

Anticipating Tomorrow: the Future of the European Construction Industry

Final Report of the ECI Industry Futures Task Force

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Executive summary

Exploring alternative feasible futures through engaging in a collaborative futures scenario development process has identified and prioritized a series of Key Actions for the ECI and its member organisations over the next 10 to 20 years.

The very real challenges of how to most effectively address uncertain futures and rapidly changing working environments catalysed this work. The ECI Futures Task Force worked alongside the Big Ideas research team at Loughborough University to investigate and debate the range of issues and factors that might impact upon the European construction industry in the next couple of decades. This resulted in a set of four possible future scenarios for the industry and a series of five key characteristics for ECI's preferred future for the industry.

The work from the Task Force has identified two priority areas concerning the future of the European construction industry which are perceived to warrant further proactive intervention. Consequently the creation of two new Task Forces has been proposed – on 'people' and 'collaboration'. These topics were chosen as being key areas in which ECI and its members could instigate proactive change and that would have a significant positive effect on the future of the European construction industry. The 'collaboration' topic also aligns closely with the vertical scenario axis. The horizontal scenario axis of energy scarcity and stabilised supply reflects more the wider background in which the construction industry operates, and which we therefore have less tangible control, and was therefore not chosen as an ECI Task Force.

The focus of these proposed Task Forces would involve additional ECI members in further investigating future issues and taking a lead in implementing some of the Key Actions to help ECI and its members prepare for the future challenges ahead.

It was agreed that the Industry Futures Task Force would produce the following outputs:

- Final report highlighting methodology
- ECI preferred future action Fact Sheet
- Key actions from Fact Sheet
- Recommendations for potential New Task Forces

It was agreed that the Industry Futures Task Force would continue with its existing members plus the Chair persons of the newly created Task Forces, meeting twice per annum. It would provide a futures overview to ECI and the other Task Forces, engaging in horizon scanning, highlighting new issues as they emerge, and providing futures advice and expertise to ECI and the other Task Forces as they require.

Summary

This report outlines the work to date undertaken by the Big Ideas research team at Loughborough University for the ECI Industry Futures Task Force. The background and reasoning behind the formulation of the Task Force is outlined and a description of the 6 workshops held so far is provided.

The Task Force first met on 19th April 2007 and discussed how ECI should proceed with this topic. A process was adopted which utilises the futures scenario process developed by Loughborough University to help establish priorities for the Task Force in relation to which specific issues they should investigate. A **draft remit** for the Task Force was presented:

- To work with other organisations to understand, within limits, where the European construction industry will be in 20 years time
- To select the 3-5 key issues which will benefit ECI current and immediate future members most fully
- To initiate, perform, collate and communicate programmes to support members in evolving towards that end successfully

More than 200 issues of future relevance to the future of ECI member organisations were brainstormed by the Task Force, and three **priority areas** for investigation by the Task Force were agreed (in no particular order):

- How to inspire young people to be interested in engineering and technology
- Energy scarcity
- How to encourage more cooperation in a fragmented supply chain

The group also selected an additional three potential priority areas:

- Multicultural or interculturprise
- Construction technology changes- driven by customer or industry
- Disaster response trends

A future scenario building workshop process was then used to develop four scenarios looking 20 years ahead. Most of the six priority areas identified by the Task Force were then used as the axes, or framework, for the four future scenarios, namely energy scarcity and supply, and an integrated and multicultural industry and supply chains.

Five key characteristics of ECI's and its member organisations' preferred future were identified from the scenarios (in no particular order): collaboration, innovation, stewardship, people and natural resources.

Key immediate potential actions for ECI, for its member organisations, or for both were then identified, together with possible subjects and areas for future ECI Task Forces.

During the fifth and final workshop the titles and timelines for the four future scenarios **Tough Love, Happy Days, Running on Empty and Fence Me In** were debated and agreed. In light of these scenarios, the key actions for ECI and for its members were also discussed, reviewed and refined, and grouped under the headings **Collaboration, Innovation, People** and **Natural Resources**.

Among the outcomes identified were for the ECI to build a stronger and therefore more influential organisation through actively encouraging wider membership. In addition, focus was placed upon ECI developing a leadership role on a number of fronts promoting collaborative working and support for enabling innovation through addressing key barriers to this process.

The **future of the Task Force** was discussed and it was agreed that the following outputs would be produced:

- Final report highlighting methodology (this report)
- ECI preferred future action Fact Sheet
- Key Actions from Fact Sheet
- Potential New Task Forces

It was agreed that a streamlined Task Force would meet twice per annum and provide a futures overview to ECI and the other Task Forces, engaging in horizon scanning, highlighting new issues as they emerge, and providing futures advice and expertise to ECI and the other Task Forces as they require.

It was proposed that two new Task Forces should be formed, one on 'people' and one on 'collaboration', with the precise theme and aims being decided by the Task Force members themselves, with input and guidance from the Industry Futures ECI Key Actions list. The 'collaboration' topic also aligns closely with the vertical scenario axis. The horizontal scenario axis of energy scarcity and stabilised supply reflects more the wider background in which the construction industry operates, and which we therefore have less tangible control, and was therefore not chosen as an ECI Task Force. Each Task Force will consist of a Chair person, one member of the Industry Futures Task Force, and between 10 and 15 members. It was suggested that half of the members should be young members (<35 years).

Introduction

This report outlines the work to date undertaken by Loughborough University for the ECI Industry Futures Task Force. The background and reasoning behind the formulation of the Task Force is outlined and a description of the four workshops held so far is provided.

Background

Over the last few years, there has been considerable change in the industrial climate in Western Europe and beyond, which has dramatically affected the way manufacturing and infrastructure assets are provided and maintained. There is little sign of this change coming to an end. Indeed, the challenges currently faced by the industry are increasing. Issues such as global competition and migrant workers, significant shortages of resources and key skills have, together with a declining indigenous supply base, led to a switch from a buyer's to a seller's market. Other factors such as volatile energy costs, raw material shortages and increasing concern about climate change together with increasing regulation and bureaucracy continue to reshape the environment in which the industry operates. It is in response to this that ECI established an Industry Futures Task Force.

Workshop 1: Initial meeting

The new Task Force met on 19 April 2007 and discussed how ECI should proceed with this topic. A process was adopted which utilises the futures scenario process developed by Loughborough University to help establish priorities for the Task Force in relation to which specific issues they should tackle. An industry and ECI futures presentation was given by Stephen Weatherley, ECI UK Operations Director. A draft remit for the Task Force was presented:

- To work with other organisations to understand, within limits, where the European construction industry will be in 20 years time
- To select the 3-5 key issues which will benefit ECI current and immediate future members most fully
- To initiate, perform, collate and communicate programmes to support members in evolving towards that end successfully

Delegates then brainstormed an initial list of issues.

Workshop 2: Issue identification and clustering

The aim of the workshop, held on 22 June 2007, was to explore some of the issues, factors and outcomes affecting the future of the industry and hence ECI members. The terminology to be used in the workshop was explained and is presented in Appendix 1. The key stages of the workshop consisted of:

1. **Brainstorm issues individually.** Participants brainstormed the key issues, factors and outcomes which they thought would impact upon ECI member companies in the next 10 to 20 years. More than 200 issues were identified.
2. **Cluster issues.** These key issues, factors and outcomes were debated and grouped by the participants under 5 high-level categories.
3. **Add additional issues, factors and outcomes.** At this stage, participants were asked to add or discard additional pre-prepared issues and factors taken from:
 - The Big Ideas project, extracted from 15 recent construction futures reports
 - The minutes of the 1st ECI Industry Futures Task Force held on the 19th April 2007; and
 - The slides of the futures presentation given by Stephen Weatherley, ECI UK Operations Director at the previous workshop
4. **Identify internal and external issues and factors.** Participants identified those issues, factors and themes which were either internal (driver) or external (force) to ECI member companies.
5. **Challenge theme headings and high-level categories.** As a group, the participants discussed and challenged the theme headings and renamed, amalgamated and / or split the headings and groups. This was to make them more relevant to ECI member companies, more specific, and more representative of the content of the cluster.
6. **Relationship between categories.** A debate was also held regarding the structure and relationship between the categories and between those which were internal and external to the industry and ECI (Figure 1).

