Assessing the Competence of Staff

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Abstract

Pipeline standards and regulations require all staff working on pipelines to be both 'competent' and 'qualified', but there is little guidance on how organizations can demonstrate their staff are competent and qualified.

Any demonstration of competence must be objective; therefore, an individual's curriculum vitae (CV) is not a convincing demonstration, as a CV is usually highly subjective and has no independent verification. Many organizations rely on individuals performing self-assessments, or rely on line management ensuring staff are competent at the tasks they perform, but usually there is no structured process for either specifying or assessing the competency. This informality is not a convincing demonstration.

Competencies need to be formally assessed (verified), to satisfy industry standards and regulations. The competencies are assessed using a 'competency standard', which details all the required skills, knowledge, and experience expected for that competency.

The assessment could be an examination, an interview, or a performance review. 'Qualified' means *'an individual that has been evaluated';* therefore, individuals passing the assessment are qualified in that competency. An individual claiming a competency, without a verification through an assessment, is not qualified in that competency.

This paper gives an outline of competence assessments, and a process for competence assessment.

1. Introduction

We all need competent staff in our organizations, particularly when our staff work in a hazardous industry, where mistakes can have catastrophic consequences. A lack of certain skills and knowledge has contributed to past major accidents: it had been assumed that an individual with a certain level of experience or training would be competent and/or that the dissemination of a procedure would be sufficient [**Error! Reference source not found.**]. This is a concern which is now increasing as organizations lose key staff through retirement, and 'multi-skilling', 'delayering', and 'downsizing' put more work onto staff [**Error! Reference source not found.**].

Competence[1] has always been key to safety, and history gives us good lessons. There was great concern about the loss of many ships (hundreds every year) in Great Britain in the 1800s, and the crews' competence was considered a big issue. Quotes from inquiries at the time illustrate the problem [2]:

 '… the indisputable fact that many such disasters are attributable to the incompetency of those placed in charge of merchant vessels…'.

'… the appalling extent of losses by sea, in lives and property… arises from incompetency of those in command of vessels'.
'… a very great proportion of the disasters which occur at sea [are caused] by those having charge of ships not being sufficiently experienced and properly qualified for such charge'.

The British Parliament set up a committee. Witnesses saw the solution in formal assessment of competence: *'men who have undergone an examination in navigation'*. One port in England required ship's 'masters' (captains) and 'mates' (second in command of the ship) to undertake an examination to determine their competence and to obtain a certificate from an independent board before being appointed to the command a ship. Another witness linked shipping losses with the drunkenness of masters, but not all officers were drunkards [3]: '… *as a general rule a sober master made for a sober crew'*. In 1856 all masters and mates were required to obtain a 'certificate of competency'.

Today we have the same emphasis on competence; for example, engineering standards [e.g., 4, 5, 6] require all staff in an organization to be both competent and qualified in all the tasks they perform. But… what is 'competent' and what is 'qualified'?

1.1 Competence

Competence is a mix of: skills (ability to do a task); knowledge (ability to understand and explain the task); and, experience (period of time doing the task). It also involves values/behaviors/attitude, Figure 1, and 'non-technical' skills (communication, decision-making, team working, etc.).

Competence is acquired by a mix of training, mentoring, and experience, with experience being the major factor [7].

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[1] 'Competence' can be viewed as the total ability of the individual, whereas a 'competency' is a single skill.

