

A metamodel for competence assessment

Co.S.M.O.[©] competences software management for organizations

Diego Bellini

Assessment Centre, University of Verona, Verona, Italy

Serena Cubico and Giuseppe Favretto

*Dipartimento di Economia Aziendale, Università degli Studi di Verona,
Verona, Italy*

Stefano A. Noventa

Methods Center, Eberhard Karls Universität Tübingen, Tübingen, Germany

Piermatteo Ardolino and Giovanna Giancesini

Assessment Centre, University of Verona, Verona, Italy

Francesco Ciabuschi

Department of Business Studies, Uppsala University, Uppsala, Sweden

Joao Leitao

*Department of Management and Economy, University of Beira Interior,
Covilha, Portugal, and*

Ajay K. Jain

Management Development Institute, Gurgaon, India

Received 9 April 2018
Revised 28 August 2018
2 May 2019
28 September 2019
Accepted 4 October 2019

Abstract

Purpose – This paper aims to propose an explorative metamodel of the key organizational competences management and presents a Web-based tool (Co.S.M.O.[©] Competences Software Management for Organizations) for all-around assessment of the identified competences.

Design/methodology/approach – Building on the Great Eight Competencies Model- GEC, the European Qualifications Framework-EQF and focus group feedback, an online questionnaire was developed to manage the key organizational competences and to adapt the competence metamodel to the Italian context.

Findings – The competence metamodel described in this study and its newly designed tool (software with online questionnaire) could be used at the organizational level to improve productivity and efficiency by allowing an easy identification of key organizational competences and facilitating their acquisition and sharing.

Research limitations/implications – Currently, the metamodel is mainly theoretical and the software sustained only a partial validation.

Practical implications – The developed tool is a dynamic, easy to use and interactive Web-based software useful for managing the competences in both for-profit and not-for-profit organizations.

Social implications – European official documents invite companies and institutions to work together and share human capital: the European Qualifications Framework-EQF, at the base of this model, facilitates a common organizational language for human resources management.



Originality/value – Managerial competence literature indicates that a comprehensive model capturing a link between the EQF and a managerial competence model has not yet been considered in the literature.

Keywords Skills, Human resources management, Competence model, European Qualification Framework-EQF, Great eight competencies model, Software design

Paper type Conceptual paper

Introduction

One of the central aims of organizations is to improve their own efficiency and productivity. To achieve that, they generally strive to create a culture that promotes learning and competence development. Competences, indeed, provide the foundations through which human resources can contribute to the very success of the organization. For over four decades, competence models have been widely used as a means for increasing organizational efficiency. For an analysis of the different definitions of competence (and competency) that can be found in the literature (Delamare and Winterton, 2005). Over years, the use of these two terms is considered essentially equivalent and interchangeable.

The first instances of this theme can be traced back to [White \(1959\)](#) and its subsequent application in [McClelland \(1973, 1976\)](#). Especially, American tradition considers skills as personal characteristics related to superior performance and motivation. In the late 1970s, the first scholar to make use of the term “competency” in the managerial context was [Boyatzis \(1982\)](#), who defined competence as a performance capability, and empirically identified a list of managerial competences including personality traits, cognitive skills and interpersonal/social skills. Later, [Spencer and Spencer \(1993, p. 6\)](#) identified competence as:

[...] motives, traits, self-concepts, attitudes or values, content knowledge, or cognitive or behavioral skills – any individual characteristic that can be measured or counted so reliable and can be shown to differentiate significantly between superior and average performers, or between effective and ineffective

Nevertheless, both meaning and definition of competence are still subject to debate because such a term encompasses multiple facets, such as knowledge, skills, abilities, behaviors and personal characteristics that allow to successfully perform critical work tasks. A more recent definition, proposed by [Rankin \(2002\)](#), describes competences as skills and behaviors that organizations expect from employees when performing work. Such a definition is the one that was adopted in the present study.

On these premises, we used a competence terminological framework to synthesize a metamodel for analyzing human capital competence consistently with the goals of the European Qualification Framework-EQF (European Commission, 2005). EQF strategies are oriented to build tools and instruments that address the needs for an integrated and shared European credit system for lifelong learning. Competence models are effective measurement tools that can help employees to define a common language and align their behavior with the strategies of the organization. Thus, organization through competence models can translate strategies into specific expected behaviors.