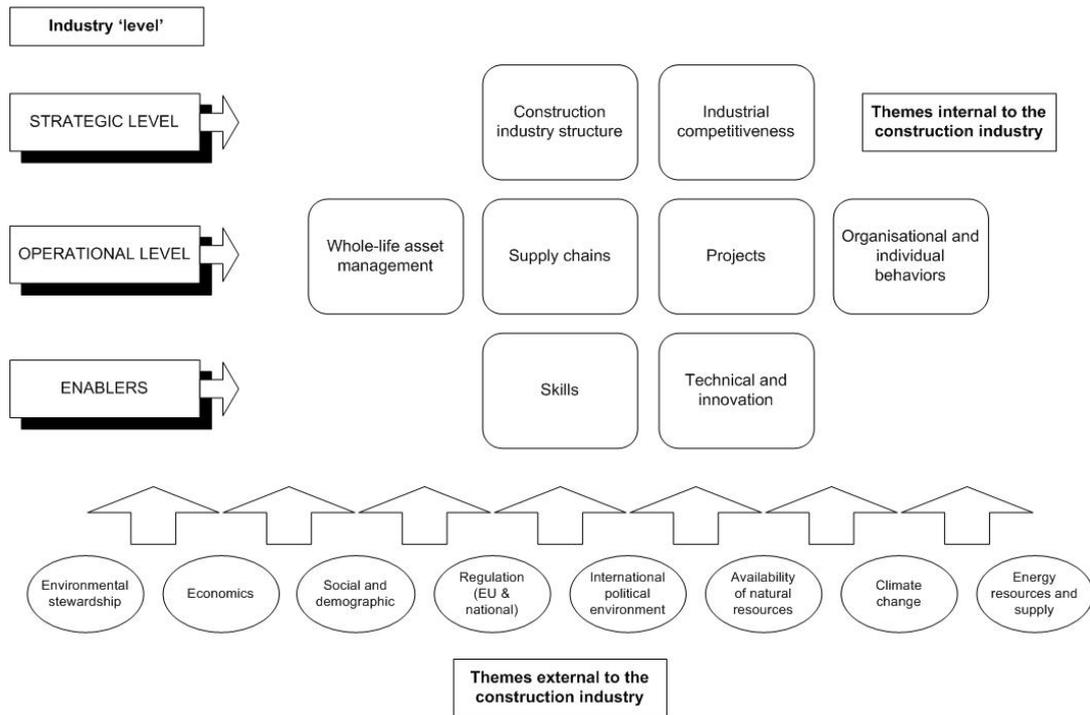


Figure 1: Construction industry level and categories

Workshop 3: Issue and key area prioritisation

The aim of this workshop, held on 20 December 2007, was to identify the 3 or 4 priority areas or issues derived from Workshop 2, that are key to ECI member companies, to assimilate and discuss these key areas and related sub-issues, and to agree the next steps.

1. **Discussion regarding results from previous workshop.** The previous workshop had produced a clustered list of 202 issues, factors and outcomes considered as important to the future of ECI member companies. A preliminary facilitated discussion was held regarding these areas, their clustering and their relevance to ECI members in order for the participants to familiarise themselves with the list.
2. **Issue / factor / outcome prioritisation.** Participants were then asked to identify the ten areas that they thought were the most important to ECI member companies and they were then discussed in detail.
3. **Identification of key areas.** The key areas resulting from this discussion were then consolidated into a single list and related areas clustered together (Appendix 2). A debate was then held regarding which of these issues, factors and outcomes the Task Force should concentrate on as priority areas, i.e. those which:
 - ECI members have some influence over
 - Would be relevant and of interest to ECI members, and
 - Have not been looked at previously by ECI, or are currently being investigated sufficiently by similar group

Main issues, factors and outcomes

The first three priority areas decided upon were, in no particular order (from Appendix 2):

- How to inspire young people to be interested in engineering and technology
- Energy scarcity
- How to encourage more cooperation in a fragmented supply chain

The group selected the next three potential priority areas as:

- Multicultural or interculturprise
- Construction technology changes- driven by customer or industry
- Disaster response trends

Workshop 4: Scenario generation and key characteristics

The aim of this workshop, held on 21 February 2008, was to take the priority issues identified in Workshop 3 and use them as the foundation for a set of 4 future scenarios. These scenarios would look 20 years into the future and be relevant to ECI and its member organisations. A standard futures studies methodology was used by Loughborough University in order to develop an integrated set of 4 scenarios based around a pair of intersecting axis (Figure 2). The rationale for the choice of the scenario axes is provided in Appendix 3.

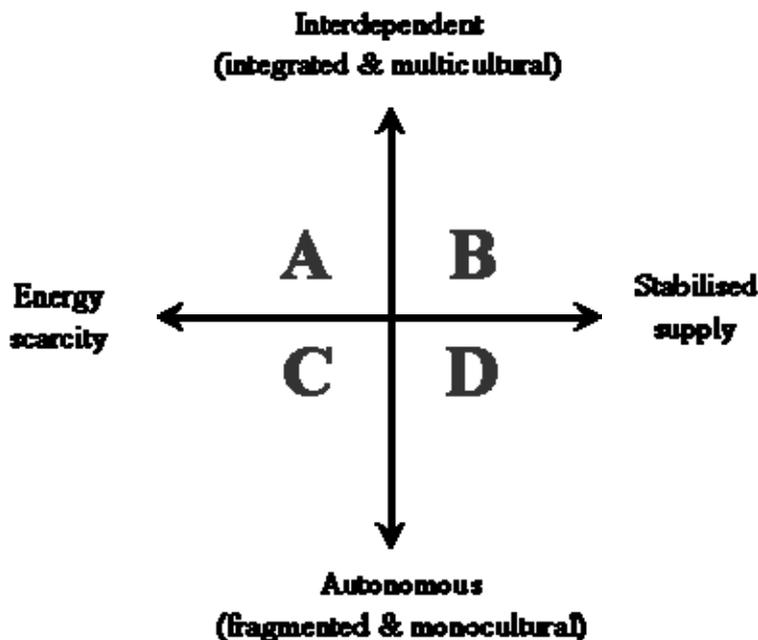


Figure 2: Scenario axes

1. **Scenario development.** Participants were split into mixed groups of client and provider and the 4 scenarios were developed in turn using a standard proforma, investigating each part of the future scenario in turn e.g. demographics, technology, environment etc. These scenarios could then be aligned along the lines of the scenario axis, as shown in Figure 3.
2. **5 key characteristics for preferred future.** Once the scenarios had been developed, they provided the foundation for a discussion on what the preferred future might look like for ECI and its member organisations. 5 key characteristics of this preferred future were then identified by the group:
 - Collaborative on targeted, shared innovations (for all)
 - Belief in benefits of collective behaviour and action and competition on CSR, value, shared goals, not cost
 - Innovative interface control and standardisation of processes
 - Managed energy consumption and reduce product energy consumption
 - Skills, image, training, education and radically improved CSR