Figure 1. Elements of Competence.
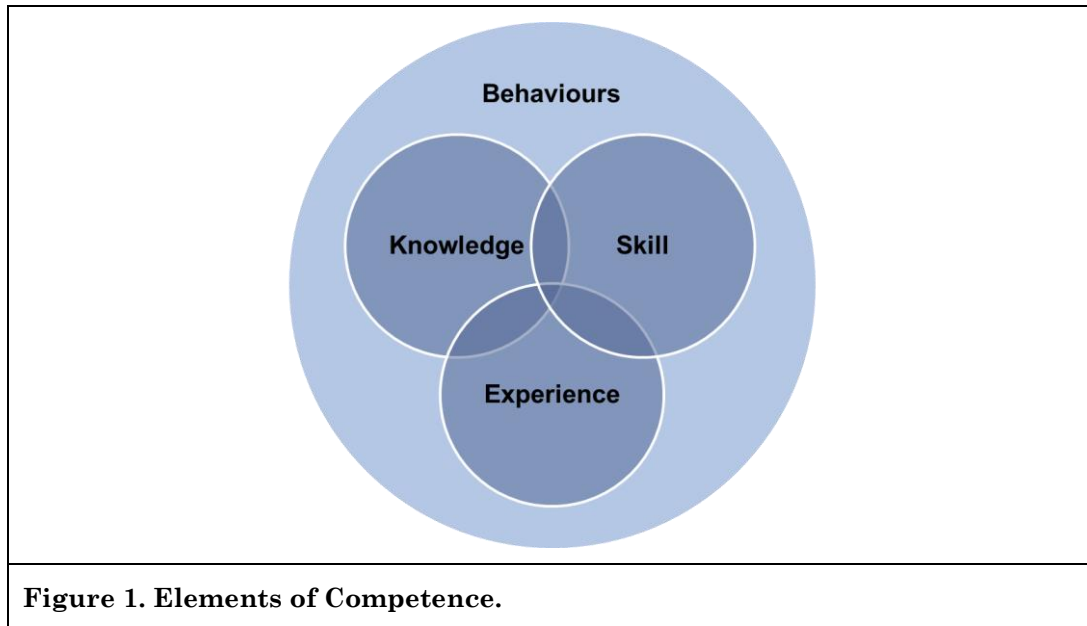
1.2   Qualified

'Qualified' means *'… an individual that has been evaluated'* [4, 8]. According to the European Commission [9] a qualification is '*a formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to a given standard'*.

Clearly, to be called 'qualified' in a competency you must pass an evaluation (assessment) of that competency. Competent does not mean qualified. Qualified means your competence has been assessed (evaluated).

1.3   How do we show we are competent and qualified?

Most individuals will demonstrate their competence by quoting their academic (e.g., BSc) and professional (e.g., PEng) achievements, training programs completed, and relevant experience. This demonstration is limited:

- academic qualifications are usually a feature of the early part of an individual's career, and may not be related to their current position;
- professional qualifications tend to be generic, and not directly related to an individual's current position;
- training programs are rarely quality assured, and attendees at industry training courses are rarely assessed (e.g., by examination), which means there is no evidence that the individual has engaged in the course, or benefitted from it; and,
- an individual's experience is usually listed in their CV, which is neither validated, nor contains supporting documentation.

This is a poor demonstration, as it relies almost totally on the individual's honesty and perspective, and has no external verification of experience (the major element of competence [7]). Reliance on this type of demonstration can lead to confidence, or even complacency, being mistaken for competence.

A better, more rigorous and objective approach, is to have a competence assurance system that sets appropriate competency standards, and requires a formal assessment and reassessment.

1.4   Changing the way we view competence

Many professions, including engineering, rely on academic/professional qualifications, ad hoc training programs, and on-the-job experience to develop competencies. Other professions (e.g., doctors and

airline pilots) have changed, and require 'demonstrated competence'. This demonstration is achieved by passing tests, enduring simulations, and performing in a variety of live settings [10].

Competence requires practice [10]. Most individuals will easily recall facts, but facts are merely data (they are easily stored, for example, electronically), but competence is more concerned with concepts, processes, and principles, all requiring lengthy practice to master [10]:

- Facts are important, but they need to have a context to be useful. Children know that falling from a height can cause injury (fact), so they decide not to climb trees, unless in a safe, organised play area.
- Concepts are used by experts to solve problems, and reside in the brain. An automobile designer can propose a new automobile, but his/her idea or concept needs to be explained (the design) and have a context (why have a new automobile?).
- Processes require constant practice to master them, but this will only allow an individual to be part of the process, and describe it. A robot will probably be better. Competence in a process will involve changing inputs, testing changing conditions, fault resolution, etc., to fully understand the process.
- Principles also will require practice, as they are applied in differing situations, and will have differing uses and outcomes.

