# Adoption of competence management practices by industries in an emerging country: An analysis via Fuzzy TOPSIS

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**Purpose**: The purpose of this paper is to examine competence management practices in Brazilian industries using ISO 10015 as a framework of analysis, which establishes guidelines for competence management and people development.

**Design/methodology/approach**: A survey was conducted with 22 high-qualified human resources management (HRM) professionals (81.8% of participants hold a PhD) with extensive experience in the Brazilian industrial sector (an average of 20.4 years). The experts assessed 13 practices (P) elaborated based on the ISO 10015:2020, considering two categories: large industries (LI) and small and medium-sized industries (SMI). Data analysis was performed using Hierarchical Cluster Analysis, frequency analysis, Fuzzy TOPSIS and sensitivity analysis.

**Findings**: The practice "individual competences are correctly defined by organizations at all hierarchical levels" was deemed the best practice for LIs, while the practice "clear definition of activities and their specificities when structuring competence management and people development programs" was considered the best practice for SMIs. The practice "organizations map employees' future competence and development needs on a regular basis" received the lowest rating for both LIs and SMIs. When compared to LIs, SMIs have more severe deficiencies in applying competence management practices. The study's findings can be of great value in assisting managers in implementing structured competence management systems and people development initiatives.

**Originality**: This study fills a knowledge gap by analyzing the adoption of competence management practices in Brazil, answering the call for HRM research in developing countries. By using ISO 10015 as a framework of analysis, this study also addresses the literature gap regarding this important and relatively new management tool.

**Practical implications**: The findings of this study can be used by managers of businesses of all sizes and economic sectors to analyze their critical points in order to identify opportunities to improve their competence management systems and people development programs.

**Keywords**: Competence management; People development; Human resources management; Emerging economy; Management system standards; ISO 10015; Brazil.

## 1 Introduction

The COVID-19 pandemic has resulted in disruptive changes in the way people live and work, as well as how organizations and societies operate (UN/PRME, 2020; United Nations, 2022). In a short period of time, the economic downturn caused business closures and a large increase in the number of unemployed, weakening countries' economic and social systems (Chakraborty and Maity, 2020; Pak *et al.*, 2020). Universities and businesses were compelled to join the lockdown without warning in order to save lives, which led to the emergence of novel work arrangements, accelerated the adoption of digital technologies, and increased the demand for workers to acquire new skills (Amankwah-Amoah *et al.*, 2021; Kulik, 2021; Srisathan and Naruetharadhol, 2022).

Understanding how to organize work in a context where the professional and personal/family spheres were merged in the same environment was one of the main challenges for organizations and workers (Anholon *et al.*, 2021; Carnevale and Hatak, 2020). According to Meri (2020) and Kulik (2021), who discuss new trends in human resources management (HRM), this new work model has brought several changes, such as increased worker autonomy and responsibilities, space for creativity, and a number of new ways of working and increasing pay.

The pandemic crisis exposed flaws in corporate management that were not apparent or as noticeable during times of growth and prosperity, especially with regard to labor issues (Sigahi *et al.*, 2021). The pandemic exposed the fact that many managers neglected fundamental concepts and actions related to people management, particularly those related to risk management, the adoption of modern management systems, and the review of business plans on a regular basis (Anholon *et al.*, 2022). In this sense, the speed with which contamination occurred mirrored equally rapid changes in organizational practices to protect individuals' health, imposing on managers the need to

rethink and restructure the way they managed their businesses and cared for their employees (Anholon *et al.*, 2021; Shchepkina *et al.*, 2020).

Such transformations show that businesses have realized that, especially in times of crisis, they depend on the talent and skills of their workforce to survive, achieve their goals, and be sustainable (Hitka *et al.*, 2021; Piwowar-Sulej, 2021). Project execution within companies, particularly in moments of crisis, depends above all on the people in charge of developing and implementing them. This context fueled the discussions on the competences required during the pandemic and that will be needed post-pandemic world, and competence management has gained increasing prominence (Acosta-Prado *et al.*, 2021; Meri, 2020) both in research with qualitative and quantitative data (Silva and Ribeiro, 2021).

In a study that analysed more than 95 million online job postings between 2015 and 2018, Strack et al. (2019) found a growing demand for skills related to technologies such as data science, cloud solutions, and software development. Lund et al. (2019) added programming skills to this list. This demonstrates that various work-related transformations in terms of required skills were already underway prior to the pandemic. The COVID-19 pandemic was only responsible for accelerating a disruptive process that was expected to take years or decades (Amankwah-Amoah *et al.*, 2021; Srisathan and Naruetharadhol, 2022). Workplace trends such as hybrid or remote work (Rampasso *et al.*, 2022), intensive use of technology, and demand for the development of e-competences (Chaudhary *et al.*, 2022), are some of the factors that are likely to continue to be seen in the post-pandemic world (Naor *et al.*, 2021).

Faced with these changes in the relationship between work and workplace, employees and employers, the ability of large firms to deal with these issues differs from that of small and medium-sized enterprises. According to a study conducted by Ionita and Dinu (2021), large companies create value more efficiently when they invest in intellectual capital, that is, people, their skills, and competences. Decius and Schaper (2017) found that, while small and medium-sized enterprises have fewer resources to invest in personnel development programs, their ability to do so is directly related to the business's success. In a broad sense, intangible resources such as employee knowledge and skills are shown to be as important as or more important than tangible resources such as equipment (Horvat *et al.*, 2019).

In this context, competence management has become a form of investment and business development in recent years. Employee competences, in fact, mediate the

relationship between HRM practices and organizational performance (Otoo, 2019, 2020) and act as enablers of innovation (Loufrani-Fedida and Aldebert, 2020). In addition, research has demonstrated that there is a positive relationship between HRM practices and firm performance (Kaur and Kaur, 2022). Given the significance of these factors, studies that assist companies in developing and implementing structured management systems are of great value (Hyland and Karlsson, 2021; Talapatra *et al.*, 2019). It is also important to note that management standards such as ISO (International Organization for Standardization) can be used by managers as a framework of a process to improve management practices, which can benefit organizations of all sizes and sectors (Anholon *et al.*, 2022). The ISO 10015:2020, which establishes guidelines for competence management and people development (ISO, 2020), stands out in this regard. Based on the concepts presented in this standard, it is possible to understand that competence management and human development are intertwined, and that implementing processes aimed at improving these aspects helps organizations increase their productive capacity, comply with the defined strategies, and achieve their objectives.

