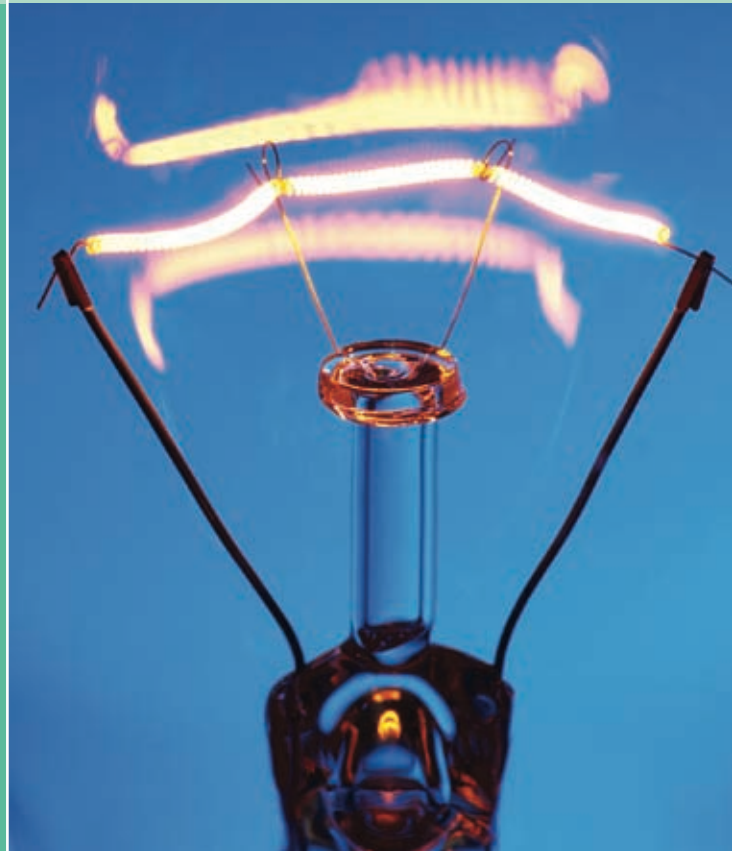


Innovation in Construction: Ideas are the currency of the future

Survey 2007



CONTENTS

1	Foreword	3
2	Introduction	4
	Purpose of Study	4
	Background research	5
3	Methodology	6
	The sample	6
4	Findings	7
	4.1 Are you a member?	7
	4.2 What is your employment status?	7
	4.3 What description best suits your profession?	8
	4.4 Which of the following sectors are you most closely involved with?	8
	4.5 How many people are employed at your organisation?	9
	4.6 How much does your company turn over per annum?	9
	4.7 How important is research and development in the construction industry?	10
	4.8 What do you believe is the main driver of innovation?	10
	4.9 Which organisations do you believe hold responsibility for carrying out R & D?	11
	4.10 Which organisations do you believe produce most innovations?	11
	4.11 Globally, where do you believe most research and development is taking place?	12
	4.12 By 2020, where do you believe the majority of research and development will take place?	12
	4.13 Which of these issues requires the most R & D?	13
	4.14 How is creativity/innovation encouraged in the industry?	13
	4.15 What is the most innovative thing that has directly benefited you over the last 5 years?	14
	4.16 How important is research and development to your company?	14
	4.17 How much does your company invest in research and development annually?	15
	4.18 How much should your company invest?	15
	4.19 Does your company encourage creative problem solving?	16
	4.21 How important is innovation for the future of construction?	17
	4.22 If you had a £1m budget for innovation, what would you develop?	17
5	Discussion	18
6	Recommendations	19
7	Resources	19

Ideas are the currency of the future.

The construction industry is not widely perceived as offering an environment that nurtures creativity, and yet this survey has not only shown that there is a huge volume, and quality, of ideas within the industry but also that innovation is regarded by many as crucial to the future of the industry.

Construction is a unique environment and by definition is a creative industry. No single project is the same as another and that diversity breeds innovation and innovative problem solving at the practical level.

It should be noted that whilst the Office of National Statistics figure within this report place a £33m value to the industry's research & development spend, it does not reflect how much the industry spends employing innovative and unique solutions at the practical level to projects. It also doesn't take it account the innovation in practices and processes that occur on site in the form of logistics, health and safety, training and development, people management or planning. This can be clearly seen on exemplar projects, like the world's tallest buildings, longest span bridges and the like. And to a lesser extent on any project in the industry.

99.7% of respondents felt that R & D was important or very important to their company and 100% also felt that innovation was important or very important to the future of construction. However 66.25% felt their own company was not investing enough. That is a concern when we consider that almost 95% were directors or managers of whom 64% worked for companies that employ over 100 people, and 65% worked in organisations with a turnover in excess of £10m a year.

What we have also seen through this research is that the issue of sustainability is clearly at the top of the agenda for innovation in construction. Some 48.25% of respondents voiced 'green' ideas that ranged from carbon neutral construction materials, renewable energy systems, energy efficient heating systems through to solar powered plant machinery and better waste management products. With 60.6% of respondents stating that 'green' issues currently require the most R & D; it is clear from this survey that there is a deep concern for environmental issues from within the construction industry.

Research conducted by the Office of National Statistics, states that construction spends a comparatively small amount on innovation.

Purpose of study

As there has been little research into innovation within the construction industry the CIOB wanted to gain an insight into what construction professionals felt about the issues of innovation and research and development (R & D). The study sought specific opinion about the current state of innovation within construction including the climate of financial investment compared to turnover.

The survey also examined the impact of current innovations and where they were most likely to come from in terms of sector and geography. In addition the study examined the respondent's aspirations and ideas as to what issues they felt would require an innovative response from the industry. The respondents were given the opportunity to express what areas they would develop with a million pound R & D budget. The aim of this was not only to give the respondents a creative opportunity to express their ideas but also to create some interesting discussion ideas that could possibly lead to future innovations within the industry.

What is Innovation in the Construction industry?

The Department of Trade and Industry (DTI) states that innovation is "The successful exploitation of new ideas" and that "it is the key business process that enables UK businesses to compete effectively in the increasingly competitive global environment." Innovation within business is not always profit driven and the construction industry in particular has to find ways of changing its procedures and technology in order to adapt to increasing governmental and public concern for the environment.

For the purpose of this survey innovation will be defined as the successful introduction of new technologies or procedures into industry. Research and Development (R & D) will be defined as the process that is undertaken to introduce innovation into industry. Innovation is not to be confused with R & D with which it is often linked. Innovation is a product of R & D and it must be remembered that R & D expenditure, which has been extensively examined in reports such as The Office of National Statistics - Research and Development in UK Businesses 2005; does not indicate the levels of innovation or technological development within a company; it merely shows a company's efforts and desire to introduce innovations.

Background Research

“It is estimated that buildings and their consumption represent more than 40% of energy use within the European Union. This means that buildings, in contrast to popular belief, contribute more greenhouse gases than traffic (31%) and industry (28%) Europe and the construction industry should take the lead in the global fight against the threat to our climate.”

Claes Björk, President and CEO, Skanska, December 2001

With concern over carbon emissions at a historic peak, the construction industry has never been in greater need of innovative technologies and processes. Recent changes to the building regulations such as the April 2006 revision to Parts F (ventilation) and L (fuel and energy conservation) have enforced maximum carbon emissions for new builds and renovations of existing building. These changes to the law coupled with growing public and academic concern over the construction industry's contribution to carbon emissions has left the industry in great need of innovation within the built environment.