Competencies need to be assessed, and a simple check list, or self-assessment, will not be able to capture all of the above.

2.   Competence Assessment

An individual's competence cannot be based solely on the individual's personal assessment (e.g., via a CV). It must be independently assessed:

"… *men and women who aspire to be recognized as professional engineers and technicians require independent assessment of their competence*…." [11].

"To be competent, individuals must provide evidence that they have the required experience, technical skills, knowledge, understanding and behavior to perform a job role/function and that they apply them consistently, safely and in accordance with relevant procedures and Standards…." [12].

Assessment is [13]: *'An instrument or method used to measure learner attainment of intended learning outcomes (including but not limited to oral or written tests, skill demonstrations, portfolios, or work products)'*.

This assessment is an evaluation and demonstration of understanding against the 'learning outcomes' (what we expect from the holder of the competency), and these outcomes must be specified (e.g. in a standard [8]). The assessment process ensures individuals are competent to undertake their job roles in accordance with an agreed standard [12].

There are various methods of assessing competencies; e.g., self-assessment; performance; examination; and, interview [14], Figure 2. Assessments will be designed to assess competencies using written, oral, practical, observational or other reliable and objective means, and will follow a procedure to ensure consistent examination administration. The design of examination requirements must ensure the comparability of results of each single examination, both in content and difficulty, including the validity of fail/pass decisions. This requires detailed planning; for example:

'Criteria for conditions (e.g., lighting, temperature, separation of candidates, noise, candidate safety) for administering examinations will be established, documented and monitored. Any technical equipment used in the examination process will be verified or calibrated where appropriate' [15].

Figure 2. Assessment Methods.
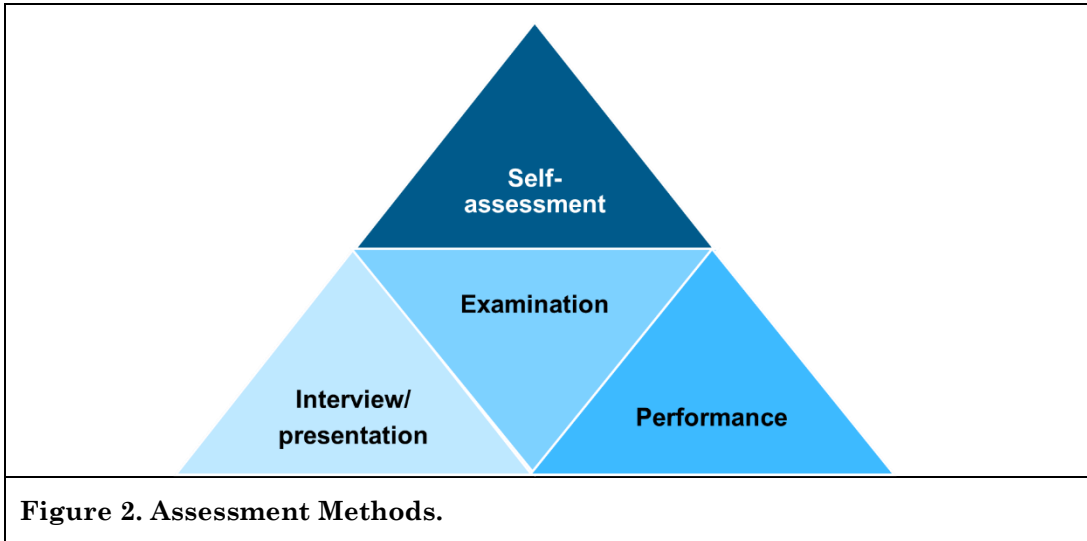
The whole assessment process must be secure (e.g., examination materials must not be accessible to the candidates in any form), and clearly specified (e.g., examination time, location, and when results are available). This may require an assessor or invigilator to be present at any examination.

