Competence in Construction

Final report
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Background

In July 2013, the Government launched the industrial strategy for UK construction, setting out the vision and plan for long-term strategic action by government and industry to work together to promote the success of the sector.

Driving up standards of competence and quality is central to a number of specific actions outlined by the strategy, which include updating the previous jointly funded Health and Safety Executive (HSE)/CITB[1] *Routes to Competence*[2] work and identifying one card scheme to be promoted through public procurement[3]. The present work will inform the industry response to these actions although this was not the sole purpose for its commission.

Routes to Competence initiated a broad discussion across the industry about competence and a number of developments have taken place in this arena since, including changes to prerequisite health and safety tests and industry certification schemes, formative work on plant operator competence and the introduction of behavioural and supervisory programmes by several contractors. Further studies since *Routes to Competence* have highlighted the need for a common approach and understanding of competence in the sector.

Building on this previous work, the Construction Industry Training Board (CITB) with support from the Health and Safety Executive (HSE) commissioned Pye Tait Consulting in early 2014 to undertake this research in order to update/refresh aspects of the Routes to Competence study from 2011 including various consultations and initiatives that have taken place within the construction industry at all levels since the publication of that report.

The research also considered factors or circumstances that influence decisions on developing the workforce, the benefit of H&S training and occupational training, as well as consulted with industry on the descriptors 'information, instruction, training and supervision' for the purposes of effective health and safety in the construction workplace. This was supplemented by consultation with stakeholders on the appetite for, and the development of, an overarching framework for competence that could help identify what contributes towards a healthy, safe and productive workplace; finally, and as a result, recommendations for a future industry process for developing and recording components of competence have been put forward.

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[1] The Construction Industry Training Board (CITB) –for further details on the industry training board and partner in the sector skills council - see http://www.citb.co.uk/about-us/who-we-are/our-role-construction-industry/
[2] HSE (2011); Routes to Competence in Construction; Pye Tait Consulting
[3] BIS; (2013); *Construction 2025*; BIS/13/955

The Competence Arena

There is no hard-and-fast definition of what competence is. Most people know it when they see it but find it tortuous to describe. Interpretations and uses of the word are as varied and numerous as the contexts in which the word is employed. Regulators, industry authorities and bodies, and companies in every sector have their own definitions, according to their own reference-frames and purposes.

Every sector's approach to competence is shaped by the nature of its working activities but all are concerned with ensuring a safe, efficient and skilled workforce. Most approaches would agree broadly that competence designates the ability to independently perform a role or task to the required standards.

Industry sectors in the UK and abroad, including construction, tend to break down competence into individual competence and managerial and organisational capability. Individual competence is required to ensure efficiency, effectiveness and safety and to increase business and drive growth but must be enabled and supported by effective managerial and organisation capability.

The development of minimum technical competencies (MTCs), the emerging importance of building information modelling (BIM) and BIM competence and the increasing awareness of human factors as a central component to both individual competence and organisational capability have all shaped thinking about competence in the construction sector in recent years.

Industry Perceptions of Competence

Our research indicates that competence at all levels in construction must be understood in the broadest sense, as being more than simply job-competence or health and safety, but rather constituting the whole toolbox: job- and task-based skills and knowledge, functional skills, health and safety knowledge and competence, and human factors.

From the health and safety viewpoint competence must extend beyond thinking of the concept in purely safety terms (safety from injury and death) and should focus equally on the prevention of occupational diseases and ill-health.

The industry recognises that competence is dynamic and must respond to change. Competence is not a binary notion – it is rarely either present or not present - but rather is located on a dimension modulated by different levels. It can be developed but is susceptible to deterioration and must be treated as a lifelong process.

It is now widely acknowledged across the industry that human factors such as situational awareness, self-awareness, risk-awareness and communication are critical components. Supervisors and developing supervisory competence is key, and numerous programmes and initiatives across the

industry have been set up to drive up supervisor standards and increase support for informed decision-making on-site.

The industry is taking ownership of the responsibility to develop and nurture competence through a variety of measures and robust systems. Employers see testing and assessment as important means of measuring, leading to evidencing, the competence of their staff. However, there is still a degree of disparity in the way the concept of competence is seen within different segments of the industry. It can mean different things to different sub-sectors and different occupational roles.

Our findings indicate industry supports the principle of a common approach towards competence – a broad "framework" to guide all developments and approaches. Such a framework would be 'for industry, by industry' and could anchor a common approach to understanding the strands of competence and all the critical factors that must be taken into account.

Ultimately, the purpose of the framework would be to bring some much-needed clarity to the industry by creating a common starting point for all stakeholders on the subjects of the constituent parts of competence, how it is developed, how it is measured and how evidenced.

In this research study we were widely advised against prescription, exclusivity and narrow approaches.

Rather, the framework is seen as being a broad indication of what competence means, how it should be best developed and measured, and how it can best be evidenced for the benefit of the sector's individuals and employers. It was almost unanimously agreed that the substantive content and structure of these elements must be decided at a sub-sector or occupational level by employers and their representatives.

Where the "evidencing" of competence is concerned there is wide agreement that a common approach would benefit the sector and that the system of "cards" could well be amended to act as more effective portfolios of evidence.

However, management and supervisors are never relieved of their duties and responsibilities by the existence of an individual's qualifications, certificates, card or cards no matter how much data and detail they contain.

Organisational capability is an equal part of the equation in terms of ergonomics/technology, policies and procedures, skills development and mentoring and support systems.

Conclusions and Recommendations

Conclusions:

1. The industry has made significant progress in health and safety terms over the past 14 years or so and, as well as continually cementing and reinforcing that progress, it is time to expand the industry's understanding of competence to include all aspects – job-role, health and safety, human factors and managerial/organisational capability.

2. A "framework" for competence is largely accepted as essential (with some caveats).

3. Information, instruction, training and supervision warrants further research as little was found to confirm employers or their employees fully understand these terms (particularly the first two) sufficient to describe how this is transferred and the way in which they relate to competence and safety in the sector.

4. Individual competence in construction comprises:

   - Occupational skills & knowledge (including functional skills)
   - Health & safety skills and knowledge
   - Human factors (including self-, situational- and risk-awareness, and communications)
   - Continuous improvement (including positive experience)

5. Organisational capability requires companies to address a range of elements which support and contribute to overall competence including:

   - Ergonomics (equipment, facilities, work design, etc.)
   - Environment
   - Policies
   - Communication

6. This research found that employers remain generally dissatisfied with what they regard as the unnecessary complexity, confusion and costs of the "certification and their cards" system. Although there have been notable improvements since 2011, confusion over the purposes of cards from certification schemes has not dissipated.

7. More needs to be done to help industry on the importance of independent assessment of training and qualifications.

8. Training on its own is not sufficient to be confident of competence. It must be supported by verification by management/supervisors and refreshed at appropriate intervals.

9. Supervisors need further support and training, in addition to safety approaches, with person-management skills, coaching and mentoring.

10. From a health and safety point of view organisational capability represents a mechanism for the identification and control of risks in terms of adequate resources, technical knowledge, procedures, and management arrangements. Knowledge, skills, health & safety, and human factors comprise INDIVIDUAL competence but the competence of even the most highly expert individual can be undermined if various elements of managerial or organisational competence are lacking.

Recommendations:

1: there needs further fleshing out and agreement on an industry-wide Framework for Competence by the UK construction industry;

2: work to disseminate and promulgate competence and therefore a wider understanding of what makes up competence at all levels, including the integration of individual and managerial/ organisational capabilities;

3: work to embed a wider appreciation of the role and vital importance of human factors in the construction sector;

4: work towards helping the framework for competence define a more effective means of presenting evidence of competence;

5: establish a new *Construction Competence Council,* to help with the development of the framework for competence, based on options presented in recommendation 6.

6: identify the most appropriate structure/ organisations to run the Construction Competence Council from the following range of options: an independent body formed of representatives from stakeholders (these would include CITB, ECITB, SSCs, card-issuing bodies, employer bodies, professional bodies and unions[4], etc.); or CITB; or a combination of CITB and ECITB as two organisations legally permitted to raise a levy[5] to help industries invest in and carry out necessary training; or a body formed of representatives from relevant standard setting bodies (for example: CITB, ECITB, SummitSkills, AssetSkills, Proskills, etc) potentially along with relevant awarding organisations. The structure, constitution and the framework itself should be discussed and agreed at a formal, national conference[6].

7: establish a small *Secretariat* to progress Council decisions, report back on developments and issues, suggest improvements, maintain communications with the card schemes and develop and maintain the database of card holders. Costs could be minimised by either the Secretariat being provided by CITB (on a clear contractual basis) as part of its services to the sector, or it

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[4] There is a strong chance that the numbers of stakeholders would make full representation on such a council unfeasible. However, we could envisage an arrangement similar to the United Nations in which certain key bodies would have permanent representation while a selected number of other stakeholders would alternate membership on a rolling basis on a year, or two years basis.

[5] As set out in the Industrial Training Act of 1964.

[6] The conference should be representative of all stakeholders, with HSE and others as observers. Appendix 6 sets out some indicative protocols and criteria which could be used as the basis for discussion.

could be fully funded and individuals could be seconded by stakeholders on a rolling basis, or a combination of the two.

8: the Council consults with industry (perhaps cascaded through associations/bodies as with the recent CDM consultation) to gather views on what should be included in the common standard for cards, and how. Further annual 'competence conferences' should be held to discuss and maintain the standard and framework for the industry, to hear about and discuss new ideas and proposals, and to highlight any immediate areas for development or improvement. Subsequent work will include monitoring the system with perhaps an annual independently-conducted employer survey to establish satisfaction with the system.

9: Funding for the Council should be provided through a small proportional (or flat fee) amount of each card fee being passed on by the card issuing body to the Council on a quarterly basis. This financial transaction could be managed by CITB or alternatively by an external independent agency.

1. Introduction

In July 2013 the Government launched an industrial strategy for construction[7], providing a vision for long-term strategic action and collaboration by government and industry to promote the success of the UK construction sector over the medium to long term. It sets out far-reaching ambitions on sustainability, efficiency, and international/export growth and seeks to improve the image of the industry to help it become a sector of choice for young people.

The strategy established the *Construction Leadership Council* (CLC) chaired by Secretary of State for Business and Sir David Higgins, Chief Executive of Network Rail. It comprises 30 key figures from government and industry.

A separate *Construction Leadership Delivery Group* is charged with responding to a number of the specific deliverables laid out in the strategy's action plan. Several actions focus on driving up standards and levels of competence across the entire workforce, including updating the previous HSE/CITB sponsored research on competence and identifying one card scheme to be promoted through public procurement. The present work will inform the industry's response to these action points, but was not the sole purpose behind the commissioning of this research.

This report is the result of research conducted by Pye Tait Consulting in early 2014 with the primary objective of conducting a review of the constituents of competence in construction at all levels and how competence in the sector might be best developed, measured and evidenced. The research also considered factors or circumstances that influence decisions on developing the workforce, the benefit of H&S training and occupational training, as well as consulted with industry on the descriptors 'information, instruction, training and supervision' for the purposes of effective health and safety in the construction workplace. This was supplemented by consultation with stakeholders on the appetite for, and the development of, an overarching framework that could help identify what contributes towards a healthy, safe and productive workplace. Recommendations for a future industry process for developing and recording components of competence have been put forward.

The work was commissioned by CITB[8], both the Industry Training Board for the construction industry - with a mandate to help improve industry's competence - and a partner in ConstructionSkills the Sector Skills Council. In addition the project included a small financial contribution from the Health and Safety Executive (HSE).

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[7] BIS; (2013); *Construction 2025*; BIS/13/955

[8] The Construction Industry Training Board (CITB) –for further details on the industry training board and role as a sector skills council - see http://www.citb.co.uk/about-us/who-we-are/our-role-construction-industry/

It is intended to build upon a number of studies that have pinpointed the need for a shared understanding of, and approach to, competence for the sector including the influential *Routes to Competence* report by HSE in 2011, and the wider "Löfstedt Report" of the same year[9] and to take into consideration the definitions and approaches used by related documentation such as BS 8454[10].

Routes to Competence set in train a wide debate on the issues surrounding competence in the sector which are too extensive to enumerate here. However, four examples of developments and activities since 2011 provide an idea of the depth and scope of ongoing change:

- additions and changes in 2012 to revise the CITB Health, Safety, Environment Test as part of the requirement for the achievement of a card[11] for access onto construction sites. Amongst other updates including behavioural case studies - it also includes three randomly chosen scenarios to test reactions to and highlight safe working practices on site;

- changes to the CSCS Green card; to acquire the new card - which is now specifically noted as being just for labourers – from July 1st 2014, there is a requirement for successful completion of a new QCF/SCQF Level 1 Award called Health and Safety in a Construction Environment; an alternative to the qualification has been recently added – the one day Site Safety Plus Health and Safety awareness course;

- the finalisation of the Strategic Forum Plant Safety Group's detailed work, supported by both HSE and CITB, on the Competence to Operate Construction Plant documentation (www.cpa.uk.net/sfpsg);

- a number of contractors reported introducing new activity/programmes focussing on enhancing supervisory competence or work-related behaviours;

The current research has also confirmed further examples of long-standing underpinning activity by contractors including evidence of human factor approaches. For obvious reasons many focus on health and safety; for example the ''Injury and Incident Free'' campaign that been around since 2001 and more recent campaigns such as *100% Safe, Zeroharm*, the '*Aiming for Zero'* initiative (Highway Agency) or the *Triple Zero* approach to safety. The latter is used by Thames Water who also operate a '*Thames Water Passport Scheme'*. Their stated next stage is the development of a competency framework – to be adhered to by all suppliers to Thames Water.

100% Safe, launched in 2011 by Morgan Sindall, is a platform that embodies the company's approach to competence, safety and efficiency: it is centred on five pillars all of which are concerned with, and reinforce key messages about, an awareness of human factors in maintaining a safe working environment.

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[9] *Routes to Competence Report* (2011); Pye Tait Consulting for HSE 2011; Löfstedt, Professor P; (2011) *Reclaiming health and safety for all;*
[10] British Standard 8454; ACoP L143 'Managing and working with asbestos'; BIS's Industrial Strategy for Construction; etc.

[11] Throughout this report we have in preference used the phrase 'certification schemes and their cards', (as a card is mainly a physical manifestation of the certification scheme). For a fuller discussion on the variety and types of certification schemes and competent person schemes etc in the construction industry please see Routes to Competence report: http://www.hse.gov.uk/research/rrhtm/rr877.htm This phrase (unless otherwise specified) does not refer to the issue of certificates as a result of completion of a course or qualification.

The five pillars are comprehensive and encompass: Safe places - environments which provide security and protection from harm; Safe by choice - choose to be safe, avoid unnecessary risks; Safe relationships - leadership and worker involvement with two way communication throughout the entire management chain; Safe by design - stay safe through proper planning and making the right decisions and Safe lives - a strategy for occupational health and actions to improve wellbeing[12].

Laing O'Rourke run a supervisory development programme built around the Institute of Leadership and Management (ILM) apprenticeship framework which is bespoke to the unique needs of their business. At the same time all operatives must pass a behavioural questionnaire and go through a behavioural induction before being allowed on site. Having worked on behavioural safety for 10 years, Laing O'Rourke has introduced a formal programme of 'occupational health and well-being' incorporating training and assessment. Commissioned as a bespoke programme to raise awareness of Occupational Health by its workforce and employees, the course has now been accredited by IOSH. The one day training course is delivered in company by in-house Health & Safety specialists who are also accredited trainers.

Routes to Competence also considered a number of other key issues that were not re-opened for the present study, for example: reviewing progress in the drive towards qualifying the workforce, the extent of penetration of qualifications and cards, and the various routes to competence in terms of the use of qualifications, traineeships, apprenticeships, NVQs/SVQs and NOS.[13]

The previous study also undertook a detailed scrutiny of health and safety data and related research which was outside the remit and the available time of the current work. The findings from that earlier study underlined the difficulty with attempting to make causal links between competence and health and safety. Accident data, however, clearly pointed to factors such as age and 'out-of-context risks' (e.g. an electrician working on a roof) as additional factors. Working at height is a particular case in point which continues to be an issue in spite of the development and introduction of the Code of practice BS 8454 for the delivery of training and education for work at height and rescue[14].

In addition, the earlier report examined the issue of ill health and the need to widen the health and safety focus for the sector to encompass not only fatalities and injuries but also occupational ill-health (e.g. dust and musculoskeletal issues). Much of what has been written concerning the prevention of occupational diseases centres on attitudes and behaviours and the vital importance of human factors in addressing such concerns.

Besides the *Routes to Competence* report other studies have pinpointed the need for a shared understanding of, and approach to, competence in the UK construction sector[15]. In addition to many other things, these studies have highlighted the complexity and potential for confusion in the recognition and measurement of competence in the industry.

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[12] Occupational health – examples of occupational diseases are mesothelioma, silicosis, noise induced hearing loss, vibration white finger, musculoskeletal with wellbeing referring to healthy lifestyle choices

[13] National Occupational Standards see: **nos**.**ukces**.org.uk/

[14] The HSE commends the use of BS 8454:2006 to those who have duties under the Health and Safety at Work Act 1974.

[15] *Routes to Competence* Report; HSE 2011; And: the independent review of health and safety legislation undertaken by Professor R Löfstedt in 2011; the Construction Industry Skills Strategy – see Construction Skills Strategy 2012-2017 , and other research and consultations.

2. Considerations on Competence

"Competence" is a simple word and almost everyone would say that they understand what it means but defining the term is extremely difficult. Different standpoints and centres of focus lead to different definitions and depths of specification[16].

For many reasons competence in construction is often regarded primarily from a health and safety perspective but it should be remembered that, to be fully competent, a person requires a wide range of job- and task-related knowledge and skills in addition to health and safety skills and knowledge. Human factors, too, are wider than those needed to keep a person safe and healthy – and encompass, for example, work-ethics, communications skills, etc.

Our research has shown that competence should always be interpreted in its widest sense in order to ensure that overall competence frameworks do not omit vital factors; and that it should not be allowed to become static but be reviewed over time as other factors, for example, digital technology, new training solutions and work practices, change[17].

Modern approaches to competence in most English-speaking nations, as well as in comparable UK sectors, tend to see competence as comprising two major components: individual competence and managerial or organisational competence.

The main reason that companies require individuals to be fully competent (setting aside health and safety considerations for the moment) is to underpin the efficiency with which work is completed to an appropriately high standard. This, in turn, underpins customer satisfaction and repeat business. In order for this to happen individuals at all levels of a company are required to possess:

- appropriate and up-to-date skills (both technical and non-technical),
- knowledge which is more than sufficient for the job role, and
- certain behaviours and attributes which are more usually encompassed within the term "human factors" (see section 3.6 for further discussion).

On top of these considerations competence can increase (and decrease) at different stages of an individual's career. Experience is a significant aspect of the development of competence in an individual's progression from novice to expert but it must be positive experience, fully learned and absorbed (see also section 5.2.1).

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[16] For example, PAS 2030 sets out in great detail what is required of a competent 'installer' in the context of the Green Deal – the government's initiative to increase the energy efficiency of public and private sector properties in the UK.
[17] See examples of this referenced in *Grand Designs: Technology and High Level Skills in the Construction Sector*, August 2013 for UKCES developed by Pye Tait Consulting

However, even the most competent of individuals may work ineffectively, and even appear to work incompetently, under certain circumstances which are controlled by their superiors. Poor managerial communication, inappropriate equipment and facilities, badly designed workflows, inadequate policies and systems, poor communications, work stress, and insufficient understanding and control of the environment in which the work is taking place can all lead to the appearance of individual incompetence.

It is for these reasons that *managerial and organisational capability* is as vital as individual competence. From a contractor's point of view much of this, and what was previously described as 'corporate competence', is now partially addressed through the work of the *Safety Schemes in Procurement (SSiP) Forum* which focuses on assessment but solely at the pre-qualification stage. The Forum came about because of a pressing need to reduce bureaucracy created as a result of the prior request of contractors to register with, and meet the requirements of, third party assessment schemes in order to get on to a tendering platform.

Again, however, it must be recognised that managerial and organisational competence is not only about safety. In the United States and in UK literature it is beginning to take form as a specialist subject which underpins all forms of business effectiveness.

One of the fundamental recommendations of the *Routes to Competence* study was that the concept of competence in the UK construction industry should be expanded to involve three main interrelated elements:

➢ **Skill:** occupational with functional skills, plus wider skills such as specific health & safety skills;
➢ **Knowledge:** wide and deep knowledge related to the occupational role and health and safety; and,
➢ **Human factors:** behaviours and attributes associated with self-, situational-, and risk-awareness.

These are supported and developed by a variety of mechanisms including education, training and experience.

The current research, therefore, has sought to take previous research forward in the context of an industry in which many organisations have already acted upon skills, knowledge and human factors in different ways. Pertinent to this is a proposal, consulted upon by HSE in 2014, to replace the Construction (Design and Management) Regulations 2007, known as CDM 2007, and withdraw the Approved Code of Practice (ACoP)[18]. The ACoP within the CDM regulations was very descriptive, therefore complex and lengthy as well as being very prescriptive.

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[18] see http://www.hse.gov.uk/consult/condocs/cd261.htm

Based on the evaluation carried out in 2011 the HSE recognises that this approach may well have led to unnecessary bureaucracy and over-interpretation of requirements.

One of the main drivers behind potential changes to replace CDM 2007 is a commitment to improve standards in the SME sector and to reduce bureaucracy across the industry. In line with an evaluation of CDM 2007 and a recommendation in Professor Löfstedt's report 'Reclaiming health and safety for all' the proposed revision is intended to aid clarity and reduce bureaucracy. There is also reference to tailored guidance, aimed particularly at small businesses, developed by HSE in close collaboration with industry.

HSE remains committed to promoting and supporting the achievement of competence across the industry but recognises the value of non-regulatory approaches to drive up standards across a wide variety of areas of competence, including business management and leadership: an approach that in many ways is better spearheaded or encouraged by industry rather than being pulled by regulation.

HSE's role is as the national regulatory body responsible for promoting the cause of better health and safety at work within Great Britain.

On this basis and in consideration of these important proposals to replace CDM 2007 this study has also taken into account HSE's 2014 vision for the future of competence in construction, which envisages:

a)   competence being seen by employers as a long-term issue beyond initial training and taking in management, lifelong learning, and skilled supervision;

b)   site-based workforces becoming steadily more qualified, year-on-year through qualifications based on agreed national standards;

c)   contractors not relying solely on "Cards" but investigating underlying skills, experience, training and health and safety knowledge, and providing training where necessary;

d)   Principal Contractors not insisting that occasional site visitors whether professionals or ancillary trades must have a card;

e)   nationally recognised qualifications such as NVQs/SVQs being recognised and maintained;

f)   colleges, skills councils, awarding bodies and training bodies embracing the need to build on trade-based occupational skills with skills which prevent accidents and ill-health;

g)   card schemes only granting cards to individuals who have nationally-recognised qualifications.

As part of this study these considerations were put to the industry via workshops, telephone interviews and a survey (the feedback of which is presented in chapter 4).

3. The Wider Landscape of Competence

As already stated, competence can be defined in a number of different ways against a variety of reference-frames, and many companies, organisations of authority and industry bodies have set out their own definitions.

As a national, independent regulator of health and safety, the HSE states that:

'Competence is the ability to undertake responsibilities and perform activities to a recognised standard on a regular basis. It combines practical and thinking skills, knowledge and experience.'

It was reported in the *Routes to Competence* report how, typically, the concept of competence forms an important element in health and safety legislation and, as such, is defined in a variety of ways across a number of Acts and regulations.

Other examples specifically refer to the individual: for example the BS 8485 defines a competent person as one who:

> *can demonstrate that they have sufficient professional or technical training, knowledge, actual experience and *authority to enable them to:*
>
> *a. carry out their assigned duties at the level of responsibility allocated to them;*
> *b. understand any potential hazards related to the work (or equipment) under consideration*
> *c. detect any technical defects or omissions in that work (or equipment), recognise any implications for health and safety caused by those defects or omissions, and be able to specify a remedial action to mitigate those implications.*

*Note: "authority" here means delegated authority to the individual by his employer to carry out a certain function or duty

Fundamentally competence can be summed up as:

> **the ability to independently perform a role or task to the required standards[19]**

In all occupations it also entails working safely with respect to one's own health and safety and that of colleagues, something that is of paramount concern in high-risk, safety-critical sectors such as construction.

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[19] Where "standards" include technical, health and safety and quality (e.g. customer service, company work standards, etc.)

A competent operative or manager in construction, therefore, can safely work independently and the employer or customer can be assured of a task completed to the standard regarded as acceptable within the context of the work.

Most experienced supervisors and managers can recognise competence when they see it. However, describing exactly what has come together to create a competent individual is a much more complex matter.

Mere knowledge and skills are rarely sufficient. A truly competent individual also displays appropriate attitudes and attributes starting at the work ethic and extending through care of themselves and others, and possessing health and safety understanding and awareness, and an awareness of the work situation and the risks associated with it.

A number of previous academic studies concur[20]:

We employ in this article the definition of competence as a functionally linked complex of knowledge, skills, and attitudes that enable successful task performance and problem solving.

[competence is …] knowledge, skills, abilities, and other characteristics (KSAOs) that are needed for effective performance in the jobs in question.

There are, however, a number of key considerations concerning the concept:

3.1 Competence is a Scalar Concept

It is widely agreed that competence is *not* a binary concept; i.e. it is not either "on" or "off" - something that is either not present at all, or present in its entirety. Rather, it must be seen, at any one time, as being located somewhere on a scale or sequence extending from "zero competence" to "deep and extensive competence" in the task or role in question. In this sense, we often hear people speak of "basic competence" of "high levels of competence", and of the important differences between a newly qualified person and an "expert".

There are strong arguments, also, that competence is something for which there is no such thing as "100%". In almost all fields it is doubtful that anyone can ever know everything that is to be known about a role or task, or that anyone can ever be able to demonstrate 100% skill in the role or task. An "expert" may be someone who is widely recognised as such but that does not necessarily mean that they are 100% competent – merely that their level of competence is extremely high.