Aside from a public and academic outcry for a new 'green' approach to construction, the industry itself has been shown in recent surveys as one of the industries least likely to invest in R & D and innovation. In January 2007 a National Statistics paper entitled Research and Development in UK businesses 2005, found that the construction industry spent £33m on R & D compared to £3308m spent in the pharmaceutical industry and £127m spent in agriculture. The UK's construction sector is the largest industry in the UK, employing around 2.2 million people and accounting for 8% of the UK's GDP in comparison to the pharmaceutical industry that contributes 0.6% to the UK's GDP.

It could be stated that this is an unfair comparison as the pharmaceutical industry is a very different type of industry and relies heavily on scientific innovation to keep up with public demands which is delivered from product innovation; whilst the construction industry is mainly project based innovation. However, the construction industry's investment in R & D does fall behind closer and fellow traditional industries such as agriculture. The construction industry's annual turnover in 2005 was valued at £169,248m with only £33m of that spent on R & D whereas the agricultural industry's turnover was significantly less at £1,084m and yet £127m was spent on R & D.

In the mentioned National Statistics paper, the construction industry is also seen as one of the only industries decreasing its annual spends on R & D. The Industry's 2005 annual spend, as stated in this paper, is an £8m reduction from its expenditure of R & D in 1999. Further studies such as Innovation in the UK: Indicators and Insights, (DTI Occasional Paper, Number 6, July 2006) states that only 6% of construction enterprises introduced new process innovations in 2005.

The OECD (Organisation for Economic Co-operation and Development) Oslo paper sets down strict guidelines as to what an R & D Innovation survey should consist of, yet there has been very little research conducted within the UK regarding the construction industry's opinions on the need for innovation and R & D. The lack of research within the industry regarding innovation has made it very difficult to determine why the construction industry is behind other industries such as agriculture when it comes to investment in research and development.

The survey was conducted using a web-based questionnaire which respondents could access through the CIOB website (www.ciob.org.uk).

Respondents were asked general demographic questions regarding their employment status, their company and their profession within the industry in order to explore the diversity of the sample within the construction industry.

An email was sent to all the members of the CIOB informing them that the survey was online but the survey was open to the general public.

Three open answer questions were included to give people the chance to express the following: what innovations have benefited them in the past; how their company encourages creative problem solving, and a chance to explain any innovative ideas that they would like to see introduced in the construction industry with a budget of one million pounds.

The sample

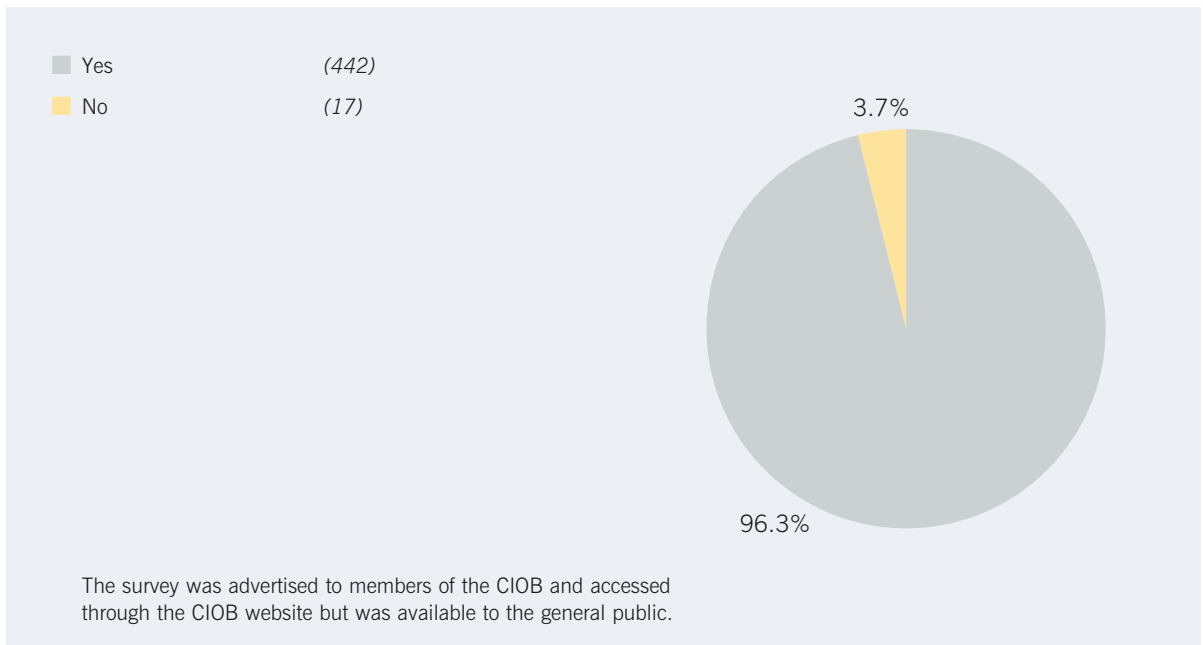
The sample consisted of 459 construction industry professionals, the majority of whom were company directors or management (433 respondents). The vast majority were members of the CIOB (93.3%). 89% of respondents were either employed or self employed. 0.9% of the respondents were unemployed whilst 7% were owners or proprietors of their companies.

The respondents came from varying sizes of organisations with 36.3% of the sample working for large organisations with over 500 employees and 40.3% working for companies whose annual turnover exceeded £100m annually. There were also 17.5% of respondents from companies that employed less than 20 people.