Appropriate methodology and procedures (e.g., collecting and maintaining statistical data) needs to be documented and implemented in order to reaffirm the fairness, validity, reliability and general performance of each examination, and that all identified deficiencies are corrected.

2.1   Self-assessment

Self-assessment [16] has a role in competence assessment: staff can initially self-assess their competencies, then compare their assessment with their manager/subject matter expert. Disagreements can be resolved by reviewing evidence, and where there is a disagreement a resolution can be sought from a third party.

Caution should be exercised with 'self-assessment', as [17]:

- incompetent people tend to see themselves more competent than they are; whereas,
- competent people tend to see themselves as less competent than they are.

2.2   Observational (performance) assessment

Competence assessment can be an 'observational assessment' by a supervisor or appointed trainer. This is a good assessment method but often involves a supervisor observing and recording performance over a long period (e.g., a year), which can be impractical, and can lead to a poor assessment.

These assessments may be better conducted using a '360-degree assessment' where the member of staff being assessed is evaluated by other staff team members above, below, and at the same level in the team structure.

2.3   Assessment by training

Training does not automatically give competence; for example, a record of training does not demonstrate a competency. Training provides a platform for competencies, but it is not enough to assume that exposure to training and experience assures competence.
The value of the training must be assessed; e.g., by examination. This is essential, otherwise there is no evidence that individuals has benefitted from the training.

2.4   Interview

Interviews with candidates can be useful in both confirming competencies, and identifying gaps. The interviewer must be aware of the individual's performance, and the necessary competencies. The interview must:

- have an agreed agenda;
- have clear objectives and outcomes;
- have a process for conflict resolution; and,
- be put on record.

An interview can include technical questions relating to the competency, but the individual should be sent examples of the type of questions he/she may be asked during the interview.

2.5   Evidence-based assessment

It is better to base a competency assessment on clear evidence that can be either measured or compared. This 'outcome-based' assessment [6] means the assessment must be 'evidence-based' and:

- state the required competency and refer to its standard;
- provide clear assessment criteria for judging performance;
- specify the level of performance evidence required for the job/task.

2.6   Resistance to assessment

Assessment in academia is expected and accepted: you would not want to employ a university graduate who has evidence that he/she attended every class for four years, but was never assessed.

Assessment in industry is different: it is not expected. The authors have taught at universities for many years, and trained thousands of people on public training courses. They set exams in universities, but have never been asked to set an exam in an industry training course. When assessment has been recommended/suggested, there has been widespread resistance. This is due to:

- organisations not seeing the value in assessment;
- assessments following training courses is not the norm in industry;
- individuals who have been in industry for many years do not want to be assessed (indeed, have never been assessed), and either see no value in assessment due to a combination of over-confidence and complacency, or fear being exposed by the assessment;
- many individuals on industry training course do not engage, or even attend, the classes in the course, as there is no assessment at the end, and no consequences of non-attendance;
- many individuals do not engage in the classes, preferring to be distracted by their smart phones/social media/emails, and these individuals know they will fail an assessment.

The organizations sending the individuals on the courses know the value of assessment, as the authors have been assessed by course attendees thousands of times following their training courses, and the results sent to the attendees/organizations. But the organizations have never asked the trainers to assess the attendees. Clearly, some rethinking in many organizations is needed.

3.   Competence Assessment Procedure

The previous Section has covered assessment types. The assessment has to be contained in a procedure that ensures consistent assessment administration. This Section presents a simple, generic, six-step assessment procedure.

