performance of construction.*

This definition is relevant to the whole of the construction industry, but in the context of this report is confined only to residential development.

### 6. The barriers to MMC

Perceived barriers to MMC are many and the potential benefits are often not understood. The Cross-Industry group spent considerable time and effort in identifying the key barriers to the adoption of MMC and finding possible solutions.

Current business models require the flexibility to cope with the wide range of conditions at the project level. They cope well with the differences and vagaries of site conditions, differing demand patterns, construction approval processes and design requirements. But
it is these very vagaries that can create a barrier to the adoption of the new processes that
MMC is and demands. In particular approval delays, regulatory complexity and changes
and the certification process can create barriers to changes and improvement. These in
turn can be compounded by lack of training of site and professional staff in the
fundamentals of MMC. The present models work so well because they have been
optimised for current conditions. If the business case for particular applications of MMC is
to be seen in the best light, all sectors of the industry will need a better overall business
climate to address the training and education challenges and to consider appropriate new
perspectives through changes in culture as well as in product and process.

Improving product and process can lead to the goals outlined. However, this cannot be
achieved by the supply side alone. In an industry dominated by regulation of both product
and the land on which that product is constructed, the regulatory climate and its local
application have a significant influence. In order to maximise the benefits from MMC both
sides will have to match improvement.

The wider recommendations of the Barker Review propose many measures for ensuring
that the planning system functions in a more efficient, market responsive and market
informed way. Addressing the issues raised by Barker on the planning regime is vital if
housing supply is to be improved in line with requirements. This work has a major bearing
on the context within which the Barker 33 Group’s own recommendations must be viewed.

The implications of current planning delays, uncertainties (including differences between
local policies) and the supply of land with planning permission necessarily affect the
climate for development. They adversely affect both the risks associated with investment
in innovation and the ease with which economies of scale for product-based methods of
construction can be achieved.

There are similar issues associated with the operation of building regulations. Frequent
changes to different sections of the building regulations, tensions between the objectives
of different parts of the regulations and sometimes prescriptive regulatory approaches can
all affect the business case for investing in innovation. Again the ultimate issue is one of
the additional business risks that can arise and the ability to achieve economies of scale
necessary to support new processes and products.

The current discussions on the “Code for Sustainable Homes ” potentially present an
opportunity to make improvements to the longer-term regulatory climate affecting
innovation in respect of some of the key business performance goals summarised above.
For the business climate for MMC and innovation to be optimised it is therefore important
that this Code adopts a philosophy and approach that is aligned with the Barker 33
Group’s recommendations.

7. Areas covered during phase 3

The work undertaken during phase 3 confirmed the barriers that were identified during
phase 2. The outcome from the six working groups who undertook the review of the
subjects listed below supported the earlier findings and advanced the recommendations
previously suggested.

- Communication, education and training
- Culture change
• Cross-industry forum
• Whole project costing (drawing on concurrent work by the National Audit Office)
• Regulation
• Warranty and certification

7.1 Communication, Education and Training

The remit of the working group was to “investigate the key barriers to MMC within house building with particular reference to education and training. To make recommendations on how these barriers could be overcome by the provision of defined education and training to all stakeholders involved in the process”.

During phase 2 it became clear that there was an overlap with the work of other groups in some areas and after consultation with the Steering Group it was agreed to pursue all areas and ensure effective communication with the other groups, communication, education and training being considered to be key components in the successful development of MMC.

The group identified the following as being main barriers to MMC:

• Lack of availability of communication, education and training on different MMC products, systems and processes.

• Lack of awareness and training in the effective use of specific MMC.

• Lack of information of existing coverage of MMC issues in current education/qualification frameworks.

• New emerging technologies create new demands and the need to respond to the dynamic nature of the skills requirements.

• Inadequate knowledge of the scope of MMC.

• Lack of content and focus on possibilities and implications of new and emerging technologies including MMC by stakeholders in their respective fields.

The key influential stakeholders who can act to ensure effective communication education and training and thereby form the six breakthrough solutions were identified as follows:

• Manufacturers and suppliers of products used by the construction industry and their trade associations.

• Housebuilders/RSL’s

• FE/HE/training providers and professional bodies

• Sector Skills Councils

• Certification bodies, BRE, warranty providers, HSE
- House builders trade association (HBF)

While the suggested actions could be addressed by individual stakeholders it was agreed that an over arching resource to co-ordinate and facilitate the process was necessary.

The following summary of the key stakeholder groups and the recommendations for educating and promoting MMC within house building to these groups contained in the tables below was reported in the 2nd Interim Report

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Issue arising from the Barrier</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>After Sales staff</td>
<td>Develop improved awareness of maintenance implications for MMC constructed homes</td>
<td>Provide appropriate information into the supply chain from manufacturers, house builders and RSL’s. Recommendations include home information packs, briefing packs and seminars arranged by trade associations. Information packs should also be developed for tenants through RSL’s.</td>
</tr>
<tr>
<td>City Investors</td>
<td>Define clear benefits of MMC within house building to allow risk analysis, &amp; to promote confidence in alternative approaches</td>
<td>Investor Days to include site visits, briefings and demonstrations. Open Days at off site manufacturers to demonstrate key benefits e.g. production efficiency, quality control, logistics and H&amp;S benefits.</td>
</tr>
<tr>
<td>Health and Safety</td>
<td>Promote H&amp;S benefits of MMC within house building</td>
<td>Total H&amp;S solution for MMC constructions through product training promoted and delivered through trade associations e.g. UKTFA and The Concrete Centre</td>
</tr>
<tr>
<td>Home Buyers and Tenants</td>
<td>Dispel myths and promote benefits of MMC within house building to create demand</td>
<td>Develop and deliver communication programme to promote, inform and educate the general home buying public and tenants on MMC benefits especially sustainability, quality, environmental improvements</td>
</tr>
<tr>
<td>House Builders/Housing Associations</td>
<td>Information, education, awareness skills</td>
<td>Communication programme to inform the boardroom, based on accurate costing frameworks and clear benefits</td>
</tr>
<tr>
<td>MMC Manufacturers</td>
<td>New skills for assembly, design and technical staff</td>
<td>Alongside existing skills, the MMC process demands that new skills are learnt. It is recommended existing qualification, accreditation and training programmes are assessed to determine how new skills required by MMC can be included. This is expected to mean new or updated training programmes to reflect the new competencies. In parallel, regular skills updates sessions for assembly, design and technical staff will need to be introduced</td>
</tr>
<tr>
<td>The professions</td>
<td>Information, education, awareness skills</td>
<td>Communication programme to inform the professions (architects, highway planners, mortgage lenders) and to raise awareness</td>
</tr>
</tbody>
</table>
Based on accurate costing frameworks and clear benefits

| Site and Contract Managers | New skills for site and contract managers | These staff will have the same needs as Manufacturers technical staff and will need similar training, certification and qualification programmes to operate MMC sites safely, effectively and efficiently. In addition, logistics benefits and planning activities will need to be learnt. It is recommended these areas become new modules of the relevant Continuing Professional Development programmes |
| Trades people | New skills for trades people | Trades people will have similar up-skilling and competency needs to manufacturer’s staff and site managers. It is proposed new MMC skills are incorporated as new modules to include logistics and planning into existing trade qualifications e.g. NVQ |

Because of their significance to the work that was undertaken during this final stage the tables produced in phase 2 which refer to General Industry Training Need (table 1), Specific Training Needs (table 2) and the table of Issues and Recommendations for each of the Stakeholder Groups they have been reproduced in Appendix 1.

Recommendations

The following 6 recommendations were made during the final stage:

- Manufacturers and their associations, in consultation with training provider, should take a lead role in the provision of education, training and information on the requirements of specific MMC systems at all levels of delivery from concept to installation to all stakeholders, particularly in the early development stages of new/emerging technologies in MMC. As these become more established and achieve a critical mass then manufacturers can be supported by the accreditation and training bodies

The training is an enhancement of existing skills rather than the introduction of fundamentally new skills. A typology needs to be developed to reveal categories of MMC from off-site production technology to on-site production practices. Each will require a bespoke training approach which will include on the job training where appropriate. It will be necessary to engage with FE/HE training providers, professional and other bodies to develop training programmes and accreditation schemes.

Use existing and active on-going research to accelerate skills forecasts and key areas for data acquisition (18 months). Use academia and existing relationships with manufacturers, HE and FE training bodies and trade associations, (1-2 years).

Manufacturers and trade associations can work with academia, designers, site and project management training. Training Providers can work with manufacturers to ensure appropriate and timely learning. Sector Skills Councils can analyse training needs in consultation with manufacturers, suppliers etc.
Having chosen an MMC solution every company (housebuilders and/or RSL’s) must ensure that the people involved in its use receive appropriate training in the specific use of MMC. This includes designers, process staff, supply chain, construction management, trades, homeowners/tenants and after sales services.

The house builders and/or RSL’s who use MMC should identify the training needs of all stakeholders e.g. by process mapping the specific MMC and consider any gaps identified including reinforcement of existing training with the support of manufacturers and other information providers e.g. certification bodies and trade associations.

If process mapping is used as a tool it will facilitate effective communication understanding and co-operation between all stakeholders and by conducting an initial audit the effect of the actions taken can be measured.

Housebuilders and RSL’s should be encouraged to share their expertise and best practice with others.

The initial needs survey and process maps can be completed fairly quickly. Timescales are likely to be longer, three years + working with professional bodies and HE & FE training providers. Quicker wins can be expected with manufacturers and the supply chain as there are existing relationships. The provision of information to homebuyers and tenants can be analysed and reviewed in a fairly short time.

Housebuilders to work with trade associations to promote learning. Manufacturers and suppliers can input and collaborate strongly with RSL’s and housebuilders to disseminate information. Sector skills councils to consider any necessary response.

The principles of MMC/emerging technology to be considered in the education and qualification framework to ensure that principles are embraced at an early stage in career development to prepare people for dealing with emerging technologies. Both Training providers and the professional bodies need to reflect and embody skills, knowledge and understanding of MMC within their educational/qualifications.

Research existing FE/HE/training providers and professional bodies to identify where appropriate programmes are being delivered. Audit existing training provision, qualification and education frameworks to assess the current level of inclusion of the development of knowledge, skills and understanding for issues surrounding the use of MMC. Encourage/persuade FE/HE/training providers and professional bodies to develop such areas of their provision/frameworks where coverage is currently inadequate. Re-audit to assess improvements.

The time-scale of the full implementation of this action is likely to be three to five years. Changing the content of professional bodies’ education frameworks and nationally recognised qualifications such as degrees, HND’s and NVQ’s is a fairly lengthy process. Quicker wins could be achieved in non-qualification based training is delivered by training providers and others.
There are several potential resources, including CITB Construction Skills that would be capable of undertaking this work.

- **The Sector Skill Councils (SSC’s), primarily CITB Construction Skills with links to other SSC’s such as Summit Skills, can assist in the provision of education and training in MMC at several levels including support for the education and training framework and support for direct provision by manufacturers and others.**

As MMC will still require traditional skills, training will be an enhancement of the existing skills. The Sector Skills Council will need to ascertain the trajectory of skills training, what type of skills are needed, and by using current skills survey research to understand what are the actual skills to obtain better quality forecasts.

