Supply Chain Management competencies: proposal of a competency framework for job posting analysis

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Abstract: The search for skilled people in the field of Supply Chain Management is increasing, being widely recognised that people's competences and ability, as well as knowledge and expertise, are the main success factors for a company. At the same time, notwithstanding the recent academic attention on this issue, is not simple to define which personal abilities are needed for a professional in this field: the nature of competence itself is multidimensional and there is no consensus among researchers on which one of these dimensions, if one, is most important. This work aims precisely at recognise which are the most important competencies in the field of SCM: taking clue from a number of reference frameworks, and after the identification of the main competencies, a comprehensive framework has been conceived, which has been used to analyse a set of job postings for SC manager job positions, in order to gain insight about the real/declared/perceived company needs. More precisely, the authors are interested in highlighting the difference in terms of needs between the so-called soft skills – as attitudes, behaviour, traits and motives – and the personal characteristics linked to technical knowledge and expertise in the SCM field. The objective is achieved through content-based analysis of the selected job postings, leveraging on the proposed framework. Results show that, in a generic job description for an open job position in SCM, soft skills are often better detailed than hard skills; this suggest that the first ones are believed to be more important than the second. This study and the framework proposed may help HR managers in a more precise definition of the competencies required for a certain professional.

Keywords: Supply Chain Management competencies, job postings competencies, Supply Chain Management

1.Introduction

Today's companies find themselves operating in a constantly evolving environment, and the ability to adapt to change and raise standards to keep the pace with the competition and the continuous demand for new products is a priority. In such a critical context, it is essential for a company to exploit its resources in the most effective and efficient way. Human resources, in all its forms, from managers to workers, without exception, cannot be excluded from these considerations (Campos, 2019).Thus, it is essential to identify in detail what each professional role within the company requires in terms of knowledge and competence, so that each resource can contribute to the main company mission in the best possible way.

The task of identifying the most suitable candidate for a given job position or to determine the actual need for the job position itself is generally entrusted to the company's Human Resources (HR) division, which often faces difficulties leading to the selection of resources that may be unable to obtain the level of employment desired by the company. These difficulties are generally linked to the definition of specific skills corresponding to the analysed job position, as there is a lack of uniformity in skills and a lack of valid and qualitative tools for this purpose (Derwik, 2016; Mageto, 2020).

It is therefore of great interest to examine the methodologies and tools that can be used for human resources management and, in particular, for the analysis of the skills needed for a certain job position, in order to ensure the greatest knowledge in the assessment and the best possible choice from a company perspective.

This need is particularly significant in the Supply Chain Management (SCM) field (Derwik, 2017) due to its complexity and diversification. The extreme relevance and possibility of impact on the whole company – with its various and peculiar functions such as: logistics, production planning, procurement, forecasting, etc. – makes it necessary to delve into the subject.

2.The concept of competence

When speaking about talent in professional roles, the term competence is the most used in scientific literature. Competences are intended as professional human behaviour abstractions and can be briefly described as those human qualities connected with skills, knowledge, ability, talent, employee engagement. They are fundamental in the management of knowledge and abilities of the workers in many application domains (Barirani, Agard & Beaudry 2013). Competence, in a general sense, refers to a person fitness to his or her job. Boyatzis (Boyatzis, 1982) defined competency as "an underlying characteristic of a person which results in effective and/or superior

performance in a job". Page and Wilson (Page and Wilson, 1994) defined competencies as "the skills, abilities, and personal characteristics required by a good manager", differentiating those elements (knowledge, skills) that are assessable and those (behavioural ones) that are not. Summing up a long research stream, it can be stated that competences include (or are a combination of):

- Knowledge: information and learning resting in a person, can be viewed as the result of an interaction between intelligence (capacity to learn) and situation (opportunity to learn).
- Skill: a person's ability to perform a certain task. There is substantial evidence that the acquisition of skill and the demonstration of skilled performance involve a combination of underlying perceptual, cognitive and motor skills.
- Attitudes: self-concepts and values (person's attitudes, values and self-image).
- Traits: refer to physical characteristics and consistent responses to situations or information.
- Motives: emotions, desires, physiological needs or similar impulses that prompt action.