Given the context presented, this paper aims to analyze competence management practices performed by Brazilian industries. A scarcity of research on competence management in Brazil was noted based on the assessment of the existing literature (Cazeri *et al.*, 2022; Pio *et al.*, 2021; Rampasso *et al.*, 2020), leading to the decision to conduct an exploratory study without restricting it to a specific sector in order to gain a more comprehensive understanding of the industrial context in this country. A survey was conducted with experts who assessed 13 practices (P) elaborated based on the guidelines of ISO 10015:2020, considering two categories: large industries (LI) and small and medium-sized industries (SMI). The findings of this paper can be of great value for the dissemination of knowledge about this important management tool, as well as for the benefit of managers who can improve competence management practices, and organizations that can be better prepared for new forms of work organization.

## 2 Theoretical background

According to Soderquist et al. (2010), the notion of competence was first defined as a human trait in the 1950s and was later elaborated in the 1980s as the centerpiece for planning, organizing, integrating, and improving all aspects of HRM systems. As research and management systems evolved, the knowledge about competences gained increasing theoretical and practical importance for organizations, and it is acknowledged as a core

component of long-term growth in any industry sector as they are associated with increased productivity and innovation (Fachrunnisa and Hussain, 2020; Loufrani-Fedida and Aldebert, 2020).

Competence can be defined as a person's underlying characteristic, which can include a motive, traits and self-concepts, attitudes or values, content knowledge, or cognitive or behavioral skills (Le Deist and Winterton, 2005). Competence can also refer to a group's or organization's ability to mobilize and combine resources to carry out an action (Defélix *et al.*, 2006) or to add value to a business in order to achieve sustainable competitive advantage (Yong and Mohd-Yusoff, 2016).

The role of context is noted in some definitions, such as competence as a standardized requirement to properly perform a specific job (Corallo et al., 2010) or a combination of resources that enables an individual to do something in a specific professional situation (Defélix et al., 2006). A distinctive competence is typically defined as an enduring firm-specific ability that leads to above-average economic performance (Corallo et al., 2010).

It is also worth noting the importance of performance in defining competence. Soderquist et al. (2010) state that competence refers to how an individual excels in specific job positions and responsibilities, whereas Spencer and Spencer (1993) understand it as a set of intrinsic attributes associated with performance in executing one or more defined tasks. In this line of thought, some authors define competence as a construct consisting of personal attributes required by a person to perform a job (Strużyna et al., 2021), or a high-order construct that describes the characteristics of an organization or a person that are prerequisites for achieving positive outcomes (Doering and Suresh, 2016).

The literature contains several ways of classifying competences. Focusing on individual competences, Corallo et al. (2010) propose that there are three types, i.e. competence-in-stock (previously acquired), competence-in-use (currently put into practice), and competence-in-making (target competences). Loufrani-Fedida and Aldebert (2020) broaden the discussion by considering the types of resources (e.g., human, financial, technological, technical, temporal, informational) and the level of analysis: the individual (personal competences), the team (collective competences), the organization (strategic competences), and the interorganizational level (interorganizational competences). As observed by Bassett-Jones (2023), it is important

to realize that strategic choices are constrained by the competences embedded in the organization, irrespective of the level of analysis or the types resources.

The literature on strategic HRM contends that the competences of the organization and the competences of employees are mutually dependent and should be aligned in order to achieve organizational and personal goals (Jiang and Messersmith, 2018; Lengnick-Hall *et al.*, 2011; Storey *et al.*, 2019). Strużyna et al. (2021) proposed three approaches to this alignment: top-down, in which organizational competences govern employee competences; bottom-up, in which workforce competences determine organizational competence development systems; and mixed, in which the interactions between organizational and individual competences are considered as mutual conditioning and their management necessitates continuous integration.

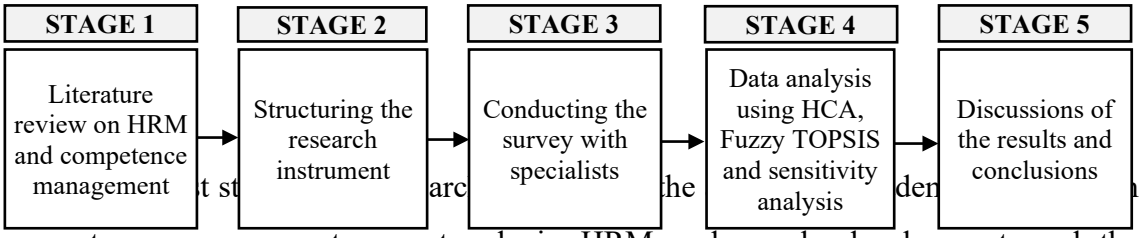
Regardless of the approach adopted by the organization, the primary goal of implementing competence management systems is to increase the competitive advantage and longevity of the organization (Strużyna et al., 2021). Competence management can be understood as the set of managerial actions taken by the organization to identify, construct, and evolve competences (Loufrani-Fedida and Saglietto, 2016), which includes both managing them (i.e. establishing and applying management rules) and developing them (Loufrani-Fedida and Aldebert, 2020). In this sense, competence management refers to a systemic, professional and deliberate approach to planning, creating, organizing, using, controlling and changing features of an organization and its members in order to foster and develop successful functional capabilities (Uzunca, 2018).

Research in HRM showed that organizational agility and resilience are strongly influenced by how organizations approach competence development at all levels (Bassett-Jones, 2023). Furthermore, competences are recognized as facilitating the process of innovation (Loufrani-Fedida and Aldebert, 2020), and competence management is regarded as a driver of administration improvement (Strużyna et al., 2021). Given the literature's emphasis on the importance of competencies for personal and organizational development, it is important to acknowledge that competence management systems are at the heart of organizational performance, as they drive training and learning strategies and processes, content development, and performance assessment (Corallo et al., 2010). Thus, expanding knowledge on competence management is critical for understanding the current and future performance of employees and organizations across all economic sectors (Strużyna et al., 2021).

## 3 Materials and methods

This study was approved by the Research Ethics Committee of the university where it was conducted (CAAE 50589421.5.0000.5404). The research was conducted following five stages as presented in Figure 1.

**Figure 1**. Research process. **Source:** Authors own creation.




t st arc the den competence management, new trends in HRM and people development, and the guidelines proposed by the ISO 10015:2020 standard. A comprehensive approach was adopted to conduct a bibliographic research employing the following terms and combinations: "competence management," "talent management," "knowledge management," "ISO 10015:2020," and "people development." In addition, the impacts of the COVID-19 pandemic on organizations and the workplace were considered as important contextual factors; thus, some terms and their combinations were included in the search, i.e. "covid-19," "coronavirus," and "pandemic." The search was conducted using scientific databases such as Web of Science, Scopus, Elsevier, and Emerald Insight. This stage was important for establishing the conceptual foundation and increasing the robustness of the construction of the research instrument. Furthermore, although a systematic review study was not conducted, the thorough and critical evaluation of the existing literature allowed us to observe the scarcity of studies on competence management in Brazil.