It is suggested that a typology be developed to reveal categories of MMC from off-site production technology to on-site production practices. Each will require a bespoke training approach including on the job training as appropriate.

It will be necessary to engage with FE/HE training providers and professional bodies to develop training programmes and accreditation schemes.

The development of a robust qualification framework, which separates the installation of MMC components as one qualification, and the manufacture of MMC components as another, should be considered.

The SSC should consider the development of a forecasting model that will help predict labour market demand for the MMC industry. Labour groups, contractors, owners, estimators, national and provincial/territorial organisations and government will benefit from using the model to predict labour market trends and requirements. In this way, they can develop appropriate training and recruitment strategies and project the movement of MMC labour.

By utilising current research on Gap analysis and skills for MMC, i.e. skills requirements. Benchmarking across EU, to advise on course and roll out training for manufacturers can be determined. Time frame 1 – 2 years.

- **Technical assessments of MMC can provide much information on their effective use by making sure this information is available to stakeholders in a user-friendly form. By providing best practice guidance Certification bodies, BRE, warranty providers, HSE can support education and training provision by others.**

Research certification bodies, BRE, warranty providers, HSE to identify where relevant assessment is being carried and audit the existing information being provided by these bodies and its ready availability to education and training providers.

Encourage/persuade the certification bodies, BRE, warranty providers and HSE to improve their dissemination/provision of information and consider the setting-up of a central repository for all such information to improve its accessibility to interested
parties.

Re-audit to assess improvements.

As the action is about improving the accessibility to information that is already held by the bodies concerned the time-scale for the full implementation of this action could be as little as six months.

There will need to be some resource allowed to co-ordinate and facilitate the process even though the main work will need to be done by the certification bodies.

- **There is a need for the housebuilders trade body to act as a vehicle to ensure that there is effective communication and dissemination of information about education and training provision and requirements for MMC between its members and other stakeholders.**

It is suggested that the HBF discuss the possibility of re-establishing an innovation review group and to consider the incorporation of relevant material and encourage the participation of other trade associations and professional bodies in the work of this forum.

Could key information be made available on the HBF website for public access? Will the HBF consider creating an "experts" contact group via their website and arranging seminar programmes for members, possibly in conjunction with other trade associations and professional bodies. Also can they discuss and suggest other awareness raising initiative/events and facilitate the communication of members’ education and training needs in MMC to the SSC’s.

HBF will need to carry out an initial appraisal for development. Many of these actions for consideration, if accepted, could be taken forward and/or advised to the SSC’s in a relatively short timescale of 6 – 9 months.

**Co-ordinating the recommendations and facilitating the process**

Who will champion recommendations and suggestions and make them happen?

Even though the suggested actions can be filtered and taken up by the respective influential stakeholders there is a need for an over-arching resource to co-ordinate and facilitate the process. All of the stakeholders will have to communicate and collaborate with each other.

The timescales for successful implementation of each recommendation will vary enormously and range from quick wins to long-term gains e.g. professional course development and changes may typically take at least three years.

For further information as to how the final stage recommendations (Action points) were developed refer to the tables in Appendix 2.
7.2 Culture change

Culture change was not address directly during the earlier phases of the Cross-Industry Group’s work. Issues arose in the Communication and Customer working group, and to some extent in the other working groups.

Both the Communication and Customer and the Education and Training working groups produced very similar findings regarding the need for various stakeholders to be brought up to date on MMC via a programme of education and training.

In order to highlight the potential of MMC as widely as possible, however, it was concluded that a more pro-active strategy would also be required. It is for that reason that in this final stage of the work previously undertaken by Communication and Customer working group has been taken forward under a newly formed Culture Change working group.

Action points

By holding an industry workshop to brainstorm the cultural barrier to MMC the Culture Change working group produced a number action points for a wide range of players. These were prioritised into the following shortlist with the objective of providing suggestions to remove these barriers:

- Create a more favourable climate and understanding in the City for MMC
- Develop a more pro-active strategy towards the regulatory environment
- Create partnerships with the established supply chain (Builders Merchants)
- Volume house builders to be encouraged to undertake an objective assessment of the business case for MMC
- Proactively communicate with the media
- Invest in training and education of traditional craft operatives

Rationale behind action points

Creating a more favourable climate and understanding in the City for development of MMC

An action plan aimed at raising awareness of the technology and the business benefits coupled with greater involvement of foreign institutions and banks already familiar with MMC should create a more favourable climate for and understanding of MMC in the UK.

The education action point has been addressed by the Communication, Education and Training working group

Within a timescale of a few months MMC manufacturers could undertake a programme of factory visits

The pan-industry forum charged with taking the work of the Barker 33 Working Groups forward should consider the establishment of a Best Practice programme and the coordination of a risk management strategy. Such a programme is likely to be costly and would need to be of sufficient length of time to allow for the programme to be developed
and launched – probably the order of a year. The risk management strategy would require input from a range of stakeholders.

**Development of a more pro-active strategy towards the regulatory environment**

Raising awareness of MMC (of both existing regulators via CPD and future regulators by targeting universities and colleges) will help overcome preconceptions, ignorance and lack of familiarity with MMC in people who are involved in the implementation of regulations (planning officers, building control officers) and those who create the regulations.

Trade associations could be more pro-active by, for example by drafting more Approved Documents etc.

Personnel in planning and building control officers have, as a result of their training and experience, a natural bias towards conventional construction. They may not be familiar with other forms of construction, or have little real awareness or appreciation of the impact that their decisions have on the people and the organisations affected. There is therefore, an immediate need to raise awareness and education which is specifically aimed at planners and building control organisations, coupled with more liaison between their respective professional organisations and trade. The liaison activities could begin straight away, but the awareness raising activities would take some time to organise (months).

The process for reviewing Regulation changes is slow and as such is not structured to cope with the rapid developments in MMC. Barriers associated with regulation are being examined by the Regulation working group.

The MMC industry could help itself by inputting more material than it currently does for the development of Approved Documents and other material for the support of regulations.

**Creating partnerships with the established supply chains**

The arrangements that Builder’s Merchants have with manufacturers and suppliers enables them to organise direct delivery of large items or quantities direct to site from the manufacturer when necessary. As such are well placed to play a significant role in the supply of MMC products by providing an opportunity to optimise supply chain efficiency, including ordering, logistics, delivery, etc.

**Encouraging the volume house builders to undertake an objective assessment of the business case for MMC**

House builders’ approach to modern methods is influenced by market incentives and the views of city analysts and their own buying departments, often compounded by a lack of information. Builders need the information to undertake an objective review of MMC in order to see the benefits to be gained through its adoption.

The HBF and NHBC should work with builders to facilitate the dispassionate assessment of whether MMC could benefit their operation in any particular case.

**Proactively communicating with the media**

If MMC suppliers could get together under a single umbrella they would be in a position to engage proactively with the media. Could the proposed Cross-Industry Forum be this umbrella organisation? Or should an existing organisation such as the HBF provide the service? Whatever the solution a high profile spokesperson should be appointed to be the voice of MMC.
Invest in training and education of traditional craft operatives

Through training and appropriate incentives it may be possible to encourage a wider acceptance of MMC by the craft trades. This underscores the need for more informed training of craft trades highlighted by the Communication, Education and Training working group.

Co-ordinating the recommendations and facilitating the process

Culture changing is a slow process therefore there is a need for an over-arching resource to co-ordinate and facilitate the process. A person, or appropriate organisation, will need to take ownership of the recommendations and suggestions made by the Culture Change working group and make them happen.

7.3 Cross-industry forum

In the 2nd Interim Report the following were identified as being barriers which prevented the wider use of MMC:

- The fragmentation of the house building industry, involving several diverse activities and interests operating within their own specialisms
- The resulting slow and irregular pace of change.

The main action points and key breakthrough solutions to overcome these barriers were identified in the 2nd Interim Report as a central, Cross-Industry Forum.

The secondary action point which the sub group then considered was whether this required the setting up of a new body, or whether there is already an existing body which could take on this role.

The primary purpose of such a forum would be to act as a legacy body to the HBF Barker 33 Group in order to co-ordinate the agreed recommendations of the final report of this group. It has become clear, as the work of this group has progressed, that the issues relating to the uptake of modern methods of construction are both pan industry and also relate to all methods of construction – not just those currently classified as ‘modern’, as follows:

- *Pan industry*, which involves those responsible for the building and commissioning of new homes, as well as for major capital works and repair of the existing stock, together with their supply chains. The issues relating to the uptake of MMC therefore involve a variety of clients, consultants, contractors, developers, sub contractors, manufacturers and suppliers, as well as house builders and members of HBF. Ideally the ‘legacy body’ would need to be one which is capable of including representatives from all these bodies, as well as one which has links with the relevant research bodies, as has been demonstrated by the dialogue achieved and knowledge exchanged through the involvement of the diverse organisations on the HBF Barker 33 Steering Group.

- *All methods of construction* … the focus on what constitutes a modern method of construction and what does not has distracted from the real issue, which is
concerned with both the speed of construction and the outcome – a quality product initially and in use. Innovations are currently taking place throughout the industry on a variety of products and processes, as well as in the variety of organisations involved in delivering them. In order to achieve the targets set out in the Barker Review and other government policies, the ‘legacy body’ will need to involve the representative bodies of all organisations committed to continuous improvement in the delivery of quality new homes, as well as the important involvement of HBF.

- The Cross-Industry Forum will need to focus on the dialogue necessary to co-ordinate the implementation of the recommendations of this report and on the dialogue necessary to address the pan industry issues of the future.

**Action points**

- The formulation of the role and objectives of the cross sector forum.
- The consideration of the location of the forum:
  - A new body set up specifically to address the issues described above, or a group located within an existing body.

The majority of the HBF Barker 33 Group agreed that the co-ordination of the Cross Industry Forum should be undertaken by the Housing Forum in collaboration with the HBF, and including the organisations on the Barker 33 Group.

**The formulation of the role and objectives of the cross sector forum**

The objective of this forum would be to mitigate the effects of industry fragmentation so help improve the pace of industry improvement towards achieving faster production of better quality homes.

The desired outcomes being:

- Industry and government to sign up to the proposed role and objectives of the cross sector forum, which are:
- Co-ordinate the implementation of the HBF Barker 33 Group recommendations.
- Facilitate “joined up” thinking by independently representing all stakeholder interests, including customers, maintaining independence and impartiality, lobbying for fair play through cross industry representation.

- Support and promote innovative ideas and practice, leading to improvement in house building by whatever method, focussing on process, people and culture, as well as product.
- Accelerate progress and engender change by seeking continuous improvement in process, product and performance, including training and skills needs.
• Act as a conduit to government for research, funding and general industry issues, such as seeking necessary adjustments in regulatory systems, their enforcement, and the raising of awareness of MMC issues in the regulatory community.

• Address the construction-related challenges of sustainable communities.

• Align outputs to facilitate strategic industry wide benefits and outputs of quality housing construction.

• Co-ordinate the activities of stakeholders and representative organisations involved in the implementation and delivery of the action plan arising from this report to agreed milepost targets.

