

# CR2S: Competency Roadmap to Strategy

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**Abstract:** It is well acknowledged that Human Resources are one of the most important assets of a company; as a consequence, Competency Management became a well established approach for organizing workforce recruitment, training and development. At the same time, Competency Management is more and more moving towards a tight integration with business and knowledge management frameworks, having a crucial role in business process re-engineering, giving to competencies a central role to achieve higher performance variance, determine better return-on-investment or economic value of competency initiatives, implementing deep organizational transformation, and change market and organizational strategies. Our approach, taking inspiration from Technology Roadmaps, proposes the Competency Roadmap to Strategy, an integrated model for organizing the competency bouquet of a company in coordination with strategic desing of business activities.

## 1 Introduction

The terms “Technology Roadmap”, in literature, is generally used to specify alternate “roads” or procedures that a company can follow for meeting certain performance objectives. A roadmap identifies precise objectives and helps focus resources on the critical technologies that are needed to meet those goals. This focusing is important because it allows to reduce R&D investments concentrating them to more focused targets.

Generally speaking, the notion of competency helps to break down jobs into their critical processes and skills, which employees must perform everyday in order to ensure employee safety, regulatory compliance, and productivity. Typically competencies drive the definition of training and development programs and they are used to assess and build team competencies.

Competency Management Systems (CMS) are increasingly moving towards the integration into business and knowledge management frameworks, providing an integrated environment for the management of company profiles, human resources and task assignment.

In particular, such integrated framework can help companies to have a complete mapping of available competences, associated to respective workers, with specific tasks or products, in order to produce, at any moment, a snapshot of workforce assignments with respect to the specific skills. Such an approach can play an important role also in forecasting future competency needs with respect to possible new products or services, in response to the releasing of new technologies or to the emergence of new market's requirements.

The aim of this work is to introduce a framework providing an integrated view on the connections of workers, competencies, products and services with business strategies and actions. Our claim is that only an explicit representation of the above mentioned elements can fully support the accountability of competency management impact, in a business perspective. In particular in this paper we propose the first step in the definition of the environment providing the rationale and the conceptual structure of the framework, giving a metamodel that formalize Competency Roadmaps and defining the relation between the concepts that compose the roadmaps.

The paper is organized as follows. Section 2 describes relevant literature in the field of Technology Roadmaps. Section 3 introduces the Competency Roadmap to Strategy (CR2S) approach and the rationale of our work. Then, Section 4 exposes the CR2S meta-model and Section 5 shows an example of instantiation. Finally, Section 6 gives our conclusions.

## **2 Related Works**

Roadmaps are used in organizations as decision aids to improve coordination of activities and resources, identifying gaps and opportunities in developing programs. Technology roadmap helps to forecast technological future trends based on either exploratory methods or normative approaches [Kap01]. At the corporate level, it provides a graphical means for exploring and communicating the relationships among strategies, products, and technologies over time [MHD01] [PFMP03]. Other authors speak about Science & Technology roadmap to support research institutions or government to identify those areas that have high potential promise in the public or in the scientific community [KS02].

Other kind of roadmap made product at second level and focus on services and processes, to be more close to customers [BSEJ05]. Still another type of roadmap is the one described by the DOE Environmental Restoration and Waste Management in Revised Roadmap Methodology Document (May 1993). This is an example of an issue-oriented roadmap, rather than a technology roadmap, although the availability of a required technology may be considered an issue to be addressed. This roadmapping approach, customized for DOE EM sites, is intended to identify issues and their consequences for project planning and budgeting.

### 3 Competency Roadmap to Strategy (CR2S)

The goal of CR2S roadmapping is to enable a company or an organization to make better investment decisions, since it has better information about the following situations:

- *Identify critical product or competency needs, to drive technologies selection and development decisions:* CR2S associates products and services with the related skills or competencies, giving to organization a methodology to select which technologies are currently exploitable and, consequently, which products can be developed with the available competencies.
- *Determine the competency alternatives that can satisfy critical product needs:* the complete mapping products-competencies-users allows the identification of alternative in task assignment and, indeed, in the team creation process.
- *Define a learning plan to introduce a new competency in the company:* the introduction of a new Enterprise Competency in the company will imply the creation of a set of specific Personal Competencies to be assigned to selected users. In order to fulfil that task, specific learning plans have to be designed, executed and assigned to the users the company want to exploit in the new product development.