It has to be noticed that there is no clear distinction between the terms "competence" and "competency" and their usage: Teodorescu (Teodorescu, 2006) resumes the differences between these terms stating that competencies are those characteristics – knowledge, skills, mindsets, thought patterns – that when used whether singularly or in various combinations, result in successful performance, while competence equals worthy performance that leads directly to the most efficient accomplishment of organizational goals; as an implication of these differences, Teodorescu points out that competency is related to the definition of skills, knowledge, attributes and behaviours that successful people have; competence refers to the definition of measurable, specific, and objective milestones describing what people have to accomplish to consistently achieve or exceed the goals for their role, team, division, and whole organization.

One of the most interesting, dated and debated questions about competency is which are the best predictors of outstanding on-the-job performance, and though many authors contributed to this research question, there is still no unanimous consensus (McClelland, 1972; Boyatzis, 1982; Spencer, 1993).

2.1 Competence in SCM

As the demand for qualified personnel in the field of SCM increases, the theme of competencies gain importance. Evidence to this is given by the evolutionary timeline presented by Derwik in her comprehensive review (Derwik, 2017) highlighting that competence in SCM began to gain academic attention particularly in the last fifteen years. Many authors tried to identify specific competencies required within the field of SCM (Kotzab, 2018; Lorentz, 2013), others proposed a set of competencies or a reference competency framework (Liikama, 2015; Derwik, 2016; Prifti, 2017) others focused on methods for teaching SCM (Tisch, 2017, Abele, 2017). Another interesting information offered by Derwik is the presence, in SCM literature, of the distinction among competence elements:

- Functional competence deals with activities related to existing SCM business functions and company processes, such as sourcing, manufacturing, and distribution, etc.
- Relational competence deals with interaction between all possible stakeholders, such as employees, customers, suppliers, partners, managers, and departments.
- Managerial competence includes all competences related to more general management aspects, such as implementation of new businesses, process control and evaluation, resource management (people and cost), and overall strategy development.
- Behavioural competence relates to built-in or developed attitudes and characteristics tied to the stakeholder, such as creativity or orientation to change.

The questions addressed in this paper are: which side of competence is more important for companies, when they define their job profile requirements? Which are the fundamental competencies for a professional in the field of SCM? To answer these questions, an analysis on a set of job descriptions (JDs) published into posts of professional positions in SCM has been performed. This analysis relies on the assumption that the content of job description portrays the real need of the company, or at least the perceived need by the company.

In scientific literature it is common to focus on what can be defined as "soft skills", giving less space to knowledge-based skills. This approach may have an influence on job advertisements, and the aim of this work is also to gain insights about the preferences between hard or soft skills.

The analysis of JDs is based on a proposed competencies framework. Since here the interest is on the characteristics to fit in a certain job position, henceforth the term competency (competencies) will only be used.

3. Structure of the proposed framework

As reported above, there are numerous attempts to develop a framework for SCM skills in literature; these have been the subject of an in-depth analysis in an attempt to deduce their founding characteristics. The proposed framework has been conceived with the aim of identifying and map the skills required within a JD. JDs may consistently differ one from the other, thus deductive content analysis approach has been used. Here one of the obstacles was that the contents of JDs do not have a consistent structure, and they vary in detail (Todd, 1995).

The proposed framework has been conceived also to support an easier analysis of the JD set. The framework presents a branched and stratified structure on several levels of generality and competencies details: the levels of the framework represent aggregations, or competence "families". Going down the tree, the competencies inside

the lowest levels are more specific and detailed. The tree structure, reported in Table 1 – allows to uniquely classify each competence: a specific competence can thus belong to only one of the categories in the framework, on a specific level. Descriptions of competences belonging to the lowest level (the most specific) are presented, according to evidence in literature.

3.1 Competency Domains

An important assumption that has been considered in the design of the framework is the differentiation between two major groups of competencies for an individual under analysis:

- the set of competencies developed in the previous professional experience of the individual, thus thanks to his training and his work activity; these cognitive competencies are closely related to the knowledge of the resource, whether generic or specific, of a certain work environment;
- the set of skills closely related to the personal sphere of the individual, those related to his personality traits, his aptitudes and inclinations.

