



Competency based management: a review of systems and approaches

Competency
based
management

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Abstract

Purpose – Aims to review the key concepts of competency management (CM) and to propose method for developing competency method.

Design/methodology/approach – Examines the CM features of 22 CM systems and 18 learning management systems.

Findings – Finds that the areas of open standard (XML, web services, RDF), semantic technologies (ontologies and the semantic web) and portals with self-service technologies are going to play a significant part in the evolution of CM systems.

Originality/value – Emphasizes the beneficial attributes of CM for private and public organizations.

Keywords Competences, Competences framework, Modelling, Information management

Paper type General review

1. Introduction

Competence management (CM) is an important research object in the more general area of knowledge management and a CM system is often integrated with learning management systems (LMSs). CM can have an important contribution at an organizational and personal level, as it identifies the key knowledge that an employee or an organization should possess in order to achieve his/its targets.

Competence and skills management have been tightly linked to the efforts of companies to create a setting for the empowerment of their workforce in order to increase competitive advantage, innovation, and effectiveness (Houtzagers, 1999). In addition, CM is directly related to corporate efforts to leverage internal knowledge and initiate consistent knowledge management initiatives (Hellstrom *et al.*, 2000; Ley and Albert, 2003). Recently, CM is a research field attracting efforts to leverage personnel development (Beck, 2003), knowledge sharing (Won and Pipek, 2003), corporate e-learning efforts (Hockemeyer *et al.*, 2003) as well as applications of semantic technologies like ontology management (Colucci *et al.*, 2003).

Our objective in the present paper is to review the most common and widespread competency management (CM) systems, to study their characteristic applications and to provide future research directions.

The paper is organized as follows: in the first section, we provide a short introduction to CM. Next, we provide definitions of the key concepts of competency based management and analyse the competency lifecycle and the core application areas of CM systems. In the third section, we describe the different phases in developing a competency model, the cornerstone of a CM system. In the fourth section, we present our analysis on 22 CM systems and 18 LMSs which incorporate



CM modules. We also present the common CM features in both categories of systems. Finally we discuss the technologies which will be evolutionary in the CM area and propose some research directions. An appendix (provided by the authors upon request) presents a description of the CM and e-learning systems we reviewed.

2. Competency based management: an overview

2.1 Definition of key concepts

The competency approach to human resources management is not new. The early Romans practiced a form of competency profiling in attempts to detail the attributes of a “good Roman soldier”. The introduction of competency based approaches within the corporate environment initiated around 1970 and their development and use since then has been rapid. The distinguished Harvard’s psychologist, David McClelland is credited with introducing the idea of “competency” into the human resource literature, in his efforts to assist the United States Information Agency improve its selection procedures. The latter argued that traditional intelligence tests, as well as proxies such as scholastic grades, failed to predict job performance. McClelland’s counter argument to the growing dissatisfaction with intelligence testing and the traditional job analytic approaches to personnel selection, was the proposal to test for competency. As a case study, he proposed the selection of Foreign Service Information Officers (McClelland, 1973). In his research, McClelland found that competencies such as interpersonal sensitivity, cross-cultural positive regards and management skills differentiated superior from average Information Officers (Dubois, 1993).

Throughout the years competency based approaches have proved to be a critical tool in many organizational functions, such as workforce and succession planning and performance appraisal.

The main reasons for selecting these approaches are the following:

- They can provide identification of the skills, knowledge, behaviours and capabilities needed to meet current and future personnel selection needs, in alignment with the differentiations in strategies and organizational priorities.
- They can focus the individual and group development plans to eliminate the gap between the competencies requested by a project, job role, or enterprise strategy and those available.

According to the HR-XML Consortium Competencies Schema (http://ns.hr-xml.org/2_0/hr-xml-2_0/cpo/competencies.pdf), a competency can be defined as:

A specific, identifiable, definable, and measurable knowledge, skill, ability and/or other deployment-related characteristic (e.g. attitude, behaviour, physical ability) which a human resource may possess and which is necessary for, or material to, the performance of an activity within a specific business context.

In Table I, we present the main definitions of “competencies” from different writers or companies in an effort to provide a complete understanding of the different aspects that this term incorporates.