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[20] Spady WG (1994) Outcome-Based Education: Critical Issues and Answers; ERIC
Baartman LKJ, Bastiaens TJ, Kirschner PA, (2007); Evaluating assessment quality in competence-based education: A qualitative comparison of two frameworks; Educational Research; Elsevier
Campion MA, Fink AA, Ruggeberg BJ (2011); Doing competencies well: Best practices in competency modelling; Personnel Psychology; Wiley Online Library

For any given job role – the word "competent" may be used in a number of different ways. For a newly-trained and qualified person the word could be expanded to "just competent" – ie competent to undertake relevant tasks but perhaps with supervision of varying intensity. After a period of further learning and experience that same person may become "competent" in the sense of being able to undertake most tasks without supervision. Finally, after lengthy continual-learning and experience (including practice at the work) that individual may become what most people would call an "expert" – someone who can work on their own and deliver very high quality results consistently.

These "levels" relate to exactly the same job role but fall under different "grades" which, in earlier times were called novice, journeyman and master.
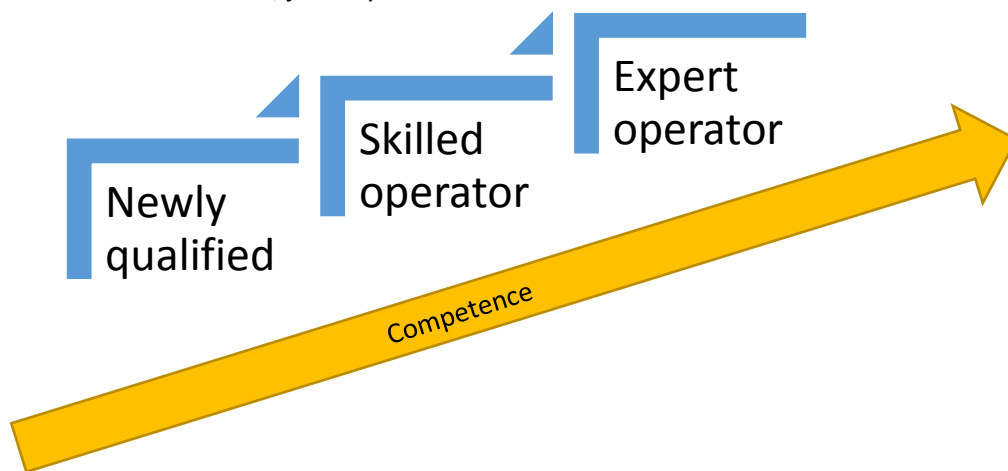
Professor Olle ten Cate of the University of California San Francisco regards this picture as being extended "below" competence to allow for education and training as a novice and beginner[21]:
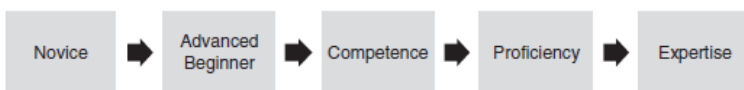
Figure 2. Spectrum of skills acquisition (Dreyfus & Dreyfus 1980).
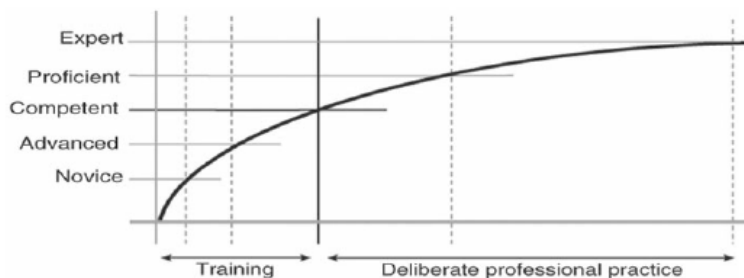
Figure 3. General curve of skills acquisition reproduced from ten Cate (2010).

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[21] ten Cate O, Snell L, Carraccio C. (2010): Medical competence: the interplay between individual ability and the health care environment. Med Teach.

3.2 Competence is not forever

And, competence is not something that can be attained once and then remains fixed forever. Not only do times change – with impacts on knowledge, techniques, and equipment - but human memory and capability can also degrade over time.

Complacency is another issue that can impact on competence especially as experience increases or where tasks are repetitive. The converse is also true, i.e. where some tasks or equipment are not carried out or used very often.
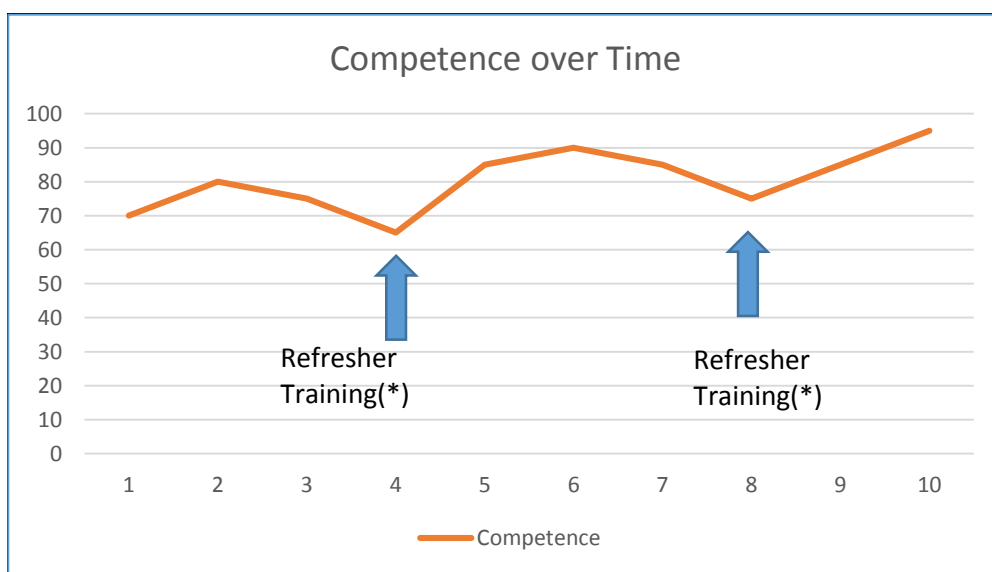
(*) this should include informal training as well as formal, courses and in-house, manufacturer training and so on.

There is some evidence also that "time" is a strong factor at the early stages of a person's career for both occupational and health & safety competence. Statistics demonstrate, for example, that the most critical period of health and safety risk for construction operatives is immediately after a new employee enters the industry or joins a new company.

Maintaining, refreshing and up-dating competence is, therefore, a key issue, following effective pre-assessment, and one that any framework of competence needs to consider. The role of such activities as "tool-box talks", on-site mentoring, in-service refresher training, etc., are all pertinent – as, indeed, is any move towards limiting the currency of a given qualification (or certification scheme) by setting time limits beyond which the qualification or card must be re-applied for and competence proved afresh.

3.3 Competence is more than the individual

Ascribing "competence" purely to the individual is akin to arguing that a modern football team can succeed merely with eleven skilled players and without coaching or management. The role of the organisation and its management when discussing competence is a key element in modern considerations of overall competence. Individual competence is not enough.

Although not widely discussed, the concept of organisational or managerial competence is one which impacts strongly upon the final output and not only in health and safety terms.

Even the most competent individuals and teams can produce less-than-effective results or can be less than safe if they are not supported by a fully aware and competent organisation.

This can be illustrated by an ergonomic example in which a competent and experienced plant operative was killed by his own machine due to a failure to fully consider the impact of ergonomics. In the case in point, the driver of a bulldozer in an overseas nation was killed because he did not apply the parking brake effectively when getting down to examine a broken part. The machine rolled forward with fatal effects. The enquiry found that there had been a failure to spot that the layout of the controls on this particular type of bulldozer was very different to that on the machines with which the operative was familiar and that he mistakenly thought he had applied the correct brake when he had not.

Management had failed to understand the vital importance of ergonomics and, in this particular case, had failed to train the operative on the new machine[22].

3.4 Competence includes the prevention of occupational diseases

For many years the focus for health and safety has been on accidents causing injury and fatalities but construction loses far more productivity and perhaps more human suffering due to ill health.

An estimated 1.4 million working days were lost in 2011/12. Of those 818,000 were due to ill health and 584,000 due to workplace injury. An average of 0.7 days lost per worker (Labour Force Survey, 2012)[23].

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[22] It is unknown here about other contributing factors, i.e. whether the machine was parked on an incline, whether the use of a chock for wheels/tracks to prevent movement was not used or if use could have been made of lowering to the ground, for example, the front dozing blade.

[23] Construction fares slightly better in comparison to manufacturing (est.10% of the workforce) whereby an estimated 3.1 million working days were lost in 2011/12, 2.3 million due to ill health and 787 thousand due to injury, making a total of 1.2 days lost per worker (LFS, 2012), and agriculture, for which no LFS data for 2011/12 are available, although voluntary (self) reporting and reporting by doctors (THOR

It is necessary therefore to develop a specific focus on ill-health in construction – i.e. diseases caused by dust, back pain caused by heavy lifting, unsafe working practices, and so on, as well as mental well-being.

For example, the Health & Safety Executive states that vibration white finger, carpal tunnel syndrome, occupational deafness and dermatitis are the most common cases of non-lung disease in the construction industry[24].

The HSE Report *Routes to Competence in Construction* pointed out that:

There is considerable evidence to suggest that construction workers are not only at heightened risk of fatality or injury, but also of occupational disease and ill-health. The areas of principal concern are asbestos-related disease, where the single most vulnerable occupational category has, historically, been carpenters and joiners. Asbestos risk is now much more comprehensively controlled than ever before, but the risk of encountering asbestos when working on older buildings remains high.
In addition, there is significant evidence that construction workers are particularly vulnerable to musculo-skeletal disorders (MSD). Data from the Labour Force Survey suggests that both the construction sector as a whole, and 'skilled construction and building trades' had significantly higher than average incidence rates of MSD.

We have noted that the dangers of asbestos has been set down as a specific focus for the Health & Safety Executive over the next three years[25] (see Appendix 2). Recent construction statistics signal this concern by pointing out that the construction industry suffers the largest burden of occupational cancer amongst all industrial sectors: over 40% of the occupational cancer deaths and cancer registrations stemmed from construction work. Most of them were caused by past exposures to asbestos and silica[26].

The emphasis is on the priority areas of small sites, refurbishment, major projects/large contracts and working with asbestos. Work has started on the next three-year plan. Major changes are not proposed but one of the main aims, with the support of CONIAC[27], will be to further push the health agenda.

3.5 Competence -where from and how measured?

Within the overall concept of competence, a number of further questions must be considered, including:

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and THOR-GP) indicate that new cases of work-related health are double that of all sectors. For construction they are 60% more than all industries and about the same for manufacturing.
[24] Industrial Injuries Disablement Benefit (IIDB) scheme
[25] HSE Board paper 09/13
[26] Health and Safety in construction in Great Britain, 2013
[27] Construction Industry Advisory Committee (**CONIAC**) - HSE

- How is competence developed?
- What are its component parts? and,
- How is it measured?

Competence is developed and maintained in a variety of ways: through education and training interventions (whether formal or informal), through coaching and mentoring, and through continuous development over time (usually using one of the foregoing approaches).

Its principal components are:

- Knowledge (including health and safety)
- Skill (including occupational, functional skills)
- Human factors

In each element the "competence" must include both the job role/task in question as well as the necessary health and safety understanding and behaviours.

Competence is measured, against an agreed syllabus of knowledge and skill, by tests and examinations or other forms of assessment (e.g. observation). Whereas, human factors elements – such as risk and self-awareness, etc. are almost always measured by observation and informal assessment.

3.6 Competence is wider than health and safety

In common with other high risk economic activities, the UK construction sector has a rigid and a constant focus on the health and safety of its people and its clients and customers. The issue has been at the forefront of developments in the sector for decades but particularly so since around the turn of the current century when a stringent programme was instituted, industry-wide, to reduce an escalating rate of fatalities and injuries.

In this the sector has been very successful but, as highlighted in the 2011 Routes to Competence report, the sector is not resting on the laurels of its significant achievements but is striving to reduce injuries and fatalities even further[28].

For these reasons the issue of Health and Safety must be integrated into all training and development programmes rather than being regarded as an additional, "bolt-on" element of training that sits alongside existing occupation-specific courses.

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[28] HSE, Board Paper, 09/13. 'In 2012/13, the provisional number of fatal injuries to workers is 39; the lowest number on record. This equates to a rate of 1.9 per 100,000 workers, which equals the lowest rate on record'

It would seem logical and rational therefore for health and safety to also be integrated within any "framework" which might be developed to represent the sector's approach to competence.

3.7 Human Factors

In any occupation job-related knowledge and skill are never sufficient for full competence to be developed. Functional skills are a vital underpinning for everyone's skill-set and are developed and assessed in most modern qualification systems alongside technical skills and knowledge.

However, there are also extremely important skills which employers value highly and which individuals must demonstrate in order to be judged fully competent. These go by a number of names – "attitudes and aptitudes", "behaviours", and "human factors". We have opted to use the latter term because it is broad enough to encompass all relevant human elements while avoiding the specificity of the former terms. "Human factors" is a term which originated with the military and has been a common descriptor in aviation and other high risk activities for a long time. It is a portfolio term for all of the attributes, attitudes and behaviours which a truly competent employee must possess and demonstrate on a daily basis in their work.

Teamwork, leadership, the work ethic, business morality, and so on, are all non-specific, overarching terms for collections of human factors. However, in high risk sectors such as the nuclear, aviation, and construction sectors, groups of very specific human factors must be considered. These include:

Situational awareness
This is not simply the ability to look around and spot dangers but encompasses the understanding that everyone works to visual "habits" and <u>assumed</u> pictures of what might lie around them. Awareness of "risks" is generally taught in most occupational programmes in the construction sector but only rarely is there treatment of the individual tendency to assume the context based on many previous experiences of it and, therefore, to make crucial assumptions as to "what happens next".

The psychology of situational awareness is generally founded on considerations of what are called "schemata" – that is assumed pictures of a familiar environment or situation.

Incidents in which the participants' reports begin with phrases such as "but I thought …" or "I thought it would be there/not there because that's the way it has always been …" are examples of a breakdown in individual situational awareness, of individuals seeing what they expect to see rather than what is actually there.

Self-awareness
Closely linked to the above, this requires an understanding of one's own mental and physical strengths and weaknesses.

It goes beyond situational awareness of physical risks and an understanding of how one's mental and physical state can impact on risk, into the vital area of one's own health and that of colleagues, and how one is affected by various potential causes of ill-health.

Risk-awareness

This is actually part of the other elements discussed in this section. It is what they are all about from an individual and team standpoint. However, if examined separately it is more than just the traditional "risk awareness" which targets an understanding of physical and situational hazards, but an extended personal and team awareness of the dangers posed by 'out of context' risks. Traditional approaches to teaching or mentoring risk awareness tend to focus on given situations and with the "student" fully alert and aware of what the purpose of the teaching is.

In reality risk awareness depends very much on an individual appreciation of personal strengths and weaknesses in terms of perception and also in terms of an awareness of one's one position on the risk-averse to risk-gambler dimension.

Communication

In human factors terms, communication is the foundation for good practice. Numerous minor and some major accidents are caused by a failure of effective communication between managers and operators and between co-workers.

In a number of cases these are exemplified by someone saying that they "assumed a colleague knew" about a given hazard or potential danger. In others – and these are probably the most difficult for individuals to comprehend and overcome – ambiguity and misunderstanding are the culprits (for example when an operative shouts to another that the "the ladder is there". If the other person is distracted or busy they may assume that this means the ladder is in the expected place and safely tied off, but the original operative may merely have been pointing to a position far from the expected one where the ladder has been temporarily left ready to be moved into position.)

3.8 Minimum Technical Competencies and other Standards

In recent years, a new term has emerged that relates to competence and links to competent person schemes: that of 'minimum technical competencies' (MTCs).

Prompted largely by the introduction of Green Deal, PAS2030 (2012; '*Improving the energy efficiency of existing buildings. Specification for installation process, process management and service provision*') was developed. It sets out, for example, what technical skills make a competent loft insulation installer, installer of condensing boilers, or installer of windows and external doors. In most cases the Minimum Technical Competencies have been developed by making using of the relevant National Occupational Standards (and prompting much 'mapping' to the NOS to keep track and make sense of such developments).

The Department for Communities and Local Government (DCLG), working with competent person scheme operators, have created these MTCs – a requirements for operatives working in certain sectors (reaching across a number of sector skills councils, including CITB). This requirement has far–reaching implications for businesses. For example, from June 2014 all installers and surveyors of replacement windows and doors in domestic properties will need to prove compliance with the new Minimum Technical Competencies, requiring the registration by businesses of their operatives for skills testing and assessment.

Another avenue for the description of (largely technical) competence are British or European Standards. In many sectors, besides national occupational standards and qualifications, there are also Technical Standards resulting in a Code of Practice developed by UK-wide panels of experts or by the European Committee for Standardisation (Comité Européen de Normalisation).

One such relevant example is the BS 8454:2006 (for those training and delivering training in Working at Height). This could be considered an example of good practice with its recommendations and guidance to help training providers promote the delivery of training to a high standard, in a safe, controlled environment by competent and experienced staff. Many companies find selecting training and choosing a course difficult and this gives information on how to do this and what to look for – principles equally applicable across industry and to other industries.

In the main these standards are aimed at organisations as part of their capabilities for developing or implementing training, although they feed into and support individual competence, thus setting the framework for occupational training and managerial approaches across a sector or trade.

3.9 BIM and Competence

Building Information Modelling (BIM) is having a huge impact on the construction landscape and is seen as a key innovative opportunity for the UK in terms of global leadership. As part of the Government Construction Strategy (GCS), Government will require fully collaborative 3D BIM (with all project and asset information, documentation and data being electronic) to Level 2 as a minimum by 2016[29]. This refers to all centrally procured Government projects as outlined in the Strategy including new build and retained estate, vertical and linear.

The PAS 1192-2 standard sets out how to share information on BIM projects and is designed to eliminate clashes between firms using different BIM practices and software, leading to costly delays and conversion costs. Compliance with the standard will be mandatory on all public sector jobs from 2016. Most key stakeholders in the industry have strategies, information portals[30] or awareness campaigns about BIM in place, for example the network of BIM regional hubs[31] established by the

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[29] For further information, see: www.bimtaskgroup.org

[30] For example, CIOB at www.ciob.org/building-information-modelling, CIBSE at http://bimtalk.co.uk/, ICE at www.ice.org.uk/topics/BIM

[31] From March 2012, CIC has established these Hubs to help raise awareness and the benefits of BIM to the industry as a whole and facilitate the early adoption of BIM processes and working methods throughout the UK's construction industry. The Hubs provide linkage to the BIM Task Group and the CIC BIM Forum.

Construction Industry Council (CIC) and the "BIM4SME" initiative. CIC were also involved in updating Construction industry National Occupational Standards to reflect new industry practices relating to BIM.

3.9.1 What is BIM?

Building Information Modelling is a collaboration between the construction sector and the software industries[32] - a value-creating capability providing opportunities and synergies for both. From a competence perspective it represents a "new" series of demands on the competence, not only of project managers, but of supervisors and potentially front-line staff.

BIM embeds key product and asset data and a 3D computer model that can be used for effective management of information throughout a project lifecycle from earliest concept to operation. Since product information is fed into the computer software, the 3D model generated represents not only the physical structure of the construction asset (eg a building) but all the intelligence about the component parts that make up that structure.

In a sense, one might regard it as 'four-dimensional' with the fourth dimension going beyond the spatial – incorporating time, materials, construction sequencing etc. BIM enables closer interaction with the client by making it possible to see the end product in real-time, real scale, using accurate information.

3.9.2 BIM standards and frameworks

Although the UK BIM Task Group has not introduced a standard for BIM training and education nor recommended a specific BIM accreditation scheme, it has published an initial 'learning outcomes framework' which provides early information for employers' BIM training programme development; and to give guidance to institutions, training providers and educators developing and delivering the training courses required to upskill employees in the sector and support the Level 2 BIM ambition for 2016[33].

Representing a large number of UK universities, the BIM Academic Forum (BAF) is developing a 'BIM academic framework', which will provide a roadmap to embedding BIM learning at the appropriate levels within 'discipline-specific' undergraduate and postgraduate education[34]. The development of this framework has been supported by ongoing research and consultation[35].

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[32] HM Government (2012), *Building Information Modelling*, Industrial strategy for Construction 2025: government and industry in partnership.
[33] For further information, see: www.bimtaskgroup.org/education-and-training
[34] Further information about the activities of the BIM Academic Forum are available at: www.bimtaskgroup.org/bim-academic-forum-uk
[35] For example, see: Higher Education Academy (2013). Embedding Building Information Modelling (BIM) within the taught curriculum

3.9.3 BIM competence and skills

A number of degree courses at Universities across the UK are now being offered to help prepare companies for this significant change[36].
The "BIM Academy", co-founded by Northumbria University and Ryder Architecture, offers research, consultancy and education[37] opportunities. Other organisations/providers such as CITB[38], BRE[39] and Ramboll are also offering courses on BIM.

One impact of BIM is the change to traditional roles and responsibilities in the industry and therefore the individual competency requirements for each role. With this partly in mind, RIBA has published a new plan of work, paying special attention to the changing role of Project Model Manager and new responsibilities created by a fully integrated 3D BIM environment.[40] The roadmap for competence identifies a number of new issues caused by the integration of BIM which will require responsibility being allocated to a specific role or roles and, ultimately, will impact on the way projects are procured.

The use of BIM will require not just the designers and manufacturers but also the construction workforce to be up-skilled, since the introduction of this way of working will lead to computer-assisted integration of the design, manufacture, construction, and maintenance process. Chartered Institute of Building (CIOB) research conducted last year suggests that the industry is unconvinced it has the necessary skills required to support the growth and development of BIM technology and believes that quality training is urgently required[41].

A roadmap to BIM competence aimed at specialist contractors has been produced highlighting that adopting BIM technologies and achieving competence in the area must be a company-led step-change process. On the specific issue of training, the roadmap recognised the emergence of BIM related courses, the importance of the regional hubs and recommended that firms monitor the development of 'impartial' accreditation schemes not aligned to any particular brand of software application. BIM accreditation and certification schemes are under development by the likes of BRE, RICS, Lloyd's Register EMEA, building, SMART, and Planning Planet.

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[36] For example, MSc Geoinformatics for Building Information Modelling offered University College London, MSc Building Information Modelling Management offered by Middlesex University, MSc Building Design Management and Building Information Modelling offered by Northumbria University and MSc Building Information Modelling (BIM) by the University of Liverpool

[37] Courses are offered in Autodesk Revit Software, which was specifically built for BIM and aids in design, build and maintenance of high quality and energy efficient buildings.

[38] CITB offers the course, Building Information Modelling (BIM): the basics and benefits. Further information available at: www.citb.co.uk/training-courses/leadership-and-management/building-information-modelling/

[39] BRE Academy offers BIM Level 2 Training and Certification Pathway comprising different training programmes for Information Managers and Project Delivery Managers. Further information is available at: www.bre.co.uk/news/BRE-announces-BIM-Level-2-training-and-certification-pathway-969.html

[40] RIBA Plan of Work 2013. Available from the RIBA website at www.ribaplanofwork.com

[41] The research identified a key challenge for industry and academia being to ensure that the emphasis on making construction faster, cheaper and more innovative is fully understood and exploited by the professions. SMEs in particular may face challenges in acquiring the necessary training and skills in BIM and related technology and the report recognised the role professional institutions and other bodies have in ensuring all organisations in the supply chain have the resources to engage with BIM, regardless of size. Chartered Institute of Building (2013). *A report exploring skills in the UK Construction Industry*, Berkshire.

3.10 Competence in other contexts

To aid in the general understanding of competence it may be of value to consider a number of comparable sectors and occupations and the ways in which they develop, measure and evidence competence.

3.10.1 Oil and Gas Industry

The approach of this high-risk sector is based on linking the concept of competence to NOS and associated assessment/evidencing[42]

OPITO defines competence as:

… the ability to perform activities within an occupation to the standards expected within employment. Individuals must provide evidence that they have the required experience, technical skills, knowledge, understanding and behaviour to perform a job role/function and that they apply them consistently, safely and in accordance with procedures and Standards.'

To be competent, individuals must provide evidence that they have the required experience, technical skills, knowledge, understanding and behaviour to perform a job role/function and that they apply them consistently, safely and in accordance with relevant procedures and Standards.

The purpose of the assessment process is to ensure that individuals are competent to undertake their job role or function within the oil and gas industry. The purpose of the verification process is to ensure that all assessments have been fair, safe, valid, reliable and consistent.

3.10.2 Gas

The HSE's Approved Code of Practice and Guidance for gas installations[43] states that:

"No person shall carry out any work in relation to a gas fitting or gas storage vessel unless he is competent to do so."

The document goes on to define competence in the following terms:

Competence is a combination of practical skill, training, knowledge and experience to carry out the job in hand safely, and ensuring the installation is left in a safe condition for use. Knowledge must be kept up-to-date with changes in the law, technology and safe working practice.

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[42] OPITO (2013) Oil and Gas Industry: *Competence Assessment and Verification Guidelines*.
[43] Health and Safety Executive (2013); *Approved Code of Practice and guidance; Safety in the installation and use of gas systems and appliances*; Gas Safety (Installation and Use) Regulations 1998; L56 (Fourth edition) Published 2013

The ACOP restricts who should be permitted to undertake gas work:

(a) *by a person who has successfully completed an industry-recognised training course followed by assessment of competence. Training that leads to assessment of competence in safe gas work should be recognised by the industry's standards setting body; or*

(b) *in the case of a currently or previously registered person, where they have proved competence through a certification scheme; or*

(c) *for those working at premises that fall outside the scope of the Regulations (see regulation 2(4) and associated guidance), by a person who has successfully completed an appropriate full training course followed by assessment of competence.*

It describe the sorts of training that would lead to competence in the following manners:

Training should be of a standard to enable a gas engineer to achieve competence in the safe installation, purging, commissioning, testing, servicing, maintenance, repair, disconnection, modification and dismantling of the gas systems, fittings and appliances with which they are working.

The certification schemes referred to in paragraph 80(b) require individual gas engineers to have their competence assessed at regular intervals under specific scheme arrangements set by the standards setting authority, operated by a certification body and currently accredited by the United Kingdom Accreditation Service (UKAS).