### *3.1 Survey structuring and research instrument development*

The research instrument was structured in two parts. The first aimed to characterize the participant's profile and included questions about academic and professional experience, and research topics and activities. The second section concentrated on evaluating competence management practices in the Brazilian industrial sector. The structuring and execution of the survey followed Forza's (2002) recommendations.

The ISO 10015:2020, which is recognized as a reference for establishing guidelines for competence management and people development (Lin *et al.*, 2010;

Stefanelli *et al.*, 2019), was used as a framework to elaborate 13 competence management practices (Table I) that were assessed by experts in the field of HRM.

<INSERT TABLE I APPROXIMATELY HERE>

For each of the practices, respondents were asked about their adoption considering two categories: large industries (LI) and small and medium-sized industries (SMI). For each practice and each category, respondents provided answers based on the following scale: 'Not applied' (NA); 'Applied superficially' (AS); 'Applied reasonably' (AR); 'Applied properly' (AP); or 'Applied in a well-structured way' (AW). It is important to mention that this scale was used in other studies using similar methods and investigating other types of management practices (e.g., Bobel *et al.*, 2022; Pompilio *et al.*, 2023).

This study used a non-probabilistic and judgmental approach to select participants with conceptual and practical knowledge qualified to participate in the research (Apostolopoulos and Liargovas, 2016). A sample of 22 highly qualified professionals was defined through the evaluation of educational level, experience, and knowledge. The following criteria were used to select the participants: years of experience in the field of HRM, competence management and people development; conducting research directly related to competence management; and teaching, training, and supervision activities for developing qualified human resources in the field. The sample is composed of 81.8% of participants with a PhD, with an average of 20.4 years of experience in teaching and research in the field of HRM.

*3.2 Data analysis*

Data analysis was conducted using Hierarchical Cluster Analysis (HCA), frequency analysis, Fuzzy TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) and sensitivity analysis. The combination of these methods has been used to integrate uncertainties into the analysis, thereby providing greater robustness to the results (Bobel *et al.*, 2022; Pompilio *et al.*, 2023).

The HCA made it possible to identify how the data were grouped based on the traits of the respondents, creating a hierarchy that can be visualized as a dendrogram (Subramaniyan *et al.*, 2020). In this study, the HCA was employed to comprehend how respondents were divided into groups based on their level of education, experience, and expertise in the field of competence management. The percentages reported by

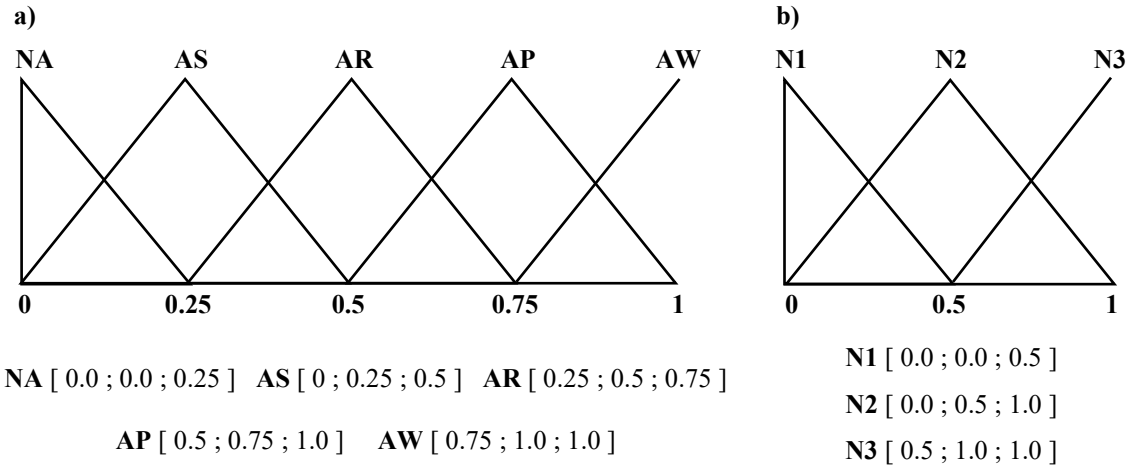
respondents for each of the 13 competence management practices examined in each category (i.e., LI and SMI) were initially analyzed using frequency analysis.

The application of Fuzzy TOPSIS followed the methodology proposed by Chen (2000), where the competence management practices served as alternatives ($A_i$) and the respondents as criteria ($C_j$) with weights based on their educational background, professional experience, and subject-matter expertise ($w_j$). The matrix $\widetilde{D}$ composed of the fuzzy numbers $\tilde{x}_{ij}$ and the vector $\tilde{E}$, which represents the fuzzy weights of the respondents were calculated as follows:

$$\widetilde{D} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \cdots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \cdots & \tilde{x}_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ \tilde{x}_{m1} & \tilde{x}_{m2} & \cdots & \tilde{x}_{mn} \end{bmatrix}; \ \tilde{x}_{ij} = [a_{ij}, b_{ij}, c_{ij}] \qquad \tilde{E} = [\widetilde{w}_1, \widetilde{w}_2, \ldots\ldots \widetilde{w}_n]; \ \widetilde{w}_j = [w_1, w_2, w_3]$$

The fuzzy version of (a) the evaluation scale of practices and (b) the levels for allocation of respondents based on education, experience, and knowledge are shown in Figure 2.

**Figure 2**. Fuzzy values of (a) the assessment scale used and (b) the levels for grouping respondents. **Source:** Authors own creation.




Following Chen (2000), the matrix $\widetilde{D}$ was normalized based on the highest score value, obtaining the matrix $\tilde{R}$, which was weighted by the vector $\tilde{E}$, resulting in the matrix $\tilde{V}$.

$$\tilde{R} = [\tilde{r}_{ij}]_{m\times n} \text{ where } \tilde{r}_{ij} = \left(\frac{a_{ij}}{C_j^*}, \frac{b_{ij}}{C_j^*}, \frac{c_{ij}}{C_j^*},\right) \ ; \ C_j^* = \max\text{ (i) } c_{ij} \ \rightarrow \ \tilde{V} = [\tilde{v}_{ij}]_{m\times n} \ ; \ \tilde{v}_{ij} = \tilde{r}_{ij}\,(.)\widetilde{w}_j$$

The next step consisted of calculating the distances $d(\tilde{m}, \tilde{n})$ between each elemento of the matrix $\tilde{R}$ and the vectors [1;1;1] and [0;0;0], resulting in the total positive ($d_i^*$) and negative ($d_i^-$) distances.