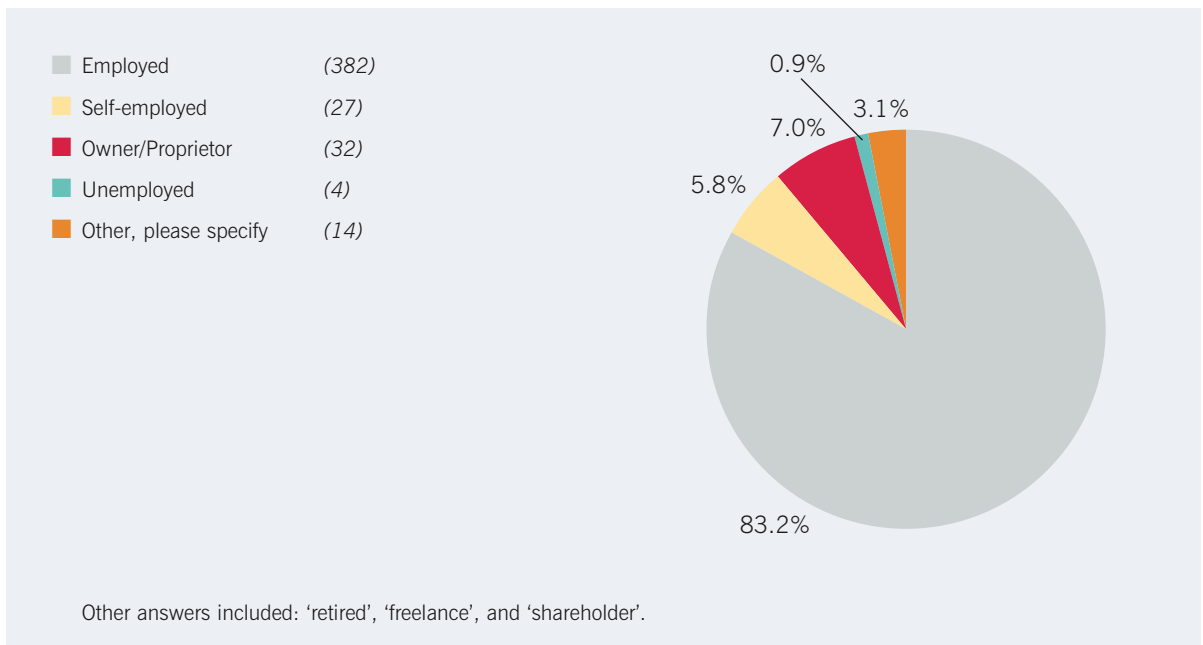
4

FINDINGS

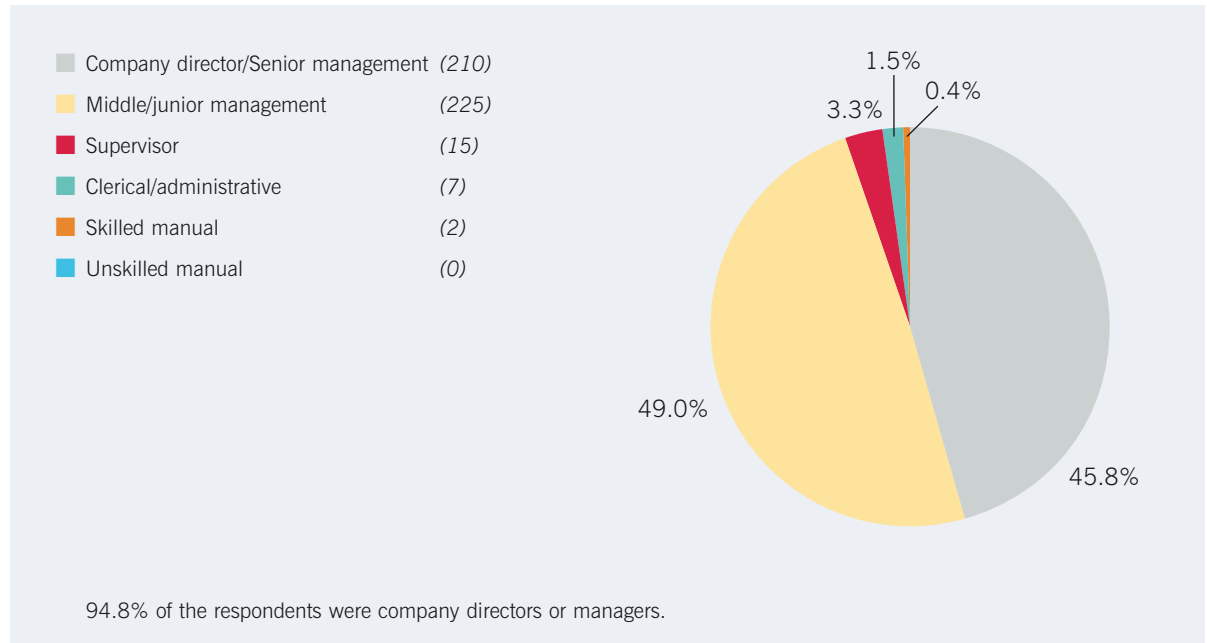
1. Are you a member?



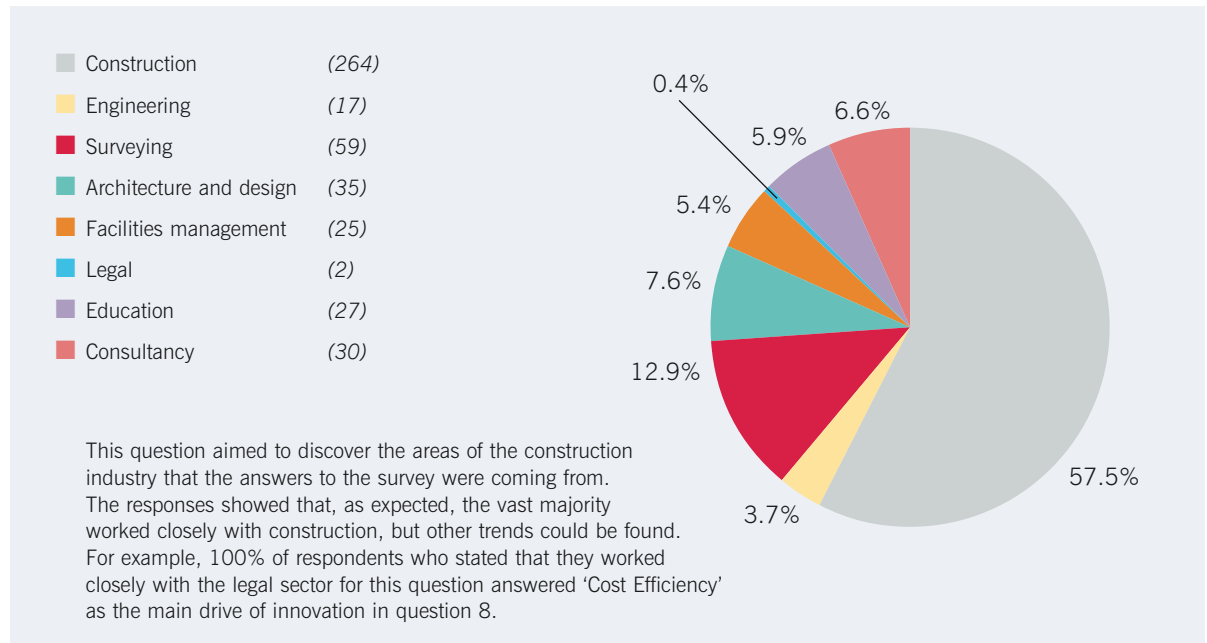
2. What is your employment status?



3. What description best suits your profession?

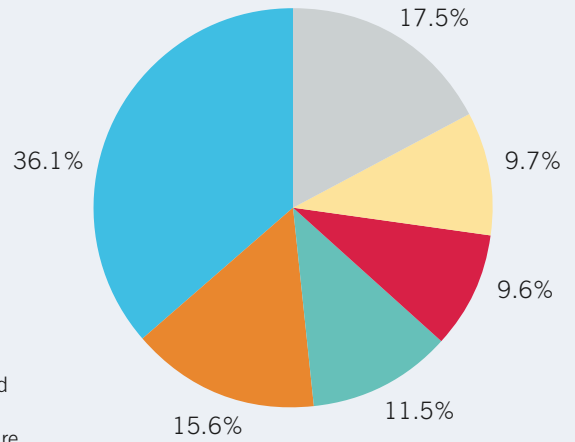


4. Which of the following sectors are you most closely involved with?



5. How many people are employed at your organisation?

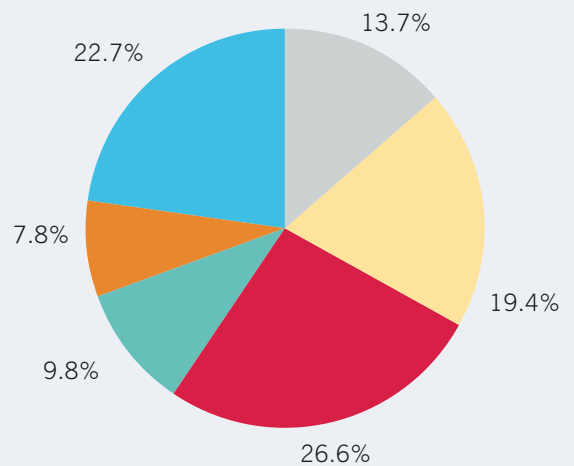
Less than 20	(80)
20 to 50	(45)
50 to 100	(44)
100 to 200	(53)
200 to 500	(71)
More than 500	(166)



63.4% of respondents were from companies who employed more than 100 people, showing that the response was mainly from large companies. The 17.5% of respondents are invaluable to the balance of the survey as they allowed us to see how much smaller companies invested in innovation.