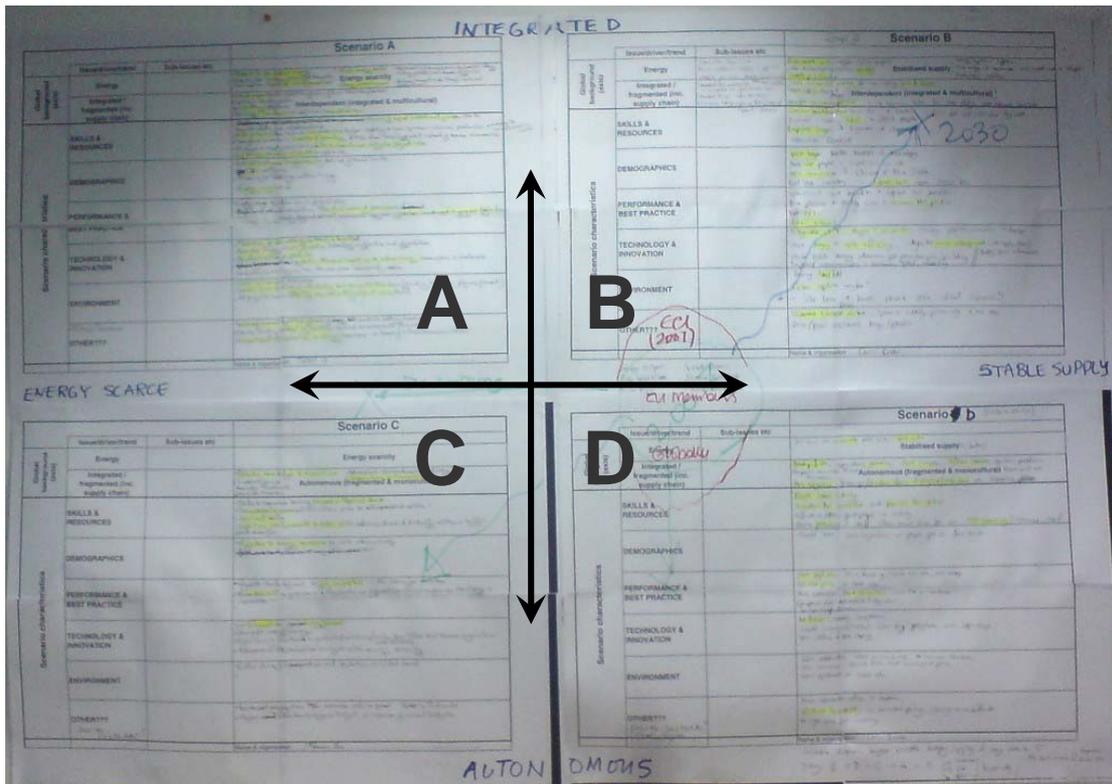


Figure 3: ECI scenarios and axis

Workshop 5: Review scenarios, key characteristics and actions

The aim of this workshop, held on 12 March 2008, was to further refine the 4 scenarios developed in Workshop 4, and to identify key actions for ECI and its member organisations for obtaining their preferred future.

1. **Scenario review.** The scenarios had been written up by Loughborough University into a scenario narrative or story, and these were reviewed by the group for content and consistency (Appendix 4).
2. **5 key characteristics for preferred future.** These were debated, reviewed and expanded in light of the scenario development (Figure 4).
3. **Key actions for now.** The key actions for now for ECI and its member organisations for obtaining their preferred future were then brainstormed and debated, and recorded on flip charts for subsequent analysis. These will be discussed in the next section.



Figure 4: The five key characteristics of the preferred future

Five key characteristics of preferred future

The 5 key characteristics of ECI's and its member organisations preferred future, were, in no particular order:

1. Collaboration
2. Innovation
3. Stewardship
4. People
5. Natural Resources

More detailed descriptions of the key characteristics are included below, together with key immediate potential actions for ECI, for its member organisations, or for both. Possible subjects and areas for future ECI Task Forces are also highlighted.

Key characteristic 1: Collaboration

Examples of potential collaboration include:

- A greater belief in the benefits of collective behaviour and action
- More innovative interface control
- Optimum integration and / or cooperation by all stakeholders in the construction supply chain
- Greater (collaborative) standardisation of processes
- Collaboration on targeted, shared innovations (for all)

Potential actions for ECI are:

- A stronger and more influential association (national and multi-national)
- Influencing regulation
- Interact with other organisations, more and better
- Expand the depth and breadth of membership up and down the supply chain
- Provide leadership (both clients and supply chain)

A potential action for member organisations is:

- Implement collaboration in their supply chains

Potential actions for ECI *and* member organisations were identified as:

- Demonstrate more the benefits of membership - evangelise
- Enthuse membership (so that members and potential members can see the benefits)
- Members provide case study examples of benefits for ECI dissemination

Key characteristic 2: Innovation

Examples of potential innovation include:

- Co-ordinated and collaborative investment in R&D, technology and innovation, implemented to the benefit of all the European construction industry and their client organisations / end users. If made workable, this could give the European construction industry a competitive advantage over rivals from other continents
- Greater (collaborative) standardisation of processes
- Collaboration on targeted, shared innovations (for all)

A potential action for ECI is:

- An innovation 'hub' in order to share needs and solutions. Priority areas could be, for example, energy, design, materials, process / management etc. *Potential ECI Task Force*

A potential action for member organisations is:

- Increase R&D

Potential actions for ECI *and* member organisations are:

- Change of mindset, as well as being given adequate time and reward for trying to innovate. *Potential ECI Task Force (possibly)*
- How to deal with the risk of failure (such as personal, commercial and H&S / regulatory failure). *Potential ECI Task Force*

Key characteristic 3: Stewardship

Examples of potential stewardship and corporate social responsibility (CSR) include:

- Radically improved CSR, throughout the supply chain
- Competing on CSR, value and shared goals, not just cost

Key potential ECI actions for now are:

- Create / expand / publicise ECI policy (and values) on stewardship, CSR and sustainability. *Potential ECI Task Force*
- Increased support for individual members (or small groups) for organising and promoting meetings and workshops (monetary, admin, networks, facilities etc)

Potential actions for member organisations include:

- Provide a better understanding of customers and how to solve their business problems
- Offer only sustainable and CSR-aligned solutions to clients, and strive to continuously improve them

Potential actions for ECI *and* member organisations are:

- Annual awards for good examples of doing and 'living' these desired behaviours (in all of the 5 key characteristics outlined here)
- Presented by the ECI (and individual companies?)
- Awards for both members and non-members?
- Announce these at this year's conference as next year's high profile ECI futures awards

Key characteristic 4: People

People were seen as an essential resource and any preferred future would include:

- A surety of availability of trained, qualified, experienced and motivated manpower resources (both blue and white collar) in the engineering and construction industries
- Increased / sufficient skills, image, training and education
- Improved ability to attract people, to develop and train them, and to establish a continuously improving image of the industry for school leavers

All of these 3 points, including the potential actions below, could provide the basis for a potential ECI Task Force.