3.10.3 Accountancy

In this sector, where competence is not defined in terms of components but is implied in how it is described[44] in respect to the profession. It is useful in terms of its split between enabling and technical. Job-knowledge and skills, CPD, and relevant behaviours are included in terms of ethical objectives.

The maintenance of professional competence requires continuing awareness and understanding of relevant technical, professional and business developments. Continuing professional development (CPD) develops and maintains the capabilities that enable a member to perform competently within the professional environment.

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[44] AAT Code of Professional Ethics (2014)

In Canada, the Chartered Professional Accountants have produced a map of competence *The Chartered Professional Accountant Competency Map*: Understanding the competencies a candidate must demonstrate to become a CPA (2012) which describes competence in terms of:

"enabling competence" which consists of …

- Behaviour
- Problem solving
- Communication skills
- Self-management
- Team working

And, "technical competence" - comprising technical accounting job knowledge and skills

3.10.4 Nuclear

Competence is, as one might expect, treated in an extremely detailed fashion – beginning with tasks and building into job roles and then the standards required to evidence competence[45].

There is no explicit inclusion of regular re-testing or re-evidencing of competence. However behaviours are included:

For each role and associated task, the competencies needed to carry out the work should be determined. The set of competencies should include both technical elements and others which may be less tangible, but which are no less important, such as management and leadership, communication and behavioural skills, etc.

Competence and behaviours are approached in a detailed task-centred fashion:

'In order to develop a suitable and effective training programme, it is necessary first to identify the roles that must be performed. […] Identifying the components of a role, and the competencies needed to carry them out, may involve the use of job or task analysis. […]

The analysis should draw upon sources such as the plant safety case, procedures, staffing levels, statements of personnel responsibilities, the licensee's overriding nuclear policy, regulatory requirements and operational experience feedback. […]

For each role and associated task, the competencies needed to carry out the work should be determined. The set of competencies should include both technical elements and others which may

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[45] The Office for Nuclear Regulation (2010) *Training and Assuring Personnel Competence*.

be less tangible, but which are no less important, such as management and leadership, communication and behavioural skills, etc. […]

The ONR Inspector should confirm that the licensee has a structured process in place to identify the tasks which are to be performed for each role, and the competencies needed to perform the associated tasks.'

3.10.5 Rail

The current system by which competence is approached in the UK rail industry is almost entirely based on a binary definition of competence (on/off) and the use of detailed written standards and NVQs[46].

Baker and Currant (2008) propose a risk-based approach rather than a standards-based one

'There are many definitions of what 'competence' is, reflecting that it is a complex concept. Certainly, 'competence' must be more than just technical skill or depth of knowledge alone. 'Competence' also seems to develop over time, as the individual becomes more practised at the activities they are performing …'

They propose what they call a "SEKA" acronym – Skill, Experience, Knowledge, and Attitudes - but they also highlight the need to include in the consideration of competence what they call "degraded situations" – for example, the impact on competence of adverse weather, impaired equipment, staff absence, etc., and this may also something worth considering for the construction industry.

Figure 1: Proposed Rail Industry Risk-Based Approach
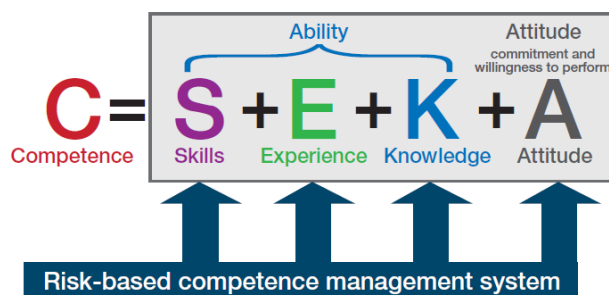
More recently, the Rail & Safety Standards Board (RSSB) has defined competence in the following terms[47]:

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[46] Baker, J. P. and Currant, P. (2008) *Developing and Maintaining Competence: Experiences from the Rail Industry*. Rail Professional Development.

[47] Rail Safety and Standards Board (2013) *Good Practice Guide on Competence Development*.

[Competence/competent is …] The quality or state, of being adequately knowledgeable and skilled to be able to perform a specific act or task to an agreed level/standard. This agreed level of performance can range from novice to expert.

It also identifies the stages of competence in a cycle:

- Unconscious incompetence
- Conscious incompetence
- Conscious competence
- Unconscious competence
- Unconscious incompetence (over time)

This explicitly recognises the degradation of competence over time and the need for refreshing and updating of competence. It is targeted at professionals who have some responsibility for competence, such as Railway Duty Holders, who have a legal obligation to ensure the competence of safety-critical staff. Case studies were contributed to the research by numerous rail service providers.

There are several relevant definitions put forward by the RSSB:

Competence/competent
The quality or state, of being adequately knowledgeable and skilled to be able to perform a specific act or task to an agreed level/standard. This agreed level of performance can range from novice to expert. Competence is the measurable outcome from the application of competencies.

Competence Management System
A risk-based system that identifies the competencies required to carry out a task, and ensures that those undertaking that task have, and continue to have, the competence required to do it. The document also addresses to some extent the issue of "experience":

Within and beyond the rail industry, experience is usually measured in time. However, rather than focusing on duration of time spent within the industry, competence development is actually the result of 'experiences' within that time, i.e. events that have provided the opportunity to learn and develop skills. Consequently, learning is a change in behaviour that results in better performance.

3.10.6 Motor Industry

The UK motor industry, like many others, has a number of Trade and Industry Bodies representing different parts of the sector (bodies, repair and maintenance, paint spray and hire and rental, etc).

One important concern for the sector centres on independent garages in the UK being opened up by people regardless of their background or ability – and possibly with unskilled, untrained mechanics, and there are often calls by various bodies/associations for the UK to match the Europeans in licensing the sector. The industry recognises that many independent garages are operated in a highly professional way by well-trained personnel but the ability of anyone to enter a market which deals with potentially highly dangerous equipment, is a worry.

For many years its professional association, the *Institute of the Motor Industry* (IMI) in conjunction with the Sector Skills Council, has led developments in training, standards and qualifications.

Those working for franchised garages typically train as an apprentice for three years to become a Level 3 Technician. Over the following two years most manufacturers would expect technicians to attend regular training courses before becoming 'master technicians'. Even when this level is reached, technicians expect to have their competence assessed every three years.

Another recent initiative of the IMI, in an effort to raise the standards of the industry, has been the development of a *Professional Register* - a searchable database of individuals and companies. The criteria for being on the register is either membership of the IMI or Automotive Technician Accreditation (ATA). Membership is currently increasing and is now 40,000 of a circa 250,000 workforce. The ATA is the recognised industry standard benchmark for competence and to become accredited one must:

- pass a series of practical assessments and an online knowledge test (available as a self-assessment) at an ATA-approved assessment centre;
- agree to abide by the ATA Code of Conduct;
- be re-accredited every three years to ensure that levels of competence are maintained.

Within each of 16 routes to accreditation for each automotive discipline there are a number of occupational roles which determine which assessed modules the individual must take to achieve accreditation. These assessed modules are known as skills tests. For those applying for accreditation for the first time through any route entail an hour-long practical assessment and online knowledge test.

In the practical assessment, the individual must demonstrate the ability to meet a number of skills requirements specific to the discipline or role. For example, one requirement of the module on 'refrigerant handling' (Air Conditioning route) is the ability to "select the correct refrigerant type and refrigerant quantity for a specific vehicle[48]."

The knowledge requirements of the online assessment test the individual's understanding of such things as relevant protocols, procedures, regulations, legislation, as well as health and safety.

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[48] IMI (2013) Air Conditioning Overview [online], available at http://ata.theimi.org.uk/sites/default/files/Ata_documents/182849_0.pdf

Re-accreditation

Two options are open to individuals seeking re-accreditation, and they are dependent upon which route that individual has taken. Individuals who successfully complete a full assessment within six months of the expiry date of their ATA cards will be issued with a new card once their current card expires.

Alternatively, individuals may take 'Update Modules', taken together or separately, at any time during their accreditation period. Update modules are 'bite-size' assessment modules which allow technicians to build on their proven competence and avoid reassessment in some skills and disciplines.

3.10.7 Summary:

The sector and national/international examples above (see also Appendix 5 for other examples) highlight the complexity underpinning the subject of competence. In particular they illustrate the way in which perspective impacts on the final definition or specification.

However, some clear commonalities can be gleaned. These include:

1. The importance of positive experience from which learning is fully absorbed;
2. The importance of human factors;
3. The importance of reliable assessment (e.g. OPITO. Gas, Rail, etc)
4. The important role of refresher training or continuous learning;
5. The fact that there are distinct stages of competence development;
6. The fact that competence can degrade over time and in certain conditions.

4. Industry Perceptions

As part of this study we designed and carried out an online survey together with a range of in-depth interviews with stakeholders, employers and informed employees (see Appendix 1 for research participants and project methodology). The purpose of the study was set out in a briefing document, prepared as a result of an initial workshop arranged to discuss the project. The minutes of that workshop were made available for review here[49] by interested parties and those participating in the survey. The central purpose, as explained to the participants, was to evaluate the potential for a single overarching framework guiding the industry's approach to competence for the future.

Overarching framework
A framework could help identify what contributes towards a healthy, safe and productive workplace and take into account a much wider range of important variables such as the competence of an individual worker, the organisation's capability (focusing on management and supervision) and the construction activity to be undertaken. Further detail on the framework is discussed in Section 4.2.6.

Such a framework for competence might have the potential to translate what has been described (see report's Introduction) as a confused and highly complex current situation into one under which all stakeholders would work to a common set of guidelines and philosophies, and, in time, potentially to help the wider industry integrate health and safety more effectively into training and qualifications.

The concept of an 'overarching' framework is therefore not intended to standardise but to create a common starting point for all stakeholders, a common philosophy or approach to the whole issue of:

- o the constituent parts of competence in the UK construction sector *(what does competence mean in construction),*
- o how it is developed, (*for example as a result of experience and/or education and training*)
- o how it is measured (*for example is it independently assessed*), and,
- o how evidenced (*for example through successful completion of a certification scheme*).

We were advised that any such framework must be capable of being flexible, avoiding any rigid and prescriptive framework of rules, in order to accommodate such a diverse and complex industry as construction (see section 5.1 for discussion regarding the scope of construction for this study) with so many sub-sectors and occupational roles.

It was also explained to us that most people do understand the basic concept of competence in relation to trade skills and the necessary health and safety requirements for construction workers, but a major benefit of the framework would be to help some parts of the industry improve their basic training and assessment by recognising that a health and safety test and any sort of knowledge or skill they may have gleaned whilst on the job is insufficient in terms of the industry's need for a much wider and deeper individual competence.

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[49] http://www.pyetait.com/construction/ The construction zone held minutes of the larger of two workshops and a link to the survey held open for a month till mid- June 2014.

4.1 Online Survey

The online survey received 113 valid responses from a range of employers, business owners and senior employees (i.e. managers, site managers, etc.) across a fairly even spread of business activities. Around 70% of respondents were from companies employing 50 or more people, and over 60% operate UK-wide.

Figure 2: Responses by Activity
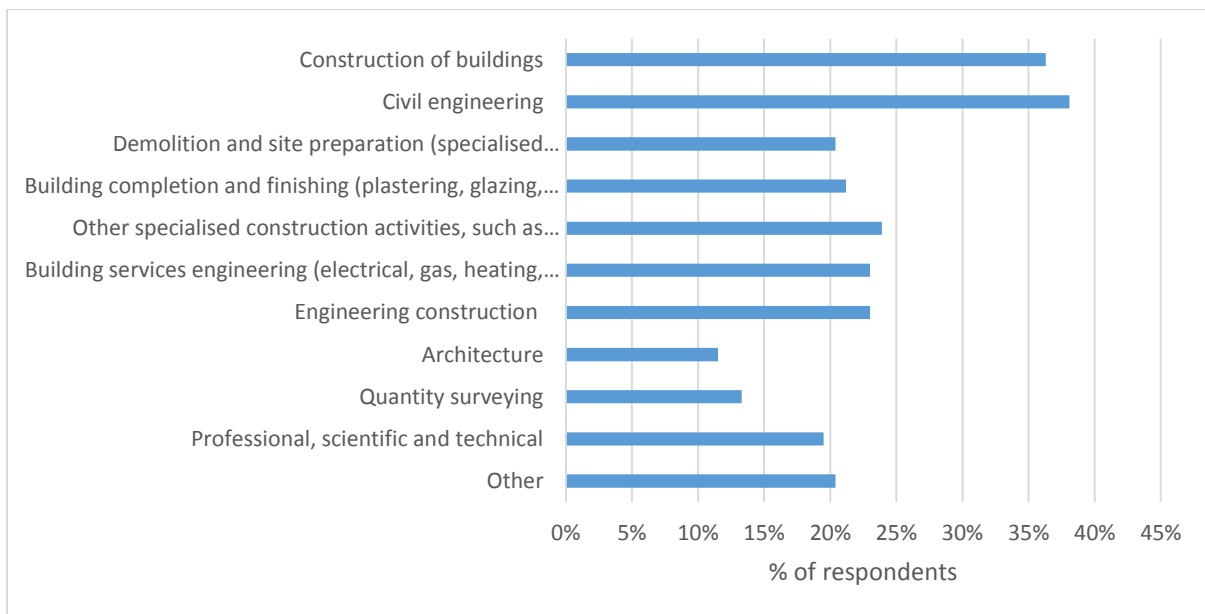
Note - bars total greater than 100% overall due to multiple selections being possible.

What is Competence?

Participants in the online survey were asked to say whether they agreed or disagreed with a number of statements about competence and how they rate a set of statements about how competence is achieved and maintained.

Respondents were very clear as to the importance of supervision and management, the need for re-assessment and refreshment and the variability of competence depending on personal and situational factors.

Figure 3: Views on competence
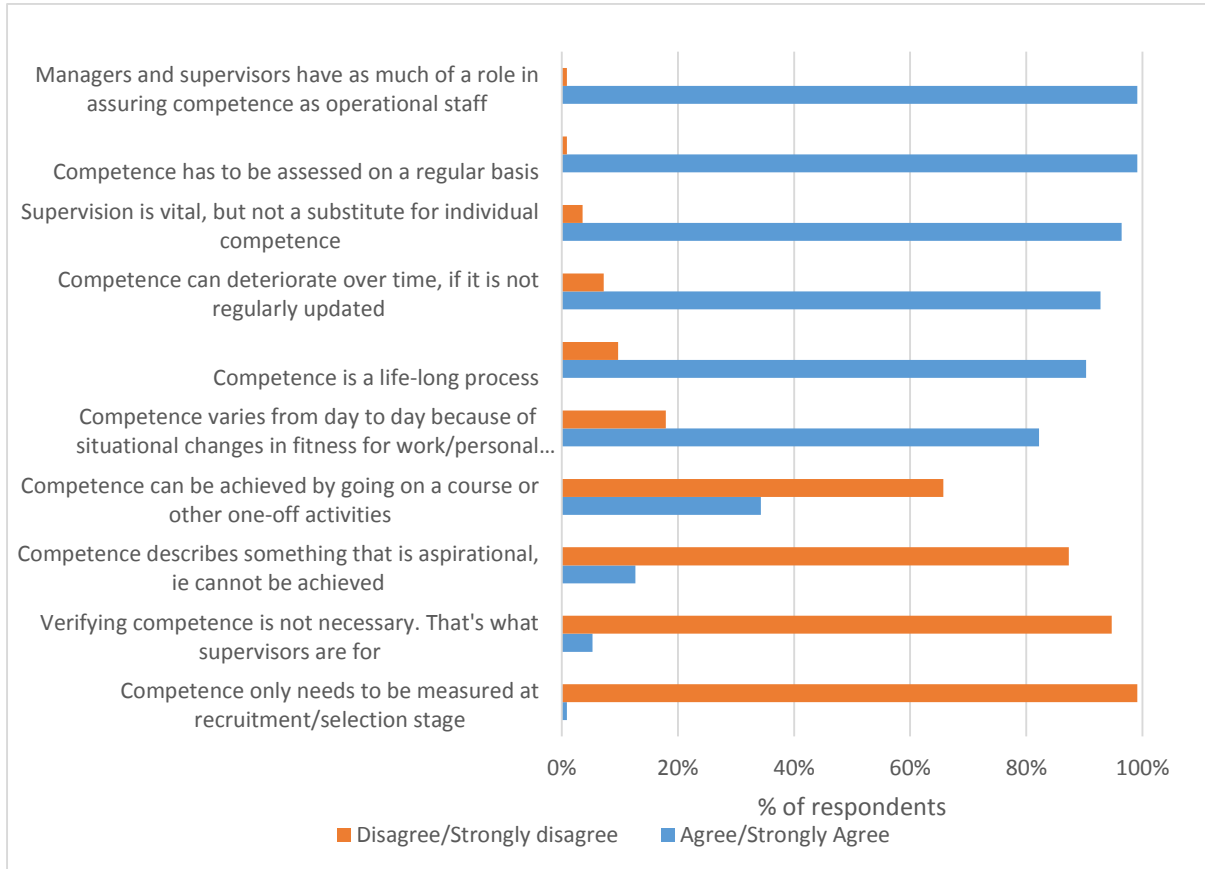
Figure 4: Importance of key factors in achieving/maintaining competence
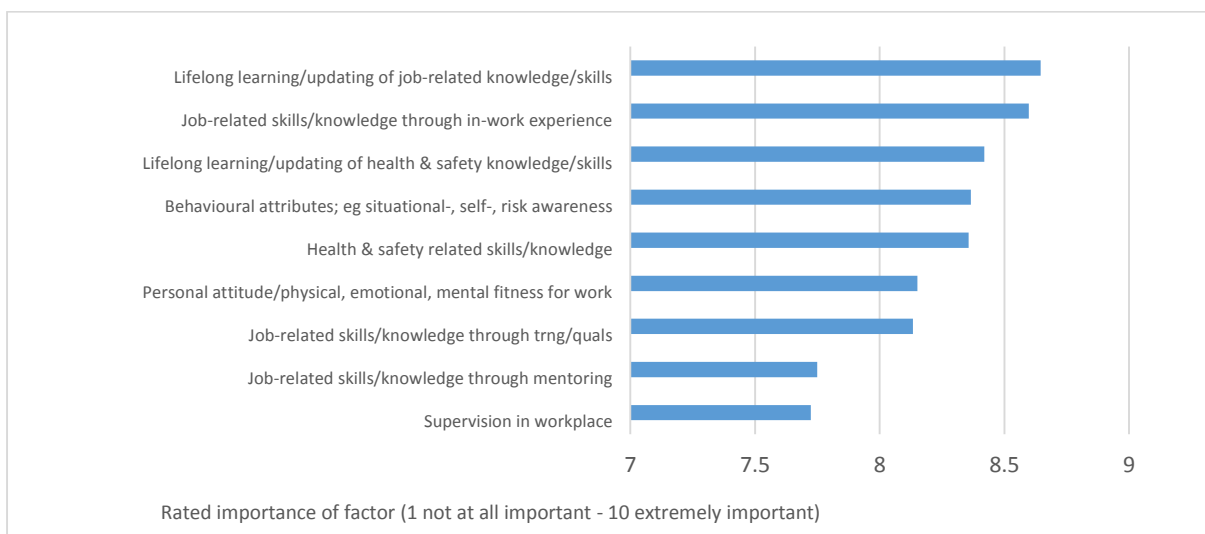
Many respondents felt that behaviour attributes including: attitude; personality; willingness to learn; drive; team work and communication skills; perception of risk; and pride in ones work need to be taken into account when developing and maintaining workforce competence.

The impact of day-to-day changes on an individual's competence was recognised by a number of respondents as a factor that needed to be given greater consideration. Several respondents felt that supervisors and managers need to be visible on site so as to develop a good understanding of their staff's personalities and the ability to recognise when an individual is not performing to their typical standard.

Other factors respondents felt were essential to the maintenance and development of competence included:

- employees' experience in the sector and occupational role;
- recognition of a trade qualification as an indication of competence; and
- the currency of an individual's skills and the number of man-hours spent using these skills.

Changes to technical practices and equipment, legislation and regulations, and the working environment were also mentioned by several respondents as important factors to consider when devising staff training.

Verifying Competence

Participants in the online survey were asked two main questions around the subject of how they verify the competence of their employees. The first focused on the main way this was achieved while the second asked for all other ways used.

The two questions prompted a slightly different (but not contradictory) view of the industry's approach to verifying competence. Cards and certification schemes are stated by around 45% of respondents as being the MAIN way that they verify competence. On the other hand cards and certification schemes are used as PART of the evidence of competence by around 60% of respondents.

Clearly, in spite of the predominance of "cards/certification schemes" and "relevant training/qualifications" as key factors, the industry uses a variety of measures of competence – with six different specific measures being used by a majority of respondents (Figure 5).

Figure 5: Main way of verifying competence

Figure 5: Main way of verifying competence

Figure 6: All ways of verifying competence
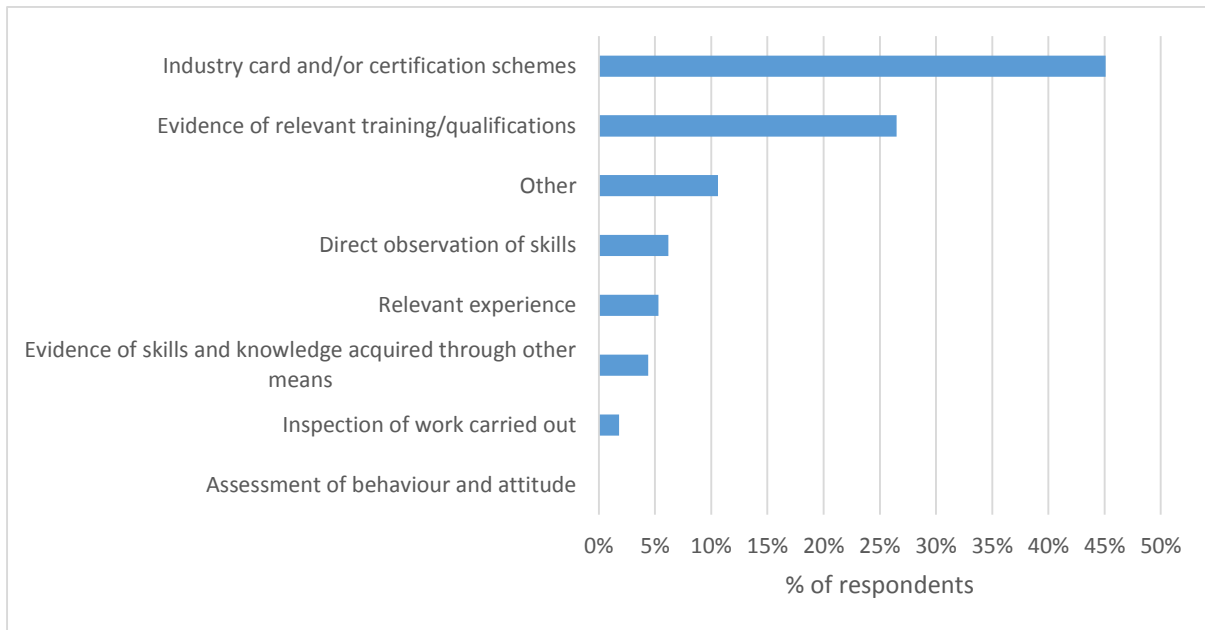
Figure 6: All ways of verifying competence
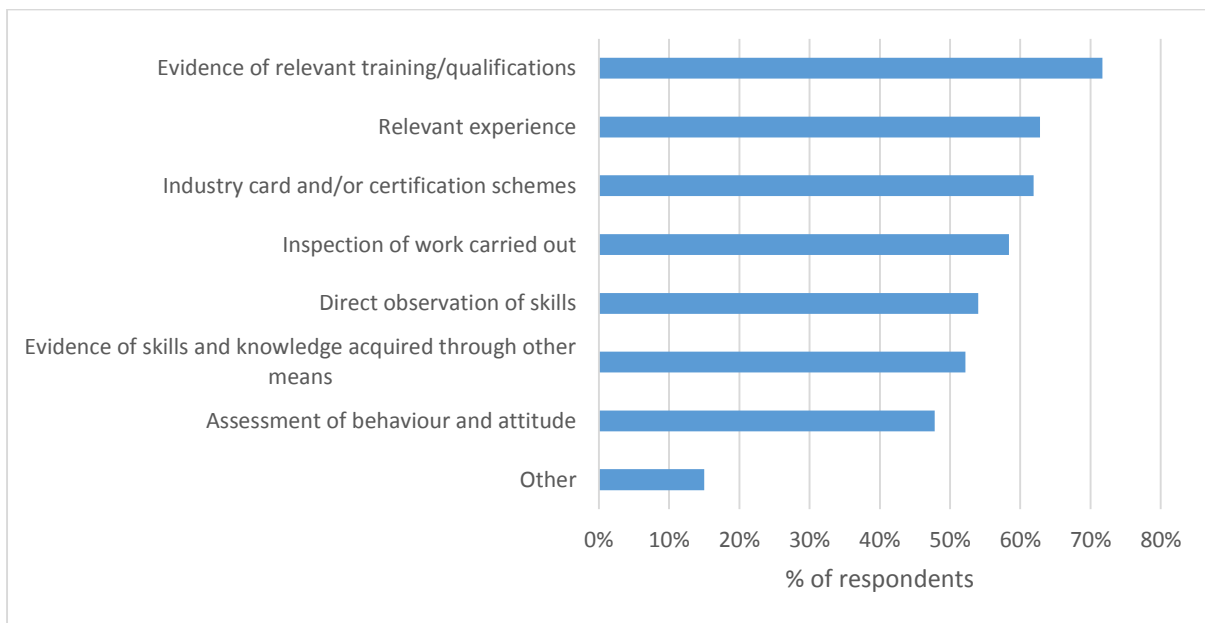
Some respondents said that they measure staff competence against a company training or competency matrix which enables them to identify learning requirements and skills gaps and which then feeds into annual performance reviews or staff appraisals and can inform progression routes.

A number make the distinction between verifying competence at selection stage and ongoing verification for existing staff. Qualifications and experience are usually the primary measure at recruitment, and inspection of work or company competency framework are used for existing staff.

"There is no main way [of verifying competence]. We have two approaches. For existing staff, we have a matrix of competences in place. When we recruit, we look for the relevant qualifications and experience."