In the managerial literature, different competence models are currently available as well as several attempts to develop competence models for the HR management in the organizations ([Sanchez and Levine, 2009](#); [Schippmann et al., 2000](#); [Kurz and Bartram, 2002](#); [Tahir and Abu Bakar, 2010](#)). Similarly, the EQF model has been thoroughly investigated, but a critical review of the extant studies on managerial competences ([Campion et al., 2011](#); [Stevens, 2012](#)) reveals that a comprehensive model that captures the link between the

European Qualification Framework and managerial competence models has not yet been considered in the literature.

This paper aims to fill this literature gap by using both theoretical and practical approaches. First, we propose a comprehensive metamodel of managerial competences combining the EQF (European Commission, 2008) with the Great Eight Competencies (GEC) model described by Bartram (2005). Second, we translated the theoretical model, suggested in the first part of the manuscript in competences that are uploaded in a software expressly development. This Web-based software package (*Co.S.M.O.*[©] *Competences Software Management for Organizations*) allows the collection, storage and analysis of each subject's responses to measure these key competences and detect individual differences consistently with the literature. A constant update of the competence model is indeed necessary for organizations to adapt their unique assets and human capital to the changing business environment. Furthermore, the comprehensive model presented in this paper, which encompasses both theoretical and empirical aspects, was developed by considering contextual factors that could have an impact on workers' competence, such as sociodemographic variables and organizational culture. This latter, in particular, was included in the Web software by allowing decision-makers to investigate or set *a priori* the relevance of each item as perceived in the context of their organization.

Managerial competences and models

In recent years, the term “competences” has assumed several meanings, which evolved from the common usage of the term to more complex and nuanced definitions and interpretations. However, within the organizational context, such a term can be briefly conceptualized as the capability of a manager to determine the acquisition and deployment of organizational resources and the conversion of these resources into products and services (Lado and Wilson, 1994). As the basis for this proposition, competences are strictly connected with what a person is able to do and what can be observed (Campbell *et al.*, 1993). Specifically, Boyatzis (1982) identified 19 generic behavioral competences associated with the average managerial performance and grouped these into five clusters (goal and action management, leadership, human resource management, focus on others and directing subordinates). Three main competence approaches can be found in literature (see, e.g. Sparrow, 1997). The first one, the management competence (or “technical/functional”) approach (Knael and Meed, 1994), fixes expected standards of workplace behaviors through a functional analysis of job roles in a specific job. The second (or behavioral) approach (McClelland, 1998) accounts for behavioral competences of effective and superior managers who are able to promote behaviors that leads to enhanced performance. The third (or job competence) approach (Mansfield and Mathews, 1985) refers to organizational competences (or strategic “core competence”), characterized by three components – tasks, task management and job environment – which interact with each other in enhancing performances.

Research has shown the role of competences in predicting leaders' productivity in the organization (Tahir and Abu Bakar, 2010), considering technical knowledge and the importance of social competences as well. In addition, researchers have acknowledged the importance of aligning organizational collective competence with strategy and the objectives of organization to promote its future success (Vakola *et al.*, 2007).

Therefore, each organization, to best suit its specific needs, identifies which competence model better describes the knowledge, skills and behaviors needed to perform a role effectively within that specific organization. Competence models offer then a “behavioral guide” for people in the organization. Competence models are models that identify, define and measure the combination of knowledge, skills, abilities including (but not limited to)

motives, personality traits, self-concepts, attitudes, beliefs, values and interests that are required to perform successfully on the job (Schippmann *et al.*, 2000).

The managing of competences enables organizations to provide competitive advantage. As reported by O'Driscoll *et al.* (2000), a competences development program focusing on future business developments is one of the most important success factors of organizations. For example, resource-based theory (Barney, 1991, 2001) explains that specific resources and strategies provide organizational performance and progressive competitive advantage for organizations. In line with this theory, Prahalad and Hamel (1990) argue that competitive advantage is not caused by unique resources but by the “core competences” of the organization. These core competences are defined as “the collective learning in the organization; the ability to coordinate diverse production skills and integrate multiple streams of technologies” (Pralhad and Hamel, 1990, p. 82). Advantage for organization is produced by the ability of management to transfer the production skills and technologies in competences.

Hogan and Warrenfeltz (2003) identified four main skills in the managerial competence model: intrapersonal, interpersonal, leadership and business skills. Recently, Asumeng (2014) in a critical review underlined the possibility of considering career and mentoring as important skills for managerial performance.

