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Enterprise Collaboration Maturity Model (ECMM): Preliminary Definition and Future Challenges

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Abstract. Collaboration and interoperability are pervasive topics today as organizations struggle to attiain competitive edge in today's global market fostered by new economies of scale. Moreover, the deep introduction of Internet in our lives both at personal and business level is changing all aspects of our economies and societies and the way enterprises and individuals interoperate and collaborate.

In the COIN IP project [IST-216256], a strategy based on readiness assessment to adopt best collaboration and interoperability practices has been implemented following the maturity models approach.

The aim of this paper is to present a process improvement approach conceived as a maturity model for collaborative networked organizations, in which organizations participating in a network are assessed, both as a stand-alone company and with respect to the network. The result of this assessment will provide the organization with a picture of where they are at that moment and where they have to be if the maturity model is fully complied. Additionally a roadmap and an improvement plan is suggested, which will help the company fill the gap.

Keywords: Enterprise Collaboration, Enterprise Interoperability, Maturity Models, Networked Environments, Readiness Assessment.

1.1 Introduction and Problem Description

In the current globalized and networked society, it is widely recognized that collaboration and interoperability are key issues for today's organizations. As professed in the introduction to the COIN IP project, both concepts are different but they are so interconnected that can be considered two sides of the same COIN [1].

In this new situation where enterprises have shifted towards networked enterprises, companies need to adopt innovative forms of collaboration in order to compete and maintain their position in the global market. These new ways of collaboration are mainly based on Information Technologies and therefore interoperability capabilities at different levels have become crucial to create value and success, combining technology and business approaches to catalyze and sustain added value for enterprises and customers.

New economic activities have arisen alongside with new classes of networks and services, new forms of enterprise collaboration, new business models and new value propositions. Business has changed as well [2]. As stated by the European Commission in its published Enterprise Interoperability Value Proposition, economies of scale can now reach world wide, allowing firms to tap into the narrowest parts of the long tail of demand. In fact, collaboration is one of the global trends in business nowadays and collaborative practices are gaining importance in firms. These collaborative practices are being carried out in different forms, from cohesive and stable networks like Collaborative Networked Organisations (CNO) to more ephemeral and occasional cooperation like Virtual Business Ecosystems.

Existing literature points out different definitions and analysis of new types of collaboration forms [3], as well as numerous enterprise interoperability types and practices [4]. There are also existing proposals on readiness for certain types of collaborations forms, like the Aricon approach [5], where a methodology for Virtual Enterprises and Product development is presented. However, for enterprises, it is still a hard task to identify best practices and improvements to start implementing collaboration and interoperability practices inside different types of networked environments.

Presuming that an organization is collaborating in any type of the networks aforementioned, the question they face is: how is my company performing alone and in the network, that is, how mature is my organization in terms of collaboration and interoperability and what can be improved to perform better?

In order to answer this question, a maturity model is being developed in the framework of the COIN project. This maturity model, named ECMM (Enterprise Collaboration Maturity Model), has the main objective of assessing organizations that desire to know their collaboration and interoperability maturity level with respect to a set of best practices. The result of these assessments will present,

among other issues, an improvement plan and a roadmap to increase the enterprise's collaboration and interoperability capabilities, instilling in organizations the benefits of excellence models.

1.2 ECMM

The term maturity model was popularized by the SEI (Software Engineering Institute) when they developed the Capability Maturity Model ® in 1986. A maturity model is a framework that describes, for a specific area of interest, a number of levels of sophistication at which activities in this area can be carried out. In the current case of ECMM the specific areas of interest are Collaboration and Interoperability as ECMM focuses on different disciplines that an organization can address to improve its business in a networked environment.

Maturity models define a structured collection of elements that describe characteristics of effective processes. Models say what is to be done but it does not specify how it is to be done, and it is used mainly to achieve two objectives:

- Help set process improvement and priorities, improve processes, and provide guidance for ensuring stable, capable and mature processes
- Appraise organizations for the sake of improvement.

Thus, the application of the ECMM approach to assess networked organizations will provide several benefits:

- A place to start: It is important to identify each organization's current state, this will help setting the actions that are necessary to achieve the objectives defined.
- The benefit of a community's prior experiences: A model is a collection of industry good practices proven by experience to be effective.
- A common language: Setting a model implies sharing a common dictionary that will assure that every party involved is using a common language.
- A shared vision and a framework for prioritizing actions: A model provides a shared vision of the improvement path, what the goal is, what is being aimed for and, how it can be achieved.

Hence, this maturity model approach elicited in the context of COIN project will help organizations to evaluate and improve the capability for collaboration of an enterprise inside its collaborative network and to support collaborative and interoperability practices in the scenarios defined within the project: collaborative networks, supply chains and business ecosystems.