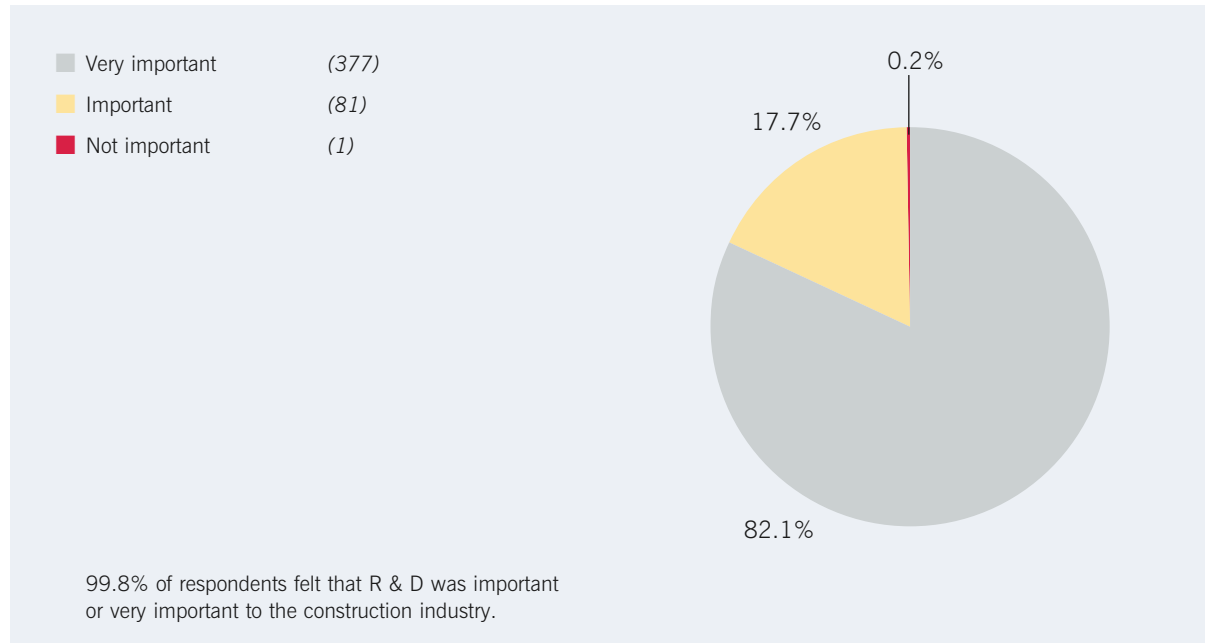
6. How much does your company turn over per annum?

Up to £500,000	(63)
£500,000 to £10m	(89)
£10m to £100m	(122)
£100m to £250m	(45)
£250m to £500m	(36)
Above £500m	(104)

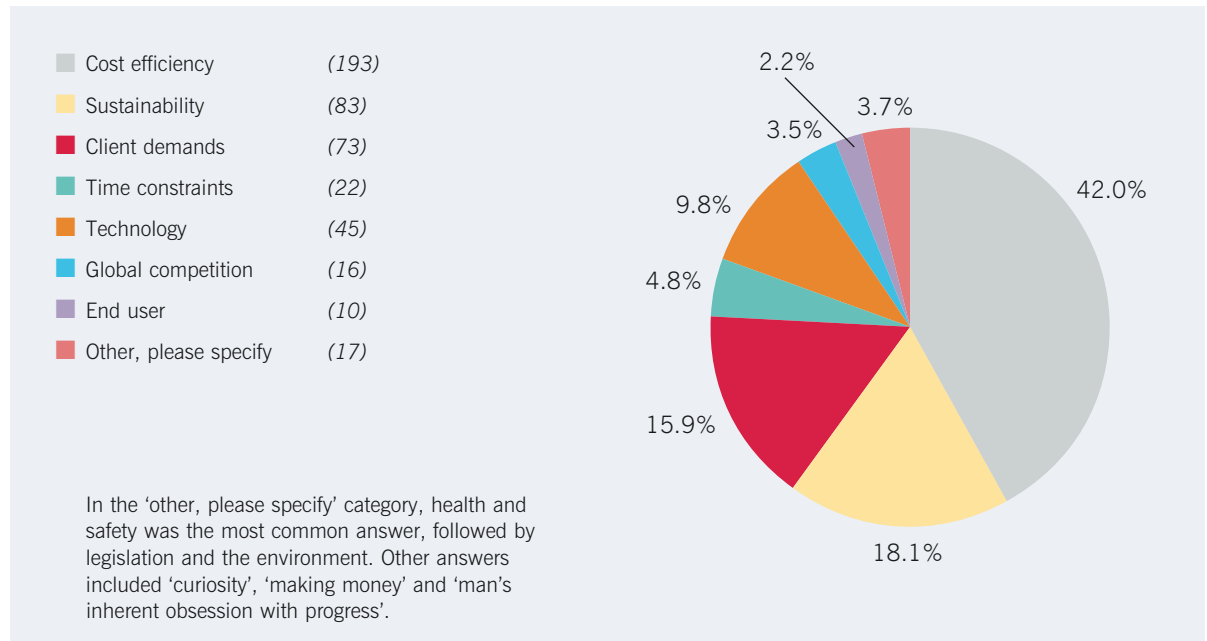


40.3% of respondents worked for companies that turn over more than £100m per annum. Of the respondents who work for companies turning over £500,000 or under, 38.7% of them believe that their company invests nothing into research and development and 49.2% of them stated that their company only invests up to £5,000 per annum into R & D.

7. How important is research and development in the construction industry?

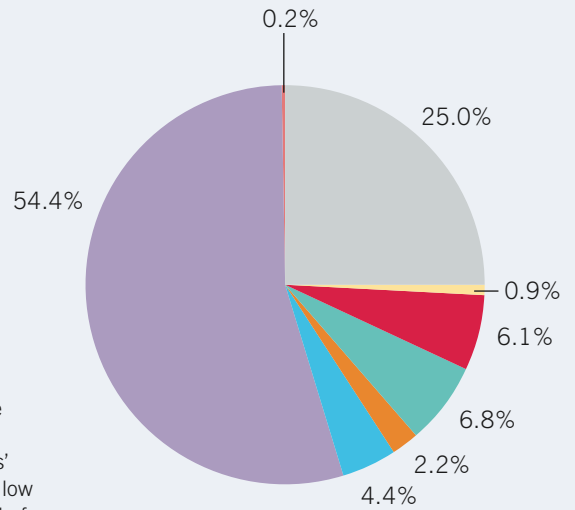


8. What do you believe is the main driver of innovation?



9. Which organisations do you believe hold responsibility for carrying out R&D?

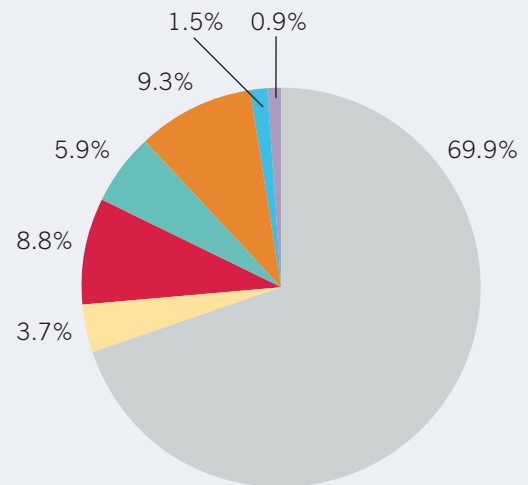
Product manufacturers	(115)
Consultants	(4)
Academic institutions	(28)
Professional bodies	(31)
Contractors	(10)
Government bodies	(20)
All the above	(250)
Other, please specify	(1)



