Rethinking Competencies in Hazardous Industries

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Chapter 9
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Case Study of the Nuclear Sector in France

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Abstract Nuclear safety depends largely on the competence and competencies of the employees in the sector. While this is not a new subject, numerous current and future changes once again bring into question these competencies and their management. In recent years, a number of studies have demonstrated the limitations of the managerial approach to competencies, in particular their failure to take into account the collective dimension of said competencies and the contextual aspects of their implementation. In our opinion, competencies must be considered in terms of the work activity so that they are not restricted to a systematised formalism, and their management must be tackled within the organised framework in which they are deployed.

Keywords Competencies · Nuclear sector · Work activities

9.1 Introduction: Why Study Competencies in the Nuclear Industry?

French nuclear facilities are ageing, which raises new technical issues regarding the use or replacement of certain items of equipment, as well as the decommissioning work that can be expected. At the same time, the development of complex technologies—from digital twins to the use of artificial intelligence to identify probable failures, as well as the design of small modular reactors (SMRs)—reveals the critical importance of competence and competencies.

Meanwhile, the retirement of numerous workers in the nuclear sector in Europe and more especially in France, in addition to the poor opinion that younger generations have of the nuclear industry, raises questions regarding the development, and even the upkeep, of knowledge capital in the sector. This point is not new, as it was

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raised in the early 2000s by Mr. El Baradei,[1] Director General of the International Atomic Energy Agency (IAEA) from 1997 to 2009.

The way in which competencies in the nuclear industry are taken into account is related to the way in which people are integrated in socio-technical systems. This connection has evolved with the history of the sector and as a result of major nuclear accidents. It was after the accident at the Three Mile Island (TMI) power plant on 28 March 1979 that questions inherent to the training of operating staff came to be seen as being of major importance [11]. More recently, the accident at the Fukushima Daiichi power plant in Japan on 11 March 2011 can be considered as a new factor in the way competencies are taken into account in the nuclear industry. The earthquake and the tsunami that followed seriously affected the nuclear facilities as well as their environment. Consequently, providing support to the power plant agents proved complicated and, to a large extent, they had to cope on their own with a "beyond design" situation far exceeding the realm of what the plant was designed to withstand. Analysts at the time pointed out the importance of the resilience and competencies required to cope with unexpected events [12]. This accident raised questions, firstly, around the implementation of the competence and competencies of nuclear players in "extreme situations" [7] and, secondly, around the competencies of players not specifically belonging to the nuclear sector, but who are nevertheless stakeholders in crisis management (politicians, emergency services, medical staff, etc.).

Questions concerning the training and competencies of personnel working in the field of safety and radiation protection, therefore, fall within the scope of a long-term process marked by critical events. The subject of competence and competencies is not new, but has evolved further to these events and the questions they raised. They have led nuclear operators to define and deploy a set of systems to identify competency requirements in the short and medium terms, then evaluate, acquire and maintain said competencies.

However, this managerial approach to competencies has its limitations. In this document, we will attempt to describe them and to present an approach aimed at surpassing them.

9.2 Limitations of Managerial Approach to Competencies

In France, Strategic Workforce Planning (SWP) is built into the labour code: since 2005, all companies with more than 300 employees must renegotiate the SWP every three years. These companies, supported by management science researchers, have thus conducted long-term studies on the creation and deployment of a managerial approach to competencies.

While one undeniable advantage in taking these competencies into account has been the "production and renewal of numerous HRM (Human Resources Management) tools" [2, p. 40], the use of this concept has also led to studies on the work

[1] Speech by Mohamed El Baradei, during the IAEA general assembly in 2002.

itself and on workers (as opposed to qualifications focusing on workstations) and to more emphasis being placed on the role played by the work environment and its various components as contributing to the acquisition and mobilisation of such competencies. These two advantages—the development of a managerial approach to competencies and the work itself being taken into account—form the "competencies paradox". On the one hand, there is a move to standardise these competencies, and on the other hand, the assertion of a singularity that the systems struggle to encapsulate.