$$\mathrm{d}(\tilde{m}, \tilde{n}) = \sqrt{\frac{1}{3}[(m_1 - n_1)^2 + (m_2 - n_2)^2 + (m_3 - n_3)^2]}$$

$$d_i^+ = \sum_{j=1}^{n} d(\tilde{v}_{ij}, \tilde{v}_j^*) \quad ; \quad d_i^- = \sum_{j=1}^{n} d(\tilde{v}_{ij}, \tilde{v}_j^-)$$

Then, the last step of the method was calculating the proximity coefficient ($CC_i$), which allowed the structuring of the ranking of the competence management practices according to their level of adoption in the experts' perception.

$$CC_i = \frac{d_i^-}{(d_i^* + d_i^-)}$$

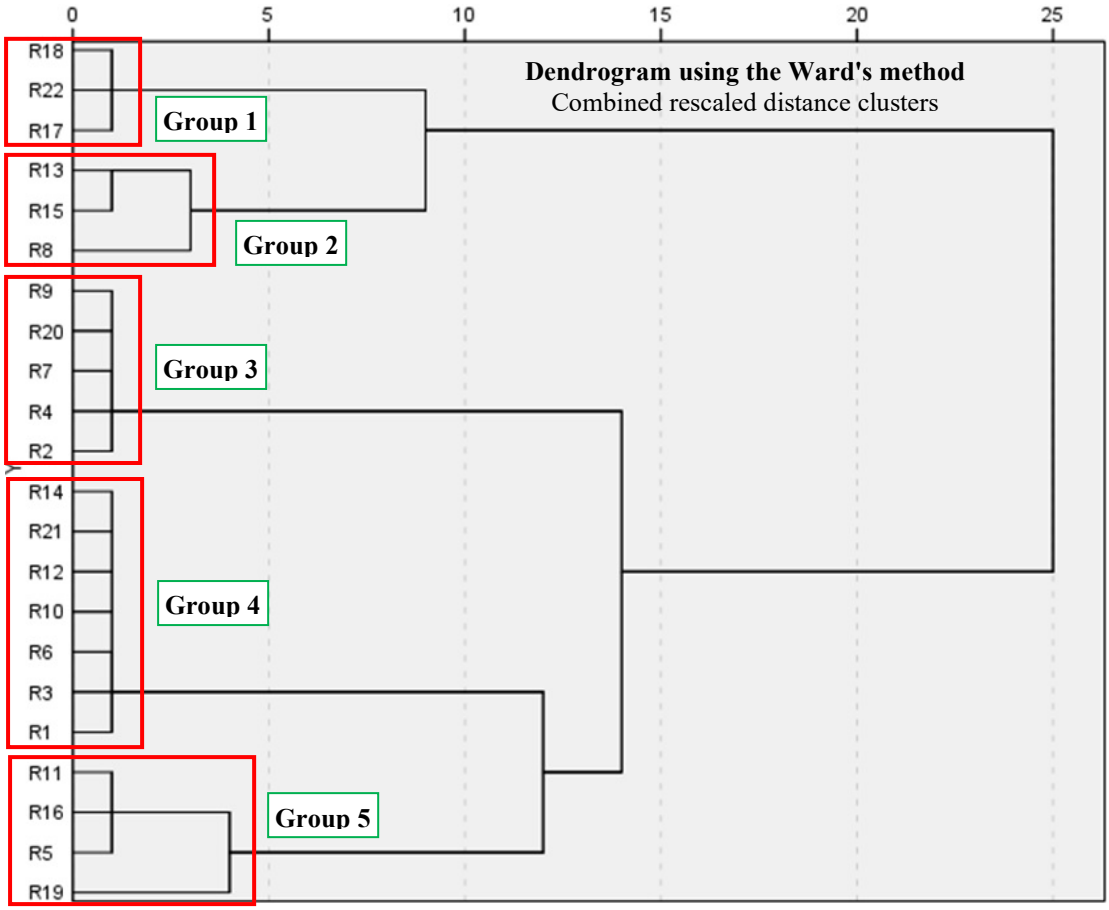
Finally, a sensitivity analysis was conducted by examining various scenarios, each one considering the exclusion of a group of respondents as defined by the HCA, which allowed understanding how each one influenced the ordering of the competence management practices.

## 4 Results

### *4.1 Hierarchical Cluster Analysis*

The HCA was used to create clusters that grouped the 22 experts according to their similarities (Figure 3), taking into account their educational background, experience, and knowledge (i.e., years of experience in the field of HRM, competence management and people development; conducting research directly related to competence management; and teaching, training, and supervision activities for developing qualified human resources in the field).

**Figure 3**. Dendrogram from the Hierarchical Clustering Analysis. **Source:** Authors own creation.




The groups of specialists were then assigned in levels 1 (Group 1), 2 (Groups 2, 3 and 5) and 3 (Group 4) (Table II). Level 3 corresponds to the highest level of education, experience and knowledge, followed by levels 2 and 1.

<INSERT TABLE II APPROXIMATELY HERE>

*4.2 Observed frequency analysis*

For each of the 13 competence management practices evaluated (P1 to P13), which illustrate essential topics of the ISO 10015:2020, the frequency of responses was calculated corresponding to the scale options: ‘Not applied’ (NA); ‘Applied superficially’ (AS); ‘Applied reasonably’ (AR); ‘Applied properly’ (AP); and ‘Applied in a well-structured way’ (AW). This procedure was performed for the categories of large industries (LI) and small and medium-sized enterprises (SMI).

*4.2.1 Data analysis for large industries (LI)*

The global frequency of data referring to LIs is presented in Table III.

<INSERT TABLE III APPROXIMATELY HERE>

In the scenario of LIs in Brazil, it is worth noting that all practices, with the exception of P9 (organizations encourage team and individual participation in the planning of initiatives related to competence management and people development) and P13 (organizations regularly map employees' future competence and development needs, taking relevant factors into account), were classified as 'applied in a well-structured way' (AW) by at least one of the respondents, although only P4 (organizations conduct competence management and team-level development activities including group training, professional forums, knowledge sharing, targeted communication via newsletters, and recruitment to fill specific gaps) and P7 (organizations develop individual learning programs, networking events, personal development plans, mentoring, instruction, and supervision, among other actions, related to competence management and people development at the individual level) received this evaluation by more than three experts.

The highest concentration of scores was in 'applied reasonably' (AR), with all practices evaluated at this level receiving more than 25% of the total answers, and P7 being the only one not evaluated by more than one-third of the experts.