Although 'consultants' and 'contractors' have a low response value it must be remembered that 53.8% of respondents answered 'All of the above' which encompassed 'consultants' and 'contractors'. The most significant figure here is not the low percentage for certain bodies but the high percentage for 'All of the above' which shows clearly that majority of the respondents believe that all bodies should be responsible for R & D.

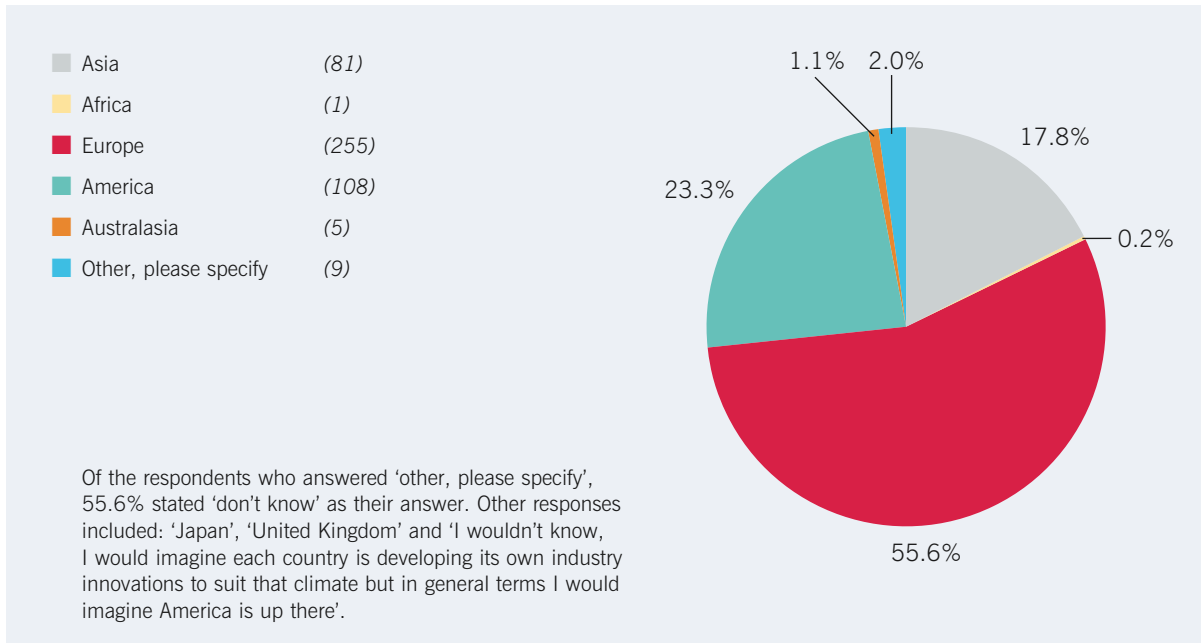
10. Which organisations do you believe produce most innovations?

Product manufacturers	(321)
Consultants	(17)
Academic institutions	(40)
Professional bodies	(27)
Contractors	(43)
Government bodies	(7)
Other, please specify	(4)

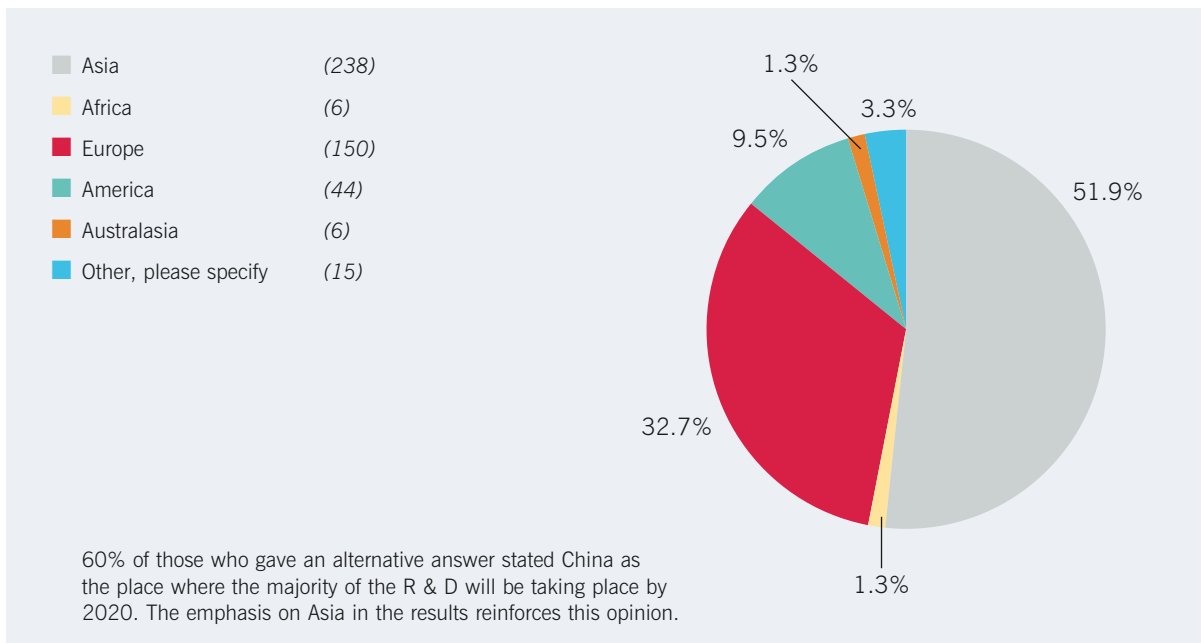


'Other' answers specified included: 'private sector', 'collaboration between manufacturers' and 'private individuals'.