Most definitions of competency are based on elements put forward by ergonomics and psychology, where competence is defined as

> the individual taking initiative and responsibility for problems and events that they face in professional situations. [...] a practical understanding of situations that relies on knowledge acquired and transforms them... [18, p. 70]

This transformation depends largely on resources that can be mobilised in a given situation and the abilities of the individual to mobilise them.

Presented in this way, competencies are transformed whenever they are implemented; they are what allows the player to take action in view of what is available and what is missing. It is, therefore, difficult to contain them in management systems that endeavour to normalise a situation in order to manage it. By attempting to specify and categorise competencies at all costs, we risk creating constraints that are too rigid or an administrative management that is disconnected from the reality of actual working situations, despite the fulfilment of such activities relying on the ability to adapt and invent new solutions.

Another limitation of the managerial approach to competencies lies in their individualising nature. While work requires increasingly collective activity to be performed, the managerial approach to competencies struggles to take into account the collective dimension of competencies.

This is evident in the way competence is evaluated, primarily on an individual basis [15], which is a major component of the "logic of competency" [14], at the core of the differentiation between players and their remuneration.

Despite these limitations, competence and competencies are always present as components of performance, both as regards production quality and industrial safety. Competencies are used in the texts of nuclear operators and regulators as an action lever and a guarantee of efficiency. Questions evolve, the subjects treated change, but competencies continue to be the centre of attention.

As an example, in 2004, the IRSN launched an analysis of the system managing the competencies of the operating personnel working for a nuclear operator. This study demonstrated that the competency reference frames, or "mandatory points of passage" of the competency approaches [13], are often highly detailed and consequently difficult to use. Similarly, the collective dimension of the activity is largely ignored by the management system, which also struggles to consider the competencies in a dynamic manner. Lastly, the deployment of the approach is incumbent upon the trades (mechanics, boilermaking, automation, etc.), while some activities, such as the monitoring of service providers, do not come under the role of a particular trade and find themselves partially "forgotten" by the management system [9].

The APTEIS[2] report entitled "Analyse de la chute du Générateur de Vapeur usé n°2 EDF—CNPE de Paluel" ("Analysis of the fall of the Paluel EDF—CNPE worn steam generator No. 2") published in 2017 confirms some of these results concerning competencies related to the monitoring activity, which corroborates the fact that the managerial approach to competencies has its limitations.

If the managerial approach to competencies has limitations, how can we tackle competencies whose implementation takes their singular nature into account, while also taking into consideration the needs of the companies, managers and operators who manage these competencies?

9.3 Rethinking Competencies in Work Activities

We do not consider that there are recommendations on the one side and actual work on the other, but rather that work is an activity that mobilises various resources—including recommendations—which must be understood, adapted and interpreted. The players' abilities to adapt are, therefore, not confined to a controlled area of freedom; they are inherent to the normality of work. According to Cuvelier and Woods [5], this "normal deviation" leads to the construction of competencies, instruments and work collectives. Competence is shaped by activities, by combining resources to reach the objective set in view of the specificities of the work situation. Competencies also establish the link between regulated safety and managed safety: effective safety is the expression of competencies implemented during the work activity, which mobilises various resources including recommendations. We, therefore, consider that competencies must be "taken seriously", in other words analysed firstly in their natural environment, that of the work "being done", and secondly considered with respect to the "organised framework" in which they lie and which they structure in return.

9.3.1 Analysing the Situational Implementation of Competencies

Competencies

> are not deployed in neutral universes, but in structured frameworks in which an employer expects the personnel or employees to comply with a hierarchical organisation, a division of the work, the scope of their "job" or "function", and to use the tools that have been imposed. [16, p. 89]

The resources (including know-how, tools, procedures and colleagues) are not always accessible, and the normative frameworks sometimes restrict the players, direct them,

[2] For "Analyse Pluridisciplinaire du Travail, Etudes et Interventions sociales", a group of experts specialising in multidisciplinary analysis of work and performing social studies.

even "prevent" them from being inventive. Knowledge is put into practice through relations—with managerial representatives, peers, customers—involving power relationships, effects of identity construction, belonging and self-image. The uses made of technical devices and systems that allow for competencies to be developed also contribute to players' strategies and behaviours. Competencies, therefore, consist of a dynamic combination insomuch as they are the result of mobilising knowledge and "supports" specific to the work context. They are remodelled each time the individuals and work collectives must "do what is necessary" to obtain an expected result, depending on their status at a given time and what is available. Consequently, the competencies implemented cannot be identified without analysing the situated activity.