The only cases that showed more than 50% agreement in the responses were P1 (organizations conduct a critical analysis of individual and team competences requirements in order to identify existing gaps and deficiencies; based on this, they develop actions to address them), P2 (organizations conduct mapping of internal and external issues, as well as surveys of the needs and expectations of interested parties, to verify what can impact the needs of organizational competences), P5 (individual

competences are correctly defined by organizations at all hierarchical levels to ensure the effectiveness of each function), and P10 (organizations consider the specific activities to be delivered, the locations where the activities will be conducted, the duration of the activities, and how achievement of objectives will be measured and recognized when structuring competence management and people development programs), all considered 'applied reasonably' (AR) by the experts.

*4.2.2 Data analysis for small and medium-sized industries (SMI)*

The global frequency of data referring to SMIs is presented in Table IV.

<INSERT TABLE IV APPROXIMATELY HERE>

In the scenario of SMIs in Brazil, none of the practices was considered to be 'Applied in a well-structured way' (AW), with the exception of P11 (Organizations structure work teams with well-defined roles and responsibilities when implementing competence management and people development programs, including the definition of the employees responsible for training and communicating with stakeholders), which received only one score in this level. Furthermore, none of the practices were considered 'Applied properly' (AP) by more than one expert.

The highest concentration of scores was in 'Applied superficially' (AS), with all practices evaluated at this level by more than one-third of the experts. Of these, six practices showed more than 50% agreement (P1, P6, P7, P10, P11 and P12).

P3 (organizations consider relevant aspects such as leadership styles, team structures, cultural aspects, and desired results, in order to correctly define the competences for each group or team) and P9 (encourage team and individual participation in the planning of initiatives related to competence management and people development) presented the highest frequency in the lowest level of adoption ('Not applied') with 40.9%.

*4.3 Comparative ordering analysis via Fuzzy TOPSIS*

Following the procedures proposed by Chen (2000) and described in section 2.2, the proximity coefficients ($CC_i$) were calculated and based on them the practices were

ordered considering LIs and SMIs. In addition, sensitivity analysis was performed to verify the influence of each group of respondents in the ordering of practices.

*4.3.1 Data analysis for large industries (LI)*

The results of the ordering of practices via Fuzzy TOPSIS and sensitivity analysis for LIs is presented in Table V.

<INSERT TABLE V APPROXIMATELY HERE>

For Brazilian LIs, the first place, that is, the competence management practice with the highest level of application in the perception of the specialists, was P5 (individual competences are correctly defined by organizations at all hierarchical levels to ensure the effectiveness of each function), while the last place was P13 (organizations regularly map employees' future competence and development needs, taking relevant factors into account).

The sensitivity analysis reveals that P5 was ranked first in three scenarios, with P10 and P11 appearing in first place in one scenario, while P13 was last in all of them. The group that had the most influence was G4, showing that the assignment of different weights to the three levels was done properly, since N3 (which encompasses G4) corresponds to the highest level of education, experience and knowledge and should be the one with the greatest impact.

*4.3.2 Data analysis for small and medium-sized industries (SMI)*

Finally, the results of the ordering of practices via Fuzzy TOPSIS and sensitivity analysis for SMIs is presented in Table VI.

<INSERT TABLE VI APPROXIMATELY HERE>

For Brazilian SMIs, when all groups of respondents are considered, P10 (organizations consider the specific activities to be delivered, the locations where the activities will be conducted, the duration of the activities, and how achievement of objectives will be measured and recognized when structuring competence management and people development programs) is ranked in the first place, while the last place was P13 again.

The sensitivity analysis reveals that P10 was ranked first in three scenarios, with P4 and P11 appearing in first place in one scenario. P13 was ranked last in four scenarios, with P3 appearing in the last place in one.

The group that had the most influence was G4 (classified in N3, the highest level of education, experience and knowledge), demonstrating high impact both in the first and last positions.

## 5 Discussion

Based on the results, it was clear that LIs apply competence management practices at a higher level than SMIs, though there were common deficiencies that must be carefully observed, particularly P13 (organizations regularly map employees' future competence and development needs, taking relevant factors into account), which was ranked last in the overall classifications by category and in nine of the ten scenarios evaluated. This point is critical regardless of the industry sector, since knowledge of employees' competences is central to aligning with organizational skills (Strużyna *et al.*, 2021) and, consequently, increasing productivity and promoting innovation (Fachrunnisa and Hussain, 2020; Loufrani-Fedida and Aldebert, 2020).

P8 (organizations plan competence management and people development programs by clearly defining the objectives and criteria for monitoring activity progress, taking into account statutory and regulatory requirements, and analyzing motivational aspects and potential associated risks) and P9 (organizations encourage team and individual participation in the planning of initiatives related to competence management and people development) presented deficiencies in both categories and should be looked at carefully by managers. Researchers have emphasized planning as a central component of competency management systems, as poor planning will harm the subsequent actions of this system, i.e., build and develop competences (Loufrani-Fedida and Aldebert, 2020; Loufrani-Fedida and Saglietto, 2016).

The practices P5 and P10 appeared ranked in the top 3 for both LIs and SMIs. Thus, in the opinion of the specialists, the strengths of the Brazilian industry in terms of competence management practices are related to the understanding of the competences required for an employee to perform a certain function, as well as the definition of activities and their specificities when structuring competence management and people

development programs. On the one hand, this is an encouraging result for managers of Brazilian companies, since the correct definition of the necessary competences is closely linked to the performance of both the individual and the organization as a whole, as observed in the literature (Doering and Suresh, 2016; Soderquist *et al.*, 2010; Strużyna *et al.*, 2021). On the other hand, it should be noted that the highest concentration of scores for LIs and SMIs was in 'applied reasonably' and in 'applied superficially', respectively, demonstrating that there is still enormous room for improvement in terms of competence management.

The findings revealed that competence management practices are poorly adopted by SMIs, despite being defined and explained in standards such as ISO 10015:2022. No practice was evaluated at the two highest levels ('applied properly' and 'applied in a well-structured way') by more than one expert in this category. At this point, it is worth emphasizing the significance of competence management in SMIs, which has been shown in the literature to be a determining factor for innovation (Loufrani-Fedida and Aldebert, 2020) and organizational performance (Otoo, 2019, 2020). The low level of application of competence management practices indicates the immense difficulty that SMIs have been facing in recovering from the impacts of the COVID-19 pandemic (Bobel *et al.*, 2022), since organizational agility and resilience are in large part determined by how organizations set about building their competences at all levels (Bassett-Jones, 2023).

In general, the findings show that, despite its importance being recognized by the academic community and practitioners, competence management is still little transformed into practice in Brazilian industries. This point becomes even more critical in a context of rapid and constant technological changes that impact HRM, such as the emergence of industry 4.0 in Brazil (Pio *et al.*, 2021), with significant implications for the forms and environments of work (Sigahi *et al.*, 2021), competence management and people development will be critical factors for the success of organizations of any size and sector (Strużyna *et al.*, 2021).

