Competence management systems for rail engineering organisations

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Introduction

Traditional approaches to safety have focused on engineering and process risks, and sought hardware solutions to them. However, studies show that 'human factors' contribute to up to 80% of workplace accidents and with competence issues being a significant factor in many, if not all, cases. Examples in the transport sector include Clapham Junction, the Kegworth Air Crash, Ladbroke Grove and Chancery Lane.

What is competence?

'Competence' is a complex concept, consisting of personal and job-related factors. Personal factors include the thinking and practical skills of the individual as well as their experience, knowledge and attitude. Job-related factors that affect an the competent performance of an individual include the provision of a suitable working environment (adequate lighting, heating) as well as the provision of the necessary tooling and equipment. The final job-related factor is the provision of sufficient additional resources (such as technical support and co-workers) to permit the maintenance tasks to be completed without the need to omit elements because of time constraints or for an incorrect diagnosis to be made due to the absence of technical manuals, drawings or expert technical advice.

These factors are all inter-related as depicted in the figure below – the absence of, or shortfalls in, any one of these elements will mean that competent performance is adversely affected.

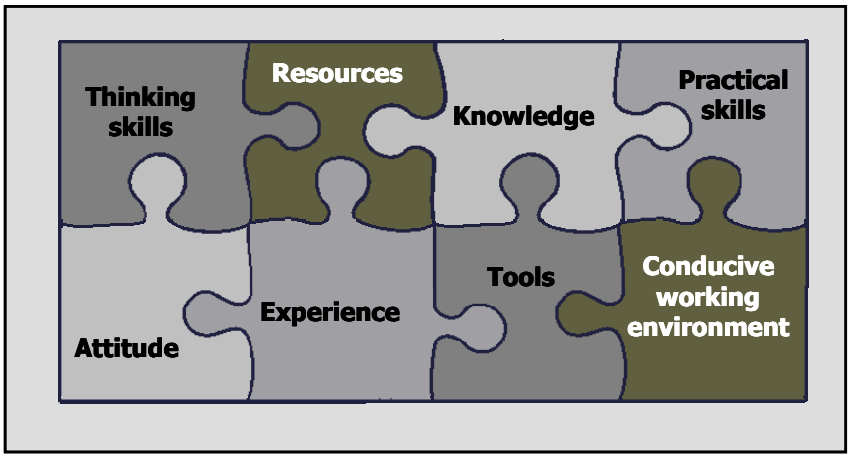

Figure 1; Components of competence

The significance of competence in maintenance error is now widely recognised and several regulatory standards and guidance documents have been produced to ensure that organisations formally monitor and assess staff competence. A formal competence management system means

that there is an intrusive, independent means of checking a practitioner's activities which should result in problems being detected at an early stage and for appropriate corrective action to be taken (such as on-the-spot coaching or by removing the individual from the work activity until competence is developed). From this it can be seen that having a competence management system is about reducing risk; competent practitioners may still make errors but the frequency of occurrence should be significantly reduced and the severity of the consequences far less.

The UK rail industry (in common with practice in the UK generally) focuses on measuring a practitioner's performance against standards of occupational competence (standards defining the competences required to do the job). This approach is well established and is now the accepted way of doing things. However, there are some implicit assumptions with this approach which should be challenged as they do not ensure that practitioners really are competent.

This paper explores some of the key findings of recent research funded by the Rail Safety & Standards Board as part of the Rail Safety Research Programme and carried out by Risk Solutions. This research explored how rolling stock maintenance organisations have implemented competence management systems to comply with the Railway Group Standard.

Factors affecting the competence of an individual

The target of effort for competence management systems within rail industry organisations is the individual maintenance practitioner (fitter, electrician, technician).