A recent example of a competence model with 140 possible linked behaviors was developed based on research from more than 20,000 respondents (HR professionals and their line and HR associates) around the world. The authors identified six competences: credible activist, strategic positioner, capability builder, change champion, human resource innovator and integrator and technology proponent (Ulrich *et al.*, 2012).

Furthermore, in the literature on competence models, two validated models emerged and led us to design our proposed meta-model: the European Qualification Framework-EQF (European Commission, 2008, 2018) and the Great Eight Competencies-GEC (Bartram, 2005). These two models are described in detail in the following section.

The EQF and the GEC

The European Qualification Framework-EQF model represents a metaframework, enabling national European and sectorial frameworks and systems to relate and communicate with each other (European Commission, 2008). The EQF is a metaframework that provides a reference for different qualifications framework and can be also seen as part of a qualification system (i.e. a framework for frameworks) in which the levels of qualifications are explicitly described in a single hierarchy.

A central trait of the EQF is the learning outcomes approach, consisting of eight reference levels from basic (i.e. high school graduation certificate) to advanced (i.e. doctorate). The EQF encompasses all levels of educational qualifications acquired in general, vocational and academic training. It also addresses qualifications acquired in initial and continuing education and training. EQF learning outcomes are specified in three categories:

- (1) knowledge – K;
- (2) skills – S; and
- (3) competences – C.

Those are what a learner knows understands and are able to do after the completion of a learning process. This means that qualifications comprise a broad scope of learning outcomes.

The knowledge, skills and competences-KSC concept was used in the definition and clarification of the European Centre for the Development and Vocational Training-Cedefop (Winterton *et al.*, 2006).

The EQF was adopted in February 2008 and 2010 was the first target year for the 32 European countries that had signed up to the framework, to report to other countries on how their National Qualifications System is set up and how their national qualifications levels relate to EQF. The use of the European model helps the definition and transfer of qualifications, as expressed by learning outcomes that are certified by a competent body at a national or sectorial level (European Commission, 2018). It requires reference levels and descriptors that are sufficiently generic to encompass the variety of qualifications existing at national and sectorial levels. For this reason, EQF learning outcomes are synthesized in terms of individual responsibility and autonomy, ranging from low to high.

Within this framework, the Great Eight Competencies-GEC factors (Bartram, 2005):

- (1) leading and deciding;
- (2) supporting and cooperating;
- (3) interacting and presenting;
- (4) analyzing and interpreting;
- (5) creating and conceptualizing;
- (6) organizing and executing;
- (7) adapting and coping; and
- (8) enterprising and performing.

are used as the criterion measurement framework. The GEC also explores the validity of potential predictors of workplace performance such as ability and personality. We choose this model because it is supported by a meta-analysis of 29 validation studies, $N = 4,861$, showing eight factors described better a competencies model and performance in the workplace, and provides the opportunity to consider the eight reference levels of the EQF model – from basic (i.e. high school graduation certificate) to advanced (i.e. doctorate) – in relation not only to general learning outcomes (knowledge, skills and competence) but also to the Great Eight factors. In this way, it is possible to monitor competences development over time due to new informal and formal learning. Furthermore, the GEC emerged from factor analysis and multidimensional scaling analysis of self and manager ratings of workplace performance.

The two models/frameworks presented here have been identified for the proposed metamodel because, according to our interpretative approach, they allow the creation of a link between the conceptual references of the training/education (EQF) and those of the management of human resources in organizations (GEC). A summary of the metamodel described above is presented in [Table I](#).

From metamodel to software design: the process

Aims, approaches and procedure

The main aim of this study is to present a metamodel of HR competences for both profit and nonprofit organizations. In addition, the manuscript illustrates a dynamic and interactive Web-based software developed to measure these competences within any organization.

The specific aims are to:

- introduce a meta-model of competence based on the EQF and GEC models; and

- present a Web-based dynamic and interactive software tool built on our model for competence analysis and purposely developed for organizational use, to measure the identified key competences within organizations (Co.S.M.O.[©] Competences Software Management for Organizations).

To achieve these aims, in this study, a combination of approaches (or a mixed method) strategy was used (Creswell, 2009), both:

- *Qualitative*: two focus groups with 12 Italian managers were conducted to identify the most relevant competences in organizations and organize them within the Great Eight Competencies-GEC model; and
- *Quantitative*: a prototype of the online questionnaire (content in the software Co.S.M.O.[©] described above) was developed to further investigate and confirm which are the more relevant and significant competences (described in our meta model, and especially in the GEC model through eight factors) for each specific organization.