The implementation of our approach is related to the introduction of a strategic methodology into the competency management process. In fact, competencies are not treated as separate and independent elements of the company HR system, but they are organized in a structured trees allowing the application of specific reasoning activities that could help in the identification of missing skills and in the organization of *ad hoc* learning activities.

CR2S has been formalized in the metamodel described in Section 4 to define a flexible structure able to model any specific company situation. As an example, Section 5 presents a simple instance of the metamodel describing a Software House, specialized in web design, that has to face the absence of a skill in response to the supply of a new product.

### 4 CR2S Metamodel

The core of the approach introduced by the paper is described in full by the introduction of the CR2S metamodel. In particular, the metamodel approach allows identifying all the objects that implement the methodology and all the relations that incur between the objects. The definition of the metamodel should be formalized using the OMG's MetaObject Facility (MOF) [OMG10] procedures and described with formalized XML Schema ready to be exploited in integrated frameworks.

The structure of CR2S metamodel is depicted in Fig. 1. It clearly describes the hierarchy between the objects, and the relations between them, without any constraints about the cardinality of objects and relations.

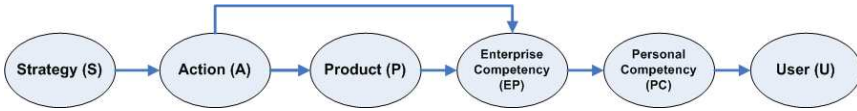


Figure 1: CR2S Metamodel structure

The top element represents strategies guiding the business model implemented by the company. A strategy is a plan designed to achieve a particular aim. Then the *Strategy (S)* class expresses an aim and a plan. The aim is contained in the strategy itself while the plan is implemented through one or more actions.

The *Action (A)* class describes any kind of activity, precisely or broadly defined, implemented to achieve the particular aim expressed by the strategy of reference.

The Action class is directly followed by the *Product (P)* class, that describes the set of products and services managed by an organization whose implementation, deploying, and maintenance requires a precise set of competencies to be present in the company.

Following the hierarchy, the *Enterprise Competency (EC)* node defines all the high level competences that describe the capabilities of the company. As for instance, an example of EC is “Secure Web Site Developing”, that is requested in case of the releasing of a e-commerce portal, and that requires a set of skills from its workers like PHP Programming, SSL, and so on. The cardinality of the relation between EC and the next node defines the expected size of a precise skill that has to be available in a working team, as well as the required level of competency that a user has to reach to be included in the team, can be described as properties of the relation itself.

In fact, the “Personal Competency PC” class describes all the single skills that could be assigned to a user or worker of the organization. The skill definition must be carried out following precise methodologies and covering all the competencies that are required for realizing the EC they are connected to. Example of skills are “PHP Programming” and “Java Developing”.

Finally, the *User* class identifies a component of the organization that will be associated to her personal skills; the relation could be enriched with a property that defines the level of ability in that particular competency.

## 5 CR2S Model

The structure proposed in Sec. 4 gives the building blocks for defining the competency roadmaps that will manage the process of stimulus management at the basis of CR2S methodology. In fact, a complete and exhaustive instantiation of a CR2S model, adherent to the structure and competency of an organization, will help in finding possible competency gaps in response to specific stimuli, in terms of missing competencies that have to be granted to specific users.

In that Section an example of instantiation will be proposed describing a common Software House active in the web development field; for each level a series of objects has been defined, along with the relations between the nodes (see Fig. 2).

The first level, as introduced in Section 4, has been omitted, while the below levels depict the competency map of the organization starting from the delivered products, the skills necessary to implement them, and the users involved. This level could be represented, for instance, by one of the standards discussed in [CAG10]. About the actions in our example we identified three distinct class, but the set could be enlarged applying the approach in different scenarios:

1. *New Task Assignment*, when a new task is created and assigned to the working group; the task could be assigned by the management to the respective business function, with the goal of realizing a new products or releasing a new service.
2. *New Job Title*, when a new technical figure is introduced in the organization, requiring the addition of new competencies to the company's profile.
3. *New Market Challenge*, when the study of market trends or community identify the emergence of new challenges or exigences from the market itself, like for instance a new product released by a competitor, or an interesting discussion on a new technology in a forum that gathered a great number of followers and that could be of interest for the Company.