3.1   Step 1 – Know your competencies and their 'levels'

Individuals need to know what competencies they are expected to have, and at what level of expertise. Competencies will normally be specified in an individual's job specification, or following annual performance appraisals.

Each level of competency can then specify the required skills, knowledge, and experience, requirements. This will allow the levels to become descriptive; for example a 'Level 1' could be a 'Foundation' level, a 'Level 2' could be a 'Professional' level, and a 'Level 3' could be a 'Master' level [1418]. It is also useful to have an 'entry' level for a competency; for example, 'Awareness'. This entry level can be used as a simple introduction, or primer, to a competency

A review [19-22] of published competency levels and descriptions [18, 23-30] concluded that three levels are both practical and convenient: 'Foundation'; 'Practitioner'; and, 'Expert'. These increasing competency levels correspond with increasing job responsibilities, and cognitive characteristics [31, 32]; for example, on the lowest level (Foundation) the expectancy would be an ability to recall facts and basic concepts, but on the highest level (Expert), new and original work would be expected. References 20 to 22 give more details on these levels.

3.2   Step 2 - Assess your competencies against a standard

An individual's competencies are assessed against a 'competency standard'. Competency standards provide a common definition of a competency and contain the required skills, knowledge and experience for a competency. Individuals with documented and validated evidence that meets the requirements of a competency standard can be awarded a 'qualification' in that competency.

There are examples in the literature, many produced by standards bodies and trade organizations (for example, [18, 22-30]). These standards are an integral part of the process to qualify and certify staff as being competent [19-22].

3.3   Step 3 - Provide evidence to show you meet the standard

An individual will need to compile evidence that he/she meets a competency standard. This evidence is essential and should be tangible (e.g., examination results, or references), rather than intangibles only (e.g., self-assessment).

3.4   Step 4 - Find an assessor

Competence assessment must be formal, recorded, and independent. Competency assessment is conducted by an individual (e.g., a subject matter expert [33]) or an 'Assessment Body'. This individual or Body must be a suitably qualified, and independent, and be able to demonstrate appropriate knowledge, skills, and experience to perform the necessary assessments of the topic under consideration.

Organizations can conduct these assessments, assuming they have suitable, qualified assessors, but the assessment process must be formal, recorded, and rigorous. This type of 'self-certification can work well for organizations, but may be problematic for an individual. This is because other organizations

may not recognize the assessment process. This means the qualifications obtained from the assessment process are not 'portable'.

It is better to use a qualified, independent, third party Assessment Body.

3.5   Step 5 – The assessment

It is possible that the evidence collated by the individual is considered sufficient to demonstrate competence. Where evidence is not sufficient, the candidate will require a formal assessment. The assessment should be conducted by comparing the required competencies for the job with those possessed by the candidate. Competency standards give the necessary detail of the competency and its level (Awareness to Expert). This allows a simple assessment against the standards.

There are various methods of assessing competencies, including: self-assessment; performance; examination; and, interview, Figure 2. The competency standard will recommend a suitable assessment method. The best competency assessments are 'outcome-based' or 'evidence-based', where:

- the competency is stated and described;
- assessment criteria for judging performance are listed; and,
- the level (detail) of performance evidence required for the job is stated.

Assessment is against these outcomes.

3.6   Step 6 – The award

When individuals pass an assessment based on the standard, they are awarded a qualification in that competency. The award can be by the individual/organization who has conducted the assessment, or the Assessment Body. Obviously, an independent, third party, Assessment Body is the best option in terms of credibility.