To identify the competences, a three-step process was used (as in Khoshouei *et al.*, 2013):

- Step 1: During focus groups, managers identified and labeled competences, and for each one of them, they described several specific behaviors with the support of researchers. They provided a numerical score for each competence to rank these by importance on a five-point Likert scale. Initially, managers assigned a score to each concept independently; subsequently, a pooled rating was derived by mathematically averaging scores to guarantee content validity.
- Step 2: A list of competences, as described in the previous step by specific behaviors, was analyzed and filtered by two organizational psychologists. To ensure face validity, experts identified those competences that did not have a clear meaning and suggested an alternative phrasing and new terms.
- Step 3: Each identified competence and corresponding behaviors were included in an online questionnaire. All identified competences fitted with our model and were stored in an electronic device.

The questionnaire assesses the extent to which each identified competence within the metamodel and the corresponding behaviors (identified by a national and international literature analysis and confirmed during focus groups) are actually showed by employees.

EQF eight levels of learning outcomes in terms of individual responsibility and autonomy

European Qualification Framework-EQF European Commission, 2008, 2018	K Knowledge	S Skills	C Competences
Great Eight Competencies-GEC Bartram, 2005	Analyzing and interpreting Creating and conceptualizing	Organizing and executing Enterprising and performing	Supporting and cooperating Leading and deciding Interacting and presenting Adapting and coping

Table I.
A Summary of the proposed metamodel for competences analysis

Moreover, building on EQF level, the questionnaire measures employees' levels of individual responsibility and autonomy. Further, employee self-evaluations are compared with managers' evaluation of their employees (heteroevaluations) and it is possible to involve all the hierarchical levels (all-around assessment). Specifically, for each competence (e.g. decision-making), the questionnaire asks:

- How much of the following competences do you think you (or your employees) possess?
- How much do you think you (or your employees) use the following competences?
- What is your level of autonomy?
- What is your level of individual responsibility?

Managers and employees express their level of agreement on a five-point Likert type scale ranging from “not at all” (1) to “completely” (5) to assess competences possessed, from “never” (1) to “always” (5) to measure how often competences are used, and from “low” to “high” to evaluate levels of autonomy and responsibility. The last part of the questionnaire also includes questions on personal and professional data (for example, age, gender and role) and company data.

The questions and competence were uploaded in the Web software which was developed building on the abovementioned model for competence analysis within organizations. The software is described in the following paragraph.

The competences software management for organizations, Co.S.M.O. © A PHP (Hypertext Preprocessor) script language was used to develop a Web-based software able to collect, store and analyze the responses of individuals to an arbitrary number of items nested within an arbitrary number of factors. The software was conceived to measure not only the key competences described in our meta-analytic framework (especially in the GEC model) but arbitrary online tests and questionnaires. To achieve this, the software (based on respondent answers that completed the competence questionnaire uploaded on the Web-software) inspects both the reliability of each single factor and the validity of each single item by means of subjective evaluations of their relevance (either expressed by the very same individuals or by external raters). In particular, software procedures have been implemented to both automatically and manually select the best items within every factor, to assess the interrater reliability of item relevance, to weigh the items with respect to such relevance and finally to provide a synthetic output for decision-makers in an organization, such as business area managers and function or department managers. In particular, different output options have been provided to visualize results at both the individual and aggregated data level. Consequently, the software can be used for different purposes, ranging from measurement of pure performance indicators and individual differences and evaluations (as in key-competences assessment) to aggregated indicators of performances (as in customer satisfaction). Specifically, because the output of the analysis can be adjusted with respect to specific evaluation weights, which are based on the analysis of interrater agreement, the final display of the results appears to better represent and adhere to the relative importance of contexts that may affect the weights of items. This appears to be useful within the framework developed in this paper, as key competences can vary in their relevance with respect to different organizational contexts. The main features of these procedures are briefly reviewed in the following paragraphs. As a final general note, a friendly graphical user interface was developed to assist users during all stages of creation, administration and analysis of tests and questionnaires. The rationale behind the choice of a PHP interface,

supported by a MySQL (or an open source relational database management system), was the possibility of easy access from every device with an internet connection.