The first set of competencies is commonly referred to as "hard skills", while the second group as "soft skills". It has been chosen to structure the framework differentiating hard and soft skills to analyse whether companies are looking for more cognitive or aptitude skills. This is an old and long debated issue: in 1993 Spencer argued that knowledge and skills are easier to develop than traits and motives, consequently, is more effective for companies to hire basing on the second ones (Spencer, 1993). This division is also present in the work of Radovilsky (2012) in which competencies related to work requirements in the SC are categorized according to the trends in this sector; a subdivision of competencies into: skills based and content based. A comparable subdivision is presented in the work of Suttiwatnaruput (2014) which distinguishes the competencies of interest in the SC sector between "technical knowledge and application" (skills related to learning and putting into practice previous knowledge of the resource related to its working environment) and "traits and management skills" (skills related to the typical traits of the subject and related to the management of interpersonal interactions between resources themselves).

On this basis, two "*Competency Domains"* are defined as:

- Knowledge Based Competencies (KBC): competences linked to the technical knowledge of the subject matter of interest for the employment of the individual, originating from the individual's background, linked to his work experience or training.
- Personal Competencies (PC): this domain combines the set of skills related to the intrinsic nature of the person, its natural behavioural traits and its way of interpreting reality and relating to it and to others.

3.2 Competency Types

The identified Competency Domains have been then detailed defining a first level of competency sub-groups, called *"Competency Types"*. In order to define the Competency Types, the literature concerning the division of the SCM competences into groups that maintain a certain level of generality has been taken into consideration: Mangan (2005) studied the key areas of knowledge and core competencies required from managers of logistics and supply chain functions, defining three groups of competencies that are divided between: General, Logistic/SCM Specific, and Competencies/skills. This division presents, in view of the objectives of this work, advantages and disadvantages: although it identifies the SCM Specific group – which is of particular interest for this analysis - it is limited by the merging of personal traits with competencies related to previous working experiences of the resource, in the last competency group. Lapina's work (Lapina, 2015) identified four groups of competencies and, for each one, a set of competencies that characterize them. The relevance of this work lies in the possibility of applying the identified competence groups in a generalized way, regardless of the reference work area. The competence groups identified in Lapina's work are: Professional Competencies; Personal and Responsibility; Leadership Competencies; Social and Communication Competencies; Innovative and Learning Competencies. Mendoza-Fong (2019), dealt with the use of methodologies and tools in the evaluation of resources, in particular competence-based approaches. In his work a series of constructs are identified that define the "knowledge and skills that a Logistics Manager should have", therefore directly extendable also to the SCM; these constructs are listed as: Knowledge and Skills; Supply Chain Management; Quantitative Methods; Information Technologies; Finance; Legislation; Soft Skills. Important is also the work of Bals (2019), on the identification of the skills needed for SCM and Purchasing Management. In his work Bals resumed the examination of the competences previously carried out in the publication of Tassabehji and Moorhouse (2008) and widened the analysis proposing a framework that divides the competences in the following groupings: Technical Skills, Interpersonal Skills, Internal/External Enterprise Skills, Strategic Business Skills. Finally, the recent work by Mageto (2020) unified the frameworks that use competence-based approaches for Supply Chain Management. The clustering carried out by Mageto is based on groupings of skills and abilities necessary to cover roles in Supply Chain Management.

After the analysis of the literature, the Competency Types are now defined. The structure chosen for the level corresponding to the Competency Types is divided into four groups of competences that are mutually exclusive and exhaustive of the domains in which they are inserted; this structure is as follows:

- SCM Specific Competencies (SCMSC): the set of skills and Knowledge-Based Competences closely related to the SCM domain: knowledge of the processes and practices of the value-added chain and

their use in order to maximize efficiency and exploitation of the resources of the organization.
- Business Generic Competencies (BGC): the set of skills and Knowledge-Based Competences common to organizational activities that seek to achieve profit through the efficient use of their resources and through the implementation of best practices.
- Individual Competencies (IC): the set of skills and abilities deriving from the resource's personal competencies, in particular those competencies which does not need to be related to the external environment.
- Relational Competencies (RC): the set of skills and abilities deriving from the resource's personal competencies, in particular the ability to relate to the working environment, whether collaborative or competitive.

The Competency Domain KBC is partitioned in the Competency Types SCMSC and BGC, while the Competency Domain PC is partitioned in the Competency Types IC and RC.

3.3 Competency Areas

To reach the most detailed level in the framework, the *"Competency Areas"* level, starting from the frameworks in literature aimed at identifying clusters suitable for SCM sectors, the competences recognized as fundamental for a manager in SCM functions have been elaborated. In this sense, some competence-based frameworks and their structural paradigms have been considered.