• Raise the profile of the Forum and funding to support such an umbrella group, including support from major house builders and developers to drive change.

The timescale and resources required have yet to be defined in detail and identified. The Housing Forum has volunteered to provide the secretariat.

The consideration of the location of the Forum

Should the Forum be set-up as a new body set up specifically to address the above barriers described, or be a group located within an existing body?

The setting up of a new body specifically for the purpose of assuming the role and addressing the objectives described was considered by both the sub group on the Cross Sector Forum and the main Steering Group. The majority view was that a new body would not be required and that the role and objectives could be co-ordinated on behalf of the whole industry by the Housing Forum in collaboration with HBF, including the representative bodies on the Barker 33 Group.

The setting up of a new body does not appear to be favoured by government whose agenda is to encourage the joining up of organisations which are already set-up to promote innovation and improved industry performance.

The HBF membership is currently responsible for the output of the majority of new homes built and the Housing Forum is already established as an independent body whose membership includes industry organisations across the supply chain. Both organisations have track records as lobbying bodies, and both are currently supported by membership funds.

Benefits from an HBF and Housing Forum collaboration:

The HBF would brings the following to such a collaboration:

• An extensive membership base and consequent ability to access industry expertise and views.

• An overview and understanding of all the policy and regulatory issues affecting the industry, providing the necessary wider context for further work relating to MMC and innovation
• A wide programme of National and Regional events through which feedback and guidance could be sought, including groups dedicated to the consideration of technical issues.

• Numerous communication channels to senior figures in the industry.

The Housing Forum would brings the following:

• Six and a half years’ experience of industry performance measurement, which could be expanded and adapted for future needs, including the cross sector forum targets and measures.

• The production of earlier reports on industry innovations in MMC, i.e. ‘Homing in on Excellence’ 2002, ‘Manufacturing Excellence’ 2004, each achieved by working groups drawing on a wide industry representation.

• 2005 research for the Housing Corporation into construction performance of the 70 preferred housing associations for funding, and a further programme of research planned for 2006.

• Six and a half years experience of working with senior level cross industry groups on a variety of topics, resulting in the publication of toolkits and guidance on best practice.

• The experience obtained from Its current involvement in hosting cross sector workshops for NAO research, and its proposed involvement with EP on distilling and disseminating the best practice arising from the Design for Manufacture - £60k home competition.

• Information from its current work on a Customer Driven Strategy for Housing Construction, involving member groups looking at increasing innovation in the supply of new homes, design and customer satisfaction, and improving the existing stock.

• Data from its involvement through Constructing Excellence with nCRISP (the new Construction Research, Innovation and Strategy Panel) and KTP (the Knowledge Transfer Panel), in association with DTI.

Agreement to this collaboration by both organisations is yet to be obtained. The Housing Forum Board, at its meeting on 14th July 2005, agreed that it:

• Would be happy to take on the role of co-ordinating the cross sector forum, involving all those bodies currently represented on the Steering Group, and any others as appropriate

• Considered this type of work to be the precise purpose of the Housing Forum itself, one of its current main objectives within Constructing Excellence ‘ being to establish itself as the Strategic Forum for the housing construction industry.

• Would achieve more by forming alliances with other organisations not yet within its network.
• Would also welcome any constructive criticism that would enable it to improve its impact

• Could not understand the rationale for creating a new body when recent government efficiency policy has been to rationalise the proliferation of 'change agencies' focussing on continuous improvement, innovation, and best practice and to reduce the consequent inefficiencies and fragmentation which the number of these had already created within the industry.

Measures of success

• Initially, government and industry agreement to the above role and objectives
• The commencement of business by the forum
• The setting of the targets and the means of measurement.
• An annual report which exemplifies the achievement of the forums objectives.

Co-ordinating the recommendations and facilitating the process

In order to establish the setting up of the cross sector forum the following steps need to be taken:

• Initiate discussions between the HBF and the Housing Forum

• Appoint a high profile Chair for the cross sector forum.

• The agreement of the HBF to work with the Housing Forum in co-ordinating the cross sector forum to be obtained. HBF Barker 33 Group would also need to be endorsed any agreements made.

7.4 Whole project costing

Barriers to the universal adoption of MMC that were identified in the 2nd Interim report by the Whole Project Cost sub-group:

• MMC is, or is perceived to be, more expensive than the current construction process.

• The advantages of MMC do not or are not perceived to impact on the commercial decisions of developers and RSL’s.

• The advantages of MMC to stakeholders not involved in the initial construction investment fail to influence the value placed on the product.

• The whole life cost advantages and disadvantages of MMC within house building are unclear.

Solutions proposed in the 2nd Interim report

• Produce benchmarks to compare and track costs
• Produce standard methods of reporting costs at the development level

• Produce a practical method of comparing costs on a like for like basis

• Promote potential savings to developers and RSL’s through case studies and research to identify actual savings and costs.

• Identify if savings using MMC are being fully felt by Developers or are they being absorbed by sub-contractors to bolster margins:
  1. Provide more focus/publicity on current initiatives underway by The Housing Corporation and English Partnerships. Both organisations give financial advantages to better developments by taking cost benefit and savings factors into account when allocating grants and land
  2. Promote green mortgages as these reflect savings in the amount of the loan.
  3. Promote savings to owners and tenants
  4. Promote increasing standards in Building and Manual Handling Regulations
  5. Promote environmental and safe working benefits to stakeholders

• Carry out whole life cost assessments on MMC solutions identifying who would benefit from any saving/additional cost.

**Lack of Independent benchmarks**

As the National Audit Office were about to start a study into the role of MMC in delivering housing more efficiently the Barker 33 committee felt that rather than try to duplicate this work it would give its full support to the NAO initiative.

Members of the Barker 33 committee took part in the NAO workshops and helped facilitate the provision of much of the industry-based data.

**The NAO Study**

The aim of the NAO was ‘to identify existing good practice, to promote its wider use and to encourage further improvement.' It paid particular attention to the social housing sector, because of the special interests of the Housing Corporation and Office of the Deputy Prime Minister, but the results and conclusions are relevant to the wider homebuilding industry.

The NAO study involved:

• Appointing a broad range of specialist consultants to advise us on construction process modelling, building cost calculation, modern methods of construction, on-site activities and durability assessment

• Holding four workshops involving around 50 practitioners, including developers, manufacturers, RSL’s, architects and consultants, to share knowledge and comment on the direction of the study
• Holding ongoing and detailed discussions with further practitioners, particularly RSL’s and manufacturers, to map and cost typical development processes

• Securing information from a database of observations of on-site activities;

• Normalising results to aid comparison and to ensure consistent building quality using a hypothetical development typical of those undertaken by Registered Social Landlords in England

• Consulting two expert groups on emerging results.

The NAO study was helpful in presenting costs of various methods of construction in a consistent format. It draws some conclusions about how construction fits into the wider process of housing provision and points out that improvements will only occur by integrating the whole process. The Barker committee drew extensively on the research carried out by the National Audit Office.

The NAO study found that there is potential for improvements in all methods of construction. Improvements are more about improving efficiency than the choice of construction method and illustrated the need for further work in promoting:

• The reporting of project costs
• A consistent format for reporting project costs
• The NAO report and the methodology used to compare costs, i.e. pricing the process
• Clients partnering with supply chain and planners
• Standardisation of products
• The provision of whole life cost and environmental performance data on all new dwellings
• Changes in regulation, grants and mortgages to facilitate improved quality in the value of properties.

Construction programmes for a range of methods of construction (Brick/block, timber frame, advanced panel, volumetric and thin joint blockwork) for a standard development were produced in conjunction with builders and suppliers. Labour resources were added to these programmes which together with estimates of on site materials costs, costs from off-site manufacturers, plant costs and estimates of preliminaries produced an estimate of the construction costs. Two examples for each method of construction were produced. The costs were prepared against a standard specification.

Additionally a traditional measured estimate was prepared for the brick/block model and a survey of social housing schemes of a similar size and type as the model was carried out. These confirmed that the estimate based on the resourced programme for the brick/block was representative of the market. The statistics from the survey were used to project a range of costs on the point estimates for each construction method.

A programme was developed for the whole development process which was also costed.

Savings that could result from earlier completion were estimated.
Costs are reported as:

- Construction cost per m2 (gross internal floor area) of dwellings including project preliminaries apportioned by cost.

Whole life cost issues were examined by commissioning a report on the durability of the various construction methods.

The main conclusion of the study were:

- The importance of early decisions on design and procurement and planning issues which should include consideration of:
  - Standard designs and layouts
  - Supplier involvement in the development of designs
  - Early contractor and supplier involvement in projects
- Improvements in the construction process are more influential in improving efficiency than the choice of construction method. There is potential for improvements in all methods of construction but they are essential if the benefits of MMC are to be realised. It could be said that the improvements in the construction process is the prerequisite of all MMC.
- All methods of construction are variable so that there is likely to be some overlap between their costs. However based on the NAO model current construction cost for brick/block and open panel timber frame are comparable but broadly speaking for other construction methods costs tend to rise with the extent of off-site manufacture.
- Construction time is also variable but is significantly reduced as the amount of off-site manufacture increases.
- The amount of on-site labour reduces as the amount of off-site manufacture increases.
- Earlier completion is of financial benefits to an RSL, which can offset much of the cost differential, e.g. earlier rental income, reduced interest payments and reduced on-site inspection.
- There were mixed views expressed on the influence of volume on the cost of off-site manufacture. While some savings will accrue while there is spare capacity, and there is currently spare capacity, the growth in the use of any particular MMC solution will need to be matched to the ability of the industry to supply if overheating is to be avoided.
- Whole life cost issues were not identified. Once erected, the main difference between the construction methods is the underlying structural materials, all of which have a life in excess of 60 years.
- Off-site construction brings potential advantages in build quality, which result from the quality assurance processes that are applied in a factory environment. This should lead to a reduced incidence of components failing due to incorrect installation or damage during on-site operations.
Whereas the report concentrated on the social housing sector many of the conclusions are relevant to private developers. There are significant differences particularly in the financial impact of faster delivery of schemes.

An RSL building their own stock should in addition to cost of construction, consider the revenue implications of earlier completion of the work resulting from the shorter build times which are more readily achievable with increased off-site construction.

Private developers were found to take a different approach to scheme development where flexibility and the ability to control the flow of completed homes to match sales are the key concerns. For publicly quoted companies the city takes a positive view of land banks and a negative view of unsold houses. The ability to erect houses and flats as they are sold, ideally in the time it takes to complete mortgage arrangements etc, is, in some circumstances, more important than speed in completing the scheme.

**Action points**

- Promote the NAO report as a standard format for reporting costs.
- Promote the NAO report as a methodology for comparing costs.
- Promote the findings of the NAO report, the work of the Housing Forum and Constructing Excellence.
- Promote the publication of running costs as part of details provided by sellers.

**Rational behind the action points**

Costs of individual housing projects are reported usually as £/m2 or £/unit but it is not always clear on what basis the costs and floor area have been measured. The NAO report provides costs as cost per m2 (gross internal floor area) of dwellings including project preliminaries apportioned by cost.