11. Globally, where do you believe most research and development is taking place?

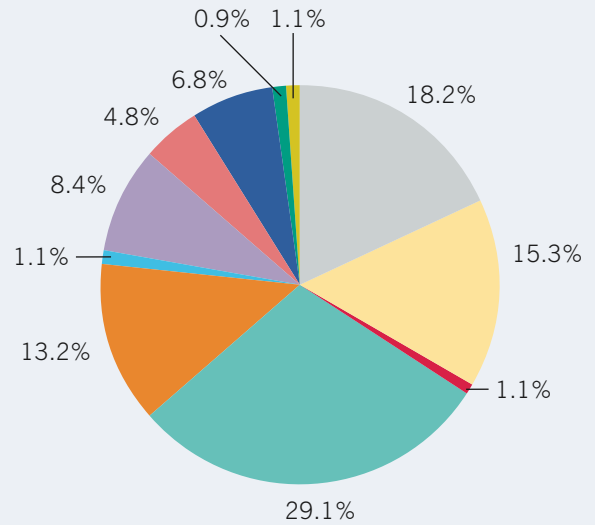


12. By 2020, where do you believe the majority of research and development will take place?



13. Which of these issues requires the most R&D?

Materials and products	(83)
Carbon zero buildings	(70)
IT and communications	(5)
Energy efficiency/carbon reduction	(134)
Building methods	(61)
Health and safety	(5)
Carbon neutral power generation	(39)
Training and education	(22)
Waste management	(31)
Policy	(4)
Plant machinery	(0)
Other, please specify	(5)

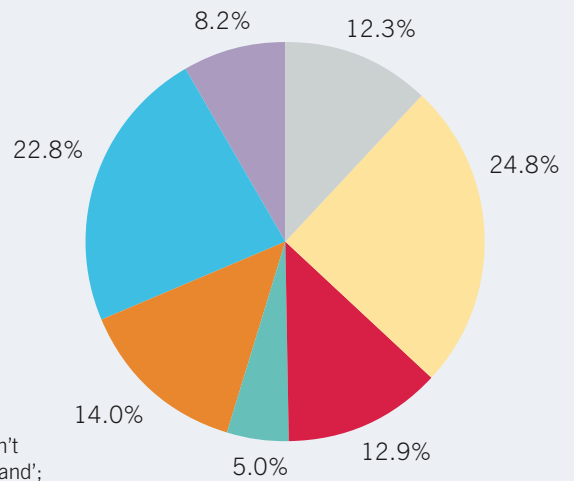


53% of respondents answered that the carbon emission issue requires the most R & D. Other answers included: 'materials', 'energy efficiency', 'waste management', 'all of the above', 'all with the slant on sustainable issues' and 'most of the above'.

It is clear from the responses to this question that the majority of respondents (60.6% including those who cited 'other') felt that carbon and waste issues need the most R & D; showing a clear concern for the environment from within the construction industry.

14. How is creativity/innovation encouraged in the industry?

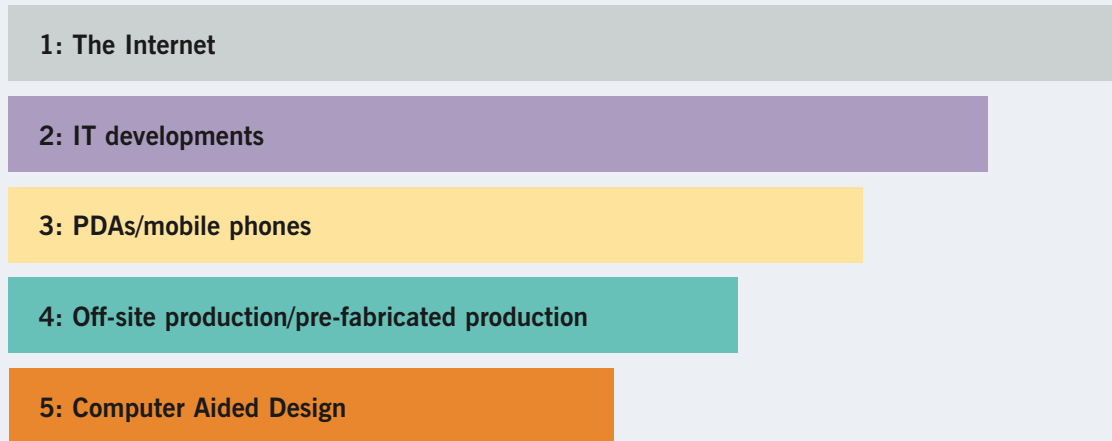
Awards	(56)
Grants/funding	(114)
Innovation programmes	(59)
Government scheme	(23)
Access to new technologies	(64)
Collaboration/partnering	(105)
Other, please specify	(38)



Other answers included: 'it doesn't'; 'profit/cost driven'; 'it isn't enough'; 'I don't think it is'; 'I don't know'; 'supply and demand'; 'tax incentives'; 'planning requirements'; 'education'; 'all of the above'; and 'commercial profit'.

15. What is the most innovative thing that has directly benefited you over the last 5 years?

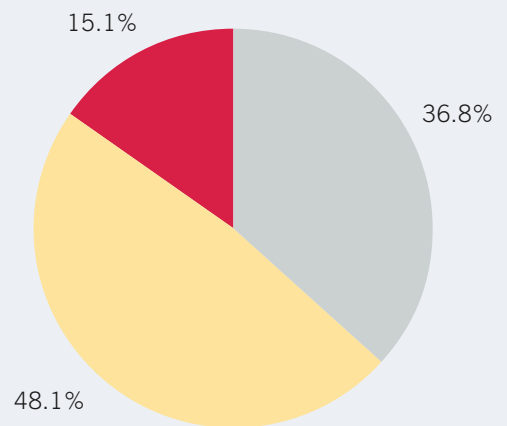
The top 5 issues in order of reoccurrence were:



Others: sustainable energy sources, heat loss prevention technology.

16. How important is research and development to your company?

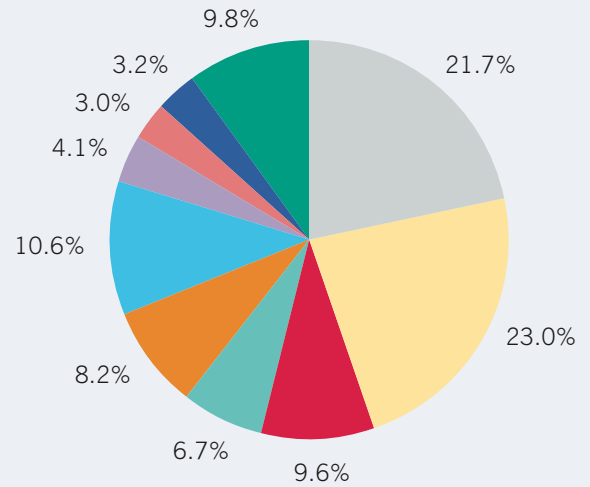
Very important	(169)
Important	(221)
Not important	(69)



85% of respondents felt that R & D is important or very important to their company.

17. How much does your company invest in research and development annually?

None	(100)
Less than £5,000	(106)
£5,001 to £10,000	(42)
£10,001 to £25,000	(31)
£25,001 to £50,000	(38)
£50,001 to £100,000	(49)
£100,001 to £250,000	(19)
£250,001 to £500,000	(14)
£500,001 to £1m	(15)
More than £1m	(45)

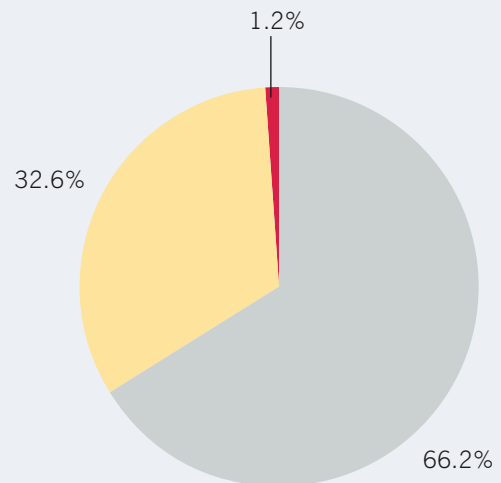


Of the respondents who stated that their company employed up to 50 people (question 5) 41.6% of them answered that their company invests nothing in R & D for question 17. 44.9% of these companies spent £5,000 or under per annum, meaning 86.5% of these smaller companies were spending under £5,000 per annum on R & D.