1.2.1 Scope and Structure

One of the major challenges while defining the scope of the Enterprise Collaboration Maturity Model has been to determine and establish which domains, vital to collaborative and interoperable environments, need to be covered. Other maturity models, like CMMI, focus on measuring and assessing the business processes, whereas they do not strive to measure and assess business strategies and business models. In the case of ECMM, since Enterprise Collaboration and Enterprise Interoperability are not only influenced by Business Processes but they are also tightly connected to Business Models and Business Strategies, it is clear that these aspects need to be treated.

However, for the final definition of the structure, we carried out several surveys to COIN end users and concluded that from the obtained answers as well as from further experiences, the concept and structure of CMMI are very clear, well understood and widely applied in the industry. With this in mind ECMM structure has been designed based on CMMI building blocks, which incorporates:

- Maturity levels
- Process areas
- Goals
- Practices
- Sub practices (not always)
- Work Products

With this in mind, four maturity levels have been identified and defined for ECMM, which are:

1. **Performed**: Collaboration with external entities is done, but in an ad-hoc and chaotic manner. Collaborative tasks and processes usually exceed budget and schedule, their past success cannot be repeated, and the potential of the technology is not used properly.

2. **Managed**: The objective is to create a management foundation for collaboration. Network technologies are used to collaborate and interoperate.

3. **Standardized**: The objective is to establish a common business strategy and business process infrastructure for collaboration. Business collaboration is facilitated through interoperability technologies and use of standards.

4. **Innovating**: The objective is to manage and exploit the capability of the networked organization process infrastructure to achieve predictable results with controlled variation. Additionally, another objective is to continuously improve the networked organization processes and the resulting products and services through continuous capability, and planned innovative improvements.

Once the structure and the maturity levels have been defined, the domains that the model should cover should be defined. A domain joins up several process areas related to one topic. The domains identified for the ECMM are:

- **Project and Product Management**: This domain contains the cross-project and product activities related to defining, planning, developing, risks management and quality assurance.
- **Business Process and Strategy**: This domain covers areas that support business process management and financial aspects.
- **Customer Management**: This contains aspects related to relationship with the customer and evaluation.
- **Collaboration, Legal Environment and Trust**: Legal activities, terms of collaboration relationships,
- **Organisation:** This domain covers activities related to management of resources, development of competences, measurement.
- **Systems and Technology**: Technologies and Services for Interoperability and Collaboration
- **Innovation**: This domain covers all activities related to innovation processes

1.2.2 Process Areas

The next step within the development of the model has been the definition of the process areas grouped into the previously defined domains, and matching those process areas into the corresponding maturity level. A brief description of each of these process areas is presented next:

- **Business Management (BM):** Business Management (BM) plans and manages the business and financial aspects of a CNO.
- **Collaboration Agreement (CA):** The purpose of the Collaboration Agreement (CA) is to set up the terms in which the collaboration within the CNO takes place as well as the management of this collaboration throughout the whole life of a CNO.
- **Collaborative Project Management (CPM):** The purpose of Collaborative Project Management (CPM) is to establish and manage the project and the involvement of the relevant stakeholders. This process area also covers the establishment of a shared vision for the project and the establishment of collaborative teams that will carry out the objectives of the project.
- **Configuration Management (CM):** The purpose of Configuration Management (CM) is to establish and maintain the integrity of work products using configuration identification, configuration control, configuration status accounting, and configuration audits.
- **IPR:** The purpose of the Intellectual Property Rights (IPR) is to clarify and agree the terms of the Intellectual Property Rights within the CNO.