Adopting the use of this format would facilitate the comparisons of both proposed and outturn costs leading to a better understanding of relative costs.

The NAO study provided a good methodology for comparing costs by concentrating on the processes required to deliver different methods of construction rather than material substitution. This methodology stresses that concentrating on improving the process of housebuilding is more important than the choice on construction method. It moves away from the costs of the various MMC products and solutions and takes a holistic approach to their incorporation in the building process. This will in itself bring better understanding to clients, developers and builders, and hopefully planners.

As the full analysis carried out by NAO is a relatively time consuming and therefore costly process and requires input from both constructors and suppliers, it is important to promote the underlying message that while additional costs may arise from the components that go into MMC solutions, savings come from the changes that they make to the construction process. So that in promoting a particular solution the cost of complete projects as well as the costs of individual products or processes is required.
Construction of dwellings is not the most time consuming part of the process of providing new homes. It is important that RSL’s, developers, planners and the Government apply as much planning and quality control to the other parts of the process.

The Egan principles of collaborative working, aligning goals and supply chain management are still to be taken to heart by the industry. A continuous improvement culture can only be brought about by teams delivering a standard product - this does not mean reduction in choice, but that the choices on offer have been thought through in the context of a standard product.

Co-ordinating the final recommendations and facilitating the process

The Government and the industry should promote the findings of the NAO report, i.e.:

- Standard methods of reporting costs
- A consistent format for reporting project costs
- The NAO report and the methodology used to compare costs, i.e. pricing the process
- Partnering with supply chain and planners
- Standardisation of products
- The provision of whole life cost and environmental performance data on all new dwellings
- Changes in regulation, grants and mortgages to facilitate improved quality in the value of properties.

For further information as to how the final stage recommendations (Action points) were developed refer to the tables in Appendix 4.

7.5 Regulation

While phases 1 and 2 of the work of the Barker 33 Group did not specifically explore the role of the regulatory system in enabling adoption of MMC it was clear that regulation (of both planning and construction) significantly influenced the benefits of MMC. The Design/Build Group in particular recognised the important role of regulation.

In the 2nd Interim report the effect of the regulatory framework on the adoption of MMC was highlighted. It stated that the goals that were outlined for MMC by improving discipline in product and process cannot be achieved by the supply side alone, as in an industry dominated by regulation of both product and the land on which that product is constructed, the regulatory climate and its local application have a significant influence. Increases in process discipline have to come equally from both delivery and regulation. Without this, the 'business as usual' model prevails and the case for improvement and innovation is greatly weakened.

The wider recommendations of the Barker Review proposed many measures for ensuring the planning system functions in a more efficient, market responsive and market informed way. It is recognised that addressing the issues raised by Barker on the planning regime is vital if housing supply is to be improved in line with requirements. This work has a major
bearing on the context within which the Barker 33 Group’s own recommendations must be viewed.

The implications of current planning delays, uncertainties (including differences between local policies) and the supply of land with planning permission necessarily affect the climate for development. They adversely affect both the risks associated with investment in innovation and the ease with which economies of scale for product-based methods of construction can be achieved.

There are similar issues associated with the operation of building regulations. Frequent changes to different sections of the building regulations, tensions between the objectives of different parts of the regulations and sometimes prescriptive regulatory approaches can all affect the business case for investing in innovation. Again the ultimate issue is one of the additional business risks that can arise and the ability to achieve economies of scale necessary to support new processes and products.

The current discussions on the Code for Sustainable Buildings potentially present an opportunity to make improvements to the longer-term regulatory climate affecting innovation in respect of some of key business performance goals summarised above. It is important therefore that the Code adopt a philosophy and approach that is aligned with the Barker 33 Group’s recommendations if the business climate for MMC and innovation is to be optimised.

The group recognised that there was a need to develop a more pro-active strategy towards regulatory environment emphasising the partnership between regulators and suppliers necessary to release best value from MMC. The current system employed by both industry and regulators is flexible, short term, non-capital intensive, and good at problem solving. It is an optimum solution to traditional problems, and as such is inherently dependant on individual skills and initiative. It is not an optimum approach to the structured culture demanded to get the best from MMC.

Industry, being deeply influenced by the commercial world within which it operates, must justify all cases for investment, perceives that the regulators do not understand this concern. Heavy capital commitment requires early certainty of regulatory intentions but as MMC requires capital commitment the present regulatory indiscipline militates strongly against MMC.

The group notes that the industry is being asked to adopt a structured and disciplined process approach to MMC. It recommends that regulators must accept exactly the same structure and discipline. This is a major culture and mindset change calling for an extensive programme of education and awareness raising.

With one or two relatively detailed exceptions the group has identified few areas where MMC is specifically prejudiced by regulation. The bigger problem is the lack of understanding identified above. But there are specific concerns regarding the inconsistency and timeliness of the planning system, which justify specific consideration. And there is a strong case for more transparency about the future direction in which regulatory systems propose to move.

**Key barriers to MMC identified by the Design/Build group**

The housing industry is very heavily regulated. There are numerous restrictions, implied or real, in current legislation and regional approval practices. Delay and uncertainty in
gaining planning approval creates business risk. There are strong commercial pressures to start on site as soon as approval has been given. Lack of type approval and the contradictions across some regulations adds uncertainty and allows local interpretation. Regulations are changing ever more quickly. This makes any long-term commitment to product by house builder or supplier very difficult. For example, if regulations are reviewed every 5 years, there is potential to have a design change every 6 months.

Regulations and approval standards

- Protracted planning processes where PPG3 mitigates against MMC
- Highway planning not in sympathy with MMC e.g. access around sites
- Building Regulations do not acknowledge MMC
- Lack of track record of industry self regulation
- Lack of cohesion and joined-up Government departments and agencies
- LPS 20-20 would become a barrier if third party certification is protracted or expensive

Lack of appropriate skills

- House builders resources are required to continually update house designs to respond to Building Regulation amendments
- History of task not process training
- Lack of training across industry and at all levels in new construction methods

Suggested solutions

- Review the proposed new Code for Sustainable Buildings. Ensure this drives a holistic and planned approach to future Building Regulations changes. It is recommended regulations are changed less frequently to minimise repeated design changes
- Provide Government support for industry initiated R&D compatible with Government policy
- Seek housing industry view on current draft LPS 2020. Amend as needed to avoid overlap with other regulatory requirements. Consider a self-regulation system such as an NHBC or Zurich fast-track approval system
- Develop clearer guidance at time of outline planning stage (e.g. density, building heights, and open space). Determine scheme design as early as possible, and promote less planning intervention at detailed building design stage
- Commission a National Audit Office evaluation of the value of MMC, and the cohesion of policy deployment across the various Government agencies.
• Ensure there is no market distortion between MMC and current forms of construction (excluding specific demonstration projects)

• Develop CIOB process training process for Site Managers

• Provide authoritative MMC briefing notes for architects, building control officers, planners, and other stakeholders.

For further information as to how the barriers and suggested solutions were developed refer to the tables in Appendix 5.

It was against this background that the Regulation Sub-Group undertook its work. It looked, in particular, at the influence of regulation within the business context and how regulatory and operational processes interact. The review identified the major action points listed below:

**Action points**

- Establish structured process for regulatory decision making
  
  (Government/Industry)

- Structured dialogue between regulators and regulated (Government/Industry)

- Develop ability to deliver increased flexibility of design within structured process
  
  (Government/Industry/Professions/Academia)

- Planning circular to set level playing field in local planning process (Government)

- Training for new and existing planners (Professions/Academia)

**7.6 Warranty and certification**

For this group the members were drawn from manufacturers, warranty providers, certification bodies including the Building Research establishment (BRE) and British Board of Agrement (BBA) as well as lenders and insurers and other stakeholders.

The Working Group agreed to focus closely on those key barriers and solutions that were not going to be dealt with by other groups and to combine barriers and solutions where there was substantial overlap. The barriers were:

- Unquantified risk
- The confidence gap
- Lack of incentives to manufacturing to pursue certification and warranties
- Lack of a centre of excellence

**Unquantifiable risk**

There is a perception amongst key stakeholders (such as lenders and insurers) that there is significant “unquantifiable risk” with the use of innovative systems. This arises from a lack of a track record for such systems, alluding to the possibility of problems over ease and cost of repairs/maintenance. Performance characteristics are unproven and performance over time is yet to be established. There is also the problem of systemic risk (i.e. risk that design/manufacturing failure will be replicated via production line techniques)
as a result of the manufacturing process. Three key action points were agreed to address this barrier:

**Action points**

- Develop new certification schemes specifically addressing these issues to compliment/extend existing MMC certification and command the confidence of key stakeholders. The key benefit would be increased confidence in MMC by key stakeholders, and an improvement in prevailing standards of MMC. BRE are currently developing a certification scheme for innovative systems LPS 2020.

- Develop the use of quality assurance schemes to cover design, specification and/or on-site practice. This should provide a way of demonstrating the adequacy of systems and reducing unquantifiable risk. Developments in quality assurance are currently being co-ordinated by NHBC and latent defects insurance providers have or are developing quality assurance schemes.

- Assess existing design standards and regulations using Failure Modes and Effects Criticality Analysis (FMECA) to determine and quantify risks and to identify gaps and duplication. Targeted and consistent certification will enable manufacturers to bring products to the market quicker and more reliably plus reduce product certification costs.

**Lack of confidence on the value of certification**

There is a lack of confidence amongst manufacturers on the value of certification and lack of incentive to pursue it.

**Action point**

- Subject to the resolution of wider issues relating to the operation of Home Information Packs (HIPs) and their impact on the residential property market, discuss with Government (ODPM) the inclusion of information about property construction types and relevant accreditation/certification in HIPs. This should improve customer and stakeholder awareness of construction issues and accreditation/certification and increase the incentive to pursue accreditation/certification. These matters are understood to be under consideration by those preparing for the introduction of HIPs.

**Action points and recommendations**

**Unquantifiable risk**

The risk that is inherent in innovative projects arising from the lack of a track record for building systems that are relatively untried which makes the forward extrapolation of risk difficult. For certain stakeholders, notably mortgage lenders and insurers, the ability to identify and manage risk is critical. Lenders must be able to assess whether a building is suitable to stand as security for a mortgage of up to 35 years. This raises issues of durability, re reparability, adaptability and whole life costs. Insurers are concerned with the
resilience of the structure to a range of perils, including storm and flood, together with the ease and cost of repair. The following three action points focus on the need to provide comfort for key stakeholders during the period in which an MMC system is gaining a track record. The action points centre on issues of certification and quality assurance, ensuring that a coherent framework of schemes is available and is properly understood by stakeholders and consumers. Though each deals with standards in MMC, the three action points are complimentary rather than overlapping.

**Action points**

- In addition to existing certification schemes that demonstrate compliance with Building Regulations, there is a need to develop standards and accompanying certification schemes that command industry confidence and address the issues of resilience, reparability, adaptability, whole life costs and on-site quality.

- Establish a framework of Failure Modes and Effects Criticality Analysis (FMECA) to assess unquantified risks, and then carry out an examination of the current profusion of design standards and regulations used to certify MMC products. This should confirm that risks are addressed, identify duplication and gaps within current and future regulatory requirements and highlight areas of weakness and areas for streamlining.