A key potential ECI action for now:

- Collaborate with relevant organisations such as ECITB, CITB, ICE etc. who are also taking action

Potential actions for member organisations:

- Company investment in apprenticeships and graduates
- Shared training (and development) of staff and employees
- Expand company alliances with universities

Potential actions for ECI *and* member organisations:

- Evangelise! e.g. school engagement (attract them young)
- Influence the content and skills of educational programmes

Key characteristic 5: Natural Resources

Examples of issues regarding the future of natural resources included:

- Reducing energy consumption, during construction and during the life of the building / facility
- Managing energy consumption
- Ensuring adequacy of secure energy provision to satisfy the needs of both business and domestic consumers
- Reducing waste
- Increase recycling

Key potential ECI actions for now:

- Provide guidance notes to minimise pollution from construction sites e.g. oil and fuel spillages, fly-tipping, mud / silt from vehicle wheels, recycling etc.
- Collate and communicate best practice in energy and sustainability practice.
Potential ECI Task Force

Potential actions for member organisations:

- There is a wide range of renewable energy technologies that can be used in buildings, some of which may be more appropriate than others for particular projects e.g. solar panels, photovoltaic installations, wind turbines, heat exchangers, etc. Work has to be done to provide data re capital versus revenue costs for such processes to allow informed decisions to be made
- Increase sustainable sourcing and production of materials
- Development of total energy self-sufficient residential buildings
- Increased worklife (whole life cost) approach of energy needs / costs on residential and commercial, including HVAC

Potential actions for ECI *and* member organisations include:

- Lobby government organisations for increased funding / tax breaks in respect of zero carbon research studies and related construction projects
- Promote inter-state integrated energy strategies with a view to brokering international agreements on higher standards of energy efficiency across all sectors of construction
- Foster greater partnership between governments and industry to address environmental concerns
- Mobilise the enthusiasm and potential of individuals and communities to generate their own energy locally. This might involve the use of solar panels and wind turbines for example. In addition, provide expert advice and support regarding the constructability of such facilities
- Press for EU legislation to ensure that all business premises have 'Energy Performance Certification' when they are built, sold or rented out

- Encourage the effective and efficient use of materials in order to: design out waste, minimise waste creation on site, reuse waste materials where possible, and ensure any unavoidable waste is dealt with appropriately
- Demonstrate to contractors how efficient waste management processes can have an immediate positive effect on bottom line profit
- Investigate if and what other industry sectors have done to reduce consumption and waste. *Potential ECI Task Force*
- Encourage membership towards efficiency in build and operation – offer (via member companies) energy and sustainability advice
- Actively seek out opportunities for ECI companies to participate in development and industrialisation of renewable and emerging energy and recycling initiatives

Workshop 6: Scenario names, timelines and Task Forces

The aim of this workshop, held on the 20th May 2008, was to review and finalise the future scenarios and to discuss the key actions for ECI and the future of the Task Force itself. Feedback from the Executive Board meeting on the 8 April 2008 and the ECI conference in Venice on the 17th and 18th April 2008, including voting on the suggested future ECI Task Forces, was also presented.

Titles for three of the four future scenarios were discussed and agreed. A suitable title was not found for the fourth scenario – Loughborough agreed to provide some additional suggestions.

The lists of Key Actions for both ECI and its members generated in the previous workshop was discussed, refined, and agreed. The continuing role of the Industry Futures Task Force within ECI was also discussed.

Executive Board feedback

The Executive Board concluded that:

- The Industry Futures Task Force should continue as a standing task force
- The potential new task forces that had been identified should be voted upon by the members at the Council Meeting in Venice

Task Force outputs and remit

It was agreed that the Task Force would produce the following outputs:

- Final report highlighting methodology
- ECI preferred future action Fact Sheet
- Key actions from Fact Sheet
- Recommendations for potential New Task Forces

It was agreed that the Industry Futures Task Force would continue with its existing members plus the Chair persons of the newly created Task Forces, meeting twice per annum. It would provide a futures overview to ECI and the other Task Forces, engaging in horizon scanning, highlighting new issues as they emerge, and providing futures advice and expertise to ECI and the other Task Forces as they require.

New ECI Task Forces

The new Task Forces suggested at the previous Industry Futures Task Force workshop were voted on by the ECI Membership Council at the annual conference in Venice on the 17th and 18th of April 2008. The votes were as follows:

- (13) Collaboration and cooperation (supply chain)
- (9) Innovation 'hub' (Risk Management)
- (1) Stewardship
- (19) People - how to attract and develop
- (2) Energy best practice
- (3) Waste and consumption reduction

The Industry Futures Task Force therefore proposed that 2 new Task Forces should be formed, one on 'people' and one on 'collaboration', both of which obtained the highest proportion of votes by the Council. The 'collaboration' topic also aligns closely with the vertical scenario axis. The horizontal scenario axis of energy scarcity and stabilised supply reflects more the wider background in which the construction industry operates, and which we therefore have less tangible control, and was therefore not chosen as an ECI Task Force. The precise theme and aims of each of these Task Forces is to be decided by the Task Force members themselves, with input and guidance from the Industry Futures ECI Key Actions list presented below.

Each Task Force will consist of a Chairperson, one member of the Industry Futures Task Force, and between 10 and 15 members. It was suggested that half of the members should be young members (<35 years), with possibly a pairing / mentoring system with a young and an experienced member from each organisation to ensure both fresh ideas and to make sure of attendance at meetings.

Industry Futures Task Force (IF-TF) & New Initiatives (Task Forces)

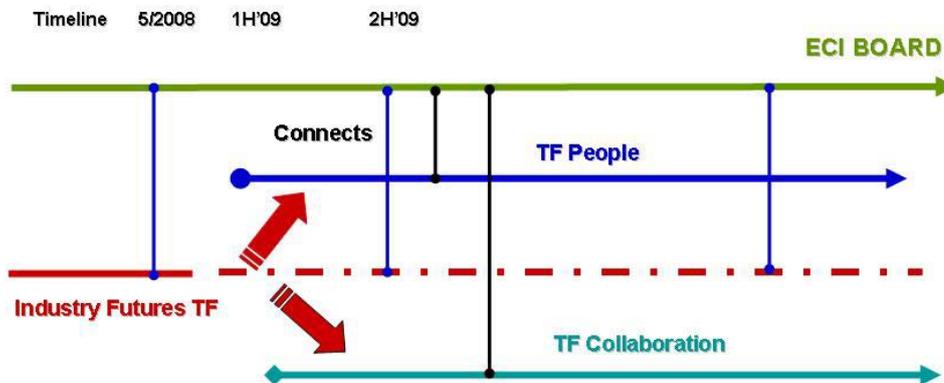


Figure 5. Development of 2 new ECI Task Forces

Future scenarios

Potential names were discussed for each scenario, including:

Scenario A:

Hungry together, Combined paucity, Energy hunters, Team energy hunters, and Tough love.

Scenario B:

Mutually-assured abundance, Partner world, Team sofa, and Happy days.

Scenario C:

All for one, Single-minded, and Lights out, Running on empty, and Hard times.

Scenario D:

Noto Kyoto, Individually rich, Ego-central, Watt's it got to do with me?, I'm alright Jack, Home alone, Rich but single, I'm fine, Only the lonely, Power Island, and Self strangulation. The group could not agree on this, therefore Loughborough decided upon Fence me in.

The final scenario names agreed by the group are shown in Figure 6.