In particular, the SCOR framework, considering its specificity in the Supply Chain Management sector, was integrated with the study of previous literature and new examples of specific analysis of skills in the SCM and OM fields. In Sinha's work (Sinha, 2016), for example, clusters of competencies closely related to the SCOR divisions of the SC have been elaborated. Sinha drew these sets of competences from the SCM job posting examination. The grouping is the following: Source, Plan, Make, Enable and Logistics. Within each of them are grouped examples of skills specific to the defined cluster. These groups of competences are particularly inherent to the SCM specific level. Further contributions can be found in the aforementioned work by Mageto (2020) describing a synthesis of the competence-based frameworks in literature. In Derwik's work (Derwik, 2016) functional competences are identified and detailed in a very specific way: Derwik offered a contribution to make a more detailed subdivision of both Knowledge Based Competencies and Personal Competencies. The works of Wu (2013) and Liikama (2015) provided a list of competences that mainly falls in the Personal Competencies domain. Further works or frameworks considered to define the Competency Areas are reported in the recent publications by Bals (2019), Bak (2019), Cvetić (2018) and Campos (2019).

The analysis and study of these contributions have allowed to define the last partition of the Framework: the subdivision of the types of competences in "Competency Areas". In Table 1 complete Competency Areas framework is reported.

4.Method

The JDs have been analysed through deductive content analysis based on the previously proposed framework. Content analysis is used to objectively describe a certain phenomenon (Elo & Kyngäs, 2008), and "precisely the deductive content analysis is used when the structure of analysis is operationalised on the basis of previous knowledge". The analysis has been manually performed, i.e. each selected job description has been read, information has been retrieved relying on the proposed framework and collected in a database.

4.1 JD selection and stratification

The first step in data analysis was the collection of JDs. A JD sample has been extracted from the LinkedIn portal (LinkedIn.com), because of its recognized leader position in the field of networking and job posting, and because it offered the possibility to conduct a specific collection on JDs concerning the SCM sector.

The analysed JDs have been extracted in December 2019 from LinkedIn using as search criteria the keyword "Supply Chain Management" and limited to the search for job positions to the Italian territory. The analysis has been restricted to a specific territory because – despite the presence of multinationals or foreign companies – the research is homogeneously directed towards professionals who are expected to have uniform competence profiles, given the uniformity of training courses. This search criterion allowed not to focus on a single job position but to include all those involved in SC management. In this way, 311 JDs have been extracted between November and December 2019. These have been stratified on the following dimensions:

- Job position, among the following categories: SC Manager, SC Analyst, SC Specialist, Operations Manager, Project Manager, Other.
- Required experience level, among the following categories: Novice, Advanced, Senior, Executive, not defined.

4.2 Analysis design

The collected JDs have been examined using content analysis as follows: for each JD, if a competency related to a certain Competency Area is mentioned, the Competency Area has been assigned value 1; 0 otherwise. Based on this analysis, a JD database has been built.

To perform the analysis, the authors conceived an index, henceforth S index, to quantify the detail level of a JD (or a group of JDs) in terms of required competencies. The S index can be calculated for a certain group of Competency Areas (f.e. Competency Areas belonging to a certain Competency Type or Competency Areas belonging to a certain Competency Domain) to gain insight about the importance of that group of Competency Areas.