4.   Case Study

The Competence Club (www.competence.rosen-group.com) is a learning portal that can advise on competence development, training, assessment, and certification. An engineer contacted the Competence Club and requested a competency assessment, as they wanted to be seen as a qualified pipeline integrity engineer. The individual wanted to show current and future employees that they were demonstrably competent in pipeline integrity and stated that they believed competence assessment would help their career. The engineer discussed their long-term career aspirations with the Competence Club, and a number of competencies and the required levels, aimed at being a demonstrably competent pipeline integrity engineer, were recommended, using Reference 20. The first competencies assessed were:

Competency	Competency Level
Ethics and Responsibilities	Foundation
Hydraulics	Awareness
Pipeline Risk Management	Foundation
Failure Analysis	Foundation
Failure Modes and Mechanisms	Foundation

Competency standards were needed in these competencies. The competency standards were obtained from the Competence Club [22], which also provided the assessment procedure, and managed the process from the request for assessment to the award of the qualification. The assessment and provision of the assessors (subject matter experts) were provided by the Qualification Panel for the Pipeline Industry (QPPI) (www.qualificationpanel.com).

The assessment process is generalized and summarized in Table 1 and Figure 3. Note that this is a formal procedure, and all evidence, documents, and interviews must be confidential and stored in secure locations.

Step	Detail
1	**Candidate** applies to an Assessment Body (e.g., the Competence Club (http://education.rosen-group.com/##club)) for an assessment of a competency(ies).
2	Candidate is sent list of competencies available for assessment by the **Assessment Body** - note there are copyright and confidentiality requirements.
3	**Candidate** selects the competency(ies) he/she wishes to be considered for assessment, and selects the level (Awareness, Foundation, Practitioner, or Expert) he/she wishes to be assessed against.
4	**Candidate** requests the relevant Competency Standard(s) from the Assessment Body.
5	**Assessment Body** sends the selected Competency Standard(s) to the candidate.
6	**Candidate** confirms that he/she believes he/she meets the requirements (qualifications, pre-requisites, and co-requisites) of the Competency(ies) Standard(s), and requests an assessment.
7	**Candidate** sends all required documents (the Competency Standard states academic, training, and experience requirements) that he/she believes support an assessment.
8	**Assessment Body** agrees to assess the candidate, after consideration of required documents, but requires interviews with the candidate.
9	**Assessment Body** appoints an assessor(s).
10	**Assessment Body** sends a Competency Assessment Form confirming the competency(ies) to be assessed, the selected competency level(s), and the assessment type and criteria for passing.
11	**Candidate** signs a 'Declaration of Honesty' (stating all documentation and evidence submitted to be correct and accurate) and sends it to the Assessment Body.
12	**Candidate** signs a 'Candidate Agreement' (confirming he/she accepts the assessment procedure, detail, and protocol) and sends it to the Assessment Body, as specified in the Competency Assessment Form.
13	Candidate is sent Appeal and Complaints procedures by the **Assessment Body**.
14	**Candidate** is assessed on an agreed date.
15	**Assessment Body** informs candidate of results of assessment.
16	**Assessment Body** awards and/or certifies a competency, and produces a certificate as evidence that the candidate has passed the assessment.

Table 1. Assessment Process

The assessment process is both easy and quick, but it requires a robust assessment procedure and the availability of a suitable subject matter expert. There are costs: the appointment of a subject matter expert can be expensive, and the procedure must be managed, logged, and audited.

The engineer passed their assessments, and continues to be assessed in other competencies to achieve their career goal of being demonstrably competent, with portable [19-21] qualifications.