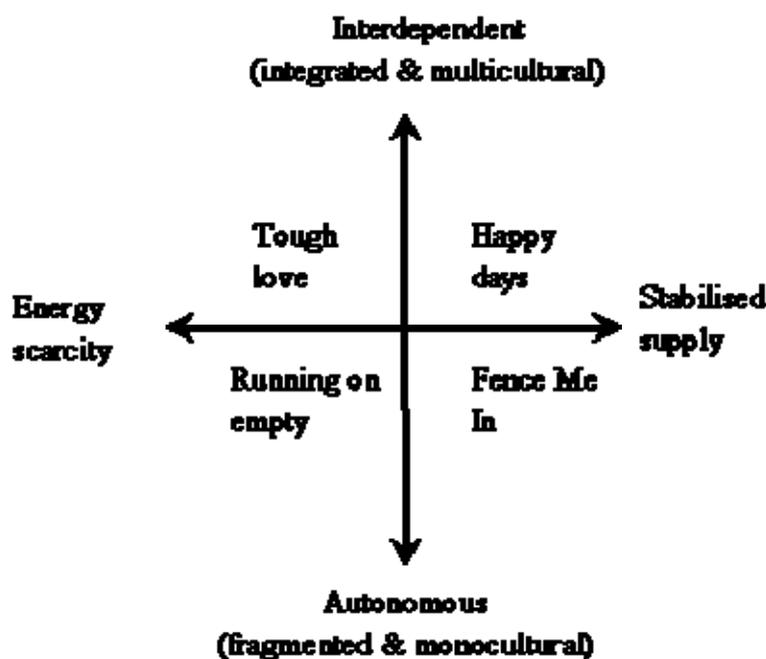


Figure 6. The four scenarios

Future scenario timelines

Suggested timelines for each of the four scenarios were drafted by Loughborough University in advance of the workshop. These timelines depicted an ordered series of between five and ten events from the present day leading up to the future as presented by each of the four scenarios. These were then debated, modified and expanded by the Task Force to ensure that they were realistic and sufficiently represented each individual scenario. These modified timelines are presented with the scenarios in Appendix 4.

Key actions

The last activity of the group was to identify the key actions for ECI and its member organisations. The potential actions noted in Workshop 5 were reviewed and refined. It was agreed that those under “ECI and its members” would be incorporated under the most appropriate of either “Key actions for ECI” or “Key actions for members”. These are summarised in the next section.

Key Actions for ECI

These Key Actions would be delivered through collective Task Force action (and individual company actions). It was considered that membership of a Task Force should become a key part of being a member. Key actions and / or the groupings are not in any order.

Collaboration

Internal:

1. A stronger and more influential association (national and multi-national)
2. Expand and enthuse the depth and breadth of membership up and down the supply chain

External:

3. Influencing regulation (the Board recognizes this need but is not set-up to act accordingly)
4. Interact with external organisations better
5. Provide leadership (both clients and supply chain)

Innovation

6. Creating the environment to encourage and nurture innovation
7. An innovation ‘hub’ in order to share needs and solutions. Identify gaps in priority areas and take longer-term view e.g. regulations, changing market, energy, design, materials, process / management etc. *Potential ECI TF*

People

8. Create / expand / publicise ECI policy (and values) on stewardship, CSR, social values, ethics and sustainability. *Potential ECI TF*
9. Collaborate with outward-facing relevant organisations with existing initiatives on recruitment and education e.g. CITB, ICE etc
10. Influence the content and skills of educational programmes

Natural Resources

11. Guidance on efficiency of using natural resources:
12. Provide guidance notes to minimise pollution from construction sites e.g. oil and fuel spillages, fly-tipping, mud / silt from vehicle wheels, recycling etc
13. Collate and communicate best practice in energy and sustainability practice
Potential ECI TF

Minimising environmental impact:

14. Encourage the effective & efficient use of materials to: design out waste, minimise waste on site, reuse waste & ensure waste is dealt with appropriately
15. Demonstrate to contractors how efficient waste management processes can have an immediate positive effect on bottom line profit
16. Investigate what other sectors have done to reduce waste.
Potential ECI TF
17. Encourage membership towards efficiency in build and operation - offer (via member companies) energy and sustainability advice
18. Outreach at the government and industry level
19. Promote inter-state integrated energy strategies with a view to brokering international agreements on higher standards of energy efficiency across all sectors of construction (the Board recognizes this need but is not set-up to act accordingly)
20. Foster greater partnership between governments and industry to address environmental concerns
21. Actively seek out opportunities for ECI companies to participate in development and industrialisation of renewable and emerging energy and recycling initiatives

Additional ECI cross-cutting actions

22. Increased support for individual members (or small groups) for organising and promoting meetings and workshops (monetary, admin, networks, facilities etc)
23. Annual awards for good examples of doing and 'living' these desired behaviours (in 5 key characteristics outlined here), by ECI & individual companies, for both members and non-members?

Key Actions for members

It was agreed that the Key Actions for members should be driven by the message that we (ECI) want to communicate. A short list of things a company could or should do should be created e.g. join ECI, bring in other companies, engage in Task Forces, promote etc.

Collaboration

1. Implement collaboration in their supply chains
2. Demonstrate more the benefits of membership- evangelise
3. Members provide case study examples of benefits for ECI dissemination

Innovation

4. Increase R&D
5. Change of mindset, as well as being given adequate time and reward for trying to innovate. *Potential ECI TF (possibly)*
6. How to deal with the risk of failure (such as personal, commercial and H&S / regulatory failure). *Potential ECI TF*