- Develop the use of quality assurance and audit schemes to minimise the risk of MMC failure due to poor design specification and/or poor practices on site.

**Lack of confidence on the value of certification**

The third action point derives from a perceived lack of confidence amongst MMC manufacturers that certification will be worthwhile in the light of the cost and resource that is typically required to obtain it. Customers, in the shape of homebuyers, are often unaware of the construction of the properties that they purchase and are insufficiently acquainted with the issues raised by the use of MMC and the potential role of certification in addressing them. Related to this is the lack of means to transmit information about construction and about certification to customers, their advisers and others with a sales role in the housing market. It is hoped that inclusion of construction information in the soon-to-be launched Home Information Packs (HIPs), together with certification/accreditation information will, over the longer term, stimulate more pressure for firms to undergo certification.

**Action point**

- Influence Government to ensure that Home Information Packs (HIPs) contain information about property construction types as well as details on any relevant accreditation/certification.

**Summary of the proposed solutions**

The solution proposed for the removal of the barrier of unquantified risk and confidence gap associated with innovative MMC’s involves:
• Quantifying the risk by means of a failure modes and effects criticality analysis (FMECA)

• Rationalising certification processes to address the risks and avoiding duplication while maintaining choice.

This would be achieved by an independent expert body, which will define the risks and provide a targeted and consistent framework for certification.

For further information as to how the final stage recommendations (Action points) were developed refer to the tables in Appendix 6.

Co-ordinating the final stage recommendations and facilitating the process

The tables in Appendix 5 to this report indicate that there has been progress on some of the action points:

• A certification standard for innovative housing systems is currently being developed by BRE with input from lenders, insurers and other stakeholders. The new standard, known as LPS 2020 is currently undergoing calibration, with the assistance of several manufacturers. BRE expect LPS 2020 to be launched by the end of 2005. In addition, CE marking of performance characteristics declared in European Technical Approvals based on published ETAG’s will generate increased confidence in the reliability of technical data relating to such systems.

• NHBC is initiating its Quality Assurance Framework, in conjunction with a range of stakeholders. A web site is currently being developed.

• Building Life Plans have a computerised software system which addresses both design and workmanship issues associated with MMC.

• ODPM is currently working to implement the new Home Information Packs for launch in 2007. The detailed content of the Packs has not been finalised.

The action points as set out are achievable but ODPM will need to be committed with support if all are to be prosecuted successfully.

While both LPS 2020 and the NHBC initiative are progressing it remains to be seen whether they will fully meet the scope of the respective action points. Similarly the outcome of HIPs implementation is still not certain. Government support will be important here.

To ensure that the action point on the examination of current regulations and standards is taken up Government will need to commit itself publicly. This will require a financial commitment. Such work could be undertaken by one of the certification bodies.

8 Summary and final recommendations

8.1 Overview of the barriers

The many perceived barriers to MMC have been examined, the most frequent being lack of understanding. It was necessary to define what constitutes MMC and make clear to the numerous stakeholders the benefits to be obtained by adopting MMC.
There is no single forum in the UK debating the issues relating to house building incorporating MMC. The need for a person, or persons, to champion the cause in order to ensure that the recommendations and suggestions are followed-up and implemented was clearly outlined in section 8.3 by the Cross-Industry Forum.

The 2nd Interim report highlighted the difficulties of innovative products competing in a mature market with tried and tested products. To gain acceptance in the UK market, MMC must develop willing champions across the industry and early adopters keen to exploit the concept.

There is no centre of excellence responsible for promoting, researching and communicating MMC best practice within house building.

The effects resulting from a failure to properly benchmark costs and performance characteristics of house building incorporating MMC were obvious. Short-term construction costs have not been balanced out against whole life costs.

The large investment required in MMC innovation by suppliers and house builders has been seen as a major barrier. This report recommends incentives, specifically through improvements in planning and building control which should be considered if Government wishes to encourage take-up of improved house building design, construction and build processes. Regulations and approvals standards need to be brought up to date to assist in the education and take-up of new building techniques.

A wide range of opportunities and challenges to address continuous development of professionals, builders and construction industry trades through education and training on MMC is proposed. Current skills will need to be retained, expanded and regularly updated to cater for the demands of MMC within housebuilding.

The action points below are summaries of the reports of the six Working Groups. They are intended to address the challenge of MMC to widen its adoption by the construction industry.

8.2 Communication, education and training:

- Establish an industry-wide understanding of MMC
- Encourage the professional institutions to recognise and promote understanding of MMC through an appropriate syllabus
- Identify and establish training for specific site skills required for full implementation of MMC
- Certification bodies etc. to provide best practice guidance to support education and training
- HBF to facilitate and support stakeholders in the provision of education and training for innovation and new technologies

8.3 Culture change:

- Create more favourable climate in the City for development of an MMC industry through exemplifying benefits
- Develop a more pro-active strategy towards regulatory environment emphasising the partnership between regulators and suppliers necessary to release best value from MMC
- Strengthen supply chains through developing partnerships with appropriately skilled suppliers
- Initiate objective assessment of the business case for MMC relevant to housebuilders
- Engage media more actively
- Invest in training and education of professional and traditional craft operatives

8.4 Cross-Industry Forum:
- Establish a Cross-Industry Forum
- Involve representatives from all sectors of the industry including financiers, regulators, manufacturers, RSL’s, housebuilders, etc.
- Engage in processes to exemplify and promote the benefits of MMC in housebuilding

8.5 Whole project costing:
- Recognise that MMC can be cost competitive
- Understand that savings in process efficiency can put MMC costs on a par with traditional construction approaches
- Appreciate that process and product improvement are the core mechanisms for cost reduction

8.6 Regulation:
- Encourage stronger discipline and structure in the regulatory processes
- Establish structured process for regulatory decision making
- Ensure dialogue between regulators and regulated
- Develop increased flexibility of design within structured process
- Seek consistency through a planning guidance circular to structure the local planning process

8.7 Warranty and certification:
- Develop appropriate standards and accompanying certification schemes that command stakeholder and industry confidence addressing the issues of resilience, reparability, adaptability, whole life costs and on-site quality
- Establish mechanisms to assess and quantify risks
- Develop the use of quality assurance and audit schemes to minimise the risk of MMC failure due to poor design specification and/or poor practices on site
- Influence Government to ensure that Home Information Packs (HIPs) contain information about property construction types as well as details on any relevant accreditation/certification.

9 Breakthrough Solutions
Having made the recommendations above, the Barker 33 Group sees these embodied in the following set of Breakthrough Solutions to be implemented by the industry at large with guidance and direction from the Central Forum:

Communication, education and training:
Guidance and training should be prepared to increase awareness of the potential benefits and advantages of adopting MMC and the skills needed to implement MMC solutions within the context of developing industry-wide understanding.

**Culture change:**
To improve the business/investment climate the benefits (both of process and product) of MMC needs developing, testing and promoting as best practice. From this an objective assessment of the business case should arise.

**Whole project costing:**
Establish a mechanism for whole project costing which provides a basis for cost and performance benchmarking across the range of construction methodologies to expose the best in class for housebuilding.

**Regulation:**
Acceptable structured processes within which the regulatory system operates need to be established through dialogue and collaboration of all parties. Guidance on the implementation and administration of these processes is also required.

**Warranty and certification:**
Establish mechanisms to assess and quantify risks; develop appropriate standards with accompanying certification and strengthen quality assurance and audit schemes.

**10. Implementation of the breakthrough Solutions**
Throughout its work, the Barker 33 Cross-Industry Group has sought to improve the climate for, and confidence in, MMC. It sees this implemented through three goals:

1. Improve regulatory discipline
2. Inspire product and process confidence through relevant and appropriate certification
3. Exemplify benefits through practical (best practice) examples.

Details are provided in this report on how all stakeholders should address these goals. The areas we feel need emphasis in this summary, the ‘Breakthrough Solutions’, are mainly the short-term actions required to make a measurable difference within a three-year period. These are the ones we wish to emphasise to build momentum from the current position. However, it is possible that longer-term issues will also demand solutions that will need a deeper understanding. Here that will necessitate collaboration between all parties will be necessary to achieve with academic research community, building on previous success.
In order to deliver these change processes and build this momentum we need to manage a concerted set of activities. This requires the establishment of a Cross-industry Central Forum to take forward the recommendations contained in the Barker 33 Reports.

To enable this to be achieved it is essential that:

- It includes the key organisations responsible for delivering private and public sector housing (goals 1,2,3)
- It involves representatives from appropriate government departments to help co-ordinate government activities either as promoters of schemes/initiatives or as regulators. (Goals 1 and 3)
- The Central Forum represents includes key stakeholders such as NHBC, CML ABI that control the acceptance of innovative products into housing sector (goal 2)
- It develops a set of firm targets, a timetable for action and reports progress.
11. **Glossary**

These acronyms are used throughout this report. For clarity a glossary is included here:

- **ABI** Association of British Insurers
- **BBA** British Board of Agreement
- **BCIS** Building Cost Information Service
- **BRE** Building Research Establishment
- **CIOB** Chartered Institute of Building
- **CITB** Construction Industry Training Board
- **CML** Council of Mortgage Lenders
- **DTI** Department of Trade and Industry
- **HA** Housing Association
- **HBF** House Builders Federation
- **HIPs** Home Information Packs
- **LPS** Loss Prevention Standard
- **MMC** Modern Methods of Construction
- **NHBC** National House Building Council
- **RICS** Royal Institution of Chartered Surveyors
- **RIBA** Royal Institution of British Architects
- **RSL** Registered Social Landlord
- **UKTFA** UK Timber Frame Association
12. Organisations involved

The following organisations participated in discussions enabling the preparation of the reports produced by the Barker 33 Cross-Industry Review Group:

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<tr>
<th>Organisation</th>
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<td>ABI</td>
<td>Fairclough Homes</td>
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<td>Nationwide</td>
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<td>Eddie Stobart</td>
<td>Zurich</td>
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<td>English Partnerships</td>
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14. Appendices index

Appendix 1  Education and Training (As reported in the 2\textsuperscript{nd} Interim Report) Summary of training needs and ideas for education delivery  50
Appendix 2  Communication, Education and Training working group table of final stage recommendations  53
Appendix 3  Culture Change working group table of final stage recommendations  57
Appendix 4  Whole Project Costing working group table of final stage recommendations  61
Appendix 5  Regulations working group table of final stage recommendations  63
Appendix 6  Certification and Warranty working group table of final stage recommendations  68
Appendix 7  Transcript of the Design and Build section in the 2\textsuperscript{nd} Interim Report  70
### Appendix 1 - Education and Training (As reported in the 2nd Interim Report)

**Summary of training needs and ideas for education delivery**

**Table 1 – General Industry Training Needs** (Excludes training needs arising after a company has selected a MMC solution)

<table>
<thead>
<tr>
<th>Who has the skills or knowledge needed?</th>
<th>Broad skills or knowledge needs</th>
<th>Ideas for training delivery</th>
</tr>
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<tbody>
<tr>
<td>Industry leaders</td>
<td>Better understanding of MMC within house building:</td>
<td><strong>Existing qualified staff</strong></td>
</tr>
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<td>Key clients including HA’s &amp; RSL’s</td>
<td>• Cost</td>
<td>• HBF activities</td>
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<td>• Benefits</td>
<td>• NHBC road shows</td>
</tr>
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<td>Specifiers</td>
<td>• Impact on processes</td>
<td>• CPD events with RICS, RIBA, CIOB, CABE etc</td>
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<td>• Logistics</td>
<td>• Exhibitions, show sites and developments</td>
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<td>• Planning/land considerations</td>
<td>• Specialist programmes – e.g. Salford University process mapping work</td>
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<td>• Sustainability and environmental issues</td>
<td>• Research bodies such as BRE activities</td>
</tr>
<tr>
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<td>• Supply chain issues</td>
<td>• Trade association activities</td>
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<tr>
<td>Company planners</td>
<td>• Skills issues</td>
<td>• Training events</td>
</tr>
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<tr>
<td>Building Control officers</td>
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<tr>
<td>H &amp; S professionals</td>
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</tbody>
</table>

**New recruits and unqualified existing staff**

- Inclusion of modules covering the range of MMC in construction technology elements of FE and HE courses.
- Inclusion of modules covering the range of MMC within house building in professional body education and examination frameworks.