Based on the analysis of the existing definitions and the further study and research that we have conducted on CM, we have concluded with the following definition of the term “competency”:

Author	Definitions
Marrelli (1998) (1)	Competencies are measurable human capabilities that are required for effective work performance demands.
Dubois (1998) (2)	Competencies are those characteristics- knowledge, skills, mindsets, thought patterns, and the like-that, when used either singularly or in various combinations, result in successful performance.
HR-XML (www.hr-xml.org)	A specific, identifiable, definable, and measurable knowledge, skill, ability and/or other deployment-related characteristic (e.g. attitude, behaviour, physical ability) which a human resource may possess and which is necessary for, or material to, the performance of an activity within a specific business context.
Boyatzis (1982)	Boyatzis described competencies as underlying characteristics of an individual, which are, causally (change in one variable cause change in another) related to effective job performance
Selby <i>et al.</i> (2000)	Selby described it as an ability expressed in terms of behaviour
UK National Vocational Council for Vocational Qualification (1997)	The National Vocational Council for Vocational Qualification described competency as performance standards, the ability to perform in work roles or jobs to the standard required in employment
Treasury Board of Canada Secretariat (1999)	“Competencies” are the knowledge, skills, abilities and behaviours that an employee applies in performing his/her work and that are the key employee-related levers for achieving results that are relevant to the organization’s business strategies
Perrenaud (2000)	A capacity to mobilize diverse cognitive resources to meet a certain type of situation
LeBoterf (1998)	LeBoterf says that competencies are not themselves resources in the sense of knowing how to act, knowing how to do, or attitudes, but they mobilize, integrate and orchestrate such resources. This mobilization is only pertinent in one situation, and each situation is unique, although it could be approached as an analogy to other situations that are already known
Jackson and Schuler (2003)	Competencies are defined as “the skills, knowledge, abilities and other characteristics that someone needs to perform a job effectively”
Intagliata <i>et al.</i> (2000)	Most fundamentally, competencies provide organizations with a way to define in behavioural terms what their leaders need to do to produce the results the organization desires and do so in a way that is consistent with and builds its culture. They should provide the ‘North Star’ by which leaders at all levels navigate in order to create synergy and produce more significant and consistent results.
PeopleSoft	A set of measurable and observable knowledge, skills and behaviours that contribute to success in a job/position
Gartner group	A competency is a set of characteristics, including skills, knowledge and attributes, that causes or forecasts performance

Table I.
Current definitions of the competency concept

A competency is a combination of tacit and explicit knowledge, behaviour and skills, that gives someone the potential for effectiveness in task performance.

A further analysis of the concept of “competency” brought us to the conclusion that, typically, a competency is defined in terms of:

- *Category.* A group to which homogeneous and/or similar competencies belong.
- *Competency.* A descriptive name for the specific competency.
- *Definition.* Statement(s) that explains the basic concept of this competency.
- *Demonstrated behaviour.* Behaviour indicators which an individual should demonstrate if the specified competency is possessed.

Table II depicts an example of a competency’s definition in terms of category, competency, definition and demonstrated behaviour. The general category of the competency is the “people management competencies”, which amongst others can include the competencies of “Building a Team’s Spirit” and “Developing People”. The table illustrates the corresponding definitions and demonstrated behaviours.

2.2 Competency life cycle and core application areas

The competency life cycle is the aggregation of four macro-phases which aim at the continuous enhancement and development of individual and organizational competencies. The four macro-phases are as follows: competency mapping; competency diagnosis; competency development and competency monitoring.

Competency mapping aims to provide the organization with an overview of all the necessary competencies in order to fulfil its targets, which are defined by the organizational business plan, the projects requirements, the group needs and the job role requirements. The required proficiency level for each job profile is defined in this phase as well.

The second phase is *competency diagnosis*, meaning an instance of the current situation of the competencies and equivalent proficiency level that each individual employee possesses. A skill gap analysis is also essential in this phase, in order to define the gap between the number and level of competencies that the employees possess, in comparison with the number and level of competencies required by the organization, according to their job role.

Competency development is the third phase and it deals with the scheduling of activities so as to increase the number and proficiency level of competencies that the employees should have, according to the previous two phases and the skill gap analysis.