Furthermore, it is important to note the potential implications of improving competence management practices on organizations and society as a whole. Organizations that focus on optimizing their workforce's skill sets are better equipped to thrive in the face of challenges and capitalize on opportunities. Firstly, by ensuring that employees possess the right competencies for their roles, tasks are completed efficiently and with higher quality, leading to an increased productivity. Secondly, promoting innovation hinges on nurturing a skilled workforce. When employees are continuously

developed and encouraged to explore new ideas, creativity flourishes, leading to breakthroughs and competitive advantages. Finally, as technology continues to reshape industries, organizations must prepare for technological transformation. Competence management facilitates the identification of skill gaps and facilitates targeted training initiatives to equip employees with the necessary expertise to embrace technological changes confidently.

## 6 Conclusions

The aim of this study was to analyze the level of adoption of competence management practices by Brazilian industries, based on the structure of the ISO 10015:2020 and the opinion of experts on the subject. For LIs, P5 (individual competences are correctly defined by organizations at all hierarchical levels to ensure the effectiveness of each function) was considered the practice with the best application rate, while for SMIs, P10 (organizations consider the specific activities to be delivered, the locations where the activities will be conducted, the duration of the activities, and how achievement of objectives will be measured and recognized when structuring competence management and people development programs) was chosen. This is important considering that organizations that prioritize optimizing their workforce's skill sets will be better equipped to confront challenges and capitalize on emerging prospects, leading to heightened productivity and improved task execution. In addition, nurturing a skilled workforce promotes innovation by fostering creativity, ultimately yielding competitive advantages.

In all scenarios tested for LIs and SMIs, P13 (organizations regularly map employees' future competence and development needs, taking into account factors such as demographic, economic, political, and social factors, the introduction of new products and services, new emerging knowledge, technological advances, and changes brought about by stakeholders) appear in the last position in the comparative ordering analysis. This finding deserves attention from industry and academic community once competence management plays a pivotal role in identifying skill gaps and facilitating targeted training initiatives, enabling employees to confidently embrace technological changes.

It is necessary to take into account that ISO 10015:2020 is relatively recent, and it takes a while from the publication of this type of management tool to the effective implementation of practices in the reality of companies. Thus, in general, the

recommended competence management practices have had some adherence in the reality of Brazilian LIs, while SMIs remain in more deficient situations. The study's findings may be useful for Brazilian managers who want to develop a structured competence management systems and/or consolidate existing practices in their organizations. In this regard, it is critical to highlight the systemic impact that improvements in people development can have, once organizations depend on the talent and skills of their workforce to survive, achieve their goals, and be viable in highly changing world.

This study fills a knowledge gap by providing a broad view of the adoption of competence management practices in the Brazilian industrial sector, contributing to advance theory on HRM in developing countries. Another relevant contribution is the use of ISO 10015:2020 as a framework of analysis, which can be useful for understanding the importance of management systems standards for organizational development regardless of the industrial sector or cultural context. As practical implications, the findings of this study can be used as a starting point by managers of businesses of all sizes and economic sectors to identify critical issues related to HRM in order to identify opportunities to improve their competence management systems and people development programs.

The limitations of this study should be acknowledge. First, this study did not delve into a specific sector, so there is a limitation in identifying differences in HRM practices by industry type. Future research can use this exploratory study as a starting point to conduct investigations that take into account the particularities of each industrial sector to understand how they impact on competence management practices. Second, this study is limited to a particular context and was based on quantitative methods of analysis. Future studies can use qualitative methods (e.g., interviews) and increase the pool of specialists to advance knowledge on competence management practices in the Brazilian context. In addition, investigating other contexts, including both developed and developing countries, can be of great value to understand how cultural factors impact competence management practices. Comparing the results of studies in different countries can help determine how LIs and SMIs are performing and evolving their competence management practices, which can be especially useful for managers.

Finally, it is important to note that ISO 10015:2020 serves as an essential reference for businesses looking to implement structured competence management systems and people development initiatives. This standard is useful for both scholars and

practitioners working in the HRM and people development fields, as well as for employees, managers, and businesses.

**References**

Acosta-Prado, J.C., Navarrete, J.F.F. and Tafur-Mendoza, A.A. (2021), "Relationship between conditions of knowledge and innovation capability in new technology-based firms", *International Journal of Innovation Management*, Vol. 25 No. 1, p. 2150005.

Amankwah-Amoah, J., Khan, Z., Wood, G. and Knight, G. (2021), "COVID-19 and digitalization: The great acceleration", *Journal of Business Research*, Vol. 136, pp. 602–611, doi: 10.1016/j.jbusres.2021.08.011.

Anholon, R., Serafim, M.P., Dibbern, T. and Leal, W. (2022), "The importance of ISO management system standards in a scenario of profound changes caused by the Covid-19 pandemic to Brazilian companies", *Brazilian Journal of Operations & Production Management*, Vol. 19 No. 1, p. e20221248, doi: 10.14488/BJOPM.2021.042.

Anholon, R., Silva, D., Souza Pinto, J., Rampasso, I.S., Domingos, M.L.C. and Dias, J.H.O. (2021), "COVID-19 and the administrative concepts neglected: reflections for leaders to enhance organizational development", *Kybernetes*, Vol. 50 No. 5, pp. 1654–1660, doi: 10.1108/K-10-2020-0707.

Apostolopoulos, N. and Liargovas, P. (2016), "Regional parameters and solar energy enterprises", *International Journal of Energy Sector Management*, Vol. 10 No. 1, pp. 19–37, doi: 10.1108/IJESM-11-2014-0009.

Bassett-Jones, N. (2023), *Strategic Human Resource Management*, Routledge, London, doi: 10.4324/9781315630557.

Bobel, V.A. de O., Sigahi, T.F.A.C., Rampasso, I.S., Moraes, G.H.S.M. de, Ávila, L.V., Leal Filho, W. and Anholon, R. (2022), "Analysis of the Level of Adoption of Business Continuity Practices by Brazilian Industries: An Exploratory Study Using Fuzzy TOPSIS", *Mathematics*, Vol. 10 No. 21, p. 4041, doi: 10.3390/math10214041.

Carnevale, J.B. and Hatak, I. (2020), "Employee adjustment and well-being in the era of COVID-19: Implications for human resource management", *Journal of Business Research*, Vol. 116, pp. 183–187, doi: https://doi.org/10.1016/j.jbusres.2020.05.037.

Cazeri, G.T., Santa-Eulália, L.A. de, Serafim, M.P. and Anholon, R. (2022), "Training for Industry 4.0: a systematic literature review and directions for future research", *Brazilian Journal of Operations & Production Management*, Vol. 19 No. 3, pp. 1–19, doi: 10.14488/BJOPM.2022.007.