Actions involve products, for example, looking at the *e-Commerce Tool* node, it is possible to derive the Enterprise Competencies needed to build the tool (i.e. *Secure Transaction Management* and *Dynamic Web Design*). Such ECs, in turn, require a set of more specialized PCs such as *PHP*, *SSL*, or *Photoshop*, that are directly connected to the users (i.e. workers) that own such skill. Note that not all the PCs have to be assigned and mapped to products; as in the case of *WS-Security*, Ann has declared that she owns such a skill, but currently any active project is exploiting it.

The information delivered by an instance of CR2S metamodel are manifold, depending on the chosen analysis level, and they can give a multilevel view of Company capabilities.

In fact, analyzing the User and PC level, it is possible to have a snapshot of company available staff and the set of competencies that the team could exploit in the developing phase, highlighting, at the same time, specific competency gaps that have to be bridged organizing new learning activities or extending the existing team.

At the EC and Product levels, the organization exposes all the Enterprise Competencies that describe the bouquet of offered services and capabilities, along with the set of products released by the Company.

Such analysis is important in case that the target is to describe the reaction of the company in response to specific Strategy stimuli. In particular, as described in Fig. 3, we assume that a market analysis performed by the organization found that the Service Oriented Architectures (SOA) are the most emerging technological trend; since the organization does not have any product based on SOA, it is important to design and propose a new service/product that could bridge this gap. As presented in the example, the company

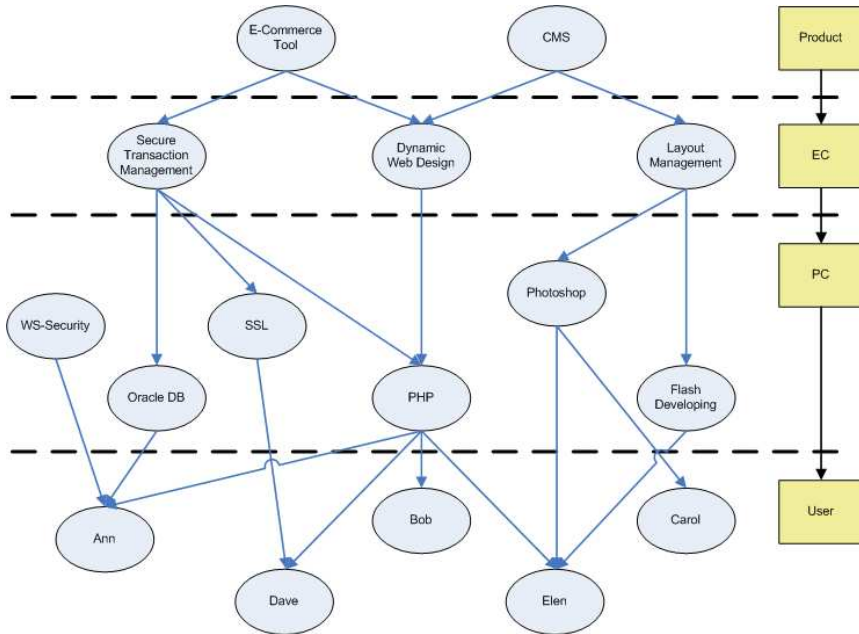


Figure 2: Example of CR2S model without the Strategy level.

identifies a new task assignment (*Service Portal*) as a response to the identified Market Challenge.

The implementation of the new framework will imply the exploitation of PCs that are already present in the company, such as all the competencies connected to the *Secure Transaction Management* node together with *WS-Security*, and a new skill (*BPEL*) that is not already included in company skill map. Indeed, to start the development of the new product filling this competency gap, the company can follow two ways, that could be followed with respect to the product time to market.