The last phase is the *monitoring of competencies*, i.e. a continuous examination of the results achieved by the competency development phase.

Category	Competency	Definition	Demonstrated behaviour
People management competencies	Building team spirit	Provide team members with the excitement and desire to cooperate with each other, contributing to common goals	Encourages help and respect to other team members Creates a common mission and a feeling of belonging to a team which aims at that
	Developing people	Help team members to reach their potential in personal development	Provide mentoring and experience transfer Provide feedback on strengths and weaknesses of the team members

Table II.
Indicative example of a competency

The typical core components of a competency-based system are as follows:

- *Identification/assessment of desired results.* One needs to know what organizational performance he is trying to achieve in order to identify the “desired state” competencies. Organizational performance assessment will also provide data to help evaluate the success of your development efforts.
- *Competency models.* Identification of the competencies that truly have an impact on results.
- *Employee competency assessment.* One needs to know the competencies of employees in order to compare them with desired/ideal state (competency model).
- *Employee development strategies and resources.* One needs to have the training and development programs and resources that can address the gap in competencies.

In the following, we present our own definitions of terms and processes which are essential in CM and competency based management systems, in an effort to provide a more complete overview of the area.

- *Competency identification.* The process of discovering what competencies are necessary for exemplary or fully-successful performance.
- *Competency model.* A narrative description of the competencies for a targeted job category, occupational group, division, department or other unit of analysis.
- *Competency assessment.* The process of comparing an individual’s competencies to those of a competency model.
- *Competency-based management.* Application of a set of competencies to managing human resources so that performance contributes efficiently and effectively to organizational results.
- *Competency standard.* Identifies the essential skills and knowledge workers must have, and defines the performance levels they must achieve, to demonstrate competency in a specific work segment or function.
- *Competency profile.* Document that describes the set of competencies particular to a position/job/occupational group/functional community.

Based on the examination that we conducted on different competency based management systems (which are examined in detail in Section 4), we concluded that competencies can be used in different parts of employee management applications, having an important role in each one of them. Competencies are important in the following employee management applications:

- *Workforce planning.* Competencies are used in order to evaluate the current and future organizational and individual competency needs. A gap analysis can reveal the chasm between the competencies that individual employees or groups or even the organization should have and contribute to the workforce development plans.
- *Recruitment management.* Competencies are used in order to compare the capabilities of the candidate with the requirements of the offered position; once the best candidate is identified, competency gaps form the basis for an initial new-hire learning plan.

- *Learning management.* Competency gap analysis can identify the needed competencies; these competencies can be linked with the equivalent learning objects.
- *Performance management.* Worker performance is evaluated against job competency requirements as well as objectives.
- *Career development.* Competencies are used to create the personal development plans of the employees. The latter can review the needed competencies of all the positions and through comparison with the competencies they possess they can identify potential positions and develop their career plans.
- *Succession planning.* Organizations assess potential replacements for key positions based on competency requirements.

3. Development of competency models

Over the past ten years, many companies and governmental organizations have addressed issues such as organizational transformation, performance improvement, employee development, succession planning, etc. by the implementation of competency modelling programs, i.e. through strategic initiatives aimed at aligning employee performance with job requirements.

A competency model is a list of competencies which are derived from observing satisfactory or exceptional employee performance for a specific occupation. The model can provide identification of the competencies employees need to develop in order to improve performance in their current job or to prepare for other jobs via promotion or transfer. The model can also be useful in a skill gap analysis, the comparison between available and needed competencies of individuals or organizations. An individual development plan could be developed in order to eliminate the gap. Important variables to be considered during the development of a competency model are the use of skill dictionaries, or the creation of customized ones and the competency identification and verification methods – surveys, interviews, focus groups, etc.

Competencies are the building blocks of competency models. For example, a competency model for an Area Sales Manager might include competencies such as sales planning, team working, market competition, industry trends and strategic thinking.

Each competency in the model would be defined, including behavioural descriptors of how exemplary and lower levels of proficiency are demonstrated. Table III gives an example of a definition and some behavioural indicators for the competency of “Strategic Thinking”.