Software accounts and questionnaire

The *Co.S.M.O.*® allows for three distinct users' accounts with different permission and restriction levels:

- (1) Basic users' access is restricted to a specific test or questionnaire. The account was created for the only purpose of administering questionnaires so it has access to neither statistics nor to results and outputs.
- (2) Advanced users are also allowed to create items, factors and questionnaires, and to access the aggregated and individual output of the analysis and the associated information.
- (3) Power users can supervise all analysis, customize them by setting cut-off values, inspect results for single items and individuals, select or drop them to re-run the analysis and customize through several options the output visualized by other users.

Questionnaires, by default, can be created with an arbitrary number of items (at least three, but the required minimum number can be increased) within an arbitrary number of factors. Items can be set to record two different kinds of information:

- (1) Response ratings, meaning the responses provided by individuals to the items of the questionnaire (which are currently set to five category responses) and that concur to create a Likert scale associated with each factor.
- (2) Evaluation ratings, meaning the subjective evaluation of individuals (or given by some external rater) about the relevance of the items themselves, intended to capture how useful and pertinent raters consider the item to be.

The coexistence of these two ratings allows for a differentiation between the subjective indicators of performance and the different weights individuals associate with specific items (these latter can also be established *a priori* to set the importance of items). As a result, two general types of scales can be derived for a factor: the first based on either summated or averaged responses and the second based on either weighted summated or weighted averaged responses. The weights of each item are based on their content validity. Two measures in particular are provided and used for computational purposes: the content validity ratio, also known as [Lawshe's \(1975\)](#) formula, given by the ratio between the number E of raters expressing a positive degree of relevance and the number N of raters:

$$VC = 2\frac{E}{N} - 1$$

and the Aiken validity index V that, given N raters and a number n_r of raters in category r , has probability p of obtaining such an agreement by chance:

$$V = \frac{\sum_{r=2}^5 (r-1) \times n_r}{4N}, \quad p = \frac{N! / 5^N}{\prod_{r=1}^5 n_r!}$$

These indexes can be directly used as weights, thus creating a ranking between the different items, but only after a procedure for assessing interrater agreement based on Cohen–Fleiss's

K has been performed (see the next subsection) to discriminate between poor and efficient raters.

Finally, scoring results (either weighted or not) are provided and graphically displayed for both single individuals, thus showing their differences, or at an aggregate level, general performance indicators by means of dashboards.

As a final notice, measures of correlation between the different factors are also provided to allow for further structural analysis.

Procedures for item selection and interrater agreement

Procedures have been provided to analyze single individuals and items, separately or jointly and to iteratively analyze both response and evaluation ratings and identify which items and individuals are more critical to the reliability and validity of the administered questionnaire. Items and individuals are interactively removed from the analysis to assess changes in performance and statistical indicators. More specifically, the procedure for item evaluation and selection is mainly based on the analysis of variance-covariance structures, correlations and Cronbach's alpha given for each unidimensional factor. As a first step, preliminary controls, graphics and warnings are generated to help power users exploring the items' properties. Figure 1 shows an example of basic descriptive statistics provided for each item as an output, such as histograms of the responses, average values, standard deviations and variances.

Analyses can then be carried out manually or automatically. In the former case, graphical displays are provided to show to power users single item distributions and how items affect scale behavior. Suggestions are also provided about which item reduce the reliability (the consistence of the measure) of the scale and so should be removed. Especially, in the latter case, an item ranking is proposed by considering how much an item affects reliability, item-total correlations (corrected and noncorrected), average correlation and standard deviation of the summated responses. Further combinations of these items are then considered to assess which collection provides the best solution. The procedure for interrater



Figure 1.
Example of basic
descriptive statistics

agreement is based instead on the Cohen–Fleiss Kappa, which extends Cohen’s Kappa to N different raters and K items. More specifically, given the average proportion \bar{p}_j of ratings expressed for the category response j , the index is given by:

$$\hat{K} = 1 - \frac{N^2K - \sum_{i=1}^K \sum_{j=1}^5 n_{ij}^2}{NK(N - 1) \sum_{j=1}^5 \bar{p}_j(1 - \bar{p}_j)}$$

Once again, as a first step, preliminary controls, graphics and warnings are generated to help power users explore the ratings expressed by individuals for each item. Analysis can then be carried manually or automatically. In the former case, graphical displays are once again provided to help the power user to display single item rating distributions and how single individuals affect the overall agreement. In the latter case, individuals are iteratively removed from the analysis to inspect how the Cohen–Fleiss Kappa and average intrasubject correlation changes. Combinations of individuals are then considered, as in the item case, to assess which collection provides the best solution.