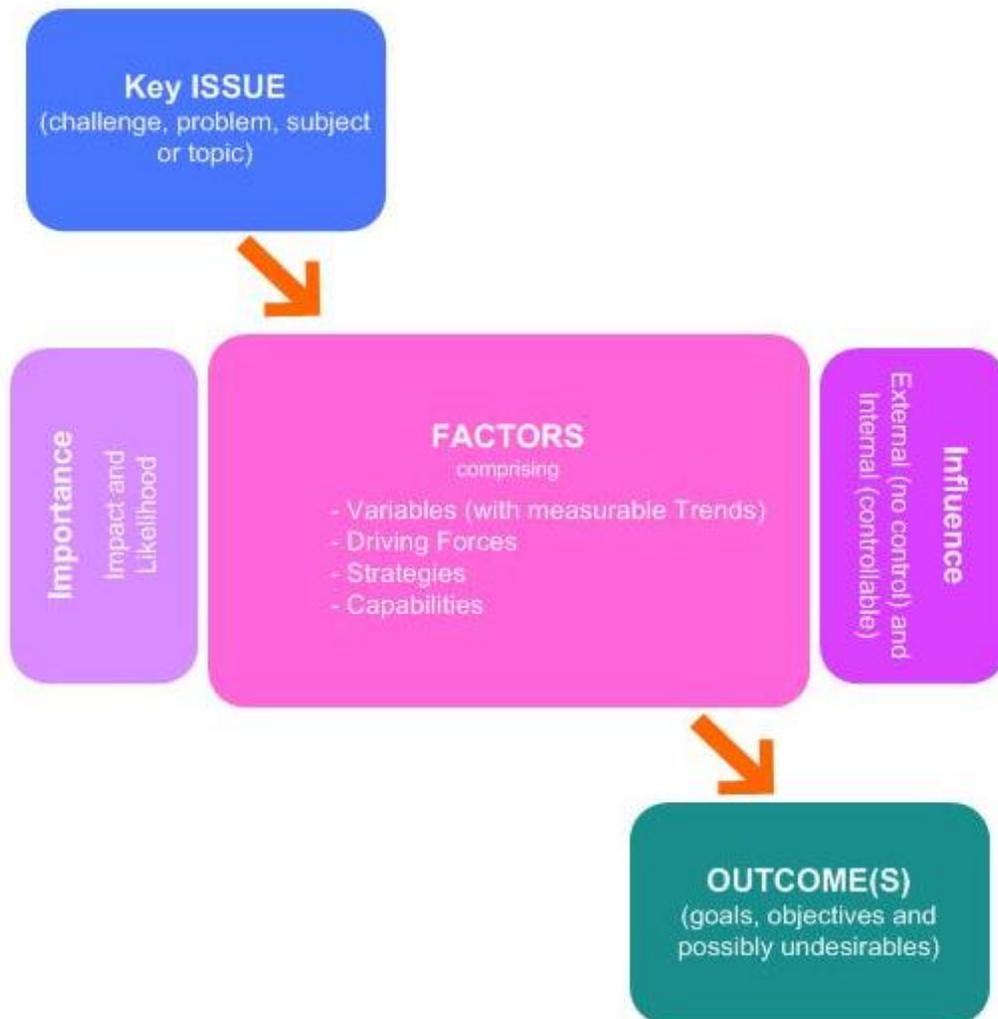
People

7. Provide a better understanding of customers and how to solve their business problems
8. Offer only sustainable and CSR-aligned solutions to clients, and strive to continuously improve them
9. Company investment in apprenticeships and graduates
10. Shared training (and development) of staff and employees
11. Expand company alliances with universities
12. Evangelise e.g. school engagement (attract them young)

Natural Resources

13. Wide range of renewable energy technologies that can be used in buildings, e.g. solar panels, PV, wind turbines, heat exchangers, etc. Need data re capital v revenue costs for such processes to allow informed decisions to be made
14. Increase sustainable sourcing and production of materials
15. Development of total energy self-sufficient residential buildings
16. Increased work life (whole life costing) approach of energy needs / costs on residential and commercial, including HVAC
17. Mobilise the enthusiasm and potential of individuals and communities to generate their own energy locally. This might involve the use of solar panels and wind turbines for example. In addition, provide expert advice and support regarding the constructability of such facilities

Appendix 1: Terminology



Appendix 2: Key issues / factors / outcomes

Ref. No.	Issue/Factor/Outcome	Ranking Preference
	SKILLS & RESOURCES	
142	Shortage of skilled resources will have a massive impact	
146	How to inspire young people to be interested in engineering and technology	1
201	Global demand exploding - insufficient resources	
153	Less engineering graduates	
144	Knowledge/experience leaving industry	
2	Work life balance moving towards life	
	DEMOGRAPHICS	
7	Multicultural or interculturprise	2
8	Demographic profile & aging population in the developed world	
10	More older people- housing, healthcare, pensions	
	PERFORMANCE & BEST PRACTICE	
109	Low cost, fast construction needed	
87	Cheapest rather than best value	
170	Inclusive & transparent approach	
	TECHNOLOGY & INNOVATION	
124	offsite fabrication	
125	Construct technology changes- driven by customer or industry	2
135	Fear of putting new technologies into construction	
136	Changes in production techniques e.g. standardisation	
122	Global IT communications	
	ENERGY	
27	Energy scarcity	1
15	Change in energy provision	
190	Carbon recovery projects being scuppered by Government inactivity	
185	Regulation that reflects industry needs	
193	European tax makes us uncompetitive	
183	North sea tax regime discourages future investment	
25	Establishing new forms of energy generation	
19	More nuclear -yes or no?	
	SUPPLY CHAIN	
85	How to encourage more cooperation in a fragmented supply chain	1
67	How can European companies be competitive with higher wage costs than rest world	
66	EU become integrated construction market	
88	Switch from buyers to sellers market	
99	Virtual teams cause chaos	
	ENVIRONMENT	
34	Carbon footprint & drive to local produce & use	
29	Carbon capture technology	
45	Disaster response trends	2
32	Waste from industry	

Appendix 3: Scenario axis rationale

The first three priority areas decided upon at the last workshop were, in no particular order:

- a) How to inspire young people to be interested in engineering and technology
- b) Energy scarcity
- c) How to encourage more cooperation in a fragmented supply chain

The group selected the next three potential priority areas as:

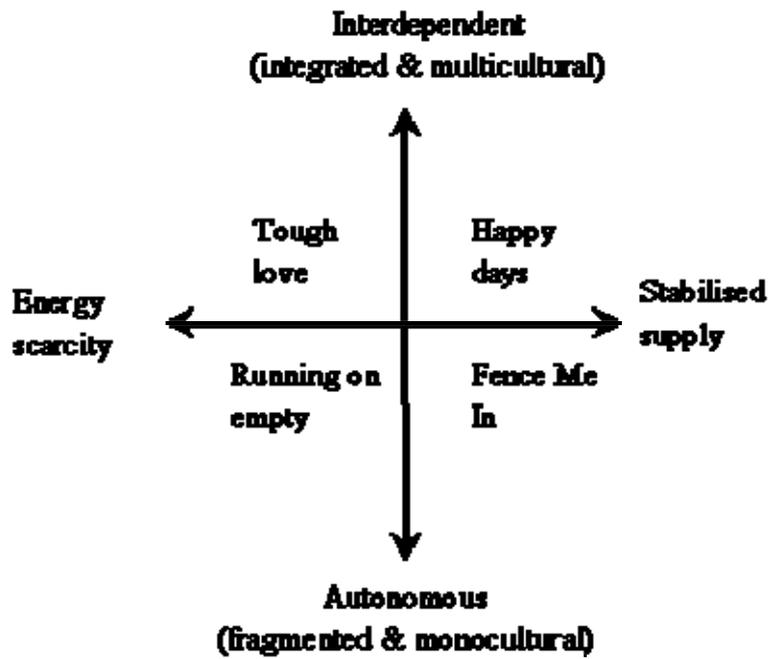
- d) Multicultural or interculturprise
- e) Construction technology changes- driven by customer or industry
- f) Disaster response trends

The horizontal axis (see figure below) is taken from priority area (b) energy scarcity, and illustrates a range from Energy scarcity (i.e. energy supply decreases as expected or is worse than expected) to Stabilised supply (i.e. where energy scarcity is not as bad as expected. This could be due to new reserves being discovered and / or technological advances in both supply and / or use of energy, which brings in priority area (e).

The vertical axis is taken from priority area (c) cooperation in a fragmented supply chain, together with aspects of (d) multicultural. Priority area (a), how to inspire young people, also comes into play along this axis to form an axis of Interdependent to Autonomous.

Using these two axes, the four scenarios A, B, C and D can be developed, all of which will combine elements of priority areas a, b, c, d and e. Priority area (f) was deemed as a 'trend' and therefore not suitable for an axis in itself, but which can be built into the resulting scenarios.

Appendix 4: The four scenarios



Scenario A: “Tough love”

(Energy scarcity and interdependent)

The future imagined is 2030. The view is a western European perspective of the world at this time. Energy is scarce. A new era of renewable technology has been born. Nuclear power is a given and fusion has been developed. High costs have driven a radical rethinking of power use and allocation strategies. Society in general has become much more energy sensitive. Micro generation is fashionable, effective and affordable. It is culturally unacceptable to waste energy in this climate. Smart homes are the only option in the marketplace. Local power generation is the norm. Attitudes to water consumption have also changed. It too is viewed as a scarce resource. East and West have become increasingly polarised in concert with the divergent resource distribution. Technology innovation in the West focuses now on renewables, driven by necessity, whereas the technology in the East is driven by maximising production outputs from fossil fuels.