Of the respondents who stated that their company had an annual turnover of over £500m (question 6), 9.7% of them stated that their company spends nothing on R & D in this question. This would suggest that throughout the industry there are a great number of companies spending either nothing or very little on R & D compared to their annual turnover.

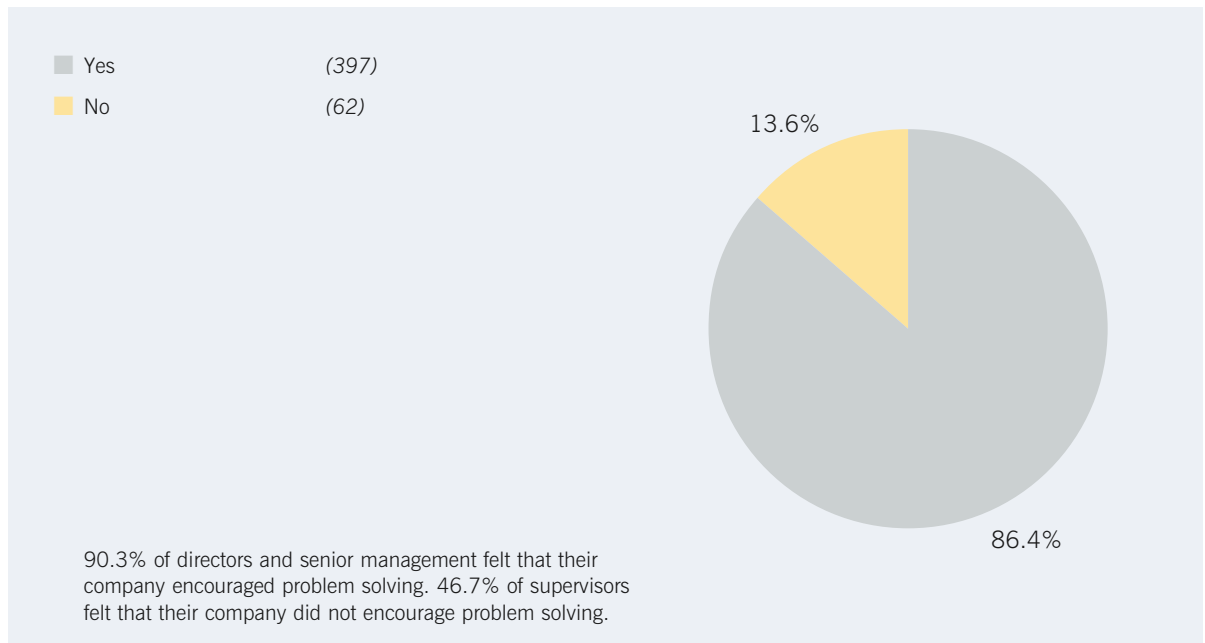
18. How much should your company invest?

More	(304)
Same amount	(150)
Less	(5)

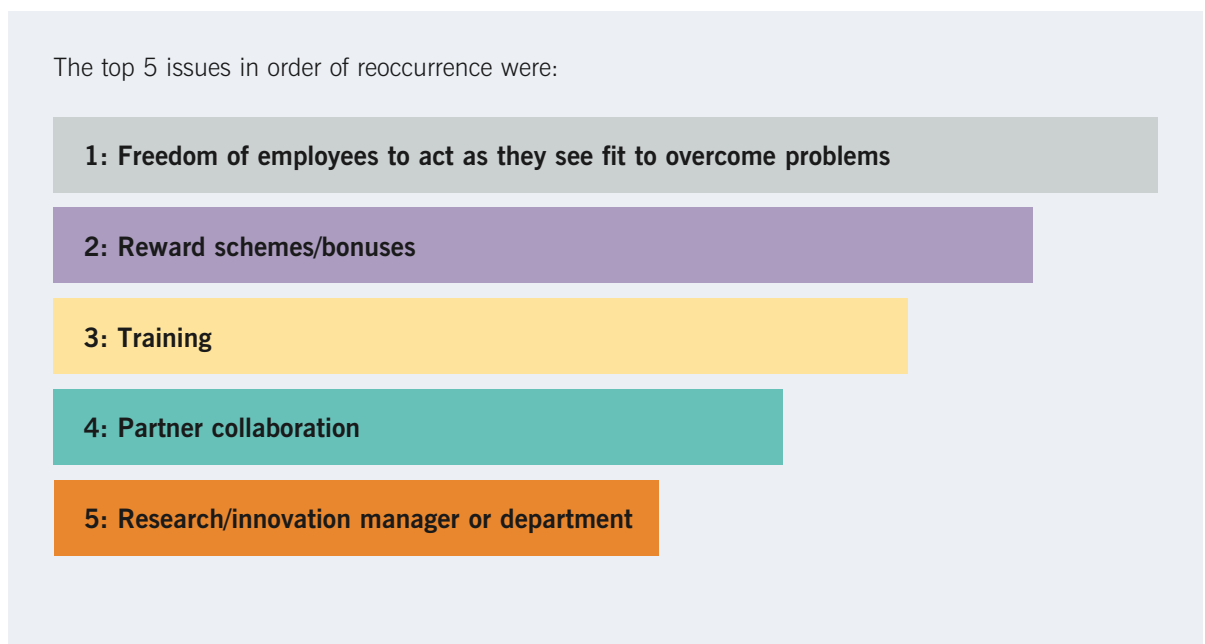


74.7% of middle/junior managers and supervisors felt that more needed to be invested into R & D. Of the 1.1% that responded that their company should spend less on R & D, 100% of them were company directors or senior management.

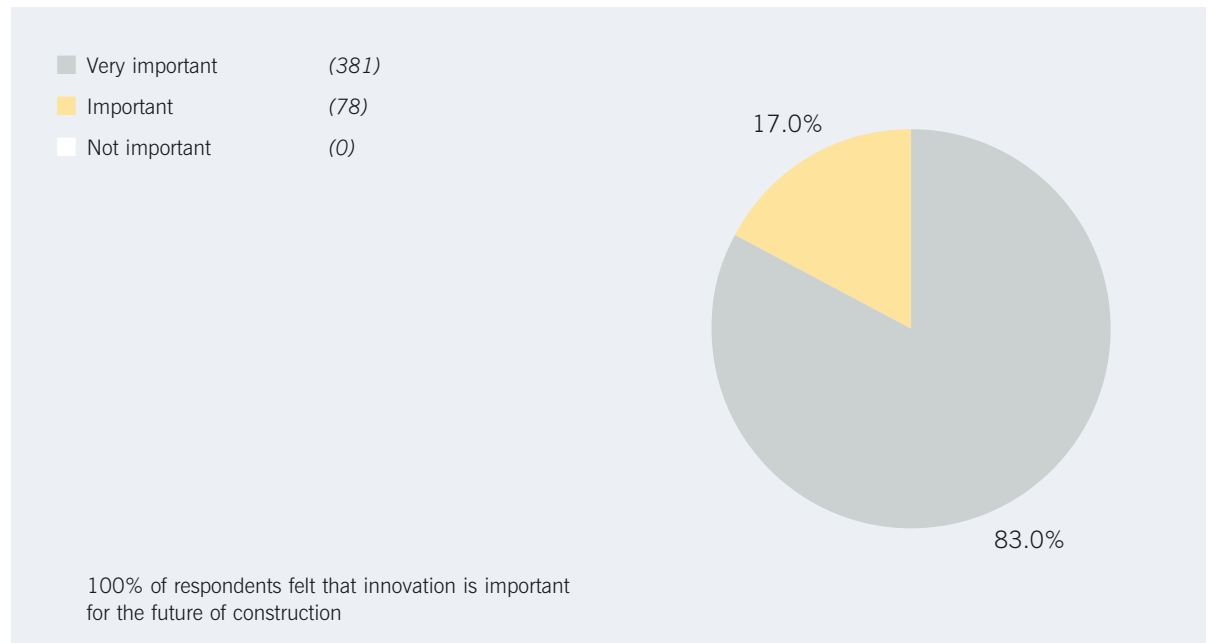
19. Does your company encourage creative problem solving?