Continued.
### Table 1 continued

<table>
<thead>
<tr>
<th>Who has the skills or knowledge needed?</th>
<th>Broad skills or knowledge needs</th>
<th>Ideas for training delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Existing qualified staff</strong></td>
</tr>
<tr>
<td>City investors</td>
<td>Better understanding of MMC:</td>
<td>• HBF activities</td>
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<tr>
<td></td>
<td>• Cost</td>
<td>• Conferences</td>
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<td></td>
<td>• Benefits</td>
<td>• Exhibitions</td>
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<tr>
<td></td>
<td>• Risk analysis</td>
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<tr>
<td>Home buyers</td>
<td>Better understanding of MMC:</td>
<td>Exhibitions, show sites and developments</td>
</tr>
<tr>
<td></td>
<td>• Benefits</td>
<td>• HBF activities</td>
</tr>
<tr>
<td></td>
<td>• Sustainability and environmental issues</td>
<td>• PR activities</td>
</tr>
<tr>
<td>Site trades-people</td>
<td>Installation requirements – basic skills to apply sound principles to all MMC’s</td>
<td>Not applicable – existing qualified trades are only likely to learn new skills needed for specific MMC’s (see table 2 below)</td>
</tr>
<tr>
<td>Manufacturers’ assembly staff</td>
<td>Technical issues</td>
<td>In-house training</td>
</tr>
<tr>
<td>Manufacturers’ technical staff</td>
<td>Assembly skills</td>
<td>Information from component suppliers</td>
</tr>
<tr>
<td></td>
<td>Process skills</td>
<td>Trade Association activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• In-house training</td>
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<tr>
<td></td>
<td></td>
<td>• Information from component suppliers</td>
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<tr>
<td></td>
<td></td>
<td>• Trade Association activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Inclusion in trade qualifications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CITB</td>
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</tbody>
</table>

**Table 2 below**
<table>
<thead>
<tr>
<th>Who has the training/knowledge needed?</th>
<th>Broad training/knowledge needs</th>
<th>Ideas for delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trades-people</td>
<td>• Specific installation requirements</td>
<td>• Manufacturers through on-site briefings, off-site training or guidance information</td>
</tr>
<tr>
<td></td>
<td>• Any additional skills needed</td>
<td>• Trade Association activities</td>
</tr>
<tr>
<td></td>
<td>• Impact on other trades</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Health and Safety issues</td>
<td></td>
</tr>
<tr>
<td>Architects and designers</td>
<td>• Design issues</td>
<td></td>
</tr>
<tr>
<td>Specifiers</td>
<td>• Impact on other parts of design</td>
<td></td>
</tr>
<tr>
<td>Technical staff</td>
<td>• CAD</td>
<td></td>
</tr>
<tr>
<td>Buyers</td>
<td>• Health and Safety Issues</td>
<td></td>
</tr>
<tr>
<td>Quantity surveyors</td>
<td>• Logistics</td>
<td></td>
</tr>
<tr>
<td>Company planners</td>
<td>• Process issues</td>
<td></td>
</tr>
<tr>
<td>M &amp; E specialists</td>
<td>• Impact on supply chain</td>
<td></td>
</tr>
<tr>
<td>Site managers</td>
<td>• Health and Safety Issues</td>
<td></td>
</tr>
<tr>
<td>Project managers</td>
<td>• Logistics</td>
<td></td>
</tr>
<tr>
<td>Contracts managers</td>
<td>• Process issues</td>
<td></td>
</tr>
<tr>
<td>Construction managers/directors</td>
<td>• Impact on supply chain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Construction requirements</td>
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<tr>
<td></td>
<td>• Maintenance issues</td>
<td></td>
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<tr>
<td>After sales staff</td>
<td>• Maintenance issues</td>
<td></td>
</tr>
<tr>
<td>Customer care staff</td>
<td></td>
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<tr>
<td>Maintenance managers and staff</td>
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</table>

Continued.
### Table 2 continued

<table>
<thead>
<tr>
<th>Who has the training/knowledge needed?</th>
<th>Broad training/knowledge needs</th>
<th>Ideas for delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality control inspectors</td>
<td>Detailed understanding of technical and construction requirements for the MMC</td>
<td>Manufacturers through training or guidance information</td>
</tr>
<tr>
<td>Warranty inspectors</td>
<td></td>
<td>Third party certification information (BBA etc.)</td>
</tr>
<tr>
<td>Building Control officers</td>
<td></td>
<td>Trade Association activities</td>
</tr>
<tr>
<td>Health and Safety professionals</td>
<td>Health and Safety issues on design and construction</td>
<td>Manufacturers through training or guidance information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trade Association activities</td>
</tr>
<tr>
<td>Home buyers</td>
<td>Impact of MMC(s) used on use of dwelling</td>
<td>Briefing by the builder or RSL at hand-over</td>
</tr>
<tr>
<td>Tenants</td>
<td>Impact of MMC(s) used on alteration of dwelling</td>
<td>Information provided by the builder or RSL</td>
</tr>
<tr>
<td></td>
<td>Maintenance issues</td>
<td>Trade Association activities</td>
</tr>
</tbody>
</table>
Appendix 2

Final recommendations: Communication, Education and Training

1st Action Point - Manufacturers and their associations, in consultation with training provider, should take a lead role in the provision of education, training and information on the requirements of specific MMC systems

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
<th>Desired outcome</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMC is a wide and disparate sector. There is a lack of education and training on different MMC systems and products.</td>
<td>Manufacturers and suppliers of products used by the construction industry, and their trade associations in consultation with training providers and bodies such as CITB to provide training education and information on the requirements of specific MMC systems at all levels of delivery from concept to installation to all stakeholders.</td>
<td>Manufacturers can provide the flexibility and specific training needs for their specific range of MMC products. This would use the most efficient use of training resources.</td>
<td>Manufacturers to provide on-the-job training and information for the enhancement of existing skills.</td>
<td>The uptake of on the job training will reduce the skills shortages currently facing MMC manufacturers.</td>
</tr>
</tbody>
</table>

2nd Action Point - Having chosen an MMC every company (housebuilders and/or RSL’s) must ensure that the people involved in its use receive appropriate training in the specific use of MMC

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
<th>Desired outcome</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of awareness and training in the effective use of specific MMC.</td>
<td>Where MMC is employed Housebuilders/RSL’s to ensure that all stakeholders including designers, process staff, supply chain, construction management, trades, homeowners/tenants and after sales receive</td>
<td>Provide appropriate stakeholders with a better understanding and awareness of the specific MMC.</td>
<td>Stakeholders will achieve a better understanding of the use of specific forms of MMC thus enabling the process and use of MMC to be more effective.</td>
<td>The improvement on initial audit of the understanding of MMC.</td>
</tr>
</tbody>
</table>
### 3rd Action Point

The principles of MMC/emerging technology to be considered in the education and qualification framework to ensure that principles are embraced at an early stage in career development to prepare people for dealing with emerging technologies.

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Action</th>
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<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of information of existing coverage of MMC issues in the current framework.</td>
<td>FE/HE/training providers and professional bodies to reflect and embody skills, knowledge and understanding of MMC within their educational/qualification frameworks.</td>
<td>Learners will understand the issues surrounding the use of MMC and develop the skills and knowledge required to make the correct choices in their use.</td>
<td>Broad coverage of the principles of the use of MMC in training courses, qualification and education frameworks. These principles will include design, manufacturing logistics/management, installation and maintenance.</td>
<td>Improvement on initial audit of MMC content in training courses, qualification and education frameworks.</td>
</tr>
</tbody>
</table>

### 4th Action Point

The Sector Skill Councils, primarily CITB Construction Skills with links to other SSC's such as Summit Skills, can assist in the provision of education and training in MMC at several levels.

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<tr>
<th>Barrier</th>
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<th>Measure</th>
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</thead>
<tbody>
<tr>
<td>Emerging technologies in MMC create demand and require a response to the dynamic nature of the skills requirements.</td>
<td>Sector Skills Council to give consideration to the collective identification of the specific skill needs for MMC.</td>
<td>Sector Skills Council can anticipate specific training needs and facilitate effective delivery for a range of MMC products.</td>
<td>The suggested framework of on the job training will reduce the skills shortages currently facing MMC manufacturers/users.</td>
<td>Sector Skills Council can suggest a framework for appropriate provision.</td>
</tr>
</tbody>
</table>
5th Action Point - Technical assessments of MMC can provide much information on their effective use by making sure this information is available to stakeholders in a user-friendly form

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
<th>Desired outcome</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate knowledge of the scope of provision of knowledge of MMC.</td>
<td>Certification bodies, BRE, warranty providers, HSE to provide best practice guidance on the use of MMC to support education and training provision.</td>
<td>Training and education bodies and other stakeholders are well informed of the effective use of MMC’s, and the potential risks and actions to mitigate those risks.</td>
<td>Clear expert, third party information readily available on the effective use of MMC’s.</td>
<td>Improvement on initial audit of availability of this information to education and training providers and other stakeholders.</td>
</tr>
</tbody>
</table>

6th Action Point - There is a need for the housebuilders trade body to act as a vehicle to ensure that there is effective communication and dissemination of information about education and training provision and requirements for MMC between its members and other stakeholders.