First of all, it can start *ad hoc* learning activities in order to give the BPEL skill to one (or more) of its workers; this solution can be followed when the time to market is not a strict requirement and the company could wait until the learning activities are successfully concluded. Otherwise, the organization can enlarge the working team staffing new figures that have experiences with BPEL; respect to the previous one, this solution is quicker and allows to include in a shorter time the new competence. In both the cases the CR2S approach gives a methodology that could help in the organization of the innovation process, giving immediate and accurate snapshots of company capabilities and suggesting solutions for unexpected competency lacks.

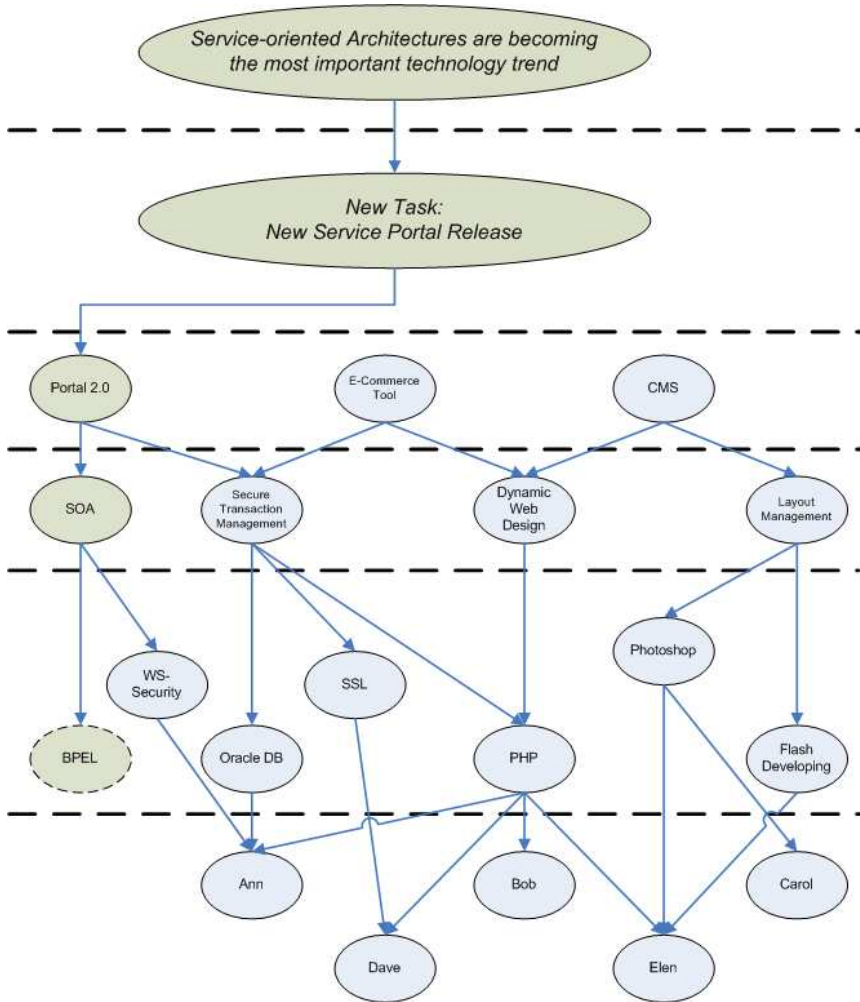


Figure 3: Example of model with Market Challenge.

## 6 Conclusions

In this paper we proposed a new framework to integrate competency management and strategic design. We described a metamodel providing the constructs to implement such an integrated approach. In section 5 we shortly illustrated which kind of analysis can be implemented on the basis of the information provided in the framework. Our final aim is to make this framework a tool for supporting quantitative analysis in competency management, enriching it with techniques to construct learning and training plans or to evaluate the specific impact of actions and strategies. To achieve this objective several open issues must be treated. The following is the list of extensions scheduled in our next

research plans:

1. Composition and aggregation of PCs and ECs. To express the conditions of activation of ECs, depending on the PCs available and their level of adeptness.
2. Instances of metrics for gap analysis. To define techniques to identify gaps with exact or soft matchers.
3. Learning Plan construction. To use gap analysis in the definition of the learning activities adapting to user requirements.
4. Team Creation. To use gap analysis in team construction maximizing the capability of teams.
5. Cost-benefits analysis of the impact of a strategy, distinguishing among short, medium and long term effects.

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