9.3.2 Importance of Organisational Dimensions in the Implementation of Competencies

In order to act, individuals and collectives require internal and external resources and must be able to control the conditions necessary to access these resources. Yet, these resources are for the most part socially distributed and the product of the inscription of personal trajectories in interaction networks, organisations and institutional structures (labour market, etc.) [4, p. 15].

Thus, the contextualised implementation of resources depends partly on the individual path along which the individual acquires experience, develops certain competencies and loses others and weaves a network of potentially mobilisable interpersonal relations during the preparation and performance of the activity. Part of this path is determined by the organisation.

In theory, the development of the "logic of competency" in companies represents a shift away from seniority-based career development in which professional promotions are awarded purely for seniority at the expense of efficiency in the mobilisation of competencies and the level of performance reached. In reality, seniority-based and merit-based promotions coexist, which may cause some players to lose interest. In addition, increased professional mobility can only be exchanged for individual responsibility in the implementation and development of competencies if the internal job market available is sufficiently large. Otherwise, this may generate a feeling of imbalance, possibly even injustice, and lead the players to become demotivated [8]. Especially since today, there are numerous possibilities for developing a "side activity" [17], professional or not, simplified by communication and information technologies [3].

This possible disinvestment represents a double risk regarding safety and security. The first is that "jaded" players restrict themselves to "procedural compliance". Since industrial safety cannot be limited to a strict application of the rules, there is a strong chance that in this type of situation, the system will seize up. The second risk concerns the acquisition, development and maintenance of competencies. In trades

where competencies are acquired in the long term, like most technical trades in the nuclear sector, the lack of perspectives and disinvestment could be prejudicial to the performance of the system.

Some authors consider that "enabling organisations", which promote the development of available resources and the possibilities of using them, must be designed [1, p. 113]. This approach illustrates the importance given to the context in which the competencies are implemented.

On the one hand, because the work context, near and far, serves as a support for the action. The resources present in the work environment—technical devices and systems, procedures, but also colleagues, customers, etc.—may be mobilised by the employees to reach their objectives. On the other hand, because the employees structure their work environment so that it offers "handholds" for the action.

9.4 Conclusion

Most of the activities performed include a collective dimension. They are the fruit of joint actions conducted within collectives where specific knowledge, routines, practices, standards and shared representations have been developed. This collective dimension of the activity, which is ignored by managerial approach of competencies, can be grasped through an analysis of the contextualised competencies, whereby the mobilisation of interpersonal networks and the periods of cooperation reveal the distributed and collective competencies [10].

Regarding safety, in the nuclear industry as in other sectors, to brush aside the aporias of a managerial approach to competencies too focused on single individuals and their know-how, we must analyse the work that goes into guaranteeing safety in a given context by mobilising and structuring the internal and external resources available and questioning the competencies related to this work (whether these competencies are focused on restructuring, finding workarounds, reorganisation or otherwise).

This situated approach towards competencies must also highlight the role of the "organised framework" on the implementation of competencies. The organisational measures set up to hire, train and foster progress for the players have an impact on the action itself, since they allow players to mobilise particular resources depending on procedures that are quite often specific to them. Conversely, players build this framework by creating rules, routines and systems; employees "fit out" their environment in such a way that it complies with and guides their action. This is made all the easier when the context is flexible.

Based on a situational analysis of the activity, a managerial approach to competencies should, therefore, firstly beware of any systematism and highlight the collective dimension of "safety work", including in the evaluation of the competencies and, secondly, consider how to make work environments more flexible. This approach would consist in adding value to surplus, asperities and duplicates, rather than erasing them.

Lastly, it may be worthwhile questioning the deployment of the "logic of competency" in organisations whose operation is still largely based on the planned organisation model [6]. Is there not a paradox, even an incompatibility, in implementing a logic advocating responsibility, autonomous and deliberate mobilisation in organisations where the activity is strictly defined and where players are expected to rigorously apply the rules and comply with the "best practices" enacted by the designers?

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