<p>Example indicators for the competency: “Strategic Thinking”</p>	<p>Formulates strategies that are achievable, cost-effective and address organizational goals by themselves or in coordination with other strategies Formulates strategies that take organization’s strengths and weaknesses into account Researches, interprets and reports on long-term customer/client trends for the purpose of formulating policy and strategy Provides analysis of policy issues, develops program proposals and develops plans that address long-term customer and stakeholder needs and concerns</p>
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Table III.
Example indicators of a specific competency

Table IV gives some examples of behavioural indicators for each level of proficiency, with the assumption that a specific competency can be characterized by three proficiency levels: the marginal, the average and the superior.

The development of a competency model consists of different steps, required for the creation and validation of the model. The validation process is a means of checking that the competencies predict successful job performance. Table V outlines the most commonly used steps in the development of a competency model.

In Table VI, we present the basic data attributes of a competency in a CM system, together with a description and some sample values.

4. Analysis of competency management systems

With the aim to analyse systematically the main features of CM as treated by existing systems, we conducted a review of 22 CM systems which can operate as standalone applications, as well as of 18 LMSs which incorporate a CM module.

The stand-alone CM systems that we reviewed are listed in Table VII, while detailed information about them can be found in the Appendix.

Apart from CM systems which operate as stand alone applications, it is a common practice for a LMS to incorporate CM features or modules. We have also conducted a review of the most important LMS and the CM features which are included in them (Table VIII).

Our review and analysis of abovementioned systems has revealed some common features that are available in most CM systems.

These features are the basis on which a CM system is built and can be later enhanced with additional modules such as multi-assessment evaluation tools, 360° feedback, talent management, succession management, e-learning library and learning objects integration and other. These features are outlined in Table IX.

5. Discussion and research directions

In this section, we discuss and analyse the main factors which could influence future research conducted on CM systems. These include web services, ontologies, use of emerging standards, portal and self-service technologies and the core characteristics of future human resource management systems (HRMS).

In the area of emerging standards, the worldwide web consortium (W3C) published XML specification 1.0 in 1998 in order to ease the enablement of e-commerce by providing a description of the way that data exchanged among systems over the internet should be tagged. The HR-XML consortium is one of the most active committees operating under the auspices of the W3C, with participation from major human capital management (HCM) vendors. A result of the work that the HR-XML consortium has done is Version 1.0 of the competency standard, which is embedded in the SEP (Staffing Exchange Protocol), used by many recruitment management vendors

Example levels of proficiency for a specific competency

Superior	Critically evaluates strategies for profit growth and increased revenues
Average	Assesses problems in context of organizational strategies
Marginal	Considers only immediate issues when making decisions at the expense of long-term issues

Table IV.
Example indicators of a
specific competency

Steps in the development of a competency model
Creation of a competency systems team (CST)

- Identification of performance metrics and validation sample
- Development of a tentative competencies list
- Definition of competencies and behavioural indicators
- Development of an initial competency model
- Cross-check of initial model
- Model refinement
- Validation of the model
- Finalize the model

As a first step, many enterprises and organizations create a CST which consists of human resources staff, top executives and employees who possess a deep know-how of the jobs included in the model. This team has a responsibility for overseeing the whole initiative. A proficiency scale is prepared in order to define superior, average and marginal performance for the jobs included in the model.

The CST develops a preliminary list of competencies which serve as a basis for building the model. The creation of such a list can be successful, through reviewing competency models that have already been developed by other organizations and considering the organization's own business strategies.

In this step, information is collected on what competencies are needed to perform the jobs in the model by conducting interviews, focus groups, and surveys with employees and managers.

The CST develops an initial competency model based on the information collected in the previous step by performing quantitative analysis of the survey results and content analysis of the themes contained in the interview and focus group results.

It is important to check that the initial model is accurate by conducting additional focus groups, interviews, or surveys with groups of managers and employees who did not participate in the defining of the initial model.

The same types of analysis used in developing the initial competency model are used by the CST to refine the model.

Validation efforts begin with converting the competencies into a questionnaire that can be used for rating individual effectiveness. The individuals identified earlier as superior, effective, and marginal performers are rated on this questionnaire by multiple individuals if possible, such as managers, peers, and direct reports. The ratings on the competency questionnaire are correlated to the performance ratings to determine if each competency relates to job performance.