Competency Domain	*Competency Type*	*Competency Area*	*Competency Area description*
KNOWLEDGE BASED COMPETENCIES (KBC)	***SCM Specific Competencies (SCMSC)***	*Sourcing and Customer Management*	Competencies related to materials planning and management, stock planning, purchasing and procurement, customer relationship management
		Production Planning Management	Competencies related to demand planning and forecasting, product development, supply chain design
		Production Executing Management	Competencies related to production order execution, processing and sequencing, inventory and material management, quality management, inventory management, maintenance management
		Enabling SCM Knowledge	Competencies related to SC system integration, SC project management, SC business process knowledge
		Logistics Management	Competencies related to logistic, transportations and distribution management, route planning, reverse logistics and 3PL
	Business Generic Competencies (BGC)	*Generic Business Practices*	Competencies related to reporting, data analytics, knowledge of budget and cost control, risk management;
		IT and Technical Knowledge	Competencies related to technical knowledge and application, ERP/software knowledge, spreadsheets, database and big data application; IT skills
		Finance and Legal Knowledge	Competencies related to contracts and legal issues in SCM; SC finance and accounting; laws and regulation, knowledge of budget and cost control
		Ethic Principles	Competencies related to environmental consciousness; business ethics; green logistics/environmental issues; salvage/scrap logistics
PERSONAL COMPETENCIES (PC)	***Individual Competencies (IC)***	*Professional Competencies*	Competencies related to personal organizational and planning skills, time management, learning & self-development, strategic thinking; responsibility, flexibility, stress management, commitment, decision making
		Traits and Attitudes	Competencies related to motivation, enthusiasm, self-confidence, optimism, humility, curiosity, creativity, passion, emotional awareness
	Relational Competencies (RC)	*People Management*	Competencies related to leadership, coaching and developing other people, motivating, supervising, deciding, listening, assigning task effectively
		Social Management	Competencies related to communication, collaboration, negotiation, conflict management, relating and networking, interpersonal skills

Table 1: proposed competency framework

The S index has been computed as follows:

$$S_{Cc,Sc} = \frac{\left(\sum_{i,j}^{\substack{i \in Cc \\ j \in Sc}} a_{ij}\right)}{Deg\ (Cc) * Deg\ (Sc)}$$

Where:

$a_{ij} = 1; 0$ as defined

i Competency Area

Cc Competency cluster, i.e. a group of Competency Areas chosen for the analysis

Deg(Cc) The number of Competency Areas within a certain Competency Cluster (f.e. Deg(BGC)=4)

j Job Description

Sc Stratification cluster, i.e. a specific job position, or a specific experience level required chosen for the analysis

Deg(Sc) The number of JDs within a certain Stratification cluster (e.g. Deg(Total set)=311)

This index indicates therefore how much the JD is "specific" (in accordance with the proposed framework) with respect to a given cluster of Competency areas, i.e. how much the company is interested that that set of competences is present in the individual. For this reason, from now on the term "specificity" refers to how much a JD (or a group of JDs) is detailed with respect to a given cluster of Competency Areas, i.e. which is the S index value for that group of Competency Areas. The higher the specificity, the higher the S index value (note that the S index value falls within the [0;1] interval).

The S index can be calculated on a specific cluster of Competency areas for a specific cluster of JDs.

5.Results and discussion

The S index on the whole set of analysed JDs presents the values in Figure 1, considering the respective clusters of competencies. With regard to Competency Domain, we can see a higher specificity of JDs as regards PC compared to KBC in the whole set of JDs; this indicates that, regardless of the job position and the experience level required, a generic JD tends to require that a candidate possesses mainly competences that are related to his personal traits rather than to his knowledge. Moreover, if we consider the set of Competency Types, among the KBC the SCMS are much less detailed than the BGC: from the extensive reading of the JDs, even considering job positions related to SCM, the specific knowledge of the sector needed is taken into account less than IT skills and software knowledge. Considering PC instead, IC rather

than RC are required with a higher level of detail. Hence the most required competencies are those related to personal organization, flexibility, decision making and so on.

It is particularly noteworthy that different stratifications of the JD set do not significantly modify the results. It can therefore be concluded that the HR divisions behind the analysed JDs tend to focus more on "soft skills" than on "hard skills", and even for those job position in which KBC requirements are requested, the BGC type prevails.

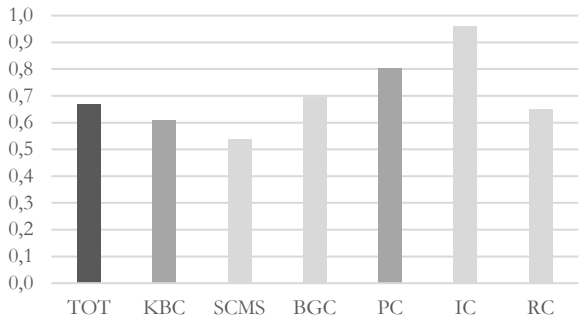

Figure 1: S index for the overall JD set

Now the stratification of the JD by job position is analysed (Figure 2). Independently from the required job position, PC result to be more detailed than KBC. In particular IC is the Competency type for which S is maximum. This type of stratification allows to highlight that also for the clusters in which the JDs are more specific, the difference between the specificity in the required KBC remains lower than the specificity in the required PC. Not even within the more detailed JD clusters, therefore, there is a higher level of detail for KBC. This suggests that the specific requirement for PC is independent from the overall level of detail of the JD, and is therefore intentional in the drafting of the JD itself.