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<thead>
<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
<th>Desired outcome</th>
<th>Measure</th>
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</thead>
<tbody>
<tr>
<td>Lack of context and focus by stakeholders in their respective field on the possibilities and implications of new and emerging technologies including MMC.</td>
<td>HBF to facilitate and support other stakeholders in the provision of education and training for innovation and new technologies.</td>
<td>Achieve a more consistent and effective approach by relevant bodies to the consideration of new and emerging technologies including MMC.</td>
<td>HBF serves as a hub for disseminating information on emerging technologies and providing seminars/events with other organisations.</td>
<td>Auditing the uptake of information and promotional activities provided by HBF. Determining by survey satisfaction of members needs for information in this field.</td>
</tr>
</tbody>
</table>
## Appendix 3

Final recommendations: Culture Change

### 1st Action point - Creating the more favourable climate in the City for development of the MMC Industry

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
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<th>Measure</th>
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</thead>
<tbody>
<tr>
<td>Understandably, many companies and financial institutions are risk averse. Their risk aversion stems in part from a lack of understanding and knowledge of what modern methods of construction are and the business benefits that can be gained from them.</td>
<td>A programme of education and awareness-raising needs to be developed, aimed at senior staff within key financial institutions and organisations. Comparisons with the situation in other countries should be drawn, and foreign banks involved. Manufacturers should be encouraged to host factory visits for decision makers. A ‘Best Practice’ programme could be developed. A risk management strategy needs to be developed.</td>
<td>Manufacturers would find it easier to develop new facilities leading to benefits for the City and the economy in general.</td>
<td>The main desired outcome from this action would be greater stability of the MMC market. That in turn may lead to better margins for manufacturers.</td>
<td>Key indicators of a better investment climate would be the share prices of manufacturing companies and the size of the market (e.g. number of dwellings built using MMC and viability of individual companies)</td>
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</table>
### 2nd Action point - Developing a more pro-active strategy towards regulatory environment

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<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
<th>Desired outcome</th>
<th>Measure</th>
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</thead>
<tbody>
<tr>
<td>Need for appropriate AD's.</td>
<td>Trade Associations to be encouraged to draft AD's.</td>
<td>Regulators and clients.</td>
<td>Quicker, more predictable decisions.</td>
<td>Volume of MMC build.</td>
</tr>
<tr>
<td>Older (up through the tools)</td>
<td>Awareness raising and education (including CPD) for planners and Building Control – also liaison between RICS, LTPA, LGA and approved inspectors.</td>
<td>Employers of industry. Manufacturers. Graduates.</td>
<td>Raised quality of build.</td>
<td>Results of survey of industry views of regulators.</td>
</tr>
<tr>
<td>Focus on traditional approaches</td>
<td>Professional institutions should lobby Universities &amp; colleges to meet their broader criteria by provision of courses Review of Regulatory system Regular surveys of industry attitudes to regulators.</td>
<td>More industry input into Approved Documents. More examples of industry drafting their own AD's (e.g. basements).</td>
<td>More industry input into Approved Documents. More examples of industry drafting their own AD's (e.g. basements).</td>
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<tr>
<td>Vernacular only</td>
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<tr>
<td>Lack of awareness of their impact and discipline</td>
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### 3rd Action point - Creating partnerships with the established supply chain (BMs)

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<th>Action</th>
<th>Benefit</th>
<th>Desired outcome</th>
<th>Measure</th>
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</thead>
<tbody>
<tr>
<td>Unclear benefits for Builders Merchants.</td>
<td>Create partnerships between Builders Merchants and manufacturers (e.g. BMs could stock standard panels). Builders Merchants need engagement on MMC with Builders and Manufacturers. Undertake regulatory review – pattern book approach for smaller builders.</td>
<td>Manufacturers – more certainty of market <strong>but</strong> costs likely to rise. Small builders – streamlined supply chain &gt; lower costs. Greater integration leads to benefits for supply chain generally.</td>
<td>Minimal backlash from BM. Facilitation of greater use of MMC by small builders.</td>
<td>Smaller companies operating more efficiently – measure inputs volume of MMC and number of Builders Merchants. Continuity of market transformation measured by volume of MMC.</td>
</tr>
</tbody>
</table>
### 4th Action point - Encouraging the volume house builders to undertake an objective assessment on the business case for MMC

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<tr>
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### 5th Action point - Proactively managing the media

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<th>Desired outcome</th>
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</table>
### 6th Action point - Invest in training and education of traditional craft operatives

<table>
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<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
<th>Desired outcome</th>
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Appendix 4

Final recommendations: Whole Project Costing

1<sup>st</sup> Action point – Promotion of the NAO report as a standard format for reporting costs.

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<thead>
<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
<th>Desired outcome</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconsistent reporting of MMC costs.</td>
<td>Promote the NAO report as a standard format for reporting costs.</td>
<td>A better understanding of cost and therefore better decision making.</td>
<td>Clearer understanding of the relative costs of different construction methods.</td>
<td>Better decision-making processes. The availability of a substantial volume of project costs.</td>
</tr>
</tbody>
</table>

2<sup>nd</sup> Action point – Promotion of the NAO report as a methodology for comparing costs

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
<th>Desired outcome</th>
<th>Measure</th>
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</thead>
<tbody>
<tr>
<td>Inconsistent cost analysis of MMC.</td>
<td>Promote the NAO report as a methodology for comparing costs.</td>
<td>A better understanding of cost and therefore better decision making.</td>
<td>Clearer understanding of the relative costs of different construction methods.</td>
<td>Better decision-making processes.</td>
</tr>
</tbody>
</table>

3<sup>rd</sup> Action point – Promotion of the findings of the NAO report, the work of the Housing Forum and Constructing Excellence.

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
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<th>Measure</th>
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</thead>
<tbody>
<tr>
<td>Benefits of improving the procurement process and the way MMC can help are not widely understood.</td>
<td>Promote the findings of the NAO report, the work of the Housing Forum and Constructing Excellence</td>
<td>Improved delivery of better houses.</td>
<td>Improved performance through partnering, the use and approval of standard designs and early appointment of builder and suppliers.</td>
<td>Better houses delivered more efficiently.</td>
</tr>
</tbody>
</table>
4th Action point – Promotion of the publication of running costs as part of details provided by sellers.

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
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<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>The benefits of better homes are not reflected in their value.</td>
<td>Promote the publication of running costs e.g. heating, as part of details provided by sellers.</td>
<td>Increased demand for better homes.</td>
<td>Some of these requirements will come about as part of the introduction of the Sellers Pack and other legislation, but encouraging housing suppliers to promote the value of more efficient housing may increase the pace of change.</td>
<td>Demand for better houses, changes in grant structures, and mortgage and insurance provision.</td>
</tr>
</tbody>
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### Appendix 5

**Final recommendations: Regulations**

**1st Action point** - Establish structured process for regulatory decision making

<table>
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<tr>
<th>Barrier</th>
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<th>Measure</th>
</tr>
</thead>
</table>
| Lack of understanding by the regulatory community of the commercial and process context of MMC. | Establish structured process for regulatory decision-making. Training/ awareness raising for:  
  - Govt  
  - Professional institutions  
  - LGA  
  - Universities  
  Structured dialogue between regulators and regulated.  
  Publicly announced timed programme of future regulatory change. | Improved business risk control.  
  Optimisation and innovation opportunities. | Structured process.  
  Informed participants. | Performance on the ground (use NAO model).  
  Improved timeliness of decision taking.  
  Better satisfaction with process for housebuilders. |
### 2nd Action point - Structured dialogue between regulators and regulated and to develop ability to deliver increased flexibility of design within structured process

<table>
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<tr>
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<th>Measure</th>
</tr>
</thead>
</table>
| The discipline implicit in MMC process and product conflicts with regulatory systems and compromises volume and design possibilities. | Recognise that MMC covers a wide range of technical solutions, not all of which will be suitable in a particular situations.  
Recognise that customer satisfaction is a key measure and some MMC/OSM solutions may not deliver this in particular situations  
Develop ability to deliver increased flexibility of design within structured process. | Most appropriate MMC solution used more often  
Increased satisfaction with solutions.  
OSM systems that can deliver mass customisation. | Architectural and customer recognition and praise.  
Availability of best practice guidance on customisation options. |  |

### 3rd Action point - Training for new and existing planners

<table>
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<tr>
<th>Barrier</th>
<th>Actions</th>
<th>Benefit</th>
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<th>Measure</th>
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</thead>
</table>
| Barriers to increasing standardisation of processes, products and designs created by inconsistencies between different planning authorities and local policies.  
The increase in complexity due to local decision making and introduction of building performance and detailed design standards into local plans. | Education process for local government on balance between local autonomy and overall costs.  
Planning circular to set level playing field in local planning process.  
Government circular on interpretation of the future Code for Sustainable Buildings and to a lesser extent building regulation interpretation. | More disciplined planning profession leading to greater predictability of decision making. | Speed and timeliness of decision making.  
Satisfaction of industry.  
Satisfaction of house buyers and local communities. |  |
Training for new and existing planners.
### Appendix 6

**Final recommendations: Certification and Warranty**

1st **Action point - Unquantifiable risk:** development of a certification scheme to address issues raised by innovation.

<table>
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<tr>
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<th>Measure</th>
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</thead>
<tbody>
<tr>
<td>Stakeholder (lenders, insurers, house builders, government bodies, etc) perception that there is a high level of unquantifiable risk associated with the use of innovative* systems.</td>
<td>In addition to existing certification schemes that demonstrate compliance with Building Regulations, develop appropriate standards and accompanying certification schemes which commands industry confidence and address the issues of resilience, reparability, adaptability, whole life costs and on-site quality.</td>
<td>In addition to demonstrating compliance with Building Regulations, the supplementary certification scheme will offer assurance on issues concerning the resilience, reparability, adaptability, whole life costs and on-site quality of innovative building systems. Where appropriate, demonstrate enhanced performance of house designs to resist perils such as flooding, burst pipes, windstorm, fire, security and environmental impact. Provide manufacturers of innovative products a single approval process for acceptance by all stakeholders (lenders, insurers, warrantee providers, builders and clients).</td>
<td>Reduction of unquantifiable risk. Reduction in confidence gap, thus gaining greater market confidence. Alleviating some of the concerns of those reluctant to move away from tried-and-tested methods.</td>
<td>Increased number of certified innovative building systems. Achieve a step change in the provision of innovative housing in the UK, as required by the government.</td>
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<tr>
<td>Such risks stem from:</td>
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<tr>
<td>- Lack knowledge and experience of the longevity of the building structure on the part of mortgage lenders and insurers, creating a confidence gap.</td>
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<tr>
<td>- The lack of standards and guidance to help stakeholders quantify the risks.</td>
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</table>

*Innovative is defined as Those building systems that are not wholly covered under current recognised standards and codes for dwelling construction and that have a limited track record of service in dwelling construction in the UK.
### 2\textsuperscript{nd} Action point - Unquantifiable risk: Need for quality assurance and audit schemes

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Action</th>
<th>Benefit</th>
<th>Desired outcome</th>
<th>Measure</th>
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<tbody>
<tr>
<td>Some forms of MMC do not have a track record of use in the UK and potential risks cannot therefore be quantified. This can lead to nervousness on the part of homeowners, lenders and insurers.</td>
<td>Develop the use of quality assurance and audit schemes to minimise the risk of MMC failure due to poor design, specification and/or poor practices on site</td>
<td>Reduce unquantified risk of MMC failure. Provide independent QA schemes that are recognized by the CML.</td>
<td>Homes built using MMC are satisfactorily designed and constructed to ensure their long-term performance. Increased confidence amongst homebuyers, lenders and insurers. Trade associations and manufacturers to only use fully trained and certified erectors. Log books issued by trade associations detailing level of training achieved. Warranty providers to train inspectors on MMC audit inspection. Warranty providers to review their own inspection systems for MMC projects.</td>
<td>Systems increasingly complying with (as applicable): - Established standards - Best practice guidance - Independent certification.</td>
<td>Homebuyers, lenders and insurers are confident.</td>
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</tbody>
</table>
**3rd Action point - Unquantifiable risk: need to examine current web of regulations and standards for gaps or overlap**