The last step involves eliminating any competencies that do not correlate with the performance measures to provide a validated model that is linked to effective performance.

Table V.
Steps in the development
of a competency model

Name of competency data element	Description	Sample values
Competency code	Unique identifier	Alphanumeric
Competency type	Classification	“Hard” skill, “soft” skill, education, license, certification, other
Competency level	Some form of comparative scale	Could be numeric (1-5) or descriptive (BA/MA/PhD); will vary by competency type
Expiration date	Date competency will expire	
Validation type	How competency is assessed or validated	Educational institution, certifications, written test, supervisor
Validation date	Date the competency was validated	
Validator	Who or what is validating the competency level	Course instructor ID, University, Manager ID

Table VI.
Sample core competency data attributes

Competency management system	Company	Website
Skills gap management system	CAPSA, Consulting incorporated	www.capsaconsulting.com
SkillBase	Claymore Inc.	www.skillbase.net
On track for training and ontrack online	DKSystems, Inc.	www.dkssystem.com
Occupational skills analysis system (OSAS)	Educational Data Systems	www.edsincorporated.com
KSA online	Gyrus Systems	www.gyrus.com
HRScope	HR Technologies	www.hrscope.com
TL4	Humeng	www.humeng.ca
RemoteHR	Illion	www.remotehr.com
Talent management system	KnowledgePool Americas	usa.knowledgepool.com
Learner	LifeTime Media	www.lifetime.com
Meridian KSI knowledge centre	Meridian Knowledge Solutions	www.meridianksi.com
SkillQuest	People Sciences	www.peoplesciences.com
PeoplePower	People3	www.people3.com
ClickEM	Peopleclick	www.peopleclick.com
HR pulse	Pilat NAI	www.pilat-nai.com
PlanView software	PlanView	www.planview.com
Training and performance management (TAP)	Prismatics	
PROTECH	Proactive Technologies	
CompAssess	Right/Career Directions	www.careerdir.com
SkillView enterprise 5.0	SkillView Technologies	www.skillview.com
IntelliSkill and ITG databases	SKillView Technologies	www.skillview.com
SkillSolutions	SynTact Solutions	www.syntactsolutions.com

Table VII.
List of the CM systems that we reviewed

and core human resource packages. Future research should be conducted on enhancing this standard so as to increase adoption of competency data exchange and application interoperability.

Furthermore, research should also focus on the potential usage and integration of CM systems with web services, which are web-based services targeted to the simplification of the way that applications communicate and share information.

Table VIII.
Competency features
included in LMSs

Vendor of LMS	Product	CM features included
Click2learn, Inc.	Aspen Learning Management Server 1.1	Determine gaps in the individual's skills. It also tracks an employee's progress in skills acquisition
Docent, Inc.	Docent LMS	Measures competency at a company level. Skill search capabilities. Competency assessment through 360 feedback. It tracks gaps between student competency levels and job profile specifications, produces personalized learning plans to fill individual skill gaps and matches employees to job requirements using skills-mapping capabilities
Element K, LLC	KnowledgeHub (Learning management system)	None
GENESYS Software Systems, Inc.	PeopleComeFirst – hosted version, client requirements 1.0	Skills gap analysis and personalized learning paths
	PeopleComeFirst – licensed, in-house version 1.0	None
Hyperwave Information Management, Inc.	PeopleComeFirst Healthcare Learning Advantage 1.0	None
IBM	eLearning Suite 1.3	None
KnowledgePlanet.com, Inc.	Lotus learning management system	None
	HCM Suite 6.0 KP Learning (No CMS Features)	It performs a skill gap analysis based on which a performance review or personalised learning path can take place. Through its learning content management system, it leverages the reuse of learning objects. Finally, through its application interfaces and content development kit it provides organizations and enterprises with access to skills data and competency models
Learnframe, Inc.	Learning Center 1.5 Nebo 1.2	None
Longview Solutions, Inc.	Pinnacle Learning Manager 4.3	None
Open Text Corporation	LRAI 3	None
Oracle Corp.	Liveliink for Learning Management 1.2	It integrates with HR systems in order to update employees' skills inventory and skills gap analysis
	Oracle iLMS	None
OutStart, Inc.	Evolution 4.0	None
Pathlore Software Corp.	Pathlore LMS 5	Skills management
Pedagogue Solutions	Pedagogue Testing	None
Plateau Systems, Ltd	Plateau 4 Learning Management System 4.2	Skills gap analysis and customization of curriculum according to it
Saba Software, Inc.	Saba Enterprise Learning Suite 3.5	
SAP GmbH	SAP Learning Solution	
THINQ Learning Solutions, Inc.	Learning Management System 5.x	A web based system which performs skills gap analysis