Figure 2 shows an example of how the software evaluates the quality of raters. Raters are indeed organized in a histogram that shows if their presence contribute to improve the agreement between the raters. The histogram is expressed in units of the cut-off values for the change in the Cohen–Fleiss K index (ΔK default value = 0.0003). Raters on the far right worsen the agreement and should be removed, whereas rather on the far left improve the agreement. A similar procedure is implemented for the items to allow the user to select those that perform better and eliminate those that perform worse.

Both procedures can be handled step-by-step by a power user or interactively automatized. Cut-off values (reported in Figure 3) and optional choices are provided to power users to control every step of the procedures, such as setting the thresholds for deletion and inclusion of both items and subjects in subsequent iterations. In the following, we describe the main cut off and thresholds criteria reported in Figure 3 and used by the Web-software to remove items or users [e.g. “cut off missing response in 25 per cent,” the software remove users that did not answer more than 25 per cent of the item; “cut off standard deviation” the software warns and removes item with standard deviation lower than 0.15; “Cutoff r_ij negative, positive, Bloated specifics”, the software warns negative item correlation and higher than -0.15, lower than 0.30 and higher than 0.70; additional details available from the first author on request].The output of the analysis can then be

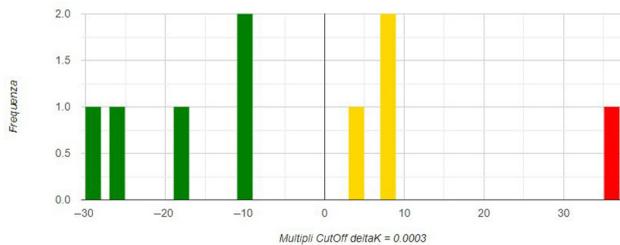


Figure 2.
Evaluation of the quality of raters

Soggetti da eliminare per questo fattore nel calcolo delle risposte						
-29	-26	-18	-10	4	8	36
<input type="checkbox"/> 55	<input type="checkbox"/> 52	<input type="checkbox"/> 60	<input type="checkbox"/> 54 <input type="checkbox"/> 56	<input type="checkbox"/> 57	<input type="checkbox"/> 59 <input type="checkbox"/> 58	<input type="checkbox"/> 53

The screenshot shows a graphical user interface for configuring software settings. It features a grid of input fields and checkboxes. Key settings include:

- Response bias:**
- Missing Responses:**
- Controllo assenza variabilità item:**
- Numero minimo di item per fattore:** 3
- Cutoff Missing Responses:** 25
- Cutoff Deviazione Standard Item:** 0,15
- Cutoff r_{ij} negative:** -0,15
- Cutoff r_{ij} positive:** 0,3
- Cutoff r_{ij} Bloated Specifics:** 0,7
- Cutoff inferiore correlazione media \bar{r}_{ij} :** 0,15
- Cutoff superiore correlazione media \bar{r}_{ij} :** 0,5
- Cutoff corr. item-tot. corretta r_{ij} , sup.:** 0,8
- Cutoff dev. st. ric. var. somma:** 0,25
- Cutoff Δa :** 0,01
- Cutoff ΔK risposte:** 0,0003
- Cutoff ΔK pertinenze:** 0,0003
- Valore imputazione pertinenza:** 3
- Cutoff Lawshe:** 3
- Item da eliminare:** 75
- Soggetti da eliminare:** Scegliere nella procedura manuale i soggetti da eliminare
- Indicatore per grafici:** Media

Figure 3.
Graphical interface –
Setting controls and
cut-off values

synthetically displayed to decision-makers in the form of dashboards that can be adjusted according to selected criteria. Figure 3 shows an example of the graphical interface that allows the users to manually set specific controls and cut-off values used by the software in the subsequent analysis.

There are several limitations of the software. First, the range of responses is currently set to a five-step category scale. Second, as it would be computationally intensive, not all possible combinations of items and raters are actually considered by the analysis but only some optimized subsets. Third, the main procedure for item selection is currently based on classical test theory rather than more modern approaches such as item response theory and generalizability theory, but an iterative structure has been devised to accommodate further methods or indexes of convergence in future developments. Fourth, although the structure of the software has been devised to allow for a certain flexibility in the type of administered questionnaire, it requires that items be aggregated within factors underlying coherent structures.