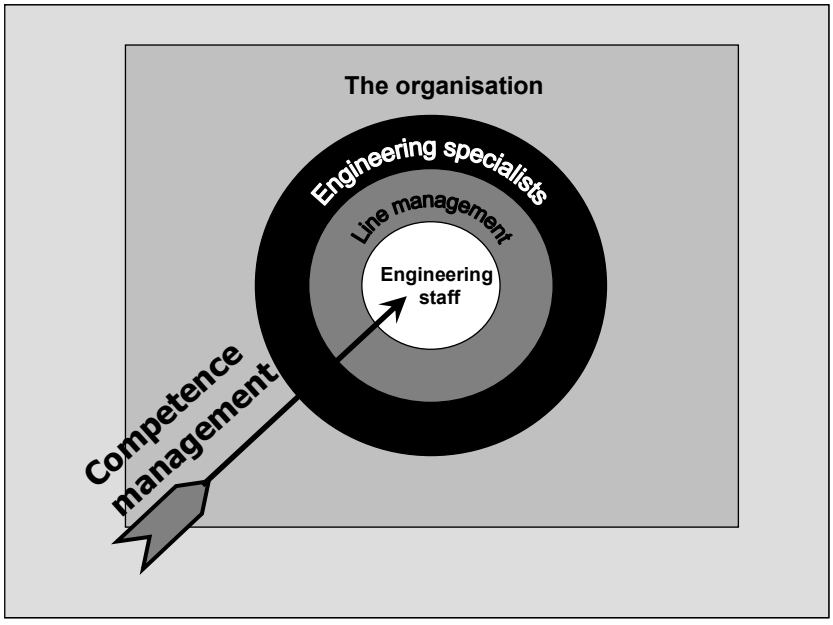

Figure 2; Target of competence management system efforts

However, if we consider the points made earlier about competence being made up of both personal and job-related factors it soon becomes apparent that the links to individual competence are more far-reaching, extending out within the employing organisation - and even beyond this.

For example, line managers have an important role in providing a suitable variety of work for practitioners to develop and maintain competence and management style can have a significant effect on individual practitioners' attitudes towards the tasks and the care that is taken in performing them. Engineering specialists within the organisation can affect the competence of

individual practitioners through the provision of accurate and intelligible technical documentation, coaching and teaching staff about technical issues. The policies and systems in place in the employing organisation itself can also have a significant impact on individual competence. For example, the policy of only employing individuals that have completed a recognised engineering apprenticeship (or equivalent) should ensure that a base level of competence exists throughout the workforce. Likewise, a rewards policy that recognises and appropriately rewards personal competence may encourage individuals to actively seek opportunities to maintain and develop their competence. Effective communication, through briefing and supported by printed material, should ensure that individual practitioners are aware of changes and technical developments. The range of organisational systems that therefore influence competence of an individual is represented below:

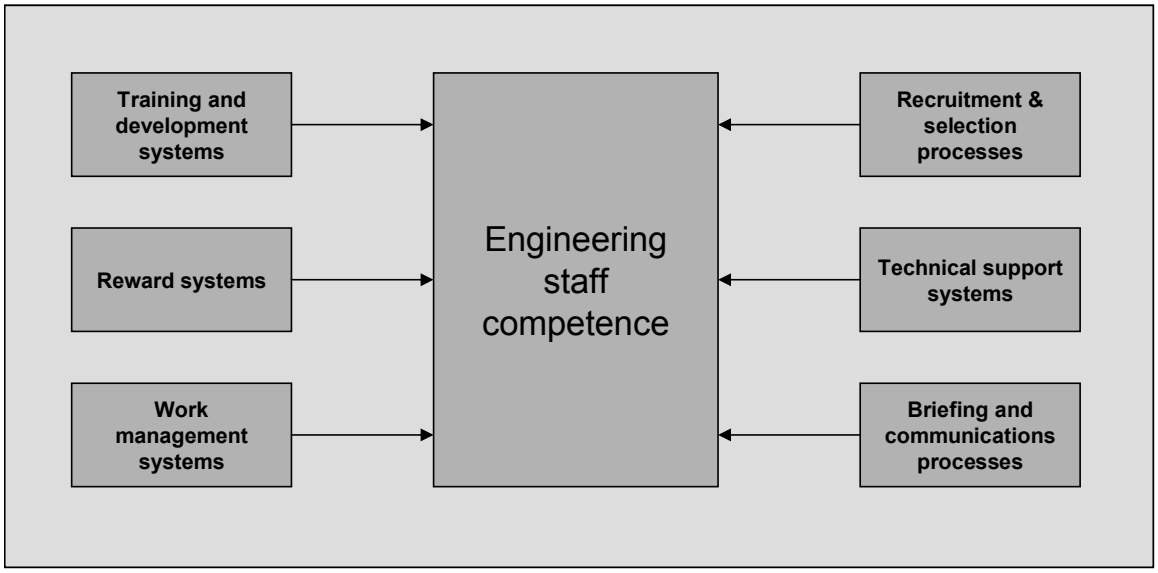

Figure 3; Influences of organisational systems on competence of front line staff

Looking outside the employing organisation it is apparent that there are factors that can influence the scope and operation of competence management systems, the standards of competence required by individual front line staff and, to a lesser degree, an effect on an individual's competence itself. Regulatory bodies (HSE Railway Division and the Strategic Rail Authority for example) can, through the creation of legislation or national frameworks, affect the scope of competence assessment systems and influence industry-wide initiatives such as national award programmes (NVQs). Engineering professional bodies (such as the Engineering Council and the various Institutions) also affect the competence requirements for practitioners through the setting of generic competence standards and the creation of national registration schemes.

The reliability of the components and the quality of supporting documentation can impact on the competence requirements for individual practitioners – if the quality of delivered spares is variable, then a higher level of competence may be required in the maintenance staff to ensure that defects are identified and rectified.

A further influence comes from the asset owners (rolling stock leasing companies, infrastructure controllers) who may specify maintenance requirements and take an active interest in the competence standards of the organisations carrying maintenance on their assets.

This network of relationships affecting the competence requirements of individual practitioners is represented below:

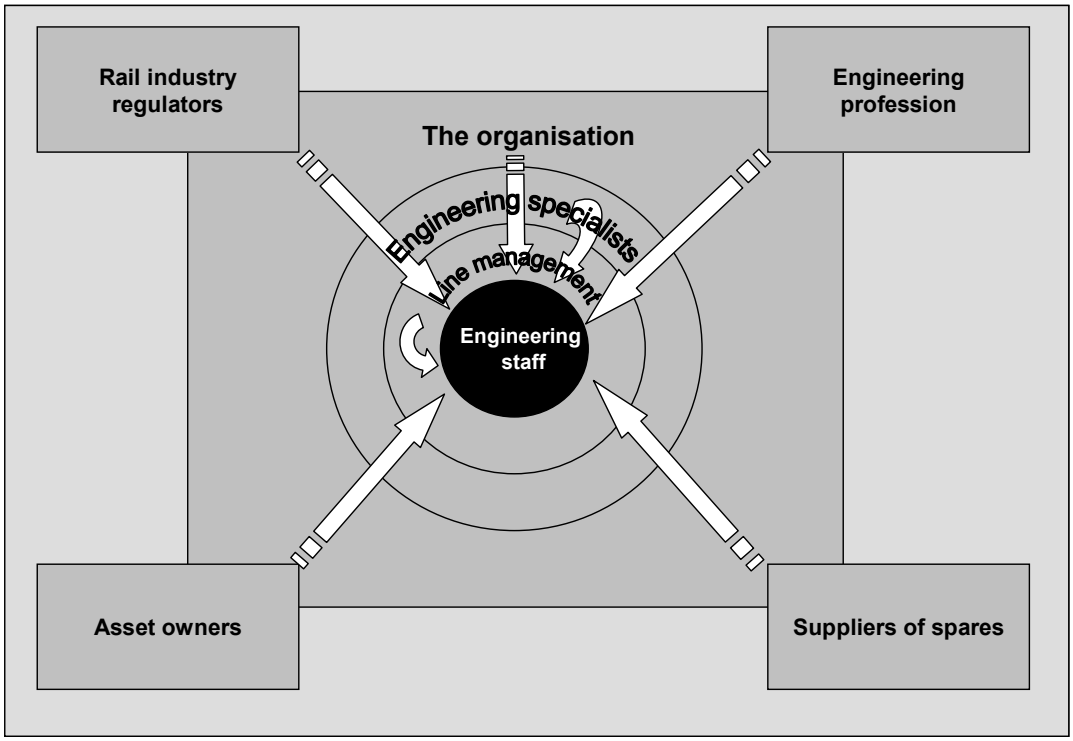

Figure 4; Influences on competence of front line staff

All this means that the individual is fairly passive in the development and maintenance of their own competence - there is little incentive (either 'carrot' or 'stick') for them to take a more active role. The result of this is that organisations are committing a significant resources to managing the competence of individual practitioners.