Previous ways of manufacturing become obsolete with the dearth and exorbitant cost of energy resources. We have become dependent upon the East to supply much of what we require. Increased political clout from countries like Russia, the Middle East and China reorients the balance of power. This situation drives innovation in the West. Only those organisations who truly operate in integrated, interdependent ways survive. With a less mobile workforce (due to the high cost of energy and transport) the need to retrain personnel takes on increasing significance as does the ability to tap into additional sources of labour. The environmental movement is very strong and consequently obtaining the required planning permissions associated with power generation becomes increasingly challenging.

At another level where resources are scarce there is a continued need to hire contractors and labour from Africa, or possibly China. It appears that with scarce resources migrants are less welcome at some levels within society. The energy scarce future curtails the previously widespread travel people had become accustomed to. This influences many dimensions of living. Cultural change has taken place involving less social interaction and a consequent step-change in leisure activities. Home working is now common. The pressure to commute no longer exists with people able to work more locally. Firms have more regional presences and are decentralised in operational terms. New housing is now in concentrated high-density urban areas reducing the need for unnecessary travel and conserving resources. Eco towns also exist. There is pressure to revert to multi-generation living spaces for energy efficiency. Co-location of health and education services is now a requirement for minimising excessive travel. Mass transportation options have replaced cars and powered individual-use systems are no longer available. People now move around either on foot in high-density urban living areas, or via public transportation. Industry and business is based within major ‘industry parks’ with local energy provision on site. There is a mass shift in favour of agricultural production in response to the economic and environmental reality and cost of importation from elsewhere; localization is a key feature of 2030. Genetically modified (GM) crops are the

prime means of efficient production. Diets are predominantly vegetarian by necessity.

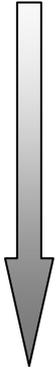
Companies that thrive are bigger entities with centralised structures, but with strong regional hubs. They have massive buying power and benefit from energy efficiencies, gaining significant cost savings. Local production is fundamental to this but ultimately price is still the dominant concern. Three dimensional video capabilities have made mass communication media more acceptable from a social interaction point of view, allowing more accurate simulation of face-to-face encounters. The dominant transaction-based approach to doing business has given way to longer-term thinking and relationship building. Greater willingness exists to work collaboratively on projects whilst distributing risk and sharing reward. There is also more coordinated investment in R&D, IT, technology and innovation. Young people want to work in this environment and see it as an exciting and dynamic place to be.

A cultural shift has taken place with the understanding that interdependence is fundamental to sensible and effective activities. Standardization has enabled integration at project and organisation levels, together with significant reduction in labour requirements. Superior levels of performance can now be achieved. This standardization is visible not only in the shift to prefabricated systems in construction, at the expense of traditional creative architectural developments, but also in terms of how management processes and interfaces are adapted to facilitate integration between systems and project partners. Less time is spent on site. Managing whole project planning is based upon a superior understanding and costing of embodied energy, and energy in use. The focus of attention has shifted to re-using space effectively. The preference is for refurbishment and repair of existing structures. Much less new build takes place; the favoured word is 'renewal'. At the outset of projects there is far more investment in the clear definition of common goals, costs, time and profit margins. Repeated consortia work is common place, as a proven means to achieve efficiency.

Government legislation has channelled efforts to deliver low energy consuming products and low energy materials. Western policy is aimed at securing energy resources. In an interdependent world inter-country agreements are the norm and these are mediated by cultural similarity and political criteria. Economic viability and questions surrounding sustainability infiltrate all our thinking. Stark choices exist. Length of life is explicitly linked to one's ability to pay the real costs. There has been a big, but necessary, realignment of health policy. The population could not sustain the resource implications of previous health strategies; treating 'lifestyle' diseases like obesity is one casualty of this rationalised model. Waste in all guises has become unacceptable. Environmental risks and consequences are fundamental issues which have become routine considerations influencing how and where buildings are constructed now.

Timeline

The Present



- Building Regulations changed to make the design of all new buildings 'smart / intelligent'
- The production of waste on construction sites becomes illegal (offsite minimising labour requirements, recycled materials, refurbishment of energy inefficient buildings)
- Effective 3-D communication tools (to reduce travel and energy) become standard across Europe
- Most people travel by public transport
- European Energy Agency along the lines of the EU drafts regulation on energy use across Europe
- Defence budget in Western Europe lower than 'Energy Support' budget
- Devastating extreme weather events in Western Europe are avoided by 'smart' local power generation and distribution networks

The Future

Scenario B: “Happy days”

(Stabilised supply and interdependent)

The year is 2030, a world in which energy supply is stable. There is a greater mutual understanding culturally and politically, between Western nations and across borders. Integrated ways of working predominate.

Continuous source energy and secure supply means that facilities can be operated at low risk of energy loss. This is a very customer focused, end user driven environment. Various sources and types of energy are available from politically stable regions. Oil and gas still feature in the mix, but renewables, (including bio fuels) and nuclear (with very high safety levels to avoid meltdowns) are the important sources of power. Concerns over global warming in combination with current legislation prevent unrestrained energy consumption. Whilst there is plentiful supply society is not profligate. Legislation drives innovation where energy efficiency is concerned. A change in mind sets has taken place, and European legislation has restricted our use of energy. The existence of tight energy allowances at an individual, company and national level have contributed to stabilise demand. New waste is minimised. Additionally, there is improved technology for storing power and general improved energy efficiency. Extraction possibilities have been enhanced. It is no longer adequate to talk about energy in generic terms - the type of energy source does matter and critically whether it is perceived to be environmentally friendly. Corporate social responsibility (CSR) has a vital role to play in attracting young people into the industry and is intimately linked to energy use.

Stable prices are viewed as very important for industry and price volatility is a thing of the past. Predictable costs enable planning ahead. Conditions of political stability prevail. Standard EU contracts for construction, engineering and energy exist. Less undercutting of prices means more work for everyone. The construction industry is an attractive place in which to work and there is sufficient available skills and resources. The existence of increased automation and more efficient building processes play their parts in attracting people to the industry and making it more productive. Life here is noticeably less confrontational. Parties are no longer forced to deal at lowest cost or compete for resources. More people choose to work in the construction industry due to the improved wages. Engineers enjoy a higher status in the professional world and also enjoy enhanced remuneration. Common education systems and qualifications enable national boundaries to be crossed by labour and facilitate co-ordination of work. The routine sharing of best practice has had a positive impact; quality is consistently good. A ‘United States of Europe’ is on the horizon because all the stakeholders are working in such cohesive terms. Common languages facilitate integration through fluent communications - English is still the predominant language across Europe, although Spanish and Chinese are increasingly important internationally.

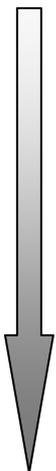
Standardised contracts apply right up and down the supply chain. Global contracts exist and are accepted by international contract law. Standardised energy solutions deliver infrastructure on site reliably. People are retiring later

and are in better health. Technological advances continue to progress. Because of the uniformity of standards, fewer projects are problematic and processes function well. Advances in the integration of IT systems have improved ways of working on a number of levels - project, organisationally and internationally. Communications are now reliable and effective. Tools have been developed to allow the measurement of best practice where ever you are in Europe - to assist decision making and facilitate optimum efficiency. Streamlined invoicing systems operate and purchasing systems are cost efficient and swift. Backup power systems are redundant because systems work optimally and reliably. A global online database of contractors and clients with open information regarding quality of service and benchmarking against a whole series of performance criteria enables greater clarity and visibility over quality standards. As a consequence confidence levels have risen. Holistic approaches to understanding client businesses predominate and this optimises operations as well as client and contractor satisfaction. Integrated working permits the various stakeholders to legitimately make a reasonable level of profit from their endeavours.