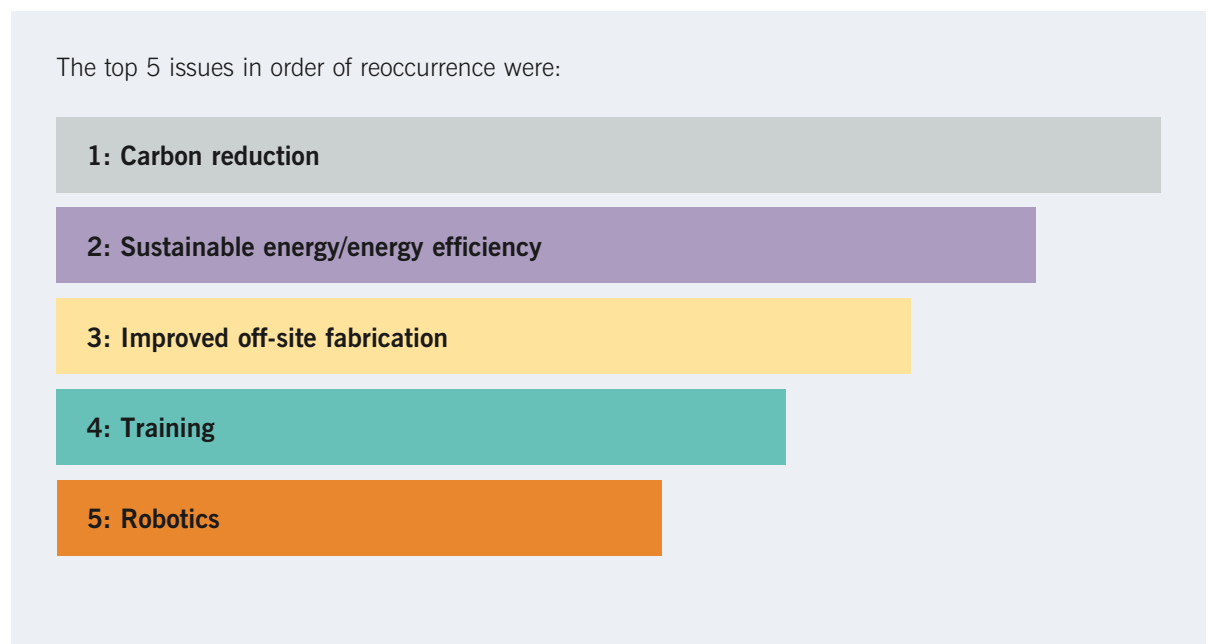
20. How?



21. How important is innovation for the future of construction?



22. If you had a £1m budget for innovation, what would you develop?



With 66.25% of respondents stating that their own company was not investing enough in R & D it is clear that more research is required to uncover how companies can do more to innovate from within their own organisation.

Construction is an environment that is constantly applying leading edge and innovative solutions, as no single project is the same as another. But whilst the industry innovates it is clear from this survey that the knowledge gained is not always a shared experience that can be learnt from by the industry as a whole. This manifested itself in the CIOB survey with some respondents expressing ideas that already existed in the marketplace.

48.25% of respondents would use a million pound budget to invest in 'green' innovation. This shows there is clearly not only a demand for improved 'green' technology but also a mass of ideas from within the industry of how to implement such innovations. The amount of varying ideas expressed in the final question of this survey is a great call for further discussion regarding the opportunity to innovate within the industry.

In addition 60.6% claimed that 'green issues' actually require the most R & D. However, 42% of respondents claimed that cost efficiency was the main driver of innovation. If green innovation can be shown as a clear business benefit there would be greater incentive to develop future green technology and techniques.

With 100% of people stating that innovation was important or very important to the future of the industry there must be further research into where these innovations are going to come from. With the current concern of carbon emissions the time to act is now and these ideas need to be nurtured and supported. Further research must be conducted into the ideas within the industry.

Whilst the CIOB recognises the validity of the DTI statistics (with regard to the construction industries spend on R & D), a more accurate figure could be derived from the R & D capital allowances tax credit that construction companies claim. Unlike other industries the construction industry often innovates in practice. As an example world leading projects include innovative problem solving and employ leading edge solutions by their very nature. Many companies and professionals are not aware of the benefits of the R & D tax credit and are often not aware when they are spending in areas that would qualify as R & D.

Further discussion is also needed regarding how innovation and creativity is encouraged within the industry as question 14 produced divided results as to where the people believe the incentives come from; with a number of respondents stating that they did not know or that there were not enough incentives.

6

RECOMMENDATIONS

The link between creativity and reality is an area that the CIOB believes could be improved and not just through grants and awards. The Institute would recommend that greater advice and information on turning ideas into practical solutions should be made more frequently available. The CIOB would call for the industry to encourage and support new ideas and place a higher focus on innovation than is currently expressed.

The CIOB would recommend the development of a platform to nurture and progress certain ideas from within the industry and to widen awareness of what actually constitutes as R & D. The Institute would like to encourage greater communication of innovation, where people can share their ideas with other industry professionals in order to find out what technology is actually available; many of the respondents in question 22 called for the development of technology that was already available.

The CIOB would also recommend the development of a web based forum where construction industry workers can find out how to develop their ideas, see what new innovations have been made recently and discuss whether their expenditure qualifies for R & D Tax Credit.

The CIOB believes that greater promotion of R & D tax credits is required from within the industry. Although the government has promoted R & D tax credit through its case study with Terrapin International Ltd it seems that there could still be a greater awareness of what large and small companies can save in tax through the tax credit.

Education and training also have a serious role to play as a springboard for creativity and innovation. The CIOB would welcome a greater onus on creative thinking through lifelong learning and training.

The CIOB also believes that investing in innovation would help tackle other issues within industry like skills shortages. If the industry invests in developing new technologies it could increase productivity and create greater efficiencies.

7

RESOURCES

www.dtistats.net

www.dti.gov.uk

www.defra.gov.uk

www.sustainable-development.gov.uk

www.statistics.gov.uk

National Statistics, *Research and Experimental Development (R & D) Statistics 2000*, in 32 'Economic Trends' No. 585 August 2002

DTI OCCASIONAL PAPER NO. 6, July 2006, *Innovation in the UK: Indicators and Insights*

OECD (1997), *OSLO MANUAL: PROPOSED GUIDELINES FOR COLLECTING AND INTERPRETING TECHNOLOGICAL INNOVATION DATA 2ND Edition*

Newport : National Statistics (January 2007),
Research and Development in UK Businesses (Business Monitor, MA14)



The Chartered Institute of Building
Englemere
Kings Ride
Ascot
Berkshire
SL5 7TB
Tel: 01344 630700
Fax: 01344 630713
www.ciob.org.uk