Chakraborty, I. and Maity, P. (2020), "COVID-19 outbreak: Migration, effects on society, global environment and prevention", *Science of the Total Environment*, doi: 10.1016/j.scitotenv.2020.138882.

Chaudhary, P., Rohtagi, M., Singh, R.K. and Arora, S. (2022), "Impact of leader's e-competencies on employees' wellbeing in global virtual teams during COVID-19: the moderating role of emotional intelligence", *Employee Relations: The International Journal*, Vol. 44 No. 5, pp. 1048–1063, doi: 10.1108/ER-06-2021-0236.

Chen, C.-T. (2000), "Extensions of the TOPSIS for group decision-making under fuzzy environment", *Fuzzy Sets and Systems*, Vol. 114 No. 1, pp. 1–9, doi: 10.1016/S0165-0114(97)00377-1.

Corallo, A., Lazoi, M., Margherita, A. and Scalvenzi, M. (2010), "Optimizing competence management processes: a case study in the aerospace industry", *Business Process Management Journal*, Vol. 16 No. 2, pp. 297–314, doi: 10.1108/14637151011035615.

Decius, J. and Schaper, N. (2017), "The Competence Management Tool (CMT) – A New Instrument to Manage Competences in Small and Medium-sized Manufacturing Enterprises", *Procedia Manufacturing*, The Author(s), Vol. 9, pp. 376–383, doi: 10.1016/j.promfg.2017.04.041.

Defélix, C., Klarsfeld, A. and Oiry, E. (2006), "Introduction de l'ouvrage", in Defélix, C., Klarsfeld, A. and Oiry, E. (Eds.), *Nouveaux Regards Sur La Gestion Des Compétences: Apports Théoriques et Pistes d'action*, Vuibert, Paris, pp. 1–9.

Le Deist, F.D. and Winterton, J. (2005), "What Is Competence?", *Human Resource Development International*, Vol. 8 No. 1, pp. 27–46, doi: 10.1080/1367886042000338227.

Doering, T. and Suresh, N.C. (2016), "Forecasting and Performance: Conceptualizing Forecasting Management Competence as a Higher-Order Construct", *Journal of Supply Chain Management*, Vol. 52 No. 4, pp. 77–91, doi: 10.1111/jscm.12111.

Fachrunnisa, O. and Hussain, F.K. (2020), "Blockchain-based human resource management practices for mitigating skills and competencies gap in workforce",

*International Journal of Engineering Business Management*, Vol. 12, p. 184797902096640, doi: 10.1177/1847979020966400.

Forza, C. (2002), "Survey research in operations management: a process-based perspective", *International Journal of Operations & Production Management*, Vol. 22 No. 2, pp. 152–194, doi: 10.1108/01443570210414310.

Hitka, M., Schmidtová, J., Lorincová, S., Štarchoň, P., Weberová, D. and Kampf, R. (2021), "ustainability of Human Resource Management Processes through Employee Motivation and Job Satisfaction", *Acta Polytechnica Hungarica*, No. 18.

Horvat, D., Moll, C. and Weidner, N. (2019), "Why and how to implement strategic competence management in manufacturing SMEs?", *Procedia Manufacturing*, Elsevier B.V., Vol. 39, pp. 824–832, doi: 10.1016/j.promfg.2020.01.422.

Hyland, J. and Karlsson, M. (2021), "Towards a management system standard for innovation", *Journal of Innovation Management*, Vol. 9 No. 1, pp. XI–XIX, doi: 10.24840/2183-0606_009.001_0002.

Ionita, C. and Dinu, E. (2021), "The effect of intangible assets on sustainable growth and firm value – Evidence on intellectual capital investment in companies listed on Bucharest Stock Exchange", *Kybernetes*, Vol. 50 No. 10, pp. 2823–2849, doi: 10.1108/K-05-2020-0325.

ISO. (2020), "ISO 10015:2020 - Quality management — Guidelines for competence management and people development", International Organization for Standardization, Rio de Janeiro.

Jiang, K. and Messersmith, J. (2018), "On the shoulders of giants: a meta-review of strategic human resource management", *The International Journal of Human Resource Management*, Vol. 29 No. 1, pp. 6–33, doi: 10.1080/09585192.2017.1384930.

Kaur, S. and Kaur, G. (2022), "Human resource practices, employee competencies and firm performance: a 2-1-2 multilevel mediational analysis", *Personnel Review*, Vol. 51 No. 3, pp. 1100–1119, doi: 10.1108/PR-08-2020-0609.

Kulik, C.T. (2021), "We need a hero: HR and the 'next normal' workplace", *Human Resource Management Journal*, No. August 2020, pp. 1–16, doi: 10.1111/1748-8583.12387.

Lengnick-Hall, C.A., Beck, T.E. and Lengnick-Hall, M.L. (2011), "Developing a capacity for organizational resilience through strategic human resource management", *Human Resource Management Review*, Vol. 21 No. 3, pp. 243–255,

doi: 10.1016/j.hrmr.2010.07.001.

Lin, W.T., Wu, Y.C., Tung, C.L., Huang, M.R. and Qin, R.S. (2010), "Establishing ISO 10015 accreditation system performance model for domestic enterprises", *Expert Systems with Applications*, Vol. 37 No. 6, pp. 4119–4127, doi: 10.1016/j.eswa.2009.11.013.

Loufrani-Fedida, S. and Aldebert, B. (2020), "A multilevel approach to competence management in innovative small and medium-sized enterprises (SMEs): literature review and research agenda", *Employee Relations: The International Journal*, Vol. 43 No. 2, pp. 507–523, doi: 10.1108/ER-04-2020-0173.

Loufrani-Fedida, S. and Saglietto, L. (2016), "Mechanisms for Managing Competencies in Project-Based Organizations: An Integrative Multilevel Analysis", *Long Range Planning*, Vol. 49 No. 1, pp. 72–89, doi: 10.1016/j.lrp.2014.09.001.

Lund, S., Manyika, J., Segel, L.H., Dua, A., Hancock, B., Rutherford, S. and Macon, B. (2019), *The Future of Work in America: People and Places, Today and Tomorrow*, *McKinsey Global Institute*.

Meri, M. (2020), "NEW TRENDS IN HRM & KNOWLEDGE MANAGEMENT IN THE HEALTH SECTOR BEYOND COVID-19 - A PRACTICAL MODEL", *Business Excellence and Management*, Vol. S.I. No. 1, pp. 5–21, doi: 10.24818/beman/2020.s.i.1-01.

Naor, M., Pinto, G.D., Hakakian, A.I. and Jacobs, A. (2021), "The impact of COVID-19 on office space utilization and real-estate: a case study about teleworking in Israel as new normal", *Journal of Facilities Management*, doi: 10.1108/JFM-12-2020-0096.