"NVQ level 3 should be the industry standard for all operatives, NVQ level 4 for managers."

The majority of respondents have systems in place to monitor and assess the competence of their workforce and, for some, this extends to sub-contractors. Respondents noted several other factors to be taken into account when verifying competence, including reputation of the individual (peer review), recommendation from a previous employer, and observed situational awareness, safe behaviour, and job ability.

Respondents have a range of systems and internal procedures in place designed to monitor and develop competence, usually linked to training matrixes. In many cases employees are expected to attain specific vocational qualifications or progress through a dedicated route built around a hierarchy of occupational roles. Employees are usually assessed through appraisals, performance reviews and ongoing supervision. A number of these systems examine 'soft skills' in addition to technical competences. Other key features used by employers include regular CPD training sessions, project reviews assessing work carried out so far, inspections and test plans.

"We would expect to see a training matrix in place and named individuals placed against it to see what they have prior to coming on site. We don't just accept (card) as proof of competence."

"All members of staff have vocational qualifications or are working toward an NVQ - as a business, we use this to measure competence too. We undertake a formal review process and ensure ongoing supervision. Unfortunately, not all supervisors have the necessary technical knowledge required."

Members of the Federation of Master Builders (FMB) members[50] were asked in a separate survey what methods they use to verify the competence of staff. Respondents chose between the alternatives used in this study's fieldwork, all of which, except 'Other', received support from at least 40% of members. The most popular verification methods were 'Relevant experience', 'Direct observation of skills', and 'Inspection of work carried out' with each selected by approximately 70% of respondents.

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[50] The FMB agreed to include questions from Pye Tait in a survey of their own for members, which focused on health and safety in the construction industry. It is likely, therefore, that the questions were understood by most respondents to be purely about health and safety, rather than competence in a wider context. There were 333 respondents to the survey in total, of whom circa 200 FMB members answered each of Pye Tait's questions.

Members were asked which verification of competence method is the most effective, with the most commonly cited being 'Direct observation of skills', accounting for 30% of respondents;

Supervisors

Supervisors are regarded as highly important to construction companies. Their importance, in the survey, was rated at over eight on a scale from one to ten (8.4).

Across the full range of respondents eight out of ten believe that supervisors need more training. Respondents from larger companies were more definite about this need – more than nine out of ten agreed that supervisors require further training, while the equivalent proportion from smaller firms was slightly less than seven out of ten.

Mentoring – as a means of reinforcing skills in the workplace – was highly regarded by respondents, who rated the activity at over eight on a scale from one to ten (8.3).

Respondents were in general agreement on the skills and knowledge they expected supervisors to possess. An understanding of, and experience in, the occupational roles over which they supervise was considered by the majority to be highly important, and many expected supervisors to have the technical skills needed to complete tasks themselves. Many respondents acknowledged that "mere" technical skill does not ensure a competent supervisor. Person-management skills including: leadership, mentoring ability, the ability to manage conflict and unsafe situations, and administer appraisals were identified by the majority of respondents as essential supervisor attributes. Other skills mentioned frequently included: good communication; public speaking skills; and the ability to deliver presentations and toolbox talks. A number of respondents praised specific training schemes such as SMSTS and IOSH as a good method of developing these skills.

In addition, respondents felt that supervisors should possess a good understanding of workplace health and safety and employment law, and should be expected to regularly update this knowledge.

Supervisors, it was argued by several respondents, have a pastoral role to play. Many respondents expect supervisors to be able to build relationships with their staff - to command respect but also employ emotional intelligence and empathy. The majority of respondents felt that supervisors need to have a deep understanding of how personal behaviour and day-to-day changes in attitude and personal circumstances will affect an individual's competence.

"To be a good supervisor they need to know how to do the actual job but also how to manage people, their skills and development, and their behaviours."

"Soft skills such as being able to deliver a presentation such as toolbox talks. How to lead a conversation, such as intervention on an audit or an unsafe situation."

"They need to have good interpersonal skills, the ability to speak to clients, the ability to deliver the work and the skills to do the job that they are asking the staff to do."

"Supervisors would benefit from training in how to be good leaders. Many are promoted from an operative level, and so some do not naturally have good leadership skills, however, these skills are important for supervisors."

Training

Around half of respondents use a variety of methods to test the effectiveness of training received by their people including questioning and testing acquired skills in the workplace. The same proportion record the fact that such questioning or testing has taken place.

Figure 7: Testing Training Outcomes
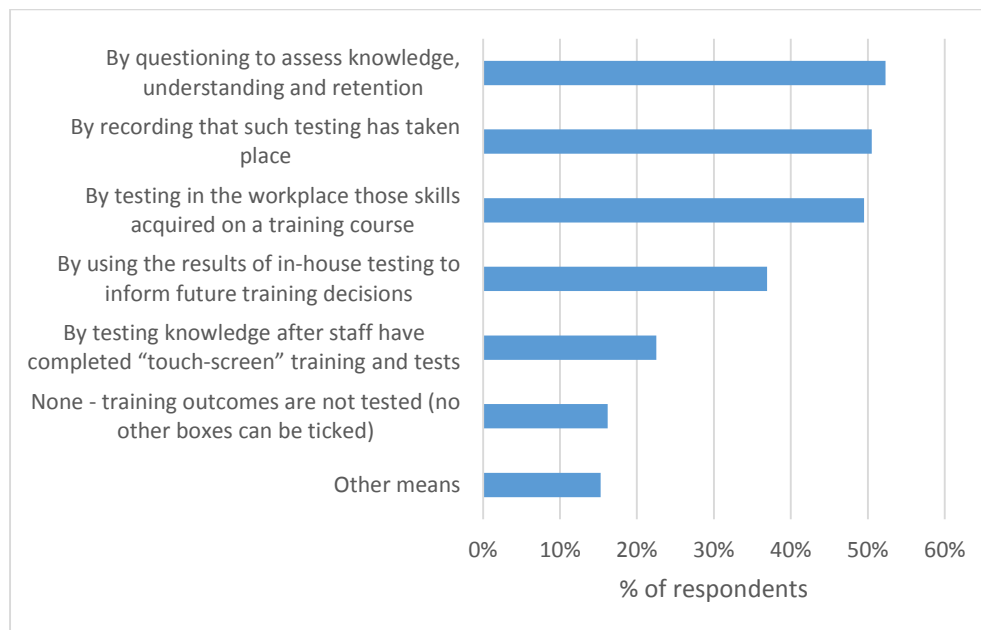
Respondents also acknowledged that staff training needs to be tailored to suit the needs of the individual, taking into account factors such as length of experience, qualifications, performance on site, and behavioural attributes.

Refresher training was a strong topic for debate among respondents; many acknowledged that regular CPD training is essential for ensuring employees maintain up-to-date knowledge and skills.

Mentoring is clearly considered to be a crucial factor in the development of competence, especially among apprentices and less experienced employees, although respondents did recognise that mentoring was not always practically viable for all businesses.

"Competence is important to the retention of young labour – whilst I don't expect young workers to know things on day 1, I do expect them to learn and to respect other workers and the workplace. Behavioural attributes are important because some workers become too confident too quickly and this results in mistakes being made."

"I believe that mentors are required and they should have a specific role. Gone are the days when apprentices/ground workers start off with a shovel and told how to look after and care for it. This bottom up approach is required again – it works."

A number of respondents reported that they routinely test training outcomes, though not necessarily for every course. The skills acquired from some courses, for example those pertaining to high-hazard activities or those required by clients, are more likely to be subject to post-training testing than others.

The most commonly-cited method of testing training outcomes is through feedback from the attendee or trainer. This feedback may take several different forms, from a conversation between the trainee and their manager/supervisor (most commonly through an appraisal or annual review process), to a post-training evaluation or questionnaire. One employer reported that staff are expected to deliver a 30-minute presentation to co-workers on the outcomes of training.

On a more general level, employees are observed by the supervisor, in the workplace, to evaluate the retention and application of skills gained on a training course. This normally takes place through 'shadowing' and supervisor reports and site audits (mentioned specifically for the gas industry).

Respondents commented on the varying requirements for post-training testing, and it was said that product training is particularly relevant to this. One employer reported that outcomes of these courses are tested by an onsite supervisor assessing if a product has been understood and utilised correctly.

Others reported that they regularly review the content, relevance and quality of training programmes – and employee feedback is very often an important input to this process. A number of respondents argued that they have limited time and budget to routinely test training outcomes and that they should be able to trust the quality of accredited external training courses that incorporate some form of assessment at the end of them.

"In-house appraisals are used to discuss the outcomes of training sessions and identify any deficiencies. These take place two times a year on a one-to-one basis."

"In-house assessment informs our employees' training. Craft operatives are subject to an annual review process which measures behaviour competences and skills competences, and identifies skills gaps so these can be addressed."

"During the annual appraisal, employees' retention levels are assessed, examining what has been achieved from going on the course, and whether, after being sent on a course to improve their skills in a particular area, they are now performing more successfully - if not, why and how can this be resolved?"

Almost a quarter of respondents reported they have a training matrix or database in place for all staff, which record courses undertaken and completed and, where appropriate, exam or test results. In many cases, the matrix will indicate when training is due for renewal for each employee. Training requirements in some cases are identified as part of the employee appraisal process.

"All staff are added to the training matrix for the company which states what training has been carried out including the expiry dates (for ease of gaining a refresher course)."

"Certification is kept on file and updated to the training matrix, which details all courses, all expiry dates etc. We have a specific training room for training courses, and deliver training courses for other roofing contractors in the local area.

"As part of the appraisal process, the courses are identified, booked and employees undertake the training. We collect certificates at the end; the results are logged with HR and employees get rewards for significant results, for example, for becoming chartered, and this gets publicised on the internal website."

Behaviours

Around two thirds of respondents say that they assess behavioural attributes with respect to their employees. Almost eight out of ten employers assess attitude and over 60% assess the employee's physical fitness for work.

Less than half say they assess mental or emotional fitness for work.

Figure 8: Behavioural attributes assessed
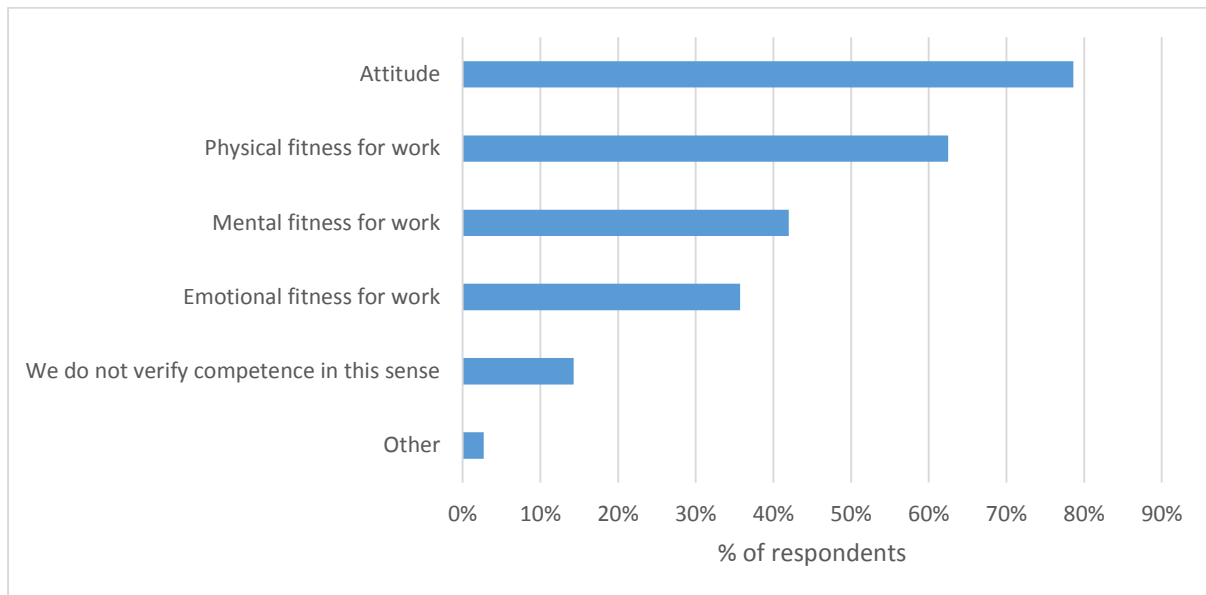
A number of respondents say that assessment of behaviour is done on an 'informal' basis by the site supervisor, through discussion, interviewing or observation of site operatives. However, a large number of respondents state that behavioural aspects are identified as part of formal observations, site inspections and audits, and/or risk assessments by site supervisors or contract managers.

Off-site behavioural attributes are assessed through Q&A and feedback sessions, appraisals, daily briefings, and through structured interviews, both at recruitment stage and on an ongoing basis. A number of employers issue pre-start questionnaires which assess behavioural competences and safety awareness, and these are often reinforced through the site induction process or through Toolbox Talks.

The main focus of the responses about the assessment of behaviours is on the individual and their attitude to risk, their awareness of their environment and their knowledge of health and safety hazards.

A handful of employers appear to have developed more in-depth behavioural improvement programmes, in some cases utilising qualified in-house trainers and safety coaches to deliver presentations to staff. One large employer reported that they are currently developing a 'well-being programme'.

"We undertake audit control of working areas. These audits include aspects of risk analysis, completion of method statements, and we also monitor accident and incident levels."

"All operatives are assessed on their first day on site by either a supervisor or plant specialist depending on trade. A written assessment is kept on file. This is done for direct and agency employees."

"Behavioural assessment is undertaken by foremen, initially during probation, using a standard question set. This has been effective at identifying 'risk takers' allowing us to balance working gangs and manage behaviours of individuals."

"Operatives are required to attend meetings to develop a personal 'behavioural improvement plan' to then follow. Presentations are given about good and bad behaviours, and the potential consequences, plus what the expectations for staff. Supervisors are trained to understand behavioural attributes. If operatives are seen behaving in a concerning way, they will be called in for a conversation about behaviour."

It was acknowledged by employers that there may not be an objective or scientific means of assessing emotional and mental fitness but that this tends to be 'observed' on the job by the supervisor or in appraisals.

Most respondents reported that, where explicit assessment of these qualities may be lacking, they would address issues as they were raised and ensure staff are fully supported. Some of the larger employers have 'stress policies' in place to support employees.

Physical fitness tends only to be assessed where it is an explicit requirement of the role. This would generally be done through medicals.

Methods for assessing behavioural competence seem to be very similar to those used for measuring capabilities/attributes such as situational awareness, self-awareness and risk awareness.

In many cases, some form of assessment of attitude and fitness for work takes place during the recruitment stage, through interviewing and pre-employment questionnaires or medicals. New starts are often subject to a probationary or initial monitoring period (most commonly cited was three months) during which these qualities are monitored, assessed and addressed if required.

Prior to going on a construction site, the majority of respondents report that operatives must attend a site induction during which behavioural aspects will be discussed and considered. Once in the role, other measures are used to assess behavioural competence, including client feedback, health and safety visits, site inspections, performance and development assessment centres, drug and alcohol testing (particularly in highways or rail maintenance), medicals and occupational health assessments (and, where relevant, sight and hearing tests), appraisals and performance reviews, coaching and mentoring, and, most frequently, direct supervision on site.

Many respondents say that behavioural issues will be picked up in direct conversation on an informal basis with the individual and that, further, this is often a more effective technique than almost any other. Some respondents reported developing policies and training programmes around ill-health, wellbeing and stress.

"All employees are interviewed prior to being employed and assessments carried out regarding attitude to work. All employees are initially and continually assessed on behaviour to work, based on client feedback and regular health & safety visits reviews."

"We have six Supervisors, each new member of staff has to work with all of them over a three month trial period and each one has to put together a brief report back on the individual, based on a questionnaire … overall it is possible to get an idea on balance about the new staff competency and awareness."

"I think we can do more on mental and emotional fitness – this is something we're looking at. Stress is on the agenda too."

"Behaviour is assessed informally - whilst workers are on site, contract managers assess their team's competence in this respect. Ultimately, he cannot tolerate a maverick - this could be detrimental to his other staff and his contracts."

"We operate a comprehensive employee 'well-being' assessment which takes account of physical, emotion and mental state of employees. This operates on a voluntary basis and staff have access to a 24 hour help line to discuss any problems they experience."

"Physical, emotional, mental fitness is addressed in the formal assessment process but this only assesses 'competence' at a set point in time. This could alter depending upon an employees' current situation (e.g. home-life, mood etc.) or work environment factors such as the personality of their current supervisor. If any of these factors change, this could affect their competence, and whilst in their formal assessment they tested as 'competent', on a given day they may be incompetent and vice versa."

Some of these comments that refer to behaviours and attitudes could in part be credited to the recent revisions to the CITB Health, Safety and Environment test which now in effect tests attitudes through questioning on how the candidate for the test would respond i.e. what actions would they take in certain scenarios.

What certification schemes should evidence

When respondents were asked to rate the importance of certification schemes (and, thereby by implication 'cards') evidencing certain elements they placed greatest importance on those that evidence*: knowledge and skills in health and safety related to accident/injury*, and *knowledge and*

skills related to ill-health – (see the first two factors in the figure below) both of which received average ratings of close to 9 out of 10.

Experience, relevant training courses, and job-related knowledge and skills were also given relatively high scores of between 7.5 and 8.5.

Figure 9: What certification schemes and their cards should evidence
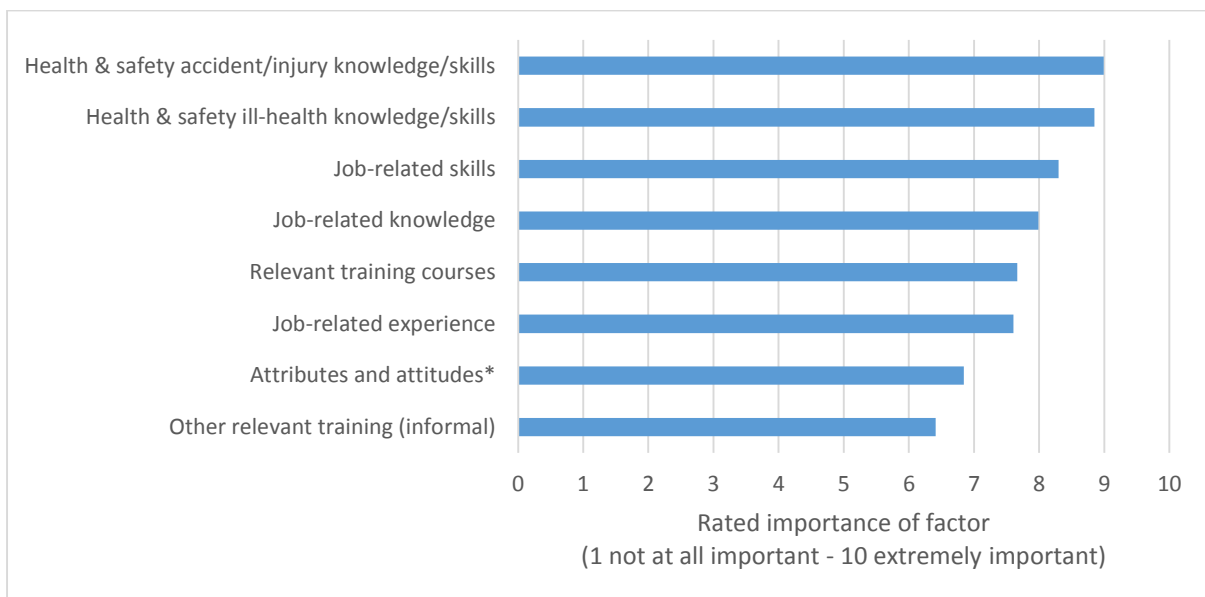
* (e.g. readiness to work, work ethics, attitude towards co-workers, team working skills, situational awareness, self-awareness)

Should cards from certification schemes be time-limited?

More than 9 out of ten of respondents believe that cards should be issued for only a limited amount of time. Over half think that all schemes and therefore ALL cards should carry such a limitation. In responses to this topic there was a noticeable difference between larger and smaller firms. Companies employing more than fifty people believe all cards should be time constrained, whereas those employing less than fifty tended to think that only selected cards should be so limited.

Figure 10: Should cards be time-limited
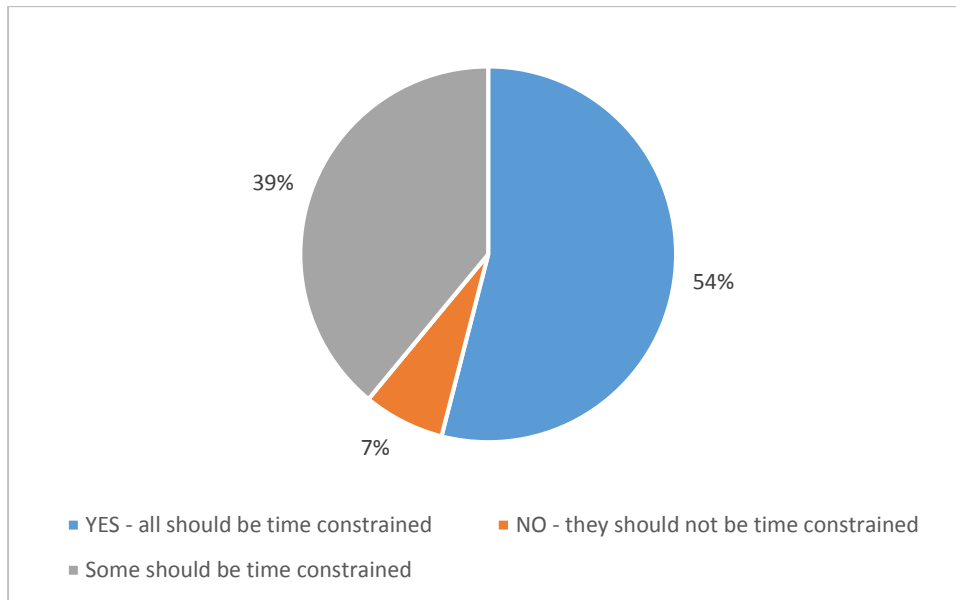
Respondents were virtually unanimous in the view that refresher training, updating knowledge and skills and CPD are of critical importance to 'replenishing' competence. The primary reasons for this requirement is the fast-changing pace of the industry, changes to best practice and legislation, technological and product/equipment developments, client requirements and expectations, the individual's health conditions, and the recognition that over time 'bad habits' can creep in and individuals can be 'de-skilled'.

Of these, changes in legislation and developments in technology were the most common reasons respondents gave for why CPD is important. Respondents believe that cards that are directly linked to legislative requirements should have time constraints. Examples of the latter were cited: Gas Safe, Refcom, Unvented Hot Water, and Water Regulations, while health and safety legislative changes were highlighted as an importance consideration for refresher training.

Around ten respondents stated that the benchmark should be a 3-year renewal period for cards associated with skills/knowledge which they utilised less often, and a 5-year renewal period for those they employ on a daily basis. Four respondents offered a compromise on the perceived industry standard of 3-5 years, by stating that 4 could be a preferable interval for most areas.

Several respondents made a distinction between 'safety-critical' or 'high-risk' activities and more 'general' skills associated with trade competence. Specific examples where it was felt there is an increased need for more regular renewal were: general health and safety in construction, lifting operations, plant operation, vehicle marshalling, scaffolding, asbestos, and working at height.

Some respondents gave their suggestions for time constraints for specific cards and refresher training but there were too few respondents suggesting various periods for the results to be of reliable value for this report.

In terms of what maximum renewal period would be preferred (both by those responding to the multi-choice question and to the text response element), the consensus (largely the same for both large and smaller companies) is for a maximum period of between 3 and 5 years – with a slight weighting towards the latter period.

Figure 11: Preferred renewal period for schemes and their cards
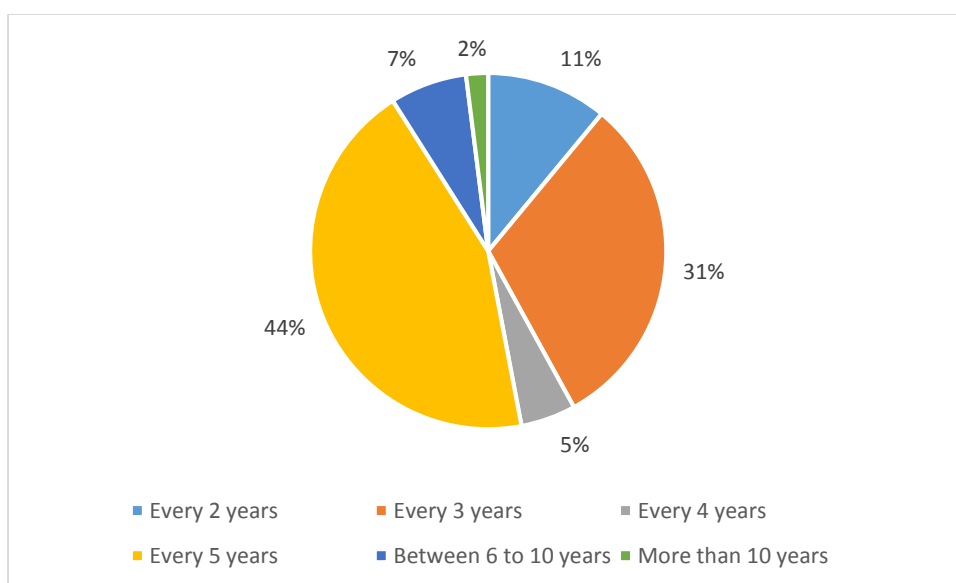
Other comments received regarding the renewal of a card for a certification scheme respondents believe that holders should provide evidence of continued learning/training and proof of continuing employment in the job role. A large proportion of respondents support formal reassessment by the card issuing authority (Fig 12). These proportions were largely the same regardless of company size.

In addition to proof of continuing employment in the job role, evidence of continuing learning and training and/or formal reassessment by the card issuing body, respondents to the text element of the questions were invited to suggest other requirements for the renewal of industry cards.

Some suggested that a health and safety test should be passed by the holder before their card is reissued, with one stating that the CITB Health, Safety and Environment test is good practice. It was suggested that health assessments or medicals should be required for renewing cards for safety-critical roles to establish the fitness to work of the holder.