Competence as a variable

A further issue is the way that competence standards are used in the rail industry (as described before, this is typical of the UK in general). The industry's approach is to describe an individual as being either 'competent' or 'not yet ready'. Unfortunately this does not accurately reflect reality; competence is not a binary state, it varies over time as skills, knowledge and experience develop. In a maintenance context we can use the example of a 1st year apprentice – a 'novice' who is likely to rigidly follow taught rules as their perception of the situation they are operating in is very limited. As the individual's experience, knowledge and skills develop they will be able to see how their actions relate to longer-term goals and outcomes until they reach the point at which their line manager trusts them sufficiently to permit them to work alone – they have become 'competent'. However, the competence of the individual is likely to continue to develop; they will be able to identify deviations from normal patterns, decisions will be made intuitively. In time, the individual will be regarded as something as an 'expert', someone that others go to for advice; someone that is able to track down the most difficult of defects in an asset's systems. The range of this variation in competence is represented below:

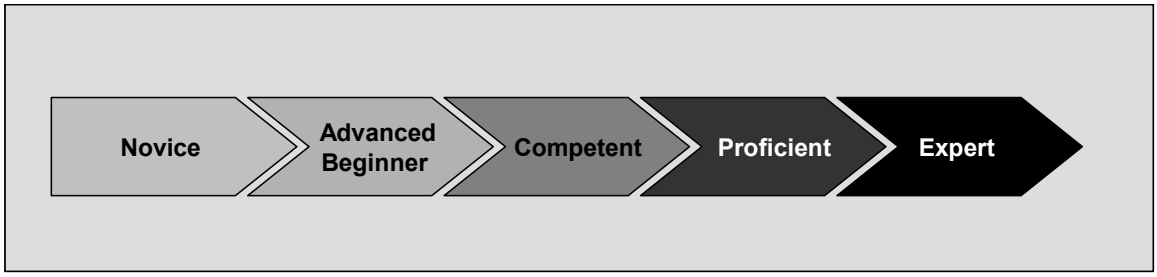

Figure 5; Competence as a variable

Recognising that there are progressive stages in an individual's competence provides a framework for incentivising individuals to develop and maintain their own competence. This would shift the balance of responsibility away from the employing organisation towards the individual practitioner.

Competence standards

There are a number of different competence standards (against which a practitioner's competence is assessed) in use in the industry. Some organisations have adopted the national occupational standards for NVQ Levels 2 and 3 developed by the Rail Industry Training Council (RITC), some organisations have developed their own standards and some standards have been developed by consultancies. Whilst use of the RITC NVQ standards should theoretically be very attractive (e.g. applicable to any type of traction, easily available), there appear to be a number of drawbacks that have caused them to be rejected by many organisations. One of these factors is NVQ standards use a vague form of language, requiring interpretation by assessors and which may then lead to inconsistent assessments. Another significant factor is that the units and elements of competence are generic in nature and not easily related to the specifics that an individual organisation may wish to focus on. In contrast, competence standards developed in-house can focus on specific asset systems and the context in which they operate. This should lead to a more effective assessment of an individual's competence as this approach should assess key risks applicable to the asset type being maintained and the way that it is used in service. The major difficulty with developing these specific, detailed standards is that they are costly (in terms of both money and time) for an individual organisation.

The outcome of some organisations developing standards independently and others using 'off-the-shelf' standards is that the industry now has many different 'standards' for similar or identical activities! The fact that different approaches have been applied also makes it difficult to compare standards of competent performance across organisations.

Frequency of reassessment

During our research we noted considerable variations in the re-assessment frequencies across different organisations even where the *same rolling stock* (e.g. HSTs) were being operated in *similar operating environments*. In such cases the reassessment frequency might reasonably be expected to be the same unless there were other significant factors affecting the overall competence levels (such as high staff turnover rates). Examples of this include the safety-critical systems of AWS where reassessment frequencies varied from 1 to 3 years and brakes where the

frequency varied from 1 to 5 years. No significant differences were identified and the variations in reassessment frequencies are therefore difficult to justify.

Conclusion

This paper has discussed how the competence of individual practitioners is dependent on many other groups of staff, extending beyond the boundaries of the employing organisation. We have also shown that the management of staff competence is interwoven with many organisational management systems. These two points together demand that the management of competence is treated holistically, not as a 'bolt-on' but as an integral part of the organisation's activities.

We have also discussed that there are variations in the rail industry's standards of competence and reassessment frequencies. Whilst this should be expected where there are differences in the types of asset, the operating environment and in the organisation itself, there should be some harmonisation where these factors are very similar or even identical.

Acknowledgements

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