Figure 3. Assessment Procedure.
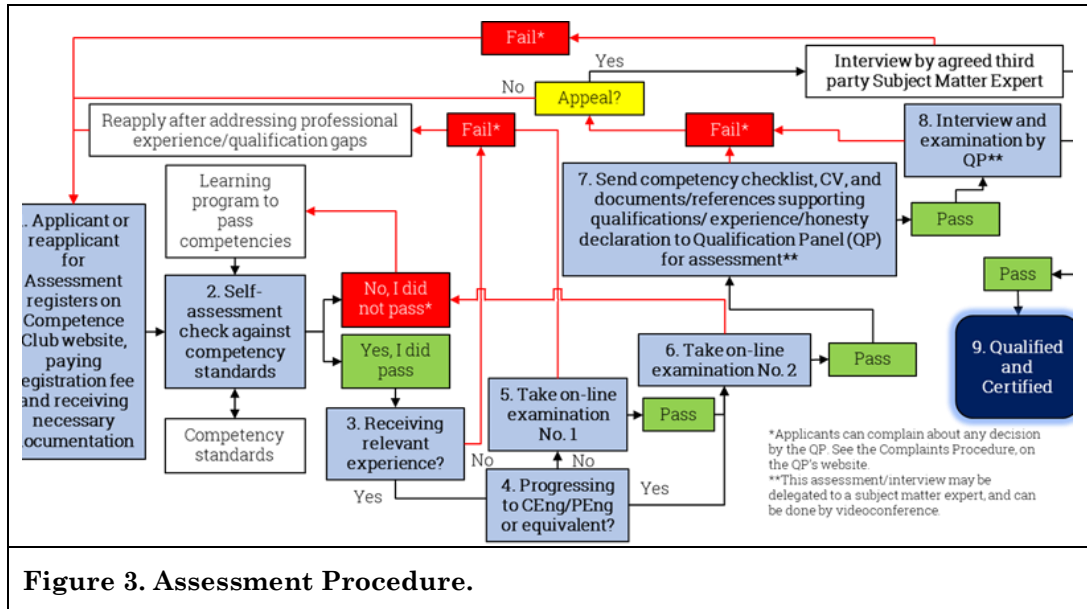
5.   Discussion and Summary

Many organizations rely on early academic qualifications, ad hoc training programs, and on-the-job experience to develop competencies. This approach is dated, particularly a reliance on training courses/programs. As the USA regulator (PHMSA) states [34]:

'Qualification is an end; training is the means to an end….Qualification results from evaluation; training does not necessarily result in qualification.'

Today, we demonstrate competence through assessment (evaluation). A competency that has been assessed and passed becomes a qualification. An individual claiming a competency, without a verification through an assessment, is not qualified in that competency.

The overall value of competence assessment is obvious, and 'competence' is required in standards and regulations; however, competence assessment is not usually (explicitly) required, so… why perform the assessment? The assessment can be costly, but it has many benefits [35]. The assessment:

- is tangible evidence of standards and regulatory compliance;
- can improve safety, as the assessments use standards which have clearly defined skills, knowledge and experience requirements, and can be aligned to improved safety;
- inspires confidence in workers, managers, customers, the general public, and regulators;
- helps individuals with career development, as it provides a clear career path;
- helps with recruitment (replacing interviews based on CV evidence, with competency-based evidence);
- can be used in an organization's personnel appraisal process;
- can be used as a quantitative basis for training requirements; and,

- can reduce staff training costs, as assessments use competency standards, which are outcome-based, meaning individuals will only go on training programs based on these outcomes, and not waste time/money on irrelevant programs.

Competency requirements and assessments are usually contained within a 'competency framework' (e.g., [18, 30]) or 'competency management systems' [e.g., [36, 37]). Indeed, in the UK, the safety regulator notes that for operators of pipelines systems: '*competency management systems [need to be] in place*' [38].

Competence assessment, like any other assessment, will not be perfect: assessment procedures will not be 100% perfect, just as an individual will not be 100% competent. Competence assessments will be treated with some suspicion as:

- it moves away from traditional, proven methods of assessment;
- it is difficult to agree on the key elements of a competency;
- measurement of a competency is difficult; and,
- it does not usually address behaviours/attitudes.

These concerns are valid, and can be addressed by a well-designed competence assessment program, but there are still organizations who do not perform competency assessments against standards. It seems a low priority task, probably due to the above suspicions, and:

- a natural and well-documented resistance to any organisational change;
- in many organizations it will be a new and untried process; and,
- competence management being considered a HR process, rather than a business need and safety requirement.

This can now change, as there are competency standards available, and easy competence assessment processes documented.

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