Figure 12: Requirements for scheme and their card renewal
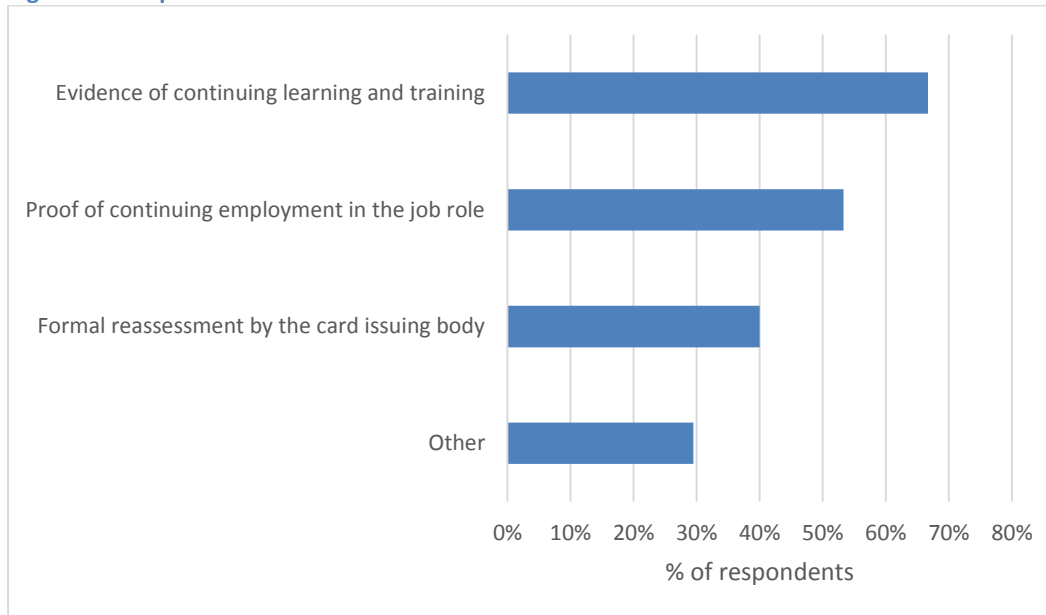
Over a quarter of respondents believe that some form of independent reassessment should be required of the card holder at the point of renewal, although it is unclear as to whether this should be performed by the card registration body, or in-house by a third party. Suggestions for re-assessment focused on the necessity for individuals to demonstrate currency of skills and knowledge in both trade and health and safety aspects.

Three respondents argued against there being additional requirements for renewing cards, stating that it is impractical and costly to make stringent training or assessment requirements and that most card holders would simply need 're-informing' where appropriate of updates to legislation or working practices.

"We would like to see a system where mandatory training, e.g. asbestos awareness, scaffold access is all captured. Not formal CPD but the basic elements that one would expect to see. You shouldn't have a wallet full of cards but all on one card, with full details of training, experience and qualifications and when they were completed, stored on a central database."

"A refresher course is normally all that is required. Some things like gas and electricity qualifications have a more in-depth renewal procedure."

"The key part is that the occupation that they have got the card in is the same occupation that they are continuing to demonstrate competence in. So many people have the wrong card."

Well over eight out of ten respondents think that it should be possible for issuing authorities to be able to revoke cards or certification under certain circumstances (Fig 13).

Figure 13: Ability to revoke cards or certification
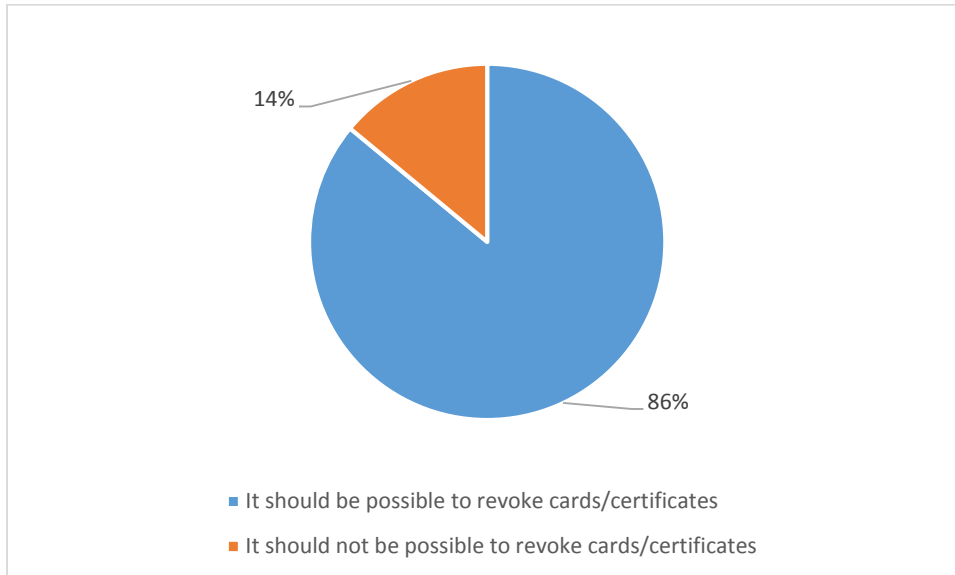
The potential for revocation was strongly supported by larger companies but around three-quarters of respondents from smaller firms also supported the idea.

Table 1: Ability to revoke cards (by respondent co. size/employees)

	1-9	10-24	25-49	50-249	250+
Yes	75%	90%	61.5%	93%	90%
No	25%	10%	38.5%	7%	10%

Respondents to the text-response elements of the questions take issues such as the following very seriously:

- gross misconduct,
- negligence,
- serious breaches of health and safety,
- criminal offences such as fraud and misuse of alcohol and drugs,
- consistently poor accident record or recurrent 'near-misses',
- deliberate failure to follow or comply with working practices, company procedures and regulations, and,
- proven occupational incompetence.

All of these were supported as circumstances where an individual may have his or her card revoked. One employer pointed out that companies will have disciplinary policies and protocols in place to deal with such scenarios in the first instance and that card revocation may be one result.

And, there is also the point to note that the impact by a scheme on an individual, of which the outcome in effect is a removal of their ability to get work, has significant implications for the individual.

The circumstances regarded as sufficient to justify card revocation largely revolve around behavioural and performance factors. The most commonly cited concern was with breaches of health and safety on site or procedures governing safety critical activities.

It was suggested by many that incidents should be investigated by independent inspectors or, in the case of criminal negligence, subject to a tribunal or legal action. One employer proposed the establishment of a central board which could review circumstances and revoke cards in certain circumstances which had been thoroughly examined, subject to an appeals process.

"Significant breaches of health and safety relating to the job role - if they have done this they should have to be retrained formally then perhaps they would take the issue more seriously."

"Only in the event of serious Health & Safety breaches, but could be a Traffic Light System? Green for a warning, Amber for a repeat of the Health & Safety infringement, Red for final warning prior to revocation of the card(s)."

"During assessments, if it is found that the employee is regularly cutting corners in the health/safety when using equipment, employers should have the right to be able to write back to supplier informing them they have a problem. If the card/certificate is revoked, the employee should have to start from scratch. This severity is because these staff members could be a liability; if they are moved owing to TUPE (for example) as a competent employee but they're not, this reflects very badly upon the business and could be dangerous."

"It's more an issue that they should not be 'passed' in the first place. The test criteria should be stricter. Comes down to quality of assessor."

A number of respondents mentioned in the text responses that they believe that there are too many cards being used in the construction industry. They argue that the perceived proliferation of cards has complicated the picture and led to confusion amongst the workforce as to what is appropriate, required or desirable in their profession. Some respondents reported dealing with as many as 40

card suppliers and "hundreds" of cards, and a number felt unable to quantify exactly how many cards their company uses[51].

There is recognition that it would be valuable for a card to capture as much as it can in terms of training, skills, experience, qualifications, job history, and trade-specific skills such as how to operate a crane or plant equipment (although respondents are divided on whether behaviours can or should be included).

It was argued by a few that a card cannot 'evidence' competence, nor assess trade qualifications, but can provide information upon which sound judgements can be made about an individual's suitability to operate on site.

"If we could have a card that held their training courses, differentiators between experience, and health checks, that would be sufficient. Make it simple by mandating it. Cards don't currently evidence job-related skills or experience, nor behaviours and attitude."

"There should be one card with everything attached to that card - occupational skills, site induction, as much as possible on that card. None of those things will prove competence - they will give information and proof they have attained this and attended that. Card schemes are extremely relevant to our industry, the card gets them on site and the supervisor will assess the competence on the day. However, cards are not there to prove competence."

On the value of cards as evidence of competence one employer commented:

"An operative who has operated a piece of equipment solidly for five years within the bounds of a card scheme does not become incompetent just because his card has expired. Equally an individual who holds a card but does not use the skill is not competent."

4.2 In-Depth Interviews

In parallel with the online survey we spoke in-depth to over thirty stakeholders and fifty employers utilising a structured script which ensured that all topics were addressed with all participants (while leaving the subjects open-ended in order to permit respondents to discuss any related issues which they regarded as important). Two workshops were also held at which attendees contributed a great deal of valuable input on the topics.

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[51] Specific schemes cited include: CSCS, CPCS, CISRS, Gas Safe, ECCS, NPORS, PASMA, JIB, ACS gas scheme, PAL (Powered Access Licence), CCDO, SMSTS, EUSR, IOSH, Thames Water Safety passport, Asbestos card, StreetWorks, and schemes specific to the utilities, civil engineering, national highway, rail, and traffic management.

There was near unanimity amongst respondents as to the need for a framework of competence. With a couple of exceptions all participants felt a framework was desirable, and necessary in its aim to benefit industry. Those responses that were positive about the concept, differed only in the detail of what individuals felt will be appropriate.

Within that context we asked respondents first whether they felt it is important for any framework of competence for the UK construction industry to specify the components of "competence."

4.2.1 Components of Competence

Most people feel that a specification of components is essential and for a number of reasons including:

- Explicitly expanding the idea of competence to include more than just knowledge and skills;
- Helping large proportions of the industry to understand the wider definition of what competence represents;
- Providing a huge step forward for the industry in establishing clarity;
- Helping smaller businesses perhaps to understand the concept following the removal of the ACoP within CDM which specified what competence is.

Other components cited include: common sense, influencing, recognising the limits of one's own skills and knowledge, sound judgement, critical thought and being engaged with the work.

All stakeholders agree that continuous improvement is critical to maintaining competence although there is a diversity of opinion on what constitutes *credible* CPD in this context.

4.2.2 Individual Competence and Organisational Capability

The majority of participants distinguish clearly between individual and organisational competence and HSE, of course, refers to this in the context of the current CDM 2007 regulations*.*

However, participants and respondents agreed that few in the industry could actually tell you what organisational competence means except in terms of training the workforce and its ensuring health and safety.

A fuller and more comprehensive understanding of what organisational and managerial competence means is necessary with a clearly-perceived need for the education of the sector in this respect[52].

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[52] Participants pointed, for example, to the issues of managerial communications and ergonomics as areas which were largely unknown or unacknowledged.

The definition for competence as stated in the BS 8454:2006 (*see section 3.7[53]*) is an excellent reminder of the importance of organisational capability in that the individual is not an island.

4.2.3 Development of Competence

Some stakeholders and interviewees referred to *The Four Stages of Learning* as providing a sound model for learning and for the conceptualisation of competence within the industry. It suggests that individuals are initially unaware of how little they know, or unconscious of their incompetence.

As they recognize their incompetence, they consciously acquire a skill, then consciously use it.

Eventually, the skill can be utilized without it being consciously thought through: the individual is said to have then acquired unconscious competence.

- Unconscious incompetence
- Conscious incompetence
- Conscious competence
- Unconscious competence

One suggestion from the workshop was that the *Strategic Forum Plant Safety Group's* flow-chart would be useful to employers to help them with developing competence and the avoidance of too much reliance on the need for cards:

employers' responsibility develops through the process of developing the competence of the individual:
- *Recruiting the right individual*
- *Initial training and assessment*
- *Developing competence (clear responsibility to manage this is with employers)*
- *Lifelong learning[54]*

4.2.3.1 Human factors

Respondents were strongly in favour of human factors being explicitly included in any framework of competence for the sector. Several suggested avoiding the use of the term *behavioural safety* as they regard it as having been widely misinterpreted[55].

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[53] …a competent person being one who can demonstrate that they have sufficient professional or technical training, knowledge, actual experience and authority…. (where authority means delegated authority to the individual by his employer to carry out a certain function or duty).

[54] Competence to Operate Construction Plant; (2014); Strategic Forum's Good Practice Guide- see www.cpa.uk.net/sfpsg

[55] For some background on the concern about the term behavioural safety and why it is used with caution in some quarters see here: http://www.unitetheunion.org/unite-at-work/informationresources/healthsafetyresources/behaviouralsafety/

Behaviours are generally seen as an important aspect but many stakeholders feel that behaviours are difficult to measure, difficult (and sometimes undesirable) to evidence via a card, and potentially dangerous to prescribe standards for.

A number of respondents agreed that communication skills should form part of this skill/behavioural attributes set.

One stakeholder informed us that their organisation is currently commissioning research looking at competence from the angle of human factors. The research will be looking at behavioural aspects and human factors in working at height.

4.2.4 Measuring and Evidencing Competence

Overall, stakeholders feel that testing and assessment of practical knowledge and skills is critical to maintaining workforce competence.

Many argued that human factors were capable of being measured and evidenced through such interventions as interviews, touch-screen tests, appraisals, site visits, observations, etc.

Amongst the most-preferred methods of measuring competence were:

- NVQs (which sharply divided respondents who were either very supportive of them or felt they were not suitable at all],
- industry-recognised training,
- knowledge examinations and tests,
- familiarisation training,
- inspections of work carried out,
- refresher training, and
- validated records of experience.

A number of the stakeholders feel that a development utilising digital technology would be beneficial to the industry. Current examples (which in the future may mean many different forms currently unknown) could be a chip and pin, or an App on a smart phone, or a matrix barcode (QR) on a card) which could act as a means to portray a mini-CV, providing secure and verifiable evidence of competence. However, opinion was divided on whether that could or should include behavioural aspects (as being too reliant on subjective assessment).

A couple of participants argued that any new approach to the evidencing of competence should contain sanctions – i.e. the potential to rescind or revoke cards under defined circumstances.

One stakeholder informed us that they are currently developing a tool to record competence via the use of Mobile Apps which allow the user to take a photo of their work while automatically logging

the time and date, and plotting via GPS their location. This method might be used to demonstrate ongoing experience and competent work but, clearly, there would need to be some method of verifying that the work is that of the individual concerned.

4.2.5 Supervision

The majority of research participants feel that the role of the supervisor in the construction workplace is absolutely critical and that there may exist a skills deficit across the industry in this area – particularly pertaining to Maths/English/ICT, communication and leadership skills.

One stakeholder told us that:

a supervisor must know good practice and must be able identify bad practice. Interpersonal, mentoring and communication skills are key to identifying hazards and supervisory competence ... Supervisors must embody this message and lead by example. They must be prepared to intervene (need to be robust) if they think work is not safe.

Some point to a need for a Supervisor standard or specification that clarifies supervisor competences, given the huge spectrum of responsibility from 'ganger' to team leader with highly developed skills.

In some sectors, eg glazing and window-fitting, work tends to be undertaken in pairings, but even here it is expected that if one member of a pair is relatively new to the industry, they will be paired with another with more experience who can provide support and advice.

Stakeholders identified a broad skillset required for supervisory staff including: communication, interpersonal, influencing, leadership, man-management, budget and contract knowledge, mentoring skills and advanced health and safety awareness.

A number mentioned both the *Site Supervisor's Safety Training Scheme (SSSTS)* for supervisors and the *Site Management Safety Training Scheme (SMSTS)* which they feel should be recognised as being part of the broader picture. There was also some comment on the fact that both appear to be heavily safety-oriented and cover person-management, human factors and mentoring, etc., to only a very limited extent. This is more fully discussed in section 5 in discussing the findings.

There is also some feeling that supervisory courses which adequately test/assess participants after the course are much more valuable. In this respect, respondents feel that the industry should be helped with understanding how to establish and evaluate such courses in order to ensure wider and deeper supervisory competence.

4.2.6 Overarching Framework

The workshops and stakeholder interviews were the main avenues for discussing this. The main workshop (17 attendees + CITB staff) was largely, but not conclusively, supportive of the concept of an overarching framework. The discussion was not without its caveats, caution and some nervousness about its intent and interpretation and conversation always led onto certification/card schemes.

Those that agreed with the idea of a framework felt that it should not be prescriptive, exclusive, should not duplicate other work or existing standards, but should be broad and applicable to all parts of the UK construction industry. The focus should be on principles, not on detailed qualifications and "occupational competences".

We asked the industry participants what they felt might be the main purposes and constituents of an overarching framework of competence.

The discussions on this subject were extremely positive. Participants pointed to a number of issues which they feel an overarching framework might draw into general debate and begin to address for the sector as a whole.

There was general agreement that certain parts of the industry tend to place "blind faith" in cards as <u>proof</u> of competence – with the result that, often, no further assessment will take place. These participants feel that cards should be the starting point of an assessment about competence, not the end point. There was wide agreement that there would be great value in re-educating the industry as a whole about what cards can do and their limitations. A recent example from *Construction Management* illustrates these concerns over confusion as to the role of cards:

> *One recent thread on the HSE's own online forum began when an HR manager asked whether site staff with a CSCS Gold Supervisors Card needed to renew their SMSTS "ticket". Responses covered various interpretations of the legal status of both qualifications, but no one could give her a direct answer. Behind the question lay a general lack of clarity over cards' status, and a lack of mutual recognition between schemes. That uncertainty – among clients and construction employers – in turn leads to a costly and inefficient "get 'em all" approach.[56]*

A small number of stakeholders oppose the idea of an overarching framework - for two main reasons:

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[56] Construction Management; July 2013

1. They are sceptical about firstly the purpose and benefits in establishing any such framework.

We do not accept the logic of the apparent conclusion of Pye Tait's previous report that the issues of competence will be resolved by an overarching framework. They will not be. We do not accept the principle of a brand.

2. They believe that there are alternative mechanisms which will attain the same end: specifically (a) something based on the British Standard BS 8454:2006, referred to earlier, which is purely about training for systems and equipment for work at height; or (b) something akin to RoSPA's National Core Competency Benchmark (NCCB) for which the underpinning theory is that it will enable qualifications and training to be mapped and compared on a pan-industry scale[57].

This latter appears to be a solid concept in principle, not unlike one of the main messages referenced in the *Routes to Competence* report. It requires consistency of approaches in the mapping and continual industry-wide support for these goals to be achieved. However, there was very little reference made to the NCCB by other respondents within the research in any of the research methods.

4.2.6.1 A Framework and the Certification schemes

A major subject of discussion in both interviews and workshops was that of the way in which existing certification schemes would relate to the framework.

One way put forward as to how this might work is the recognition of a single "authority" which would coordinate and manage all certification schemes to ensure a standardised approach to what they are "evidencing". This does not, however, mean a single card. The system would operate with all existing cards and schemes managed and operated by their existing issuing bodies. However a central authority would establish a system (see indicative Protocol in section 7) which would move quickly towards "chip and pin" cards and would gradually shepherd the system to a common framework of evidence on each card to ensure – perhaps within five years – that all genuinely evidence components of 'competence' as well as many other relevant metrics for individuals.

All bar one of the workshop participants were positive about this prospect. A few people had mixed feelings: either scepticism as to whether such a thing could work, and what it would mean in practice, or concern as to the status and future of their own cards with specific audiences (many global and wider than the construction industry) and specific purposes.

There was also much discussion as to who would run or oversee any resulting framework.

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[57] The NCCB was launched in May 2010 and permits education and training courses to be found for a wide range of safety-related job roles.

Others pointed to the fact that some cards had higher standards or more demanding requirements than others, while a few raised the fact that their own sub-sectors (e.g. electricians) already possess different ways of ensuring competence in all operatives (e.g. separate skills tests and assessments).

While there is general agreement that a framework would be valuable, opinion was mixed as to whether any top-level authority would need to be independent or whether the role could be performed by an existing construction-wide body, such as CITB. Those who want an independent body argue that the scheme or system has to be something that everyone can sign up to without fear of potential hidden agendas.

Supporters of an existing body tended to argue that this approach would be more cost-effective. Several argued that the body should be tasked to raise levels of competence as well as promulgate and promote the components of competence.

4.2.6.2 Criteria for the Framework:

Both workshop attendees and interviewees discussed the criteria which might underpin any framework. Some of their key comments are given below under the component parts:

➢ Skills and knowledge (job related)

The criteria might focus on whether there is a nationally-recognised qualification, or course that requires testing, not just a certificate of attendance. N/SVQs were not always regarded as sufficient proof of having attained a suitable level of skill and knowledge.

Many stakeholders regard formal education or training (with accompanying formal assessment) as essential.

Having said that, most respondents believe that the definition of education and training should be widened to include all training and education as long as it is adequately delivered and rigorously assessed and tested.

It was agreed that this heading includes both "technical" – job-related skills and knowledge as well as "non-technical" skills and knowledge – ie functional skills and particularly maths and English;

➢ Health & safety skills and knowledge

Participants see this subject area as being one that should be fully integrated with all education and training so that trainees and employees see it as part and parcel of their lives. Several argued that – in addition to widening the industry's general understanding of competence, this

work should be about widening its understanding of health and safety, too, to include occupational health or, in common parlance, general health and well-being.

➢ Human Factors

These are regarded in a broad sense as including such attributes as 'readiness to work', good attitude to work (work ethic), situational awareness, self-awareness, risk awareness', communication, and so on.

The respondents and participants were largely wary of the means by which human factors could be taught and assessed but many see the work, in this area, of some of the industry's larger companies as solid examples of how things might be managed effectively by companies of any size.

It was pointed out during the discussions that several large-scale projects had been extremely successful in integrating human factors elements and with great success (e.g. the DWP projects, the Olympics (see section 5.2.2), and Cross-Rail).

➢ Continuous refreshing and improvement

Most regard this as a fundamental requirement of any industry framework – something that will underline the need for this at all levels and in all sectors for the future.

➢ Experience

Experience is regarded as extremely valuable; an element that not just this industry but many others rely on to some extent for the selection and recruitment of personnel. Research participants recognise that "experience" can be problematic in terms of evidence. It was suggested that experience might be captured through validated records of specific experience – although many saw the problems of identifying who might be permitted to validate the records and how the records could be checked.

4.2.7 Information, Instruction, Training and Supervision (IITS)

In the context of examining potential components of competence, the study also sought to understand how industry uses and defines the terms "information, instruction, training and supervision" as referred to, specifically, in the Health and Safety At Work etc Act (1974) – known as HASAW - an extract of which refers to the general duties of employers to their employees:

the provision of such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of his (sic) employees;

Stakeholders and employers were asked about the terms for this research. However, it is worthy to note that an HSE consultation, documenting proposals for a replacement to CDM 2007, ran at the same time as this research[58]. There is the possibility that a connection was made in respondents' minds between the reference to IITS in that separate consultation and the prospect of 'tailored guidance' for SMEs also talked about in the HSE consultation document.[59]

The majority of stakeholders in this research did not attempt to define or describe the terms but a small proportion did say the terms are vague and warrant clarification and guidance from the HSE.

It was pointed out that some parts of the sector, and particularly SMEs, may lack the resources to fully understand HSE's requirements and that clear guidance which is both relevant and universal is warranted to benefit industry overall. Given the proposed change to remove the reference to competence when replacing CDM 2007, respondents expressed concern about a possible danger that employers will determine these meanings to suit their own needs. One did however point out that there is nothing new in the phrase, explaining that it has been present in legislation ever since the HASWA (but not present in the CDM 2007). They saw it as the model for industry. Another respondent went as far as to explain that '*instruction/information defines the way work is to be done, training indicates physically showing this and supervision is being the team leader who will supervise that it is done in the pre-ordained method*'.

The survey asked respondents to rate their confidence in their understanding of each of the terms: the average rating was over 8 (out of 10 where 1 was no confidence and 10 total confidence) for all four, with training and supervision ranking marginally higher than information and instruction.

There is recognition that requirements will vary from project to project and what constitutes <u>sufficient</u> information, instruction, training and adequate supervision may be dependent upon the client in each case. One stakeholder was sceptical as to the amount of training being carried out as the industry emerges from the recession, regardless of its inclusion in legislation.

However, no-one in this study expressly referenced, for example, method statements or risk assessments in the context of providing information and instructions to employees. Although clearly of relevance to both individual competence and organisation capability, and that, for example, the ability to interpret the instruction is part of competence – such points did not emerge or be reinforced within the survey or interviews.

There is little doubt employers could 'define' the terms if pushed, but having been accustomed to a certain level of specificity within Appendix 4 and the ACoP in CDM 2007, there is an expectation that the HSE will provide definitions and explanations in order to ensure common understanding and

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[58] In which it stated 'competence: – The concept of competence remains central to the rationale behind the proposed new Regulations, but a general requirement for information, instruction, training and supervision is proposed in place of a separate regulation on competence'
[59] See http://www.hse.gov.uk/consult/condocs/cd261.htm

clarify a possible vagueness, particularly for the terms information and instruction. A greater understanding may lead to a more risk-based approach to risk control.

Web references to these terms in the context of health and safety almost always focus on the terms training and supervision rather than information and instruction which seem to be subsumed. Close supervision is related to instruction and people have explained in the context of competence how often there is an inverse proportion between close supervision and how much instruction is required.

Similarly one could argue that instruction and information are part and parcel of good training and supervision; clearly good supervision complements the provision of information, instruction and training in the effective development and implementation of a company's health and safety policy[60].

Our research findings, which prompted very little in the way of definitions and examples of usage, concluded more could be done to help industry with the terms information and instruction and their importance. Further research to identify a greater level of granularity in the current treatment and understanding of the individual components of IITS would be very valuable: i.e. to examine how the requirements are being met by investigating industry's understanding of these items, how they are currently being interpreted and addressed within their systems.

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[60] HSG 65 Successful Health and Safety Management

5. Discussing the Findings

Drawing on the interviews and survey undertaken as well as the literature review the discussion of competence in a construction context can best be considered in three separate segments related to how it is defined, how it is developed, and how it is evidenced.