Discussion and implications

A comprehensive model of competence has not yet been proposed in the literature. Specifically, although the EQF model focuses its attention on eight reference levels as learning outcomes and on qualifications, it appears that the development of competences over time and over informal learning is largely overlooked. Our research efforts thus shed light on the importance and actual use of each competence in an organization, within a theoretical framework consistent with the literature. In particular, we considered in addition to the EQF framework a metacompetence model investigating competence on the job (the Great Eight Competencies model). All competences considered in this study were derived from discussion with group of experts within a validated model of management present in the literature and appear to have face validity.

The competence model proposed in this study together with the associated developed tool could greatly improve work efficiency and performance at all levels of organizations and increase awareness in both employers and employees of their own competences. In addition, the presented competence metamodel may facilitate the development of an

organizational culture that promotes the acquisition of key competences (not just technical) while accounting for cultural differences and different work environments.

Furthermore, the possibility of a shared base of data could create a common language on competences and provide the opportunity for improving and monitoring competence acquisition and development and a variety of other possible related applications within organizations.

Theoretically, the model represents an innovative way to measure managerial competences and a starting point for the further development of empirically based competence models. In future, throughout the Web-based software tool, it will be possible to examine longitudinally the long-term development of competence models in organizations. Nevertheless, this research is oriented toward the production of different outcomes at the social, organizational and individual levels with effects for organizations and the scientific community.

At the social level, the study is based on a European official document inviting local and educational institutions from all European countries to work together, recognized qualifications and share best practice for the development of human resources. The European Qualifications Framework - EQF facilitates the use of a common language for competences, making European companies more competitive in the global market. At the organizational level, this study enables managers to change their perspective from an approach focused on performance to one oriented toward the valorization of employees' existing and acquirable competences. At the individual level, an increased awareness of employers' and employees' own skills, knowledge and abilities may facilitate communication between organizational levels and increase professional autonomy.

As a managerial implication, the current study proposes an explorative and innovative competence model implemented in a dynamic tool for human resource management, which could be of high interest to research groups, organizations and consulting firms. Co.S.M.O.[©] Competences Software Management for Organizations could be an instrument that helps companies in competence modeling, validating and measurement, accompanying the stages of this HR management process in a shared, rapid and transparent approach.

References

- Asumeng, M. (2014), "Managerial competency models: a critical review and proposed holistic-domain model", *Journal of Management Research*, Vol. 6 No. 4, pp. 1-20.
- Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17 No. 1, pp. 99-120.
- Barney, J. (2001), "Is the resource-based 'view' a useful perspective for strategic management research? Yes", *Academy of Management Review*, Vol. 26 No. 1, pp. 41-56.
- Bartram, D. (2005), "The great eight competencies: a criterion-centric approach to validation", *Journal of Applied Psychology*, Vol. 90 No. 6, pp. 1185-1203.
- Boyatzis, R.E. (1982), *The Competent Manager: A Model for Effective Performance*, Wiley, New York, NY.
- Campbell, J.P., McCloy, R.A., Oppler, S.H. and Sager, C.E. (1993), "A theory of performance", in Schmitt, N. and Borman, W.C. (Eds), *Personnel Selection in Organization*, Jossey-Bass, San Francisco, pp. 35-70.
- Campion, M.A., Fink, A.A., Ruggeberg, B.J., Caar, L., Phillips, G.M. and Odman, R.B. (2011), "Doing competencies well: best practices in competency modeling", *Personnel Psychology*, Vol. 64 No. 1, pp. 225-262.