Virtual meetings are commonplace due to technological advances. This reduces the necessity for business travel and increases the efficiency of working collaboratively across large distances, though social and leisure travel is still widespread. Brain-activated technology is being developed. In a world where energy is in abundance the possibility of being able to teleport matter to remote locations no longer appears the realm of science fiction, with energy availability driving the development of many high-tech high-energy technologies.

Timeline

The Present

- 
- EU-wide energy strategy delivers cross-border trade (of energy)
 - World energy prices stabilise allowing long-term accurate costing
 - Low interest rates together with low inflation create a booming European Economy
 - Construction and engineering becomes the career of choice due to good working conditions and a less adversarial working environment
 - Salary levels in construction rise to that of doctors and lawyers
 - Legislation and price reduces energy demand by 30%
 - The European Construction industry awarded prestigious Global Prize for socially responsible behaviour for the fifth year in succession
 - Common IT design platform introduced across the EU
 - Nuclear fusion delivers and comes on stream
 - Legal costs associated with litigious activities in construction fall by 85%
 - European construction businesses conduct 40% of trade outside EU

The Future

Scenario C: “Running on empty”

(Energy scarcity and autonomous)

The year is 2030 and energy is scarce. Society is inward-looking and protectionist of knowledge, energy and resources. The ‘first’ world wishes to safeguard its knowledge and the third world seeks to protect its energy resources. This situation redefines traditional understandings of the distribution of world power. Locations which are energy laden are in the ascendancy and those with access to restricted sources find themselves less well positioned. Genuine co-operation is rare and that which does take place is isolated, driven by necessity and comes at a price. An adversarial transaction-based world exists. Legally-enforced financial penalties are imposed whenever outputs fail to deliver.

Nervousness in the EU causes defence budgets to rise. Social spending is constrained as a consequence and this results in more civil unrest and general social impoverishment. Those who are financially-able move closer to the energy resources within their home country. The international movement of labour is largely non-existent because of strict border controls and the potent protectionist forces in place.

The skills and resources that are available are channelled into narrow specialisations. Specialist skills are available, but at very high rates. This creates islands of knowledge and unevenly distributed resources, contributing to unrest. A greater diversity of standards and processes develops with organisations and countries developing autonomously. The effect is an isolating one. There is a localization of skills and smaller, niche, country-based activities predominate. High levels of variation in terms of production are visible at a global level due to differing drivers and contexts.

Regionally-based marketplaces however, do exist. Countries still trade with one another, but on the basis of necessity only, one-on-one. The adversarial working context means that there are difficulties in attracting quality people into the construction industry. Governments act to try and retain skills within their home nations. Similarly, governments are proactive in identifying potential skills shortages and delivering incentives and appropriate training to address the problem. National education is focused on preserving and retaining knowledge. Government policy is towards intervention, and safeguarding national interests is paramount. Fiscal measures aim to restrict energy consumption and innovation activities are channelled almost exclusively towards alleviating energy scarcity. This focused and narrow nature of innovation has the inherent risk however, of arriving at a dead end. The monocultural existence reduces the overall quality and availability of divergent ideas, constraining the spectra of possibilities and ultimately the overall levels of innovation.

The emphasis in construction is on the delivery of projects strictly as per specified in detail at the outset, with no room for manoeuvre or innovation. Much less construction work now takes place. There is still a drive for cost efficiency however, as autonomous working patterns mean considerable individual effort is

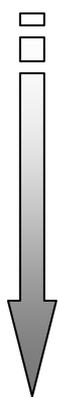
now required in order to develop solutions. Lowest price considerations are what matter, not best value.

National economies are far less stable. Competition for scarce resources is fierce and under such conditions there is little interest in seeking global environmental agreements or standards. Legislation is simply unworkable with countries developing at different rates and with varied priorities. There is no incentive to buy-in to common environmental agendas, instead anti-Kyoto style treaties emerge.

Globally there is still greater segregation according to resource allocation, be that energy, food, knowledge or labour. The gulf between rich and poor has never been greater.

Timeline

The Present



- Budget airline goes bust as fuel is scarce and people can not afford to travel
- Electricity cuts hit the construction industry
- Private petrol gets rationed for the first time
- Dramatic carbon taxes hit increasing number of low-income families living in old houses
- Fuel poverty riots –new ‘winter of discontent’
- Tighter immigration controls mean there is no foreign labour on Western European construction sites
- USA leaves NATO
- Break up of the EU as relationships break down

The Future

Scenario D: “Fence me in”

(Stabilised supply and autonomous)

An autonomous culture influences all ways of living and working at individual, company and country levels in the year 2030. In spite of stabilised energy supply there is more competition at industry level. Individual agendas take precedence over the common good. Self interest is the dominant concern. Commercially the emphasis is on making a quick profit. The adversarial approach to business causes the fragmentation of supply chains, and ultimately to higher costs. This leads to higher business failure rates and the trend towards fewer but larger organisations.

Political instability is a characteristic of this new era and political power shifts lead to a feeling of volatility. Sustainable policies which facilitate longer-term visions are notable by their absence. As a consequence organisations find themselves changing direction repeatedly, again leading to higher operating costs. This lack of cohesion is an unsettling force for both business and society. Local food production is a characteristic of the 2030 existence. There is less industrial transport and more personal transport.

The construction industry is no longer viewed as an attractive career option; recruiting and retaining the desired quality of people becomes increasingly problematic. There is less sharing of knowledge across the industry. Protectionism of home labour to the exclusion of professionals from other nations is a characteristic of 2030, and inward migration is only permitted where low-level skills are concerned.

Environmental stewardship has been largely sidelined, and only that which is forced by legislation is done. Minimum standards flourish and there is a marked decrease in concern regarding environmental issues. Hence personal health and quality of life suffer.

Competition reverts to lowest price, with fewer economies of scale, rather than best value, and adversarial relationships are the norm. Company structures become more centralised and dogmatic. Travel is not a problem under conditions of stabilised supply. Travel is routinely to sort out project problems which now occur more frequently due to the absence of any integrated working practices – ‘fire fighting’ is normal procedure. The opportunity to take pre-emptive collective action has been sacrificed on the altar of autonomous behaviour. The idea of investment in building long-term relationships is an out-dated concept. As a consequence, increasing numbers of skilled staff leave the industry early, disenchanted by the working conditions which are stressful and difficult, thereby exacerbating the problems. The industry has no single coherent voice to help safeguard its interests and consequently continues to suffer because of this. In concert with the decline in the European construction industry clients and end-users either look beyond Europe for solutions, or train their own staff to engineer and manage projects.

Technological advance has been slow and based around local solutions not long-term innovation. Local pockets of innovation still exist. The large-scale step-change type of advances have failed to materialise. Fragmented, locally-focused innovation takes place because organisations see this as a way to gain competitive advantage over their rivals. Any discoveries which are made are guarded jealously and are not shared. Various systems of IT and production have developed. Common routes to interfacing with others are not seen to be important in such an autonomous world.

Timeline

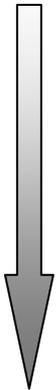
The Present



- UK abandons Zero-carbon homes legislation



- Far Eastern construction companies enter the European Top 10 for the first time



- European recession results in EU retrenching to core 12 members

- Kyoto agreement discarded

- Major new finds of oil fields supports expensive but exclusive use of oil and gas

- Smog returns to London, bringing record numbers of respiratory sufferers

- European EN Standards are discarded as individual European countries go back to their own national standards

- London second orbital motorway complete

- Engineering and construction degree student numbers fall to half 2008 levels

The Future