5.1 The Scope of the Sector

In competence terms it is important to understand fully what we mean by the "UK construction sector".

It is usually defined in terms of the type of work carried out - large scale building and engineering, commercial building, heritage work, domestic building, building services engineering, etc., and then by the "trades" involved and the individual skills required.

One type of work tends to be omitted from most considerations. Not because it does not form part of the competence frameworks for occupational purposes but because the way in which health and safety regulations have developed has tended to exclude it from most discussions. The type of work is small-scale domestic work; usually carried out by individual trades-people or specialist firms that generally, by their very nature, tend to be small scale in operation.

Some of the work - e.g. electrical and gas - is already strictly regulated but, for the most part (and excluding projects where the CDM regulations apply), it is still an unregulated segment in which competence is a major issue.

Individual householders have no effective way of knowing whether an operative is a highly qualified and competent person or merely a "cowboy" with minimum competence and a glib tongue. This situation has led to a number of high profile issues (even death) which were addressed by a recent unpublished report into the potential for licensing of domestic contractors[61].

The report looked in detail at a number of international comparator nations and their approach to the licensing of contractors and the regulation of domestic work. It concluded that such work should be licensed and recommended an approach similar to that used in some US States for the licensing of firms and individuals.

Cards are sometimes held by domestic contractors - to enable them to access and operate on larger sites and projects - but not all carry them and, in any case, the system is so complex that

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[61] BIS (2014); International Review of Licensing of Domestic Contractors; Pye Tait Consulting for BIS.

householders would not necessarily be able to understand what the card meant, and there is the danger that cards would be even more closely interpreted as being evidence of competence.

It would be worthwhile the industry considering, however, a system which begins to draw into the competence framework ALL operatives in the industry regardless of what part of the industry in which they work.

5.2 Defining Competence in Construction

A person is competent when they can undertake their job-role un-supervised and safely to produce work of the required (or higher) standard.

The Health & Safety Executive has laid out its own strategy for health and safety competence in construction (see Appendix 2 and the HSE website[62]) but it must be reiterated that this current study is about the wider subject of competence and is not primarily focused on its health and safety aspects.

There are a number of ways of looking at the overall constituents of competence and different sectors have adopted slightly different terminology and some have considered it useful to develop different acronyms as a way for people to remember the broad components of competence. However, they also carry the disadvantage of sometimes oversimplifying or even confusing the situation by attempting to "fit" the components into acronym-convenient categories. Just two examples of current acronyms are "SEKA" and "SKATE" – the first referring to *Skills, Experience, Knowledge, and Attitudes*, the latter standing for *Skills, Knowledge, Attributes, Training, and Experience.*

As demonstrated by the survey and stakeholder interviews there is unanimity throughout the construction sector that competence is founded upon knowledge and skills (both job related and health and safety) so, below, we discuss, briefly, those elements of competence which are less well-understood– experience, human factors and organisational/managerial capability, or which are critical to the operation of competence – effective management and supervision.

5.2.1 Experience

Of these proposed components "experience" per se stands out as the most difficult to understand and measure. It can be shown that experience, in anything from basketball to driving, and from waitressing to brick-laying, has the *potential* to enhance competence. However, "experience" often boils down to the passage of time: "x" years in this job role, and "y" years in another.

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[62] http://www.hse.gov.uk/aboutus/strategiesandplans/sector-strategies/construction.htm

Beyond that, experience, is extremely difficult to quantify and measure. Experience can work in very different ways. It can improve work-skills, and enhance knowledge and behaviours, but it can also develop and cement bad-habits (one of the prime reasons, for example, given by supporters of regular re-testing of even highly experienced drivers).

An operative with ten years' experience during which they have absorbed and applied little would almost certainly be less preferable to an employer than one who had qualified with good qualifications but had less experience.

What we really mean by experience when referring to it as being a component of competence is the way in which regular application of a skill and the regular observation of highly skilled colleagues has the *potential* to teach one something new about one's occupation or craft.

Experience is, in fact, one mechanism for continuous improvement - the acquisition of new or enhanced knowledge and skills. But even when positive and constructive it is still extremely difficult to measure and verify. If a new applicant presents evidence of having completed (say) five years with one relevant employer and another five with another, in relevant job roles and with equivalent equipment, can that be counted as evidence of competence through experience?

For the vast majority of employers the answer would be no. The interviewer would need to have far more detail and – almost certainly – would want to check everything with the previous employers. And even then our research for this report shows that a good number of employers would want to put the employee through practical tests and observations.

For the modern construction industry competence comprises:

- job-related skills and knowledge;
- relevant health and safety skills and knowledge;
- human factors;
- continuous improvement; and,
- positively received experience.

It is possible, of course, that industry "chip and pin'' cards could contain a simple list of work experience (role, length of time, company, etc) plus both name, company, address, telephone and email addresses for "reference contacts". Employers who validate this experience through referees could then annotate the cards accordingly thus building up a simple form of validated experience for each individual.

5.2.2 Human Factors

Where human factors are concerned we looked at a number of examples of the ways in which they have been/are being addressed in the UK construction sector as well our own knowledge and experience of their use in other sectors. For the recent Olympic Games infrastructure work the ODA and HSE researched and developed a number of reports, three of which specifically focus on communications, behavioural training and "safe culture". They make a number of relevant points from which we have identified the following:

In examining the safety climate during the construction of London 2012, the Health and Safety Laboratory found an appreciation of human factors integrated into project-wide measures. Risk assessments were based on a structured process, with involvement from appropriately experienced workers who were familiar with the work tasks being assessed. Workers had a clear understanding of risk assessments and method statements and additional training was offered in behavioural and risk assessment documentation.

The research particularly identified good practice in terms of raising and maintaining situational awareness in the workforce. This was achieved by involving workers in discussions around risk assessments, method statements and other documentation, and the results and the documents were used as the basis for daily briefings to maintain high situational awareness. Engagement with health and safety was reinforced by the development of a variety of reporting methods. The report recommended that construction companies in the UK follow this example and

"*consider ways of refreshing the methods adopted to keep their importance at the forefront of workers' minds*."

Contractors and suppliers working on the construction of London 2012 were required to have a behavioural safety management system in place. Worker involvement measures across the project as a whole were supported by a range of behavioural safety initiatives. These initiatives sought to engage workers with health and safety and make safety personal to them through dialogue and discussion about incidents and accidents. Specific initiatives included a mandatory behavioural safety course for supervisors designed to improve their communication skills and ability to engage the workforce, behaviour-based safety orientation for new starters and schemes to recognise positive health and safety behaviour through low-cost incentives. Lucy et al (2011) identified the importance of company leadership in

"… *demonstrating appropriate behaviours, and the organisation of work to encourage problem solving and participation by employee*s.

Their findings highlighted the importance of supervisor competence, particularly the development of effective communication skills, and engaging with the workforce on site.

The HSE report emphasised the contribution of leadership and worker involvement practices to the impressive health and safety performance of the London 2012 construction programme; especially the range of initiatives and approaches utilised and their impact on attitudes and behaviours. The research found that the supervisors' communication skills were:

"*widely recognised as key to the delivery of effective daily briefings to the workforce and the encouragement of feedback from the workforce*."

Daily briefings were an important method of disseminating to the operative workforce of key information about procedures, standards, and health and safety messages, as well as receiving and sending feedback back up the management chain. The 'up-and-down' dialogue depended on supervisors who were competent in

- written and verbal communication,
- building trust,
- remaining impartial,
- listening and understanding others, and
- who had a positive approach and attitude to their duties.

Effective communication both up and down the chain of command throughout all levels of the supply chain was felt to be a significant contributory factor to ensuring a high quality and safe working environment during the construction of London 2012.

Lucy et al (2011) pointed to induction, daily oral briefings, toolbox talks, meetings, posters, safety alerts, anonymous near-miss reporting, and constant reinforcement as being of prime importance.

"*… comprehensive induction and re-induction ensured key messages were conveyed and reinforced; and using example accidents or incidents from elsewhere in the industry helped ensure that lessons could be learnt*."

Moreover, the research found that generally workers were more inclined to participate in informal communication (e.g. face-to-face, oral, pre-start meetings, informal conversations with management, etc.), rather than written or more formal methods (e.g. feedback cards and suggestion forms).

5.2.3 Management and Supervision

The good experience of the London Olympics reinforces the distinctiveness and purpose of management and supervisors' roles: it is management's responsibility to decide on appropriate levels of supervision, the amount being contingent on the level of risk of the work/tasks and the competence of employees in their ability to identify and handle them. Effective leaders and line

managers should know the risks their organisations face and be able to rank them in order of importance and action required.

Fundamentally, in the context of competence, evidencing competence and whether or not ''smart'' cards presenting enhanced data are used as the portfolio of evidence – it is a management process – ie a manager or the supervisor with that responsibility – should not, on a day to day basis, rely solely on a card as being the only evidence needed. The ultimate responsibility for complying with the employer's legal duties cannot be delegated. It is therefore down to management to ensure those exercising discretion and judgement on the day are competent to do so.

The Site Supervisor's Safety Training Scheme (SSSTS) is one of the key courses for supervisors with direct responsibility for work activities and work of their teams.   The Site Management Safety Training Scheme (SMSTS) is more for those with responsibility for organising the site and with less direct interaction with operatives on a daily basis. Both courses are experiencing an upsurge in take-up, perhaps for the most part due to the UK Contractors Group (UKCG) training standard announced a few years ago, around the time of the Routes to Competence research which highlighted the need for a greater focus on support for supervisors. The UKCG requires anyone on a UKCG site to have SMSTS (Managers) – a five day course, or the SSSTS (Supervisors) - a two day course – and the most popular of all three courses, or the 1 day Health and Safety Awareness course for operatives by the end of 2014[63].

These, and their equivalences as identified by UKCG, would be excellent examples of courses that could embrace those wider components of competence as discussed in this report, most particularly human factors - self-awareness, situational awareness and communications as well as risk awareness not just within the course content but within their assessment.

A number of stakeholders and employees/ees suggested that currently these courses are health and safety focussed, but more needs to be done to help supervisors with person-management skills, coaching and mentoring skills. For that purpose many companies have turned to those bodies, such as ILM, to develop bespoke courses in this area.

5.2.4 Nudge Theory

In line with the report by Professor Löfstedt- 'Reclaiming health and safety for all' and its focus on reducing bureaucracy within health and safety legislation and his highlight on the importance of communications, so-called "Nudge Theory" has recently been embraced by the UK Government[64] but it is not new.

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[63] http://www.ukcg.org.uk/fileadmin/clients/UKCG/document/health-and-safety/UKCG_HS_Training_Standard_11th_July_2014_3.pdf
[64] In 2010, the Coalition Government established up the "Behavioural Insights Team" [a.k.a the 'nudge unit'] to apply nudge theory to try to advance policy goals and save public money.

Nudge theory has its origins in social psychology, behavioural science and economics. It argues that positive reinforcement and indirect suggestions (or 'light-touch interventions') to try to achieve non-forced compliance can influence the motives, incentives and decision making of groups and individuals alike, at least as effectively – if not more effectively - than direct instruction, legislation, or enforcement.

The 'nudge' was originally defined by Richard Thaler and Cass Sunstein as:

"A nudge, as we will use the term, is any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting fruit at eye level counts as a nudge. Banning junk food does not."

Jennifer Lunt and Malcolm Staves detailed the concept in the Safety and Health Practitioner magazine (SHP) in 2011[65], and, following further work by Dr Tim Marsh, the concept grew popular in safety, health & environment (SHE) management culture. They described a 'nudge' as any feature of a person's context that 'nudges' them to behave in a predictable way – eg, healthy lifestyle campaigns, providing free fruit at work, colour-coding equipment that should not be touched, etc. Jennifer Lunt followed the article with a speech at the 6th Annual HSE Excellence Europe Conference entitled '*Applying nudge to behavioural safety: A way forward'[66]*

Lunt and Staves argue that, because nudges operate at the sub-conscious level, nudging can help reduce human error in the workplace. The authors encourage health and safety professionals not to ignore the potential of using nudges, since they are low-cost, practical and easy to understand. The approach is potentially appealing to employers because it is intuitive, low-cost, and does not require coercion or formal regulation.

They argue that SHE professionals are already employing nudges and choice architecture to tap into automatic decision-making processes and that what the construction industry needs is the conscious integration of choice architecture and nudges in the design of future health and safety initiatives. The authors admit that nudging is more applicable to one-off behaviours than more complex chains of actions, eg, nudging a construction worker to wear a hard hat is easier than nudging safe scaffolding assembly, and they recognise that nudging is less effective against 'deliberate violation' for which a different approach is required, based on 'think' principles. Ultimately, the authors argue for an integrated approach of 'nudge, think and shove (legal mandates for compliance)' to effect lasting improvements in health and safety.

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[65] http://www.shponline.co.uk/features/features/full/cpd-article-nudge-nudge-think-think

[66] Lunt, Jennifer; (2012); *Applying Nudge to Behavioural Safety: A Way Forward*; paper to 6thAnnual HSE Excellence Europe; 17th May 2012; Jennifer Lunt, Principal Psychologist, Health and Safety Laboratory, United Kingdom

We would argue – as an extension of these approaches that nudge theory might well have value across the whole field of competence and not only for health and safety matters. Some further background is provided in Appendix 4.

Dr Mohamed Abdel-Wahab[67] was kind enough to point us towards two articles on project management with behavioural connotations[68], both of which support the contention that project managers in construction require a range of behavioural attributes but that most of these are generic and apply pretty much across the industrial and commercial spectrum.

The 2004 publication identified 12 core behavioural competences underpinning effective project management performance, such as 'composure' and 'team leadership', and produced a framework based on these. The authors argue that the framework of twelve behavioural competences

"offers an innovative alternative to normative micro-competence-based approaches that do little to engender performance excellence amongst the industry's key managers and professionals."

5.2.5 Organisational Capability

Organisational capability or competence is, perhaps, one of the most important but least precise concepts in any consideration of competence. It can be approached from a number of perspectives - project management, technology management, marketing, workforce skills, health and safety, etc., and each delivers a different definition and a different set of components.

In the context of this report we have opted to use the term "organisational capability". This avoids the confusion of "competences" between individuals and companies while retaining the potential for any new framework of competence to explicitly include crucial aspects of organisational contribution to overall competence.

The term requires capability in:

- ergonomics and technology
- policies and procedures
- skills development
- mentoring and support systems

From a health and safety point of view organisational capability represents a mechanism for the identification and control of risks in terms of adequate resources, technical knowledge, procedures, and management arrangements.

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[67] Lecturer in the School of the Built Environment at Heriot Watt University
[68] Cheng, Mei-I, Dainty, Andrew R.J., Moore, David R; *What makes a good project manager?;* Human Resource Management Journal; Volume 15, Issue 1,January 2005
Dainty, Andrew RJ, Cheng, Mei-I, and Moore, David R.; (2004); *A competency-based performance model for construction project managers;* Construction Management and Economics; 2004

Knowledge, skills, health & safety, and human factors comprise INDIVIDUAL competence but the competence of even the most highly expert individual can be undermined if various elements of managerial or organisational competence are lacking.

"*Competence in Construction* "depends very much on managerial and organisational capability without which individual competence can be rendered ineffective.

Companies and management are required to be competent in a number of different ways which support and empower their workforces. These include:

Ergonomics: the careful selection and understanding of the interface between the operative and the equipment he or she must use in the performance of their job role, and the design of the workplace and the flow of work to maximise efficiency and minimise risk.

Environment: the need to understand and manage the environment in which the workforce must operate. This includes consideration of the impact of weather, adverse conditions and difficult internal or building-related environments. The Institute of Ergonomics and Human Factors (IEHF) is of particular relevance here[69].

Policies: ensuring that the whole workforce is supported by well-thought out and clearly presented policies to regulate and smooth the way in which work is conducted.

Communications: the absolutely vital prerequisite of all of the above; clear, precise, accurate, timely, and accessible information and guidance.

The UK HSE also produces a number of excellent toolkits designed to support effective and safe behaviours (for example, the SLAM approach – "Stop – Look – Assess – Manage"). These form part of the "Leadership and Worker Involvement Toolkit" available for download on their website[70].

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[69] The Institute of Ergonomics & Human Factors (IEHF) is a professional organisation in the UK for ergonomists and human factors practitioners. Its major activities include developing the discipline, approving courses, running CPD programmes to promote professional competence, establishing the 'Code of Professional Conduct', maintaining a Professional Register and accrediting practitioners for admission to it, maintaining a separate Consultancy Register to "assess and accredit companies providing ergonomics expertise and services", etc.

[70] See http://www.hse.gov.uk/construction/lwit/info.htm which gives an A-Z list and availability for the Leadership and Worker Involvement Toolkit.

Figure 14: Components of Competence
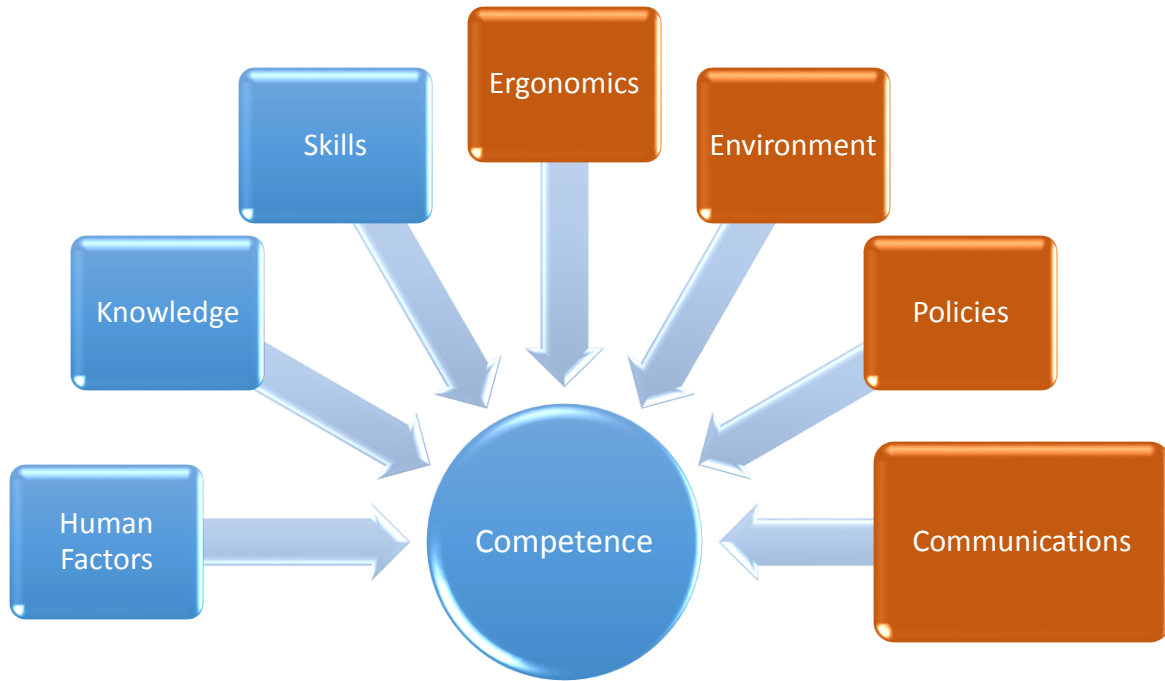
The individual components of competence (coloured blue above) consist of up-to-date, job-related skills, wide and deep knowledge of and around the job-role, and a set of attributes and behaviours such as self-, risk and situational-awareness, personal attributes, personal communication skills and so on which can best be categorised as "human factors".

The managerial contribution to competence includes the elements coloured brown in the diagram above. It is recognised that some are relevant to both – for example 'communications'.

5.3 Developing Competence

Competence is developed in a wide range of ways – indeed the process stretches back to when we are first taught to read, write and manipulate numbers.

Where what we know as "occupational competence" is concerned it is developed in certain school-level introductory courses, through college and university-based formal courses, by work-based training and assessment, via short, very specific training courses, through on-site mentoring and coaching, through "positive" experience and so on.

The development of courses of education and training takes two broad routes:

- "Regulated" – which is where courses leading to qualifications go through an accreditation process in order to be approved so that, in some cases, individuals or employers/providers are able to access public funds, and,

- "Non-regulated" – which are not capable of being supported by public funds and can consist of a wide range of general and specialist courses of varying lengths (including courses which the Skills Funding Agency, in England and Wales, regard as being the responsibility of employers).

Each education and training approach has its advantages and disadvantages. Accredited courses and qualifications are formally "recognised" on a national basis and are based in theory on a common set of standards. They can, however, be somewhat inflexible from an employer's point of view (perhaps including a great deal of material which is not strictly relevant to the job role), and their improvement and amendment can involve complex and lengthy processes.

Non-regulated courses offer the benefit of flexibility and more precise alignment with employment needs. They are also easier and quicker to amend. On the other side of the coin, there can be issues around the standard of training and assessment.

The UK has a whole host of bodies concerned with funding, accrediting and monitoring/inspection including, but not limited to: Ofsted/Estyn/Education Scotland, Ofqual/SQA, and SFA/Skills Development Scotland/Scottish Funding Council/Scottish Government/ Welsh Government, etc.

In addition, while there is a British standard for the delivery of education and training[71] for working at height (although possesses considerable applicability to most education and training delivery) it does have its limitations in that its specific focus is on just the one aspect of competence.

Employers in construction have pointed to a number of issues they feel they face in making best use of the modern education and training system. They include:

- Cost
- Assessment

- Complexity
- Verification

They did not in general refer to specific components, of equal importance but potentially also problematic, these being for example: training needs analysis and identifying training gaps at a very simple or more complex levels.

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[71] *BS 8454* Code of Practice for the delivery of training and education for work at heights and rescue; *2006; confirmed 2011*

5.3.1 Cost of Training

Cost is an issue for a great many employers especially smaller companies but – from interviews – this is a consideration that is more closely related to non-financial costs rather than financial ones. Respondents quoted such costs as time away from work, travel burdens for employees, and convenience.

Perhaps of greater concern for the industry as a whole is that many respondents said that they have training and education needs that are not to do with health and safety, and which go unfilled simply because they require the individual employee to travel (something many refuse or are unwilling to do) or entail the employer doing without a valuable member of staff for anything from a day to a week or more.

As one small to medium-sized employer said to us:

"It's alright the big boys sending staff away on valuable courses and then preaching to us that we should do the same. But the costs are high and – what's worse – we simply can't afford to be without vital members of the team."

5.3.2 Training, Selection and Assessment

Employers seem also to be concerned as to the way in which many courses are assessed. Several respondents to our survey and interviews commented on what they perceived as the lack of rigour in assessment: they quoted "easy" multi-choice tests - ie tests which are apparently not making use of standard multiple choice protocols for setting answers, and superficial questioning by course-providers. Many called for more independent assessment – even for short courses. A few complained about what they see as the waste of time and money should a course not provide substantive improvement in an employee's skills or knowledge.

The actual course content and design appears to be less of an issue. Interviewees said that it is usually possible to find a course that, on paper, offers the right mix of skills and knowledge but several respondents mentioned that they sometimes doubt the capability of the tutors to deliver the material to the appropriate level and quality.

Criteria for selecting training courses and matching the individual doing the training:

- On paper does the course provide the required skills and knowledge?
- Is the length of the course truly appropriate for the material to be taught – is it proportionate?
- Are there references given for other satisfied customers – ideally does the provider have an open "feedback" area of their website permitting all comments and censoring none?
- Is there any way of assessing after the course what the value of it has been to the business (eg ability to take on new contracts; less need for management/supervisory time, etc.)?
- What is the learning potential of the individual in terms of the course skill/knowledge requirements
- Is the course delivery appropriate to the course type (e-learning or face to face)
- What are the abilities/experience and qualities of the trainers

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Criteria regarding assessment:

- Is the assessment process rigorous enough and genuinely testing?
- Is assessment carried out by someone other than the tutor - ideally is it independent?
- Is the assessment of the course proportionate – ie a longer course's assessment should have greater rigour than say a one day course?

5.3.3 Complexity

The interviewees also commented on the complexity of the system – of multiple private and public providers offering similar courses with no genuine way of telling the difference. Many respondents mentioned the "multiplicity of health and safety courses". Not all employers and stakeholders complained about the complexity, however. One said that it was actually no worse than a householder having to choose between a multiplicity of TV sets or washing machines (although it must be said that there are more "comparison sites" online for them to compare these domestic products).

Selecting suitable courses is therefore a major concern. Employers usually know what they want in terms of enhancing an employee's skill/knowledge set but they seem to find it difficult to separate one offer from another.

5.3.4 Verification

The final perceived issue is that of verification. While a few respondents complained as to the difficulty of verifying the results of education and training, many employers seem to operate

planned systems of questioning and in-house testing to ensure that the employees have learned and retained the outputs of their recent courses.

A good number however called for more rigorous assessment by providers so that the burden on employers of verifying the outcomes could be reduced.

Good Practice in Verifying Training Outcomes:

Few people can learn and retain information and skills from a single set of inputs. The tried and tested approach of all good teachers is to repeat the teaching and testing several times – therefore reinforcing retention.

This is almost never possible for the course provider to do this, so employers are recommended – where they do not already do this – to test and reinforce the results of any course of education or instruction:

- Use a skills/knowledge matrix to assess training needs
- Identify the appropriate course to meet any individual needs
- On return verify the inputs were in accordance with the stated course objectives
- Question and test the returned employee using both oral questioning and practical observations (where appropriate)
- Reinforce any elements on which the employee is still uncertain
- Conduct the same exercise two to three weeks later to further reinforce learning and retention.

The best examples from our research were of employers who have developed "skills/knowledge matrices" for their particular types of work. These employers then use these to develop person specifications for recruitment purposes, against which individual – verified – competences can then be plotted to reveal any gaps or training needs.

A further, well-used method for developing and maintaining construction competence is through the mentoring of colleagues and supervisors and this is an area which, while fully recognised by most employers, is made problematic by the perceived skills gaps in the supervisor workforce.

5.4 Evidencing Competence

As highlighted by the *Routes to Competence* report of 2011, evidencing competence is achieved in an almost bewilderingly variety of ways, but – in the construction sector – is mainly by qualifications and certificates, by observations, and through the card and certification systems that have developed over the past decade or so.

Competence is a little like the related concept of "quality". Companies are able to evidence quality in a wide variety of ways – through accreditation to various schemes and standards, etc. – but the final test of quality is when the company delivers a piece of work (usually via the customer reaction to it).