-
- Creswell, J.W. (2009), *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, Sage, Thousand Oaks, CA.
- European Commission (2008), "The European qualifications framework for lifelong learning (EQF)", available at: www.ecompetences.eu/site/objects/download/4550_EQFbroch2008en.pdf (accessed 30 March 2018).
- European Commission (2018), "Proposal for a council recommendation on key competences for lifelong learning", COM(2018) 24 final 2018/0008, available at: <https://ec.europa.eu/education/sites/education/files/recommendation-key-competences-lifelong-learning.pdf> (accessed 30 March 2018).
- Hogan, R. and Warrenfeltz, R. (2003), "Educating the modern manager", *Academy of Management Learning and Education*, Vol. 2 No. 1, pp. 74-84.
- Khoshouei, M.S., Oreyzi, H.R. and Noori, A. (2013), "The eight managerial competencies: essential competencies for twenty first century managers", *Iranian Journal of Management Studies*, Vol. 6 No. 2, pp. 131-152.
- Kurz, R. and Bartram, D. (2002), "Competency and individual performance: modeling the world of work", in Robertson, I.T., Callinan, M. and Bartram D. (Eds), *Organizational Effectiveness: The Role of Psychology*, Wiley, Chichester, pp. 227-255.
- Lawshe, C. (1975), "A quantitative approach to content validity", *Personnel Psychology*, Vol. 28 No. 4, pp. 563-575.
- Lado, A. and Wilson, M. (1994), "Human resource systems and sustained competitive advantage: a competency based perspective", *Academy of Management Review*, Vol. 19 No. 4, pp. 708-709.
- McClelland, D. (1973), "Testing for competence rather than for 'intelligence'", *American Psychologist*, Vol. 28 No. 1, pp. 1-14.
- McClelland, D. (1976), *A Guide to Job Competency Assessment*, McBer, Boston, MA.
- McClelland, D. (1998), "Identifying competencies with behavioural-event interviews", *Psychological Science*, Vol. 9 No. 5, pp. 331-339.
- Mansfield, R. and Mathews, D. (1985), *Job Competence: A Description for Use in Vocational Education and Training*, Further Education Staff College, Blagdon.
- O'Driscoll, A., Carson, D. and Gilmore, A. (2000), "Developing marketing competence and managing in networks: a strategic perspective", *Journal of Strategic Marketing*, Vol. 8 No. 2, pp. 183-196.
- Prahalad, C.K. and Hamel, G. (1990), "The core competence of the corporation", *Harvard Business Review*, Vol. 78 No. 3, pp. 79-91.
- Rankin, N. (2002), "Raising performance through people: the ninth competency survey", *Competency and Emotional Intelligence*, Vol. 3, pp. 2-21.
- Sanchez, J.I. and Levine, E.L. (2009), "What is (or should be) the difference between competency modeling and traditional job analysis?", *Human Resource Management Review*, Vol. 19 No. 2, pp. 53-63.
- Schippmann, J.S., Ash, R.A., Battista, M., Carr, L., Eyde, L.D., Hesketh, B., Kehoe, J., Pearlman, K. and Sanchez, I. (2000), "The practice of competency modeling", *Personnel Psychology*, Vol. 53 No. 3, pp. 703-740.
- Sparrow, P. (1997), "Organizational competencies: creating a strategic behavioural framework for selection and assessment", in Anderson, N. and Herriot, P. (Eds), *International Handbook of Selection and Assessment*, John Wiley, Chichester, pp. 1-26.
- Spencer, L. and Spencer, S. (1993), *Competence at Work: A Model for Superior Performance*, Wiley, New York, NY.
- Stevens, G.W. (2012), "A critical review of the science and practice of competency modeling", *Human Resource Development Review*, Vol. 12 No. 1, pp. 86-107.
- Tahir, I.M. and Abu Bakar, N.M. (2010), "Managerial competencies in the Malaysian financial services sector", *Interdisciplinary Journal of Contemporary Research in Business*, Vol. 1 No. 12, pp. 114-124.

- Ulrich, D., Younger, J., Brockbank, W. and Ulrich, M. (2012), *HR from the Outside in: Six Competencies for the Future of Human Resources*, McGraw-Hill, New York, NY.
- Vakola, M., Soderquist, K.E. and Prastacos, G.P. (2007), "Competency management in support of organizational change", *International Journal of Manpower*, Vol. 28 Nos 3/4, pp. 260-275.
- White, R. (1959), "Motivation reconsidered: the concept of competence", *Psychological Review*, Vol. 66 No. 5, pp. 279-333.
- Winterton, J., Delamare Le Deist, F. and Stringefellow, E. (2006), "Typology of knowledge, skills and competences: clarification of the concept and prototype", Cedefop Reference Series No. 64, Office for Official Publications of the European Communities, Luxembourg, available at: www.cedefop.europa.eu/files/3048_en.pdf (accessed 20 August 2018).

Further reading

- Markowitsch, J. and Plaimauer, C. (2009), "Descriptors for competence: towards an international standard classification for skills and competences", *Journal of European Industrial Training*, Vol. 33 Nos 8/9, pp. 817-837.
- Winterton, J. (2009), "Competence across Europe: highest common factor or lowest common denominator?", *Journal of European Industrial Training*, Vol. 33 Nos 8/9, pp. 681-700.

Corresponding author

Serena Cubico can be contacted at: serena.cubico@univr.it