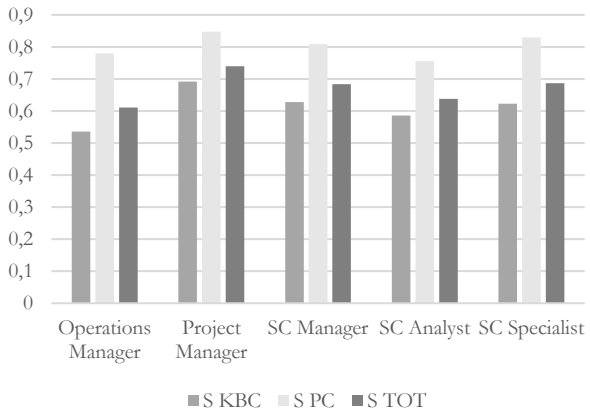

Figure 2: S index by job position

Exception to this is represented by the job position "Project Manager" (the one with maximum overall specificity), for which the S index assumes for KBC a value which is very close to the one it assumes for PC.

Now the stratification of the JD by experience is analysed (Figure 3). Regarding the required experience level, a positive correspondence can be identified between the necessary experience to cover a given job position and the specificity of the JD. That is, clusters of JDs with a higher S value are more detailed on Knowledge Based Competencies (although PC remain better detailed than KBC). Moreover, as the required experience increases, a smaller gap is found between the specificity with which the PC and the KBC are detailed.

This is particularly interesting because it allows to hypothesize that the higher the job position to be held, the higher the importance given to KBC. On the contrary, for entry level positions, what is more important is a set of skills related to personal traits, work skills, ability to relate with others. On top of this, if we consider the stratification cluster grouping those job positions for which S is higher – i.e. the more detailed JDs – as the required experience level increases, the gap between the specificity of PC and the specificity of KBC is even more significantly reduced if compared to the set obtained considering only the aggregation based on experience, and in particular the specificity for the Competency Type "SCMSC" significantly increases.

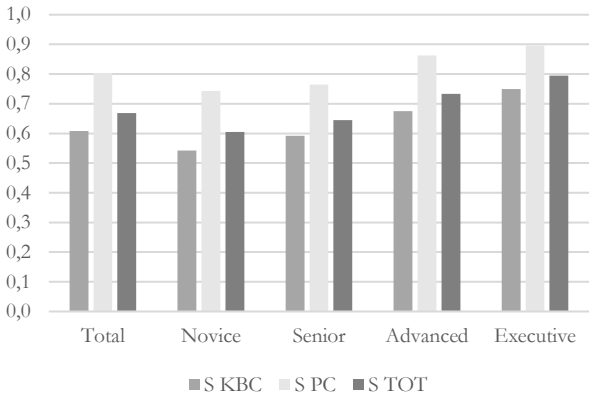

Figure 3. S index by required experience level

6.Conclusions

In this work a study of job description advertisement in SCM is presented; in particular, the analysis focuses on which are the most important competencies for an individual in a SCM job position, since there is great debate about the different importance of hard and soft skills.

The study is based on a framework used to assess the different competencies present in a job description. Relying on this framework, a set of 311 job description has been studied to gain insight on the company needs in terms of competencies for different job positions and experience level.

The results confirm that Human Resources division gives, in general, more importance to soft skills rather than hard skills, independently from the considered job position. At the same time, the study puts in evidence that hard skills become more and more important when the job position requires longer work experience. Some future works may include the analysis of result differences between countries, since the present study focuses on Italian job description.

This work is a first step in a coherent and comprehensive definition of the most important competencies to be held by a professional in the field of SCM. Further

advancements in the job posting analysis could be a semantic definition of the words used to describe competencies, this would allow to drill down the analysis up to the Competency Area level. Practical implications of this work for HR managers are significant: they could benefit from this study both in the definition of job postings but most of all in the identification of the real competency requirements for employees in the SCM area. A more precise definition of the needed competencies will also help HR in planning career shifts, as well as training and empowerment courses for internal personnel.

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