Otoo, F.N.K. (2019), "Human resource management (HRM) practices and organizational performance", *Employee Relations: The International Journal*, Vol. 41 No. 5, pp. 949–970, doi: 10.1108/ER-02-2018-0053.

Otoo, F.N.K. (2020), "Measuring the impact of human resource management (HRM) practices on pharmaceutical industry's effectiveness: the mediating role of employee competencies", *Employee Relations: The International Journal*, Vol. 42 No. 6, pp. 1353–1380, doi: 10.1108/ER-03-2019-0142.

Pak, A., Adegboye, O.A., Adekunle, A.I., Rahman, K.M., McBryde, E.S. and Eisen, D.P. (2020), "Economic Consequences of the COVID-19 Outbreak: the Need for Epidemic Preparedness", *Frontiers in Public Health*, Vol. 8 No. May, pp. 1–4, doi: 10.3389/fpubh.2020.00241.

Pio, P.C., Rampasso, I.S., Cazeri, G.T., Santa-Eulalia, L.A., Pavan Serafim, M. and Anholon, R. (2021), "Human resources and Industry 4.0: an exploratory study in the Brazilian business context", *Kybernetes*, doi: 10.1108/K-04-2021-0253.

Piwowar-Sulej, K. (2021), "Human resources development as an element of sustainable HRM – with the focus on production engineers", *Journal of Cleaner Production*, Vol. 278, p. 124008, doi: 10.1016/j.jclepro.2020.124008.

Pompilio, G.G., Sigahi, T.F.A.C., Rampasso, I.S., Moraes, G.H.S.M. de, Ávila, L.V., Leal Filho, W. and Anholon, R. (2023), "Innovation in Brazilian Industries: Analysis of Management Practices Using Fuzzy TOPSIS", *Mathematics*, Vol. 11 No. 6, p. 1313, doi: 10.3390/math11061313.

Rampasso, I.S., Mello, S.L.M., Walker, R., Simão, V.G., Araújo, R., Chagas, J., Quelhas, O.L.G., *et al.* (2020), "An investigation of research gaps in reported skills required for Industry 4.0 readiness of Brazilian undergraduate students", *Higher Education, Skills and Work-Based Learning*, Vol. 11 No. 1, pp. 34–47, doi: 10.1108/HESWBL-10-2019-0131.

Rampasso, I.S., Santana, M., Serafim, M.P., Dibbern, T., Rodrigues, E.A., Filho, W.L. and Anholon, R. (2022), "Trends in remote work: A science mapping study", *Work*, IOS Press, Vol. 71, pp. 441–450, doi: 10.3233/WOR-210912.

Shchepkina, N., Krivulia, P. and Shtapauk, S. (2020), "Competitiveness of Research and Development and project offices as a corporate innovative systems", *Proceedings of the 2nd International Scientific Conference on Innovations in Digital Economy: SPBPU IDE-2020*, ACM, New York, NY, USA, pp. 1–9, doi: 10.1145/3444465.3444483.

Sigahi, T.F.A.C., Kawasaki, B.C., Bolis, I. and Morioka, S.N. (2021), "A systematic review on the impacts of Covid-19 on work: Contributions and a path forward from the perspectives of ergonomics and psychodynamics of work", *Human Factors and Ergonomics in Manufacturing & Service Industries*, Vol. 31 No. 4, pp. 375–388, doi: 10.1002/hfm.20889.

Silva, V.V.M. and Ribeiro, J.L.D. (2021), "A discussion on using quantitative or qualitative data for assessment of individual competencies", *Personnel Review*, Vol. 50 No. 6, pp. 1460–1478, doi: 10.1108/PR-08-2019-0444.

Soderquist, K.E., Papalexandris, A., Ioannou, G. and Prastacos, G. (2010), "From task-based to competency-based", *Personnel Review*, Vol. 39 No. 3, pp. 325–346, doi: 10.1108/00483481011030520.

Spencer, L.M. and Spencer, S.M. (1993), *Competence at Work: Models for Superior Performance*, John Wiley & Sons, New York.

Srisathan, W.A. and Naruetharadhol, P. (2022), "A COVID-19 disruption: The great acceleration of digitally planned and transformed behaviors in Thailand", *Technology in Society*, Vol. 68, p. 101912, doi: 10.1016/j.techsoc.2022.101912.

Stefanelli, N.O., Teixeira, A.A., Caldeira De Oliveira, J.H., Antonio Ferreira, M. and Sehnem, S. (2019), "Environmental training: a systematic review of the state of the art of the theme", *Benchmarking: An International Journal*, Vol. 27 No. 7, pp. 2048–2076, doi: 10.1108/BIJ-12-2018-0449.

Storey, J., Wright, P.M. and Ulrich, D. (2019), *Strategic Human Resource Management*, Routledge, New York, doi: 10.4324/9780429490217.

Strack, R., Kaufman, E., Kotsis, A., Sigelman, M., Restuccia, D. and Taska, B. (2019), *What's Trending in Jobs and Skills*.

Strużyna, J., Marzec, I. and Bozionelos, N. (2021), "Competency Management in Bureaucratic Organizations: Evidence from the Polish Public Administration", *European Management Review*, Vol. 18 No. 2, pp. 43–57, doi: 10.1111/emre.12437.

Subramaniyan, M., Skoogh, A., Muhammad, A.S., Bokrantz, J., Johansson, B. and Roser, C. (2020), "A generic hierarchical clustering approach for detecting bottlenecks in manufacturing", *Journal of Manufacturing Systems*, Vol. 55, pp. 143–158, doi: 10.1016/j.jmsy.2020.02.011.

Talapatra, S., Santos, G., Uddin, K. and Carvalho, F. (2019), "Main benefits of integrated management systems through literature review", *International Journal for Quality Research*, Vol. 13 No. 4, pp. 1037–1054, doi: 10.24874/IJQR13.04-19.

UN/PRME. (2020), *2018 - 2019 Annual Report & 2020 Outlook*.

United Nations. (2022), *Progress towards the Sustainable Development Goals - Report of the Secretary-General*, New York.

Uzunca, B. (2018), "A Competence-Based View of Industry Evolution: The Impact of Submarket Convergence on Incumbent−Entrant Dynamics", *Academy of Management Journal*, Vol. 61 No. 2, pp. 738–768, doi: 10.5465/amj.2015.1080.

Yong, J.Y. and Mohd-Yusoff, Y. (2016), "Studying the influence of strategic human resource competencies on the adoption of green human resource management practices", *Industrial and Commercial Training*, Vol. 48 No. 8, pp. 416–422, doi: 10.1108/ICT-03-2016-0017.