Similarly competence cannot be fully evidenced by any single means. Individuals are able to earn and show a variety of separate pieces of evidence (qualifications, certificates, testimonials, etc) but the litmus test is job performance.

Evidencing Competence

- Formal qualifications (including apprenticeships)
- Certificates of completion of training courses
- Testimonials and references
- Observations
- Cards and certificates

5.4.1 Certification Schemes and Cards

In the UK construction industry "cards" issued by a certification scheme (or a competent person scheme) are not evidence of competence – they are a convenient mechanism for collecting evidence together in one place. Unfortunately a proportion of employers still understands cards as being evidence that the holder of them is competent, all of the time, in a given job role or task.

Most current cards are not of the "smart" ie chip and pin variety. That is employers have to establish for themselves what the holders have to do in order to acquire one. Smart cards – although by no means the latest technology of the kind – offer employers the opportunity to have a full description and a complete set of competence evidence in one convenient place.

There are, at last review, around 40 different card and certification schemes for the UK construction sector and these translate into over 350 different types and levels of card/certificate. In 2011, for the *Routes to Competence* study, and again in 2014 for the present work, we have heard many stakeholders and employers call for a rationalisation and simplification of this system and for a clearer, industry-wide understanding of what the card/certification system actually means (that is, does it "certify" competence, or merely "evidence" elements of it?).

Our research has clearly shown that employers recognise the value of the card/certification system but that they have concerns as to perceived complexity and meaning. A good many told us that they feared that some employers were treating some cards as evidence of competence when that was not their purpose. The primary issues seem to be the perceived complexity of the numbers and types of cards, and a widespread lack of understanding as to what the certificates and their cards mean.

At present, and for the most part, employers have to address – separately - completion certificates; unit certificates; qualifications; personal assessments by senior people (skill/knowledge testimonials); portfolio evidence (e.g. CVs and testimonials); industry cards, etc.). It would seem, therefore, that a more content-rich card system might well add considerable value to employers' consideration of competence by simplifying the evidence process.

It might also aid in the task of persuading employers that cards – in themselves – do not represent competence. They are the portfolios in which evidence of competence is contained.

It would seem that a framework for competence to which these matters, and all matters relating to competence can be referred, presents an opportunity for all -within the construction industry- to surmount these issues and help ultimately perhaps distinguish between the differing purposes of the certification schemes. These benefits and the framework is further discussed in chapter 6.

5.4.2 Renewing Evidence of Competence

The stakeholders and employers we spoke to were largely of the opinion that "competence is not for life", that it has to be refreshed from time to time and that it would benefit the sector were it to be re-assessed as well.

The issue of refreshment and renewal of competence (for example having to take certain assessments again after a stated period) is one that has been addressed in a number of high-risk sectors including nuclear, gas and aviation. For the construction industry it is reflected in the debate as to whether "cards" should be time-limited and revocable.

There is some evidence of relatively high failure rates for applicants pursuing the renewal of a card by a scheme where required, and a number of stakeholders have argued this could point to the need for time limits on cards to be set to "at most three years".

6. Conclusions

6.1 What would a Framework help solve?

The concept of a framework for competence in construction is not an easy one and a number of employers and stakeholders fail to see the need for one. Several respondents pointed to the possibility that the industry could adopt a "comparison" approach such as that piloted by RoSPA, or that British standards could be used to govern what goes into training courses and how they are delivered and assessed.

However none of the proposed approaches fully address the core problems facing the UK construction sector with respect to competence, that:

- there are now hundreds of qualifications and formal courses available to employers and their workforce;
- there are now (possibly) thousands of short courses on the market seeking to meet specific needs for specialist or updating training;
- there is no industry wide understanding of human factors and their crucial role in maintaining a safe and competent workforce;
- supervisory development and training is patchy and largely centred on the larger companies and those belonging to certain trade and professional bodies;
- employers at present have no way of knowing for sure whether an individual is presenting a valid card or certificate;
- many employers assume that cards represent competence, and do not know which cards are more reliable forms of evidence than others;
- there is no way of knowing simply from most cards themselves what elements of competence (or not) have been satisfied by the holder;
- with around 40 certification/competent person schemes and 350 different variations and levels of cards represents a formidable hurdle for employers and, if one considers the 1.5 million employees in the industry, a staggering potential waste of time and money in checking and verifying for individual employees;
- up to the present the vast majority of industry companies see competence in two dimensions - skill and knowledge - with a Health and Safety test – and many see no further than NVQs as the means to develop and evidence these. The vital roles played by human factors and by organisational capability are not widely understood;

Individual companies and trade bodies have developed their own approaches to some of these issues but the industry as a whole - at present - has nothing on which to base an effective and efficient way forward.

The UK construction sector is not only very large but is extremely diverse in terms of both the size of its component companies and the immense range of their specialisms. House building, public sector construction projects, domestic contracting, specialist contracting (demolition, shop-fitting, roofing, etc.), building services engineering, heritage building work, energy-related contracting, professional services, are just a glimpse of the levels of diversity across the sector which do not do more than scratch the surface of the range of different skills and job-roles involved.

This diversity, however, disguises the close connections and commonalities of purpose which characterise an economic "sector". UK construction demonstrated one such commonality of purpose when it came together in the very earliest years of this century to address its problems in the health and safety sphere. The industry has been represented by a single body for education and training for the past half century and CITB has coordinated the development of structured standards and qualifications at all levels and including health and safety at the core of its considerations.

The industry's approach to "competence" has developed over the past thirty-odd years from a fairly simple and mechanical assessment of skills and job-related knowledge through standards and N/SVQs, to the examination and testing of both skills and wider knowledge, and the more extensive focus on health and safety of the late 2000s.

The stakeholders and employers we spoke to and heard from during this research are virtually unanimous in the belief that it is time for the UK construction sector to take another step in this development process, to extend the treatment of the subject to include every step of the road towards individual and organisational competence:

- How it is defined
- How it is developed & measured
- How it is assessed, and
- How it is evidenced

The industry has made it clear that it now wishes to see "competence" delineated and described and that specification used to discuss and describe the ways in which it ought to be developed, assessed and evidenced.

To develop, in other words, a "framework for competence" to which all future activities and developments associated with competence can be referred and upon which all future developments of education and training, assessments and examinations, qualifications, and other evidencing systems should be built.

The "framework" is a means of setting out the philosophy of the UK construction sector regarding competence – a top-level specification, framework, principles, call it what you will, which acts as a guide and blueprint for the future without attempting to tackle the complex issues of specific occupations, sub-sectors, or qualifications.

A Framework for Competence in Construction, should include:

     i.   A Mission Statement – describing why the framework is being set in place
    ii.   The components of competence
   iii.   Developing competence
   iv.   Assessing competence
    v.   Evidencing competence

<u>Mission Statement</u>

The object of the mission statement is to describe why a framework is necessary and what it is intended to achieve:

The framework for competence in UK construction is intended to act as the main guide to creating and maintaining the safest and most competent Construction industry in the world.

Framework
towards the safest and most competent UK industry and construction industry in the world

Individual & Organisational Competence

Components	Development
Evidencing	Measurement
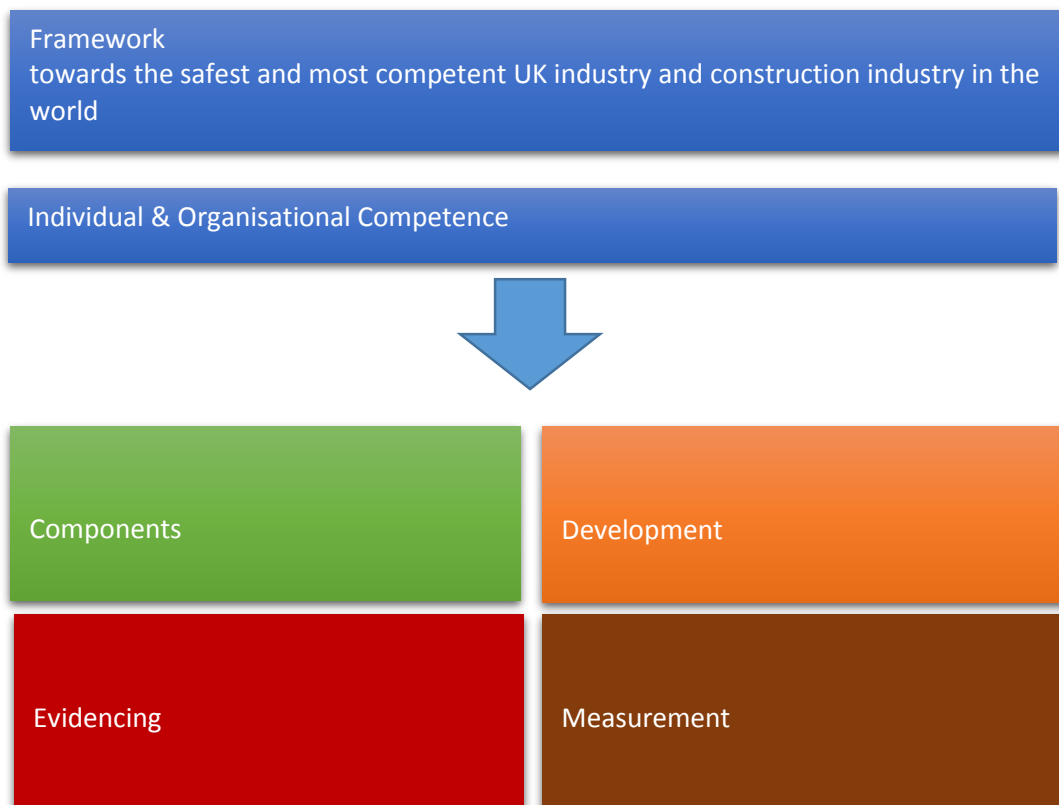
6.2 Principles of the Framework of Competence

The Framework for Competence in Construction will bring a number of benefits.

1. Wider understanding of what makes up competence

2. Wider appreciation of the role of human factors

3. Moves towards a more rational system of certification schemes and their cards which, based on common components in the framework may form a means to recognise certification schemes that assess competence to common standards in a more consistent way

In the first instance our findings indicate that the industry would prefer a flexible and non-prescriptive framework of competence based on a number of principles; these being:

1. That individual competence comprises skills, knowledge and human factors (with experience and CPD forming two of the mechanisms by which knowledge, skills and human factors are developed and honed);

2. That competence in construction is not complete without the inclusion of managerial and organisational capability;

3. That developing competence should be accomplished primarily through education and training evidenced by certification or qualification but that this should remain a matter for individual sub-sectors to select for the immediate future;

4. That competence is an on-going process and that continuous improvement is an essential element;

5. That the most convenient and efficient means of collating and presenting evidence of individual competence should be through a single certification system: that is, not a single card but a single, coordinated and managed system of cards designed to provide confidence to employers that they adhere to certain agreed content.

6. This card would, ideally, be based on a smart system approach[72];

7. That the industry's employers need a way of being able to rely on cards as presenting basic evidence of individual competence and to achieve this, the system could operate under a kite-mark or quality mark to demonstrate a mark of conformity, to be coordinated and controlled by an independent authority;

8. That this authority overseeing the framework should be responsible for standardising the content at a high level (i.e. specifying a qualification but it be left to the sub-sector to say which) and common headings for detail on cards.

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[72] Smart system - ie an approach utilising the latest technology that enables the holding of large amounts and a wide variety of data for access by employers. For a given individual they might present such information as: their basic personal details (name, gender; all forms of competence acquisition – training, education, qualifications, certificates, long-courses, short courses, etc., and experience (employers, job roles, dates, etc plus names and contact details for referees).

"Competence in Construction" Mission Principles Framework	Overarching body Founded on "Competence in Construction" Adopts Mission, Principles, Framework Principles	Sub-sectors/card issuing bodies/certification bodies Adopt principles and begin process of amending/reinforcing schemes where necessary
	Certification Schemes and their cards are evaluated regularly Ultimately the use of a quality mark signifies meeting principles.	Issuing bodies/awarding bodies enhance over time.

Construction employers
Gradually benefit from a clearer system in which they can have greater and greater confidence that schemes and their cards represent competence and contain much valuable detail

The Framework

6.3 Components of Competence

Individual competence in construction comprises:

- Occupational skills & knowledge (including functional skills)
- Health & safety skills and knowledge
- Human factors (including self-, situational- and risk-awareness, and communications)
- Continuous improvement (including positive experience)

Organisational capability requires companies to address a range of elements which support and contribute to overall competence including:

- Ergonomics (equipment, facilities, work design, etc.)
- Environment
- Policies
- Communication

6.4 Developing Competence

There are literally hundreds of ways in which competence can be developed depending on the section of the UK construction industry, the job role and even the task. It will not be the task of the framework to stipulate what sorts of development routes are appropriate, that will be the duty of the relevant industry bodies, awarding bodies, and companies.

There are, however, critical categories for the reliable development of competence which should be considered for all job roles and levels:

- Delivery through formal, independently-assessed courses of education and training, in a safe environment;

- Development based on industry-agreed standards of performance or of the required knowledge (the latter being wider than merely that required to undertake an occupation or task) to a standard that is challenging, forward-looking, appropriate to the job role and acceptable to the industry or sub-sector concerned[73];

- Development with health and safety and occupational health/well being fully integrated into the education or training courses;

- Development through on-going programmes of continuing improvement[74];

- Development via occupationally-qualified and competent educators and trainers;

- Development through positive experience.

6.5 Measuring & Assessing Competence

An interesting question was posed to us during this research by a stakeholder:

If an experienced worker is assessed to be competent, can they be "deemed" to be adequately trained?

The questions links competence with training and implies a need for training before someone can become competent. Can there be competence without training? Clearly, no (as long as one takes "training" to include "self-training and learning"). In order to be competent in anything one must learn the skills and knowledge and behaviours from somewhere; but these can be acquired in many ways and not only through formal training (otherwise a great many highly skilled craftspeople of old would have to be regarded as incompetent if they were to present themselves to an employer today).

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[73] Much thought was given to establishing a required standard at "Level 2" (intended as shorthand for what the industry has known as Level 2 for the past twenty years in England, Wales and Northern Ireland and its equivalent in Scotland) but certain job roles in the construction sector – as in many other UK sectors – sometimes require less than Level 2 competence.

[74] Respondents to the FMB survey (op cit) engage in CPD activities once per year (41% of respondents) with roughly a fifth saying 'Monthly' and 'Less frequently [than annually]'.

The key to the question lies in the word "assessed". If the individual is assessed by a competent assessor as being competent then they are competent regardless of how they acquired their knowledge, skills and behaviours. As with many things in the competence world the fundamental requirement is that the assessor is highly competent in the field being assessed. If this can be assumed then the decisions of that assessor can be trusted.

Therefore, competence for construction can only be measured through carefully designed assessments/examinations/tests which …

- are set against the agreed industry standards as defined in the development of competence (see above);
- genuinely challenge the trainee;
- are set and implemented as independently as possible;
- are assessed and graded (if applicable) to the highest standards; and,
- are assessed by expert assessors.

A further issue around the task of measuring and ensuring competence is that of renewal and refreshment. One example of this being put into practice is the *Construction Industry Scaffolders Record Scheme (CISRS).*

This is a national scheme, developed in conjunction with, and recognised and recommended by, employers. First published in 1978 it has been regularly refreshed and updated since then, to include new elements or changes as national and other requirements come on board. It is a scheme that recognises more than qualifications and some refreshing as it also considering CPD elements as well as including a skills test.

The CISRS relates to scaffolding operatives at labourer, trainee and advanced level as well as inspectors, management and supervisory levels. Its features and ambitions are set out very clearly in its scheme documentation Foreword.

They include:

- no provision for a 'fast track' route,
- a requirement that a candidate must meet all of the criteria set out on entry to the scheme, and
- that they be prepared to renew registration by completing the CITB Health, Safety and Environment test on a regular basis (currently every 5 years).

To help with currency of knowledge in the qualifications, CISR are building a series of refresher courses with a requirement to repeat short duration training after a specific period of time. The

scheme stipulates that a new trainee must complete at least 6 months on site experience before starting their Part 1 training, and this practice of 6 months on site experience for gathering work-based evidence is repeated before the commencement of Part 2 Training and prior to a Skills Test and assessment.

Assessment in the future

For the near future there are already signs that 'qualifications' as such will not always be seen as the final measurement and evidence of competence. Trailblazers for Apprenticeships are in development through various Phases. Here employers have developed standards which will replace national occupational standards along with assessment criteria based on those standards.

Some of the Trailblazer sectors are keen on qualifications while others are not. Some are looking at existing qualifications and adding complementary elements such as a sector-specific manufacturers' qualification.

This sort of development may be appropriate for those areas that do not demand a nationally-recognised qualification such as PASMA whose training is focussed very much on specific skills on equipment that involves working at heights

6.6 Evidencing Competence

There are two distinct elements to the evidencing of competence:

The first is "primary" evidence - that is, the means which show how competence has been actually been demonstrated - the examination results, test outcomes, assessment metrics, etc.

The second is the secondary mechanism by which this information is conveyed to those who need to see and consider it - this can consist of certificates, diplomas, degrees, summaries by assessors, testimonials with verified references, etc. - that is, physical forms of evidence (paper or electronic) which present the results in a comprehensible, and usually concise, manner.

We have got used to this two stage approach to evidencing competence over several centuries: the individual undertakes a learning process (school, college, university, open-learning, training course, apprenticeship, etc.), the learning of skills and knowledge is assessed at some point (preferably independent of the tutor or teacher), the results are combined and presented on a certificate of some sort, the "evidence" is then shown to a prospective employer who can take it at face value, validate through re-assessment, question and acquire further evidence if necessary.

In a very real sense the paper and electronic certificates and diplomas are 'mini-portfolios' which package "competence" in particular, specified subjects for the prospective employer.

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┌─────────────────────────────────┐
│   Learning/Education/Training    │
└─────────────────────────────────┘
                 │
                 ▼
┌─────────────────────────────────┐        ┌─────────────────────────────┐
│       PRIMARY EVIDENCE          │───────▶│  Examination/test/assessment │
│                                 │        │           results            │
└─────────────────────────────────┘        └─────────────────────────────┘
                 │                                         │
                 ▼                                         ▼
┌─────────────────────────────────┐        ┌─────────────────────────────┐
│      SECONDARY EVIDENCE         │───────▶│                              │
│                                 │        │  Certificates/Diplomas/Cards,│
│                                 │        │            etc.              │
└─────────────────────────────────┘        └─────────────────────────────┘
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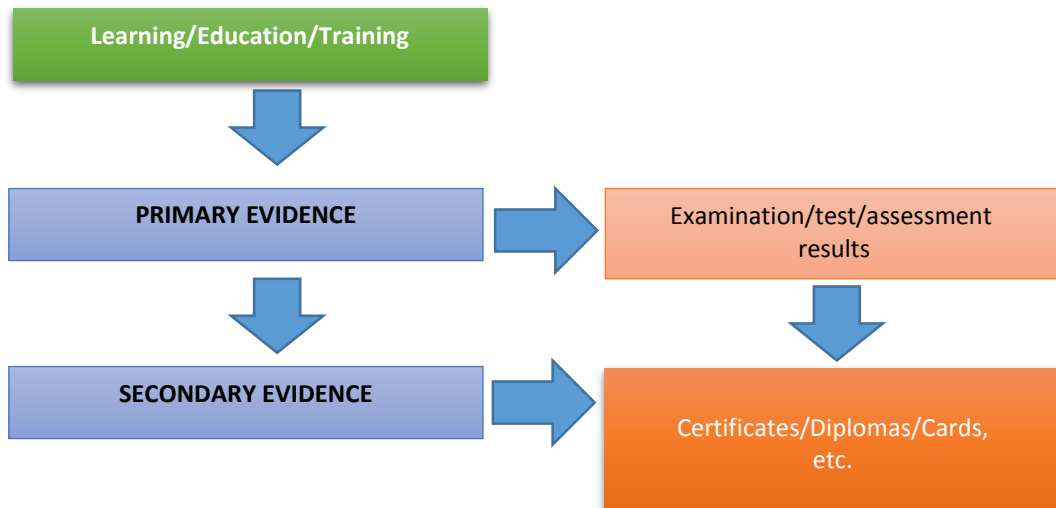
The UK construction sector uses all of these primary and secondary ways, and more, to evidence competence from a huge variety of education and training courses as well as using evidence of experience such as testimonials and references. An applicant can turn up to an interview with a variety of pieces of paper and, in the UK construction industry, with one or more cards as well as certificates. The system is confused, complex and can be open to abuse.

Although not acting in this way at present, it is conceivable that the industry card system could be used as a single portfolio to package all of the evidence that an employer requires:

- qualifications,
- training course certificates,
- health & safety certificates, and including
- "experience" and possibly even the
- contact details for referees and perhaps suggested questions on competence for supervisors to make use of when interviewing candidates.

For this Framework, therefore, competence in construction should be evidenced in a number of ways, but ideally all could usefully be presented on a card as a convenient way for employers to access the evidence. In this way, too, it should be possible for the industry to establish a[75] central database containing details of card holders and their evidence of competence, for employers to cross-check (as already largely instituted in the UK motor industry).

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[75] For this to work, it requires a strict, legally-binding data-sharing agreement between all parties.

As discussed in this report, the "certification schemes" already extant in the industry are many and complex and not all contain elements which could be reliably termed evidence of competence.

This framework discussed above therefore requires:

- an overarching system which coordinates and controls the industry's plethora of certification schemes and their cards to begin moving the system into a common approach to presentation and types of content (i.e. each card issuer would continue to set its own requirements but there would be movement towards standardising card elements - e.g. requiring an assessed qualification or certification at a level acceptable to the sub-sector or industry concerned but ideally with a minimum Level 2 across the sector being a target for all evidence[76] - and towards a common structure to the information provided);

- education and training schemes and courses (ideally designed on common principles across construction) to move towards the full integration of health & safety and human factors competences;

- all cards should move towards a smart system with all data capable of being stored and retrieved by the overarching body; this latter, ideally, should be a single organisation with the authority to monitor the certification schemes to these ends;

- a unifying "quality mark or kite mark" which, after approval, can be applied to those certificates and their cards which meet the common approach and requirements to thus assure employers of quality and the fact that the card represents evidence of quality;

- perhaps, a simple company registration scheme for domestic work which, for registration, requires the company to use qualified and fully "carded" operatives only. Companies with the registration would be covered by insurance and householders using quality-marked or branded companies could be sure of them using fully competent workers and risking their registration and insurance cover if they do not perform the work to the correct standard.

6.7 The Vision for 2025

In parallel with the long-term *Industrial Strategy* developed by BIS for the construction industry, the vision of this report is of an industry whose complexity in competence terms has been managed, via:

- A Competence Framework which describes competence, its components and a philosophy for delivery and measurement – one which recognises all ways in which competence is evidenced;

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[76] The HSE vision specifically stipulates a "nationally-recognised qualification" which we believe is too prescriptive and restrictive. We have opted to follow the Government's wider focus on "employer-led" education and training under which employers are regarded as the most effective judges of what education and training (and what evidence) is appropriate to ensure competence in their sector or sub-sector.

- A Framework which, in accordance with stated industry views is "applicable to all", flexible, and non-prescriptive;

- A Framework overseen by an overarching body/authority with a remit to bring clarity to the ways in which the industry might bring together all the evidence (for example, by using cards as "portfolios of evidence") and which will help employers by developing and maintaining a central, up-to-date means of holding data on all holders of such cards; i.e. a standard approach regarding headings for each component set out on a card.

The framework will aid all stakeholders and employers in achieving a common understanding of competence and will, particularly, aid awarding bodies and training providers when developing new education and training initiatives.

Over the next decade, the new approach would:

- contain prescriptions and advice on course level and content and overall guidance on the level of attainment appropriate for the modern construction sector.

- – while not an instant answer – benefit employers and the industry as a whole through a single portfolio of evidence of competence that can be carried by every construction employee.

- ensure all cards are issued only on achievement by the individual of certain agreed or prescribed levels of independently-assessed qualifications (or training outcomes) plus evidence of health and safety competence (if not fully integrated), evidence of continuous improvement, a list of experience and referees plus contact details, and so on.

- be readable by a single type of 'reader'. While current technology is already capable of establishing an extremely sophisticated system, it will be necessary to work at a level which meets the needs of the lowest common denominator for employers of all types and sizes and that is cost-effective.

- enable the cards to become **portfolios of evidence** as one major outcome of the Framework for construction competence.

The diagram overleaf may well be a useful checklist for employers to consider when considering the **future, wider picture** of competence.

Portfolios of Evidence

Ultimately quality-marked cards from certification schemes will contain evidence of:

Occupational Standards/Qualifications

Appropriate and acceptable to employers but reflecting wider/deeper skills and knowledge and moving towards minimum Level 2 and human factors/health and safety integration.

Health & Safety skills and knowledge

Ideally integrated into the above.

Continuous Improvement:

Refresher training / Related training

Experience: time; employer; role; testimonials

Sample questions for supervisors/site managers to test candidates' competence (*)

Scheme to be renewed/and individuals possibly retested every FIVE years at least

(*) – see 6.6 discussion on evidencing competence

The above does not of course excuse management and supervisors from their duties and responsibilities as defined in law (and as discussed in 5.2.3) i.e. it assumes appropriately ascribed information, instruction, training and supervision that matches the task to the individual who is assessed as being, on that specific day, competent to carry out that task.

7. Recommendations

The establishment of an industry-wide *Framework of Competence* by the UK construction industry would be a major step towards a common understanding of competence at all levels and a more effective means of presenting evidence of competence, but it will not be a static or limited process.

As recommended here by the authors, the Framework is intended to be a <u>first</u> step – the establishment of common philosophies and approaches which should lead to an ongoing process of industry-agreed, consensual progress and development.

> **Recommendation 1:** there needs further fleshing out and agreement on an industry-wide Framework for Competence by the UK construction industry;

The industry has made significant progress in health and safety terms over the past 14 years or so and, while cementing and reinforcing that progress, it is time to expand the understanding of competence to include all aspects – job-role, health and safety, human factors and managerial/organisational capability.