Competency categories	A group that homogeneous or similar competencies belong to (e.g. people management competencies)
Competency definitions	Statement (s) that explains the basic concept of a competency
Proficiency scale	Most of the CMS use a 0-4 or 0-5 scale, in order to grade the proficiency level that an employee possesses on a particular competency
Behaviours associated with specific competencies	Behaviour indicators an individual should demonstrate if the specified competency is possessed
Job descriptions	Job descriptions and definitions of employee roles
Assessment tool	To identify and rate competencies. This tool is often based on 360° feedback
Competency tracking by position, department and company	Most CMSs include a competencies' visualizer which depicts the status of competencies possessed by an individual, a department or a company
Link of skills gap analysis with a personalised learning path	The competencies that an employee should work on are linked with specific learning objects in order to facilitate their acquisition

Table IX.
Common features of CM systems

The majority of HCM systems have been or plan to be enhanced with the use of web services in their development environments. Although lack of a published security specification is currently limiting full use of the web services paradigm, vendors are re-architecting their own application components, mainly for internal usage. As technology matures, the use of web services and XML will enable the concept of workforce management systems' application components reading competency data from the HRMS "master" repository and updating the master with new entries or revisions based on completion of business processes.

Another area which could prove to be increasingly interesting for further research is the area of employee portals with self-service technology. Most organizations and mainly financial and telecommunications companies, have adopted or plan to deploy such portals. An employee self-service portal can be integrated with the enterprise portal, thus facilitating tracking of certain competencies which are easily self-reported – such as courses and knowledge acquired out of the organization. This could be accomplished with the use of push and pull techniques – e.g. employees receive a quarterly e-mail notification reminding them to update their competency profile, with an embedded link to the relevant self-service page.

A research direction or technology evolution in employee portals with self-service technology would be a very possible solution to the often met problem of employees' lack of time and commitment to update the content of a CM system.

Moreover, ontology capabilities leading to the semantic web appear to becoming a core future technology. As a result, ontology-based models of competencies can present a tight integration of capabilities and information in a highly contextualized user interface. At the same time, different services and components may be loosely coupled through a dynamic architecture whose coherence is ensured via a common semantic model in a rich competency ontology.

Additionally, during the next few years, ontology tools and techniques are expected to offer the unified semantics needed to support dynamic application integration at the enterprise level. Consequently, organizations and enterprises should begin exploring the integration of semantic modelling and information management skills with their competency centres. Such an evolution would deal with the problem of enterprise application integration, the integration of CM systems with other core applications of an organization.

6. Conclusions

CM is a practice that becomes more and more important in private and public organizations, helping them to attract and develop talented employees, identify the right person for a job position, performing succession planning, training analysis and other core human resources functions.

Apart from defining the concept of “competency” we have identified the four macro-phases in a competency lifecycle in a CM system: namely, competency mapping; diagnosis; development; and monitoring, and we analysed them in detail. Moreover, we provided an algorithm for developing a competency model, the core around which a CM system is based.

We conducted a review of 22 commercial CM systems which can operate as standalone applications and 18 LMSs which incorporate a CM module and identified common features and differences amongst them. Some of the most common features are competency categories, definitions, proficiency scales, associated behaviours, job descriptions, assessment tool and competency tracking.

Finally, we provided research directions in the areas of open standards (XML, web services, RDF), semantic technologies (ontologies and the semantic web) and portals with self-service technologies. Our estimation is that these areas are going to have a significant role in the evolution of CM systems.

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