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<tr>
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<th>Desired Outcome</th>
<th>Measures</th>
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</thead>
<tbody>
<tr>
<td>The existence of unquantified risk associated with innovative forms of MMC, leading to a confidence gap, within key stakeholders.</td>
<td>Establish a framework of failure modes and effects criticality analysis (FMECA) to assess unquantifiable risks. Carry out an examination of the current profusion of design standards and regulations, used to certify MMC products to: - Confirm the risks are addressed - Identify duplication and gaps within current and future regulatory requirement, - Highlight areas of weakness and areas for streamlining. Include a database listing of approved MMC's</td>
<td>FMECA will enable the risks associated with innovative forms MMC to be quantified. Targeted and consistent certification will enable product manufacturers to bring products to the market quicker, more reliably and to reduce product certification costs.</td>
<td>A rational understanding of the potential risks associated with innovative MMC's, a rationalisation of regulation and a general acceptance by all stakeholders, of the minimum acceptable levels of product compliance. This relates particularly to CML and ABI concerns of flood resilience, replacement, reparability and durability.</td>
<td>A publication which quantifies the risks associated with innovative MMC's or at least provides the framework to assess the risk. Reduced product certification costs. Reduced product lead times to market. Acceptance from CML/ABI members wishing to lend on MMC's with certification. Higher levels of MMC usage increase in approved MMC suppliers.</td>
</tr>
</tbody>
</table>

**Resources**

A collective forum of experts with wide ranging knowledge of the British and European building regulations, standards and design codes is needed to review current regulations and practises, as well as collecting stakeholders’ new issues. Pooling of areas of expertise under the chairmanship of a credible and leader, with ODPM authority is needed. This forum will need to review findings on a regular basis as new legislation is introduced.
### 4th Action point - Lack of confidence to pursue certification: need for inclusion of MMC information in Home Information Packs

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<tr>
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<th>Measure</th>
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</table>
| Lack of confidence from manufacturers on the value of certification, and lack of incentive to pursue accreditation:  
  - Absence of a well-informed customer.  
  - Lack of means to transmit information about construction and accreditation/certification data to customers and other stakeholders. | Influence Government by ensuring that Home Information Packs (HIPs) contain information about property construction types as well as details on any relevant accreditation/certification. | Homebuyers to have generic and brand information about the building system employed.  
Details of certification and accreditation (such as LPS 2020) become available to home buyers, valuers, Estate Agents and other stakeholders, strengthening the awareness of certification/accreditation and the incentives to pursue it. | Government to promote the inclusion of construction information plus accreditation/certification data in HIPs  
Information to be placed on the new homes warranty in respect of new homes (new homes will not have a Home Condition Report) and on the Home Condition Report for older properties.  
A database of property types/accreditation/certification to be established and the new Home Inspectors trained to access this to complete the Home Condition Report. Warranty providers will need to work with Government over information required on warranties. | Greater demand for certification/accreditation by manufacturers.  
Greater awareness of construction methods and accreditation/certification by homebuyers and other stakeholders. |
Appendix 7

Transcript of the Design and Build section in the 2nd Interim Report

3.4 Design and Build

There are 6 barriers to the take-up of MMC within house building in the context of design and build. These can be subdivided into industry drivers and business support failures.

Lack of industry drivers, specifically:
- Cost
- Customer value

Lack of business support, specifically:
- Government support
- Business process understanding
- Integration of designer and supplier knowledge
- Lack of appropriate skills

Cost

Cost is perceived very differently by different sectors of the house building market. Speculative developers, RSL’s and self-build each have different perspectives on costs. These perceptions to costs need to colour the thinking and our proposals on costing issues.

The house building industry is highly competitive. Players will adopt MMC if overall design and build costs can be reduced. The current perception is very clearly that MMC is more expensive. This gives rise to a major need for more transparent costing studies showing the cost benefit of MMC within house building. Material costs of MMC systems are currently higher than brick and block costs, so identifying the trade-offs needs to be identified e.g. speed, quality or risk.

Timesavings may not translate into cost savings for speculative developers as build rates need to be aligned with rate of sales. MMC design costs are usually additional to the house builder design costs.

Benchmarking industry costs is complex. Unit build costs are prone to be misquoted, as there can be considerable differences over inclusions and exclusions. Major house builders’ costs are considerably lower than general construction industry costs due to repetition and volume discounts. Therefore MMC costs will need to be competitive with those of traditional volume house builders to encourage widespread use and benefit from economies of scale. This argument is confounded by regional variations in labour skills and availability resulting in different trade supply and fit costs. Follow on site trades may require a premium to work on MMC projects due to uncertainty with new working practices, even when there are potential timesavings. The time benefit of MMC within house building can often be mitigated due to downstream construction processes being managed in a traditional way.
<table>
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<tr>
<th>Key Barrier</th>
<th>Owner</th>
<th>Sub-Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost and cost perception</td>
<td>House builders</td>
<td>Perception of a MMC cost premium. &lt;br&gt;QS cost methodology and cost substitution can omit some potential MMC cost savings. &lt;br&gt;Inaccurate benchmarking against current build costs. &lt;br&gt;No commercial incentive for follow on trade contractors/suppliers to reduce costs. &lt;br&gt;No whole process cost/benefit evaluation studies.</td>
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</table>

**Solutions**

1. Practical build cost and process guidance for developers, RSL’s, architects, specifiers and cost consultants. These to be targeted at specific market sector requirements.
2. Open and transparent build cost benchmarking from authoritative sources such as HBF.
3. Clarify the relative importance of house builders financial drivers to a site build programme e.g. cost, value and risk. Include trade off of profit optimisation versus maximum ROCE so that suppliers can align products to industry requirements.
Customer value
The benefits to customers of MMC are not yet clearly understood. Private sector customers tend to be conservative, primarily because they view housing as a long-term investment. Professional advisors will influence customers during mortgage valuations and insurance quotations. Customers will still require similar or increased choice when customising new homes after purchase. Like any new home, there needs to be flexibility to modify accommodation by adding extensions or conservatories in future.

Public sector customers tend to be housing associations and act on behalf of their tenants. Their specific needs must be catered for also.

Land sellers can also prescribe customers’ social or community values by specifying MMC or enhanced performance requirements as part of land sales agreements.

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<tr>
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<tbody>
<tr>
<td>Lack of customer demand (or customer pull)</td>
<td>Industry and Government</td>
<td>‘Prefabs’ image and lack of street scene variability and interest. Media focus on ‘high-profile’ problems. Negativity of professional advice. Houses not designed to optimise customer value from MMC. Absence of customer understanding.</td>
</tr>
</tbody>
</table>

Solutions
1. Publicise high profile design successes through a concerted public relations campaign.
2. Test new selling approaches to optimise the added value of MMC to customers. This could be achieved by selling off plan, offering enhanced customer choice or shorter delivery times.

Continued.
Customer value

3. Identify training needs for each professional body.

4. Publicise positive customer feedback to living in MMC-designed housing through an independent source. Use high profile personality.

5. Promote to the general public why building regulations have changed, what the industry has done to improve design performance of a building and the value of MMC e.g. to lifestyle, energy efficiency, building for life and flexibility of use. Consider a ‘festival of housing’. Include related information in new home buyers pack.

6. Ensure MMC construction complies with sustainable building regulations.

Understanding the business process

Designers and builders need to understand the end-to-end MMC build process, and the impact of adopting MMC on the key factors of production. The efficient sequencing of the build programme is critical for efficient resource management. Trade gangs need to be kept fully occupied on site or they will move to other sites where continuity is available.

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<tbody>
<tr>
<td>Common understanding of build process and change management</td>
<td>Industry</td>
<td>Focus on product not people or process issues.</td>
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<td>Bad experience from product solutions poorly aligned to house building processes.</td>
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<td>Use of MMC on units designed for current build process.</td>
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<td>No agreed site processes and quality checks for various forms of MMC.</td>
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<td>Need for design flexibility within a predetermined component range with good boundary definition.</td>
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<td>Lack of understanding of build and MMC processes.</td>
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<td>Process fragmentation.</td>
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<td>Designers failing to engage with production teams during early stages of a development (when seeking permission to develop land).</td>
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<td>Site Managers unwilling to change, comfortable with existing processes.</td>
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</table>
Integration of designer and supplier knowledge

Working knowledge of MMC within house building is limited. More work is required to enable house designers to take advantage of MMC through value added new products. Integration of suppliers, designers and house builders is critical. Suppliers cannot invest in new manufacturing facilities without confidence in market demand. This can be achieved by forming long-term relationships with house building clients.

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<tr>
<td>Immature Supply Chain</td>
<td>Industry</td>
<td>Uncoordinated house building process slows rate of change and improvement.</td>
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<td>Design can fail to support a systems approach.</td>
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<td>Culture of independent contractors not project-based teams.</td>
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<td>Poor planning, fragmented processes, site issues lead to last minute change.</td>
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<td>Weak MMC industry push.</td>
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<td>House designers give no consideration to build or production issues.</td>
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<td>Clarity of who is responsible for what.</td>
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<td>Need to innovate to provide MMC solutions in end-to-end process.</td>
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<td>Interlink all aspect of process through suppliers co-operations.</td>
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<td>Demand for better technical guides at a time when Government financial assistance is reducing.</td>
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</table>
Lack of appropriate skills

It is not so much an issue of shortage of skills, but an inappropriate distribution of skills. This translates into an industry-wide problem requiring re-training of certain trades, and in some cases introducing new trades. The introduction of MMC within house building requires an understanding of new processes and procedures which can be resourced from people with a manufacturing or similar background.

However, most current MMC systems do not replace the need for all current site-based building skills. Longer term, some products may eliminate this need by incorporating a high percentage of work in the factory. Therefore there is a short-term requirement to provide supplementary training and a potential longer term need for new assembly skills not requiring traditional site finishing works.

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</tr>
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<tbody>
<tr>
<td>Lack of appropriate skills</td>
<td>Industry</td>
<td>Poor site induction training on MMC products.</td>
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<td>Outdated project management (skills) to plan MMC site building programmes.</td>
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<td>History of task not process training.</td>
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<td>Site Managers who do not understand the full implications of MMC.</td>
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<td>Follow on trades traditionally accommodate or sort out previous trade problems.</td>
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<td></td>
<td></td>
<td>Lack of training across industry and at all levels in new construction methods.</td>
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<tr>
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<td>Poor site management of follow on trades.</td>
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</tbody>
</table>

Solutions

1. Develop CIOB process training process for Site Managers
2. Co-ordinate cross industry MMC training programmes through for example the Centre for Sustainable Communities
3. Establish training programme for Site Managers and tradesmen covering build programme activities following on from MMC installation
4. Provide authoritative MMC briefing notes for architects, building control officers, planners, and other stakeholders.