> **Recommendation 2**: work to disseminate and promulgate competence and therefore a wider understanding of what makes up competence at all levels;

> **Recommendation 3**: work to embed a wider appreciation of the role and vital importance of human factors in the construction sector;

We also believe that, in a similar way to the UK motor industry, the construction sector needs a central database in a standard format[77] (based on legally-binding data-sharing protocols to be in place and strictly enforced by the administrators and card-issuing bodies) of all cards and of all the evidence they contain on an individual's competence. This will be cross-referenced against individual names (NI numbers) and will form a reliable and up-to-date central reference for construction employers.

This also requires movement towards a system a common approach to presentation and types of content (i.e. each card issuer would continue to set its own requirements but there would be movement towards standardising card elements) towards a common structure to the information provided.

> **Recommendation 4:** work towards helping the framework for competence define a more effective means of presenting evidence of competence;

In order to establish and coordinate this system, we would recommend a new but low-cost organisational structure set up under an industry-representative Council. This should be an industry-

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[77] We considered the option of recommending a central portal/web solution which would link to individual databases. We feel that this would be excessively complex in the number and complexity of queries required, the need for permanent connections and access through firewall, and the technical requirements for linking databases that would be in different formats with different field structures on sometimes very different architectures and platforms. The ideal is for each data holder to supply data in an agreed structure and format to a central database.

owned body that leads on coordinating and developing the common framework for competence as well as progresses it. The mission of such a body is to improve a number of aspects of the process as discussed in the report (assessing and evidencing competence etc.). Given the long-term importance of, and benefits from, establishing a commonly agreed framework for competence for the sector and the consequent key role in that framework of a simpler, higher quality and more accessible approach to evidencing competence, we would suggest, therefore, the creation of a body which might be called *The Construction Competence Council*.

Recommendation 5: establish *The Construction Competence Council* based on options presented in recommendation 6.

Recommendation 6: identify the most appropriate structure/ organisations to run the Construction Competence Council from the following range of options: an independent body formed of representatives from stakeholders (these would include CITB, ECITB, SSCs, card-issuing bodies, employer bodies, professional bodies and unions[78], etc.); or CITB; or a combination of CITB and ECITB as two organisations legally permitted to raise a levy[79] to help industries invest in and carry out necessary training; or a body formed of representatives from relevant standard setting bodies (for example: CITB, ECITB, SummitSkills, AssetSkills, Proskills, etc) potentially with relevant awarding organisations. The structure, constitution and the framework itself should be discussed and agreed at a formal, national conference[80].

Recommendation 7: establish a small Secretariat to progress Council decisions, report back on developments and issues, suggest improvements, maintain communications with the card schemes and develop and maintain the database of card holders. Costs could be minimised by either the Secretariat being provided by CITB (on a clear contractual basis) as part of its services to the sector, or it could be fully funded and individuals could be seconded by stakeholders on a rolling basis.

The work which went into creating the SSiP approach is a good example of industry collaboration to produce a more coordinated, common approach and provides one model for possible implementation.

Recommendation 8: the Council consults with industry (perhaps cascaded through associations/bodies as with CDM) to gather views on what should be included in the common standard for cards, and how. Further annual 'competence conferences' should be held to discuss and maintain the standard and framework for the industry, to hear about and discuss new ideas and proposals, and to highlight any immediate areas for development or

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[78] There is a strong chance that the numbers of stakeholders would make full representation on such a council unfeasible. However, we could envisage an arrangement similar to the United Nations in which certain key bodies would have permanent representation while a selected number of other stakeholders would alternate membership on a rolling basis on a year, two years basis.
[79] As set out in the Industrial Training Act of 1964.
[80] The conference should be representative of all stakeholders, with HSE as observers. Appendix 6 sets out some indicative protocols and criteria which could be used as the basis for discussion.

improvement. Subsequent work will include monitoring the system with perhaps an annual independently-conducted employer survey to establish satisfaction with the system.

The Council will have important work to do for the sector and it will be vital that it has sufficient funds to perform this to an adequate standard and in reasonable timeframes.

Recommendation 9: Funding for the Council should be provided through a small proportional (or flat fee) amount of each card fee being passed on by the card issuing body to the Council on a quarterly basis. This financial transaction could be managed by CITB or alternatively by an external independent agency.

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Appendices

Appendix 1: Competence in Construction – Research Participants and Methodology

Research Participants

The consultation on competence sought views from a wide variety of different respondent groups in three main formats: workshops, telephone interviews, and an online survey. The tables below list the organisations (stakeholders, employers, training/awarding organisations and employees) which contributed to this research.

Inclusion in this list does not suggest acceptance of any or all matters discussed in this report.

Stakeholder organisations
Asbestos Removal Contractors Association (ARCA)
Association for Project Safety (APS)
Association of Interior Specialists / Federation of Plastering and Drywall Contractors (AIS FPDC)
Association of Lorry Loader Manufacturers & Importers (ALLMI)
Association of Plumbing and Heating Contractors (APHC)
British Association of Construction Heads (BACH)
Chartered Institute of Building (CIOB)
Chartered Institute of Plumbing and Heating Engineering (CIPHE)
Civil Engineering Contractors Association (CECA)
Considerate Constructors Scheme (CCS)
Constructing Better Health Scheme (CBH)
Construction Clients Group (CCG)
Construction Industry Council (CIC)
Construction Industry Scaffolders Record Scheme (CISRS)
Construction Industry Training Board (CITB)
Construction Leadership Council Delivery Group
Construction Plant-hire Association (CPA)
Construction Plant Competence Scheme (CPCS)
Construction Skills Certification Scheme (CSCS)
Engineering Construction Industry Association (ECIA)

Engineering Construction Industry Training Board (ECITB)
Event Hire Association
Federation of Master Builders (FMB)
Federation of Piling Specialists (FPS)
Glass and Glazing Federation (GGF)
Health and Safety Executive (HSE)
Hire Association Europe
Homebuilders Federation (HBF)
Industrial Rope Access Trade Association (IRATA)
Institution of Civil Engineers (ICE)
Mulholland Plant Services Ltd
National Association of Shopfitters (NAS)
National Federation of Demolition Contractors (NFDC)
National Federation of Roofing Contractors (NFRC)
National Plant Operators Registration Scheme (NPORS)
National Specialist Contractors Council (NSCC)
Prefabricated Access Suppliers' & Manufacturers' Association Ltd (PASMA)
Scottish Joint Industry Board (SJIB)
UK Contractors Group (UKCG)
Unite the Union

Training/Awarding Organisations
Bridgwater College
British Safety Council (BSC)
Cardiff University
Chichester College
City & Guilds
CSkills Awards
Dumfries and Galloway College
Edinburgh Napier University
Glasgow Kelvin College

| Heriot Watt University |
| Institution of Occupational Health & Safety (IOSH) |
| JTL Ltd |
| National Examination Board in Occupational Safety and Health (NEBOSH) |
| Pearson Edexcel |
| Scottish Qualifications Authority (SQA) |
| UK Asbestos Training Association (UKATA) |

We interviewed senior-level and middle-management level representatives from nearly 100 companies operating across the construction industry, including architects, consultants, health and safety managers, site supervisors, owners of small businesses, specialist contractors and self-employed tradesmen.

The table below gives a small randomised sample of those companies who consented to their participation being made known.

Construction companies
BAM Nuttall
Bear Scotland Ltd
Briggs Amasco Ltd
Coupland Insulation
Greystone Associates
Haskoll
Input Joinery Ltd
John Stark and Crickmay
Kier Group
Lovell Partnerships Ltd
Mid Kent Electrical Engineering Company Ltd
National Health & Safety Company Ltd
NG Bailey
Peter Makewell Installations Ltd (trading as PMI)
Rhead group
Simpson (York) Ltd
Stewart Milne Group

| Structural Soils Ltd |
| Westshield Ltd |
| Willmott Dixon |

The methodology used for this research:

1. Literature Review/Sample Framing

A review of relevant and recent literature was undertaken to identify any published and unpublished work that has been undertaken since the Routes to Competence study. In particular we identified in-company approaches of relevance and as submitted to Pye Tait post-interview. Web searches and informed experts contributed to the background and discussions.

2. Script Design and Background Paper

We developed slightly different scripts for each category of consultee - employer, employee, stakeholder and provider. We also created a specific "Background Paper" which constituted an issues think-piece and this was sent to interviewees prior to interview. This was useful to inform some of the employer and employee interviews held in the industry. And it was used as background for two workshops held with specific individuals, stakeholders and organisation representatives made aware of the workshops by CITB. The minutes of which were posted on www.pyetait.com/construction.

3. Consultation

This included a sample of employers based on a) advice from the working group, b) our in-house business database, c) our own databases of employers across a variety of construction sub-sectors, and d) the CITB levy database. We carried out 40 employer depth interviews of different sizes and across all sub-sectors and UK regions/nations with a view to ensuring at least a good level of understanding of the competence agenda. Stakeholder interviews were the main source of exploring the concept of a framework and benefits of the framework. The online survey was promoted via a number of means including CITB, representative bodies' websites and specific questions directed to FMB membership. Altogether 73 responses were received.

Total consultations:

Employers (senior representative - high level HR/Training) – interview	40
Stakeholders (senior representatives of professional bodies, awarding bodies, sub-sector representative bodies)	46
Education/Training Providers: private, FE, HE, managing agencies (CITB, JTL, BEST,)	15
Employees **online** - with self-employed, senior managers, general managers, HR managers, supervisors,)	73
Total (individual) consultees	**174**
Plus, additional responses directed via FMB's own survey with 4 dedicated question from the Competence survey	210

Appendix 2: HSE Sector Strategy for Construction (Extracts)

The (Construction) industry is one of the most hazardous in GB – around one third of all workplace fatalities occur in construction and more than 750 people (workers and members of the public) have died from injuries they received because of construction work over the last 10 years. Key risks persist and falls from height remain the single biggest cause of fatal injuries in the industry, particularly on small sites. Thousands more people are injured or made ill by their work in construction.

There is also the potential for catastrophic incidents with multiple fatalities on large and small sites whether related to cranes, scaffold or structural collapses, fire or explosion, etc.
It is widely recognised that the management of health risks has not kept pace with safety, even on large sites.

Occupational health issues include:

- Estimated 4,000 deaths annually from asbestos-related diseases and 500 from silica exposure, with concerns that the latter presents even greater future health risks
- Over half of more than 10,000 new occupational cancer registrations each year relate to construction
- Confusion over occupational health expectations affecting approaches to workplace risk control
- Poor welfare provision, particularly on small sites
- Widespread use of hazardous substances and other potential exposures

The strategy therefore characterises construction into three areas:

- Smaller sites/projects (<=15 people on site)
- Larger sites/projects (>15 people on site)
- Asbestos

Smaller sites/projects account for the largest proportion of work-related deaths in construction, with high levels of ill health and injuries each year.
Small sites are usually of short duration, sometimes operating on a cash-in-hand informal basis, often with very small profit margins and have no real health and safety organisational structure/framework/system.

In general, those running and working on small sites:

- significantly underestimate the risks to themselves

- fail to recognise when their standards are poor (even in high-risk areas like work at height) and that improvement could prevent accidents and ill health
- do not belong to a trade association
- do not seek health and safety information or attend training courses
- avoid contact with officialdom
- are unaware of, or disregard, required standards and even basic obligations
- lack competence and awareness of the actions required to effectively manage health and safety
- are often overwhelmed and confused by the health and safety goal-based system – they simply want consistent information telling them what to do
- may cut corners to reduce costs, often at the expense of health and safety
- often take on complex projects (including structural alterations and excavations) without being aware of the risks or potential for a catastrophic event

Larger sites/projects

Larger projects/businesses are often better organised and operate within a stakeholder framework that is amenable to influence. Larger organisations have mature and sophisticated management arrangements and in-house competence. However, their health and safety performance can still fail with serious consequences given the hazardous construction environment.

Issues relating to larger sites/organisations:

- Potential for catastrophic event that could create multiple fatalities affecting both workers and the public off site, e.g. scaffold collapse
- Extensive reliance on subcontracting due to the nature of construction projects and specialist nature of many firms:
    o Complex subcontract relationships may lead to the breakdown of communications and a lack of co-operation between workers and/or teams
- Poor on-site supervision – high competence at managerial level is not always mirrored at supervisory level on site
- Progress on safety risk management on large sites has not been matched by equivalent progress on health risk management:
    o Health risk management not integral
    o Although the need to prevent disease and ill health is increasingly recognised, those running and working on larger sites/projects often lack knowledge and ability to implement the required standards
    o The peripatetic/transient nature of the workforce makes consistent exposure control and monitoring difficult
- Corporate leadership and supply chain/project integration:
    o Although many larger companies provide internal leadership, it often fails to link to health and safety management through their supply chains

- o Little vertical integration and influence over key decisions such as design, procurement and cost – with knock-on effects for health and safety
- o Missed opportunities for early risk reduction – it is not necessarily on site where the most effective risk control measures (such as design, planning, procurement) can be introduced. Once on site, contractors' options may be limited to reducing or mitigating risk
- Impact of recession including; restructuring, acquisition and coming out of recession, with rapid growth and associated challenges such as skills shortages.

Asbestos

Asbestos was extensively used in the construction of buildings until as late as 2,000 and is present in more than 500,000 commercial premises and an unknown number of domestic premises.
It is the biggest occupational cause of death in GB, accounting for approximately 4,000 deaths per year due to mesothelioma and lung cancer. Although these deaths are associated with historical exposure there is a need to ensure that current practices are preventing exposure.

Many aspects of working directly with asbestos in buildings (e.g. removal and encapsulation work) are subject to a permissioning licensing regime. Those exposed to risks can be broadly categorised to mirror the regulatory framework:

- Those undertaking licensed work and working within that framework:
    - o Approximately 470 licence holders
    - o Stringent licence assessment
    - o The high standards required of licensed work are not always maintained
- Those undertaking construction work who may be exposed to asbestos:
    - o Refurbishment (trades) and demolition workers are most likely to be exposed
    - o Risk that those using buildings may be exposed to asbestos if it is in poor condition or is disturbed
    - o Inadequate awareness of asbestos risks and the necessary controls among those engaged in general construction – further education is required
- Those working incidentally in buildings that contain asbestos:
    - o All occupiers of non-domestic premises are required to manage the presence of asbestos in their building – normally achieved through a combination of asbestos surveys and management plans, which must be provided to any party undertaking construction (refurbishment) work

Aims for 2012-15

- o **Smaller sites/projects**

Creating healthier, safer workplaces

To increase the number of those running and working on smaller sites/projects who are aware of their health and safety obligations and take positive, proportionate steps towards achieving compliance.

Building competence
To increase the competence of those running and working on smaller sites/projects in identifying, understanding and proactively/proportionately managing health and safety risks.

Securing justice
To attain immediate and sustained compliance with the law by those running and working on smaller sites/projects.

- o **Larger sites/projects**

Creating healthier, safer workplaces
To create healthier and safer workplaces on larger sites/projects

Building competence
To increase individual and organisational competence in identifying, understanding and proactively managing health and safety risks

The need for strong leadership
Cross-industry and organisational leadership drives continuous improvement of health and safety within the construction industry

Securing justice
To attain immediate and sustained compliance with the law by those running and working on larger sites/projects

- o **Asbestos**

Creating healthier, safer workplaces
To ensure that asbestos risks, wherever they appear in the workplace, are properly managed

Building competence
To ensure that the full range of duty-holders are competent to manage the risks posed by asbestos

The need for strong leadership
To encourage key players from a range of duty-holders to demonstrate effective leadership in tackling asbestos risks

Securing justice
To attain immediate and sustained compliance with the law by asbestos duty-holders

Appendix 3: Summary of HSE/ODA Review Report

Requirements

In delivering the London 2012 construction programme, the Olympic Delivery Authority (ODA) issued a Health, Safety and Environment Standard which laid out requirements for those wishing to work on the project, including membership of the Considerate Constructors Scheme, work in line with the Respect for People initiative and use a behavioural safety programme. In meeting the Standard, tier 1 contractors were expected to use their own HS&E systems but also to ensure that their suppliers have the necessary competences, systems and resources to do the same.

Communication

A key component was communication with the workforce. "HS&E information is communicated to the workers on a daily basis mainly through the worker engagement processes (Daily Activity Briefings (DABs), toolbox talks and encouraging workers to speak out about their concerns)". Worker engagement activities generally occurred within projects but there was also programme-wide communication in the form of stand-down briefings to highlight hot topics and refresh workers' health and safety awareness. A number of other forums initiated cross-project communication enabling the sharing of HS&E best practice and information.

Supervision

As part of the HS&E forums, executive management teams from the ODA, Delivery Partner and the tier 1 contractors met regularly and tackled initiatives and innovations such as agreeing visual standards and establishing a mandatory supervisor course on leadership and behaviour. Supervisors were required to attend training to 'upskill' so they can be effective on the ground and deliver messages to lead on HS&E with the work teams. Operatives were given information, empowered to 'not work' if they feel unsafe and given an opportunity to discuss improvements during the daily activity briefings (DABs) and committee meetings.

Behavioural safety management

Tier 1 contractors were required to have a behavioural safety management system in place, adopting elements such as: open 'no blame' culture, leadership, robust safe systems of work, communications up and down, incentivise HS&E performance. A comprehensive prevention programme health checks, health surveillance and health promotion was provided on site by an occupational service provider.

Safety culture

Web based software packages were developed to enable the sharing of information and fostering of a safety culture. One package enabled tier 1 contractors to input information regarding accidents, incidents and to complete HS&E scorecards, also enabling ODA to send HS&E alerts as well as common standards to the contractors. A second package provided a 'safety culture climate survey' (originally developed for use on rail safety standards), carried out every 9 months of the project. Tier 1 contractors could access their own results and assess performance and ODA used the combined results to inform strategies for each project.

Appendix 4: Nudge Theory in Practice

Examples of how health and safety professionals already employ 'nudges' are:

- Using visual communication to prompt safe practices and encourage situational awareness (eg, colour-coding pipework, coloured walkways and barriers, using memorable posters, noticeboards etc)

- Trojan Horse risk messaging;

- Point-of-use pictures of safe practice to prime awareness at critical moments;

- Having a fresh pair of eyes as occasional observers to detect small changes in performance which ordinarily might be obscured by frequent monitoring;

- Drawing on defaults – using a hierarchy of controls to ensure that the safe way to behave becomes the default;

- Using workmate attitudes and leadership style to nudge work practice;

- Design of control panels (where care is taken to design dials with separate functions differently).

The authors also advocate the use of nudges at an organisational level too …

- The role of health and safety forums in shaping industry-wide norms by spreading lessons learned;

- Embedding company norms in multinational organisations spanning different cultures ("*Rolling out initiatives by specifying aims and core components while allowing the detail on how they should be run to be locally determined strikes a balance between standardising operations, and tailoring local cultural variations*")

Appendix 5: Other examples of industries and their treatment of competence.

Fire & Rescue

The Fire Service defines competence in the following terms:

'Operational competence is made up of a number of components; as well as skills, knowledge and understanding, an individual's personal qualities and attributes are also important. Every firefighter and commander will need to demonstrate all of these to be effective and competent in role.'

Competence is assumed ONLY after full assessment by a superior/training officer and CPD is a formal aspect of the system[81]

Marine

The marine contractors body defines competence in their sector as follows:

'Competence assessment is the process of collecting evidence of an individual's performance, knowledge and attitude and reviewing this against specified competences.'

Such evidence is gathered against specified standards[82].

Canadian Construction

Regulations for construction in Canada are primarily Province-centred. An example has been taken from the Province of Alberta where guidance on competence was developed by a committee of representatives of construction owners who were selected because they hold contrasting perspectives on the topic of competence verification.

The output of the committee was a set of recommendations and advice[83] in which they define competence in terms of an overarching safety code, as follows:

'The Alberta Occupational Health and Safety (OH&S) Code defines competent as follows: "Competent" in relation to a person, means adequately qualified, suitably trained and with sufficient experience to safely perform work without supervision or with only a minimal degree of supervision;

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[81] Skills for Fire and Rescue (2012) *Operational Competence: Preventing loss of life and injuries from emergency incidents while reducing risks within local communities.*

[82] International Marine Contractors Association (2012) *Guidance on Competence Assurance and Assessment.*

[83] Construction Owners Association of Alberta (2011) *Worker Competency Verification: a best practice.*

A great deal of the documentation and sources of reference for Canadian construction companies are drawn directly from the UK's Health & Safety Executive.

Chartered Institute of Ecology and Environmental Management

This professional body has been included here because it represents one of the few competence approaches we came across during our research which explicitly addresses the gradations of competence.

The CIEEM produces a document which is designed to accompany a number of competency frameworks that have been produced for job-roles in the sector[84]. The guide opens with a definition of competences:

'Competences are the skills, knowledge, abilities and personal attributes that are essential to perform certain functions and which are critical to succeed in specific roles. They are what are expected of an individual in areas and levels of performance

The *User Guide* highlights four distinct levels of competence:

Basic Competence:
Basic knowledge, with a simple understanding of terminology and concepts; some experience of practical application and able to carry out standard activities, under supervision.

Competent:
Where the individual has the knowledge and experience essential to carry out standard activities unsupervised, confidently and consistently. The individual is likely to need to seek advice before carrying out complex or non-standard activities.

Accomplished:
Where the individual has sufficient knowledge and experience of an activity to carry out complex, specialist or non-standard tasks confidently and consistently. The individual will be aware of alternative options and approaches and can provide guidance, instruction and advice to others on an activity.

Authoritative:
The individual is widely recognised as an authority, both by others within the organisation and/or by external peers for the knowledge and experience they demonstrate in relation to this activity.

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[84] CIEEM (2012) Competency Framework: User Guide.

US Ship Repair

An example of another high-risk industry from overseas is that of ship repair. We selected the following example relating to the port of San Diego in California. The training programme is intended to be part of a larger system of health and safety management in companies in this industry. It defines competence and training as follows[85]:

'Competence is a standardized requirement for an individual to properly perform a specific job. It encompasses a combination of knowledge, skills and behavior utilized to improve performance'.

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[85] Port of San Diego Ship Repair Association (2011) Implementing a Shipyard Safety and Health Management System: Training for Shipyard Workers.

Appendix 6: Potential Operating Protocols and Criteria for the Competence Construction Council or Commission

Ideally the formal conference would be tasked with agreeing the overall composition of the Council, and details such as establishing the voting system, agreeing initial Terms of Reference within a three day span and using small committees and working groups to develop and agree the proposals for the full conference.

Ultimately the Council through its Secretariat would have the power to undertake a number of tasks on behalf of the industry:

- Establish and promulgate competence through the Competence in Construction Framework
- Define the standards to be aimed at by all certification schemes and card issuing bodies
- Promote the Competence in Construction process and the expanded definition of competence to the industry and to establish online feedback systems (peer review);
- As a priority encourage the development of new approaches to supervisor training which meet the industry need for low-cost, effective training which includes mentoring and man-management, etc.;
- Begin the process of encouraging the widespread integration of "human factors" into all industry education and training courses, and promote the integration of human factors to the industry;
- Create and award an agreed "logo" or kite-mark to all cards which conform to the standards and agree to supply cards based on smart technology to a common standard within a specified period of time
- Create and maintain a web solution/portal supported by a database and data-sharing protocol of all registered card holders from all card issuing bodies and certification schemes;
- Investigate and promote the development and use of smart technology-based training and assessment with appropriately innovative training solutions;
- Investigate the best ways of establishing a common industry approach to the limited-life of all cards, the renewal process and any required revocation processes;
- Investigate the potential for the combining of cards into a "licensing system" for domestic contractors in order to bring these operatives and companies fully into the competence arena and discourage "cowboy traders";
- Monitor and maintain the system.

The operating protocols and criteria that follow are indicative only and intended as a starting point for the Conference on Competence to which all representative bodies are to be invited, with HSE, BIS and others as observers.

Indicative Operating Protocols/Criteria for the Construction Competence Council

Operating Protocol		INDICATIVE CRITERIA
Legal		
Council established as a separate charity		Limited company with charitable status
Governance		
Independent Chair		Non-construction, experienced Chair person
Council		As decided from the options but ideally representative of all industry stakeholders Equitably selected (consideration of an Executive with management decisions and deal with issues that arise)
Voting		Fair and representative system Effective (ie system will not cause gridlock in decision-making)
Secretariat		Executive Secretary and Treasurer reporting directly to Council Small, limited number of staff
Finance		
Council costs		Percentage fee (or flat rate fee) on each card/certificate issued – direct quarterly payments to CCC
Treasurer		Independent (external?) treasurer
Bank accounts		Separate and independent
Card Requirements		
Agreement		All certification schemes and card issuing bodies agree to: • Work towards the goal of moving the industry to a common and consistent high standard; • Use already or agree to move within an agreed timescale towards a standard smart technology system; • Pay a small fee to the CCC each quarter based on a return of card/certificate issues; • Standardise the structure and information content of their cards; • Within an agreed timescale move towards a minimum of Level 2 or equivalent qualifications on all cards; • Within an agreed timescale move towards agreed renewal timings and systems;

		• Supply CCC with details of all cards/certificates issued in the past month so that they can be centrally stored; • Consider the need and operation for independent audit/random sample checks on Standards.
Contents		All cards/certificates to agree to work towards cards containing details for the holder of: • Qualifications (details, level, date of award/renewal, etc) • Training courses attended; results/certificates, dates, training provider, etc • Experience: job role, company, dates, contact name, contact details, etc
Structure		Cards will contain information on the evidence of competence in standard sections with agreed headings, such as: Personal details: (full name, NI number, gender, home address, contact details, etc.) Card Information: Issue, renewal, etc. Qualifications: Name of qual, award date, awarding body, reference number Training: name of course, date of commencement, length (days:hours), training provider name, address, contact details Experience: Company name, date commenced, date finished, job role held, contact name and details. *Supervisor questions: suggested questions for supervisors/site managers (?)*
Smart		System agreed on – to ensure maximum cost effectiveness and ease of access for all construction companies Standard card reader with easy to use software
Assessment		All qualifications and substantive training tests to be independently assessed
Operation		
Executive Staff		Recruited and employed directly by CCC Answerable to the Executive Secretary
Application procedure		Card/certification schemes complete a brief form
A central repository/database		CCC develops and manages a comprehensive database (with legally binding data-sharing agreements) containing details of: Card/certificates issued and date All contents of the card/certificate