- **Measurement and Analysis (MA):** The purpose of Measurement and Analysis (MA) is to develop and sustain a measurement capability of the CNO that is used to support management information needs.
- **Process and Product Assurance (PPA):** Process and Product Assurance provides appropriate conformance guidance and objectively reviews the activities and work products of work efforts within the CNO to ensure they comply with applicable laws, regulations, standards, organizational policies, business rules, process descriptions, and work procedures.
- **Requirements Management (REQM):** The purpose of Requirements Management (REQM) is to manage the requirements of the project's products and product components and to identify inconsistencies between those requirements and the project's plans and work products.
- **Resource Management (RM):** Resource Management plans and manages the acquisition, allocation, and reassignment of people and other resources needed to prepare, deploy, operate, and support the CNO's products and services.
- **Trust Management (TM):** The purpose of Trust Management (TM) is to promote the establishment of trust relationships among CNO participants, including the assessment of the trust level among members and between members and the CNO as a whole.
- **Business Governance (BG):** Business Governance (BG) establishes executive accountability for the management and performance of the CNO's work and results.
- **Collaborative Business Process (CBP):** The purpose of Collaborative Business Process (CBP) is to establish and maintain a usable set of collaborative business process assets and work environment standards. This process area also covers the establishment of organizational rules and guidelines that enable conducting work using collaborative teams in CNO's.
- **Collaborative Customer Relationship Management (CCRM):** The purpose of Collaborative Customer Relationship Management (CRM) is to manage the interaction of potential or actual customers with the CNO
- **Defect and Problem Prevention (DPP):** Defect and Problem Prevention identifies and addresses the causes of defects and other problems that are the primary obstacles to achieving a CNO's plans and quantitative improvement goals so these defects and problems do not recur.
- **Organizational Innovation (OI):** The purpose of Organizational Innovation (OI) is to select and deploy incremental and innovative improvements that measurably improve the CNO's processes and technologies. The improvements support the CNO's quality and process-performance objectives as derived from the CNO's business objectives.

- **Requirements development (RD):** The purpose of Requirements Development (RD) is to produce and analyze customer, product and product component requirements.
- **Risk Management (RSKM):** The purpose of Risk Management (RSKM) is to identify potential problems before they occur so that risk-handling activities can be planned and invoked as needed across the life of the CNO, product or project to mitigate adverse impacts on achieving objectives.
- **Interoperability and Collaboration Technologies (ICT):** The purpose of Interoperability and Collaboration Technologies (SICT) is to standardize the usage of a set of baseline tools, techniques and methods for interoperability and collaboration
- **Technical Solution (TS):** The purpose of Technical Solution (TS) is to design, develop, and implement solutions to the committed requirements. Solutions, designs, and implementations encompass products, product components, and product-related lifecycle processes either singly or in combination as appropriate.
- **Customer Evaluation (CE):** The purpose of Customer Evaluation (CE) is to measure the customers' satisfaction regarding the delivered products and services and to set up a set of indicators internal to the CNO w.r.t. the customers.
- **Open Innovation (OPI):** Systematically explore a wide range of internal and external sources for innovation opportunities, integrate and exploit those opportunities through multiple channels
- **Organizational Process Performance (OPP):** The purpose of Organizational Process Performance (OPP) is to establish and maintain a quantitative understanding of the performance of the CNO's set of standard processes in support of quality and process-performance objectives, and to provide the process-performance data, baselines, and models to quantitatively manage the CNO's projects.
- **Quantitative Project Management (QPM):** The purpose of Quantitative Project Management (QPM) is to quantitatively manage the project's defined process to achieve the project's established quality and process-performance objectives.
- **Training and Competency Development (TCD):** Competency Development develops the competencies within the CNO's workforce that are needed to perform the organization's work using the organization's standard processes. The purpose of Training is to develop the skills and knowledge of people so they can perform their roles effectively and efficiently.

The development of these process areas is currently being finalized. Each of these process areas consists of one or more specific goals, each of these are composed of several specific practices, which result in one or several work products. Additionally, a generic set of goals and practices is currently being developed for each maturity level defined.

1.2.3 Assessment method

A way to analyse the readiness of an organization and to set up an improvement plan is via an assessment. The objectives of the assessment method are to:

- Provide a structured approach to assess the network and member organizations' processes against the ECMM selected domains/process areas.
- Establish basic requirements to make an evaluation in order to ensure that different assessments are consistent and comparables between them and it could be repeated as well.

The assessment based on ECMM model is organised on the following stages:

- **Stage 1**: Assessment preparation

    - Define the scope of the assessment
    - Collect information about network and member organizations context
    - Prepare assessment schedule and ask for documentation required
    - Train Interviewed people

- **Stage 2**: Assessment execution

    - Make an initial assessment presentation
    - Collect information through interviews for each process area
    - Elaborate improvement recommendations

- **Stage 3**: Assessment results

    - Present findings report
    - End the assessment

The participants of the ECMM assessment must be involved in each of the tasks of the assessment schedule which are the following ones:

- **Sponsor of the assessment**. Person(s) who promotes the evaluation process (e.g. one responsible person from the leading partner of a collaborative network, i.e. OEM in the automotive domain).
- **Evaluator team**. Depending on the scope of the assessment, the evaluator team may be made up by one or two persons belonging to the company that organizes the evaluation.
- **Interviewed people**. Members of the collaborative network being assessed who know in detail the processes of the evaluated organizations or collaborative network, at different levels. (e.g. Quality responsible, Process Engineer, Project Leaders and/or technicians related to the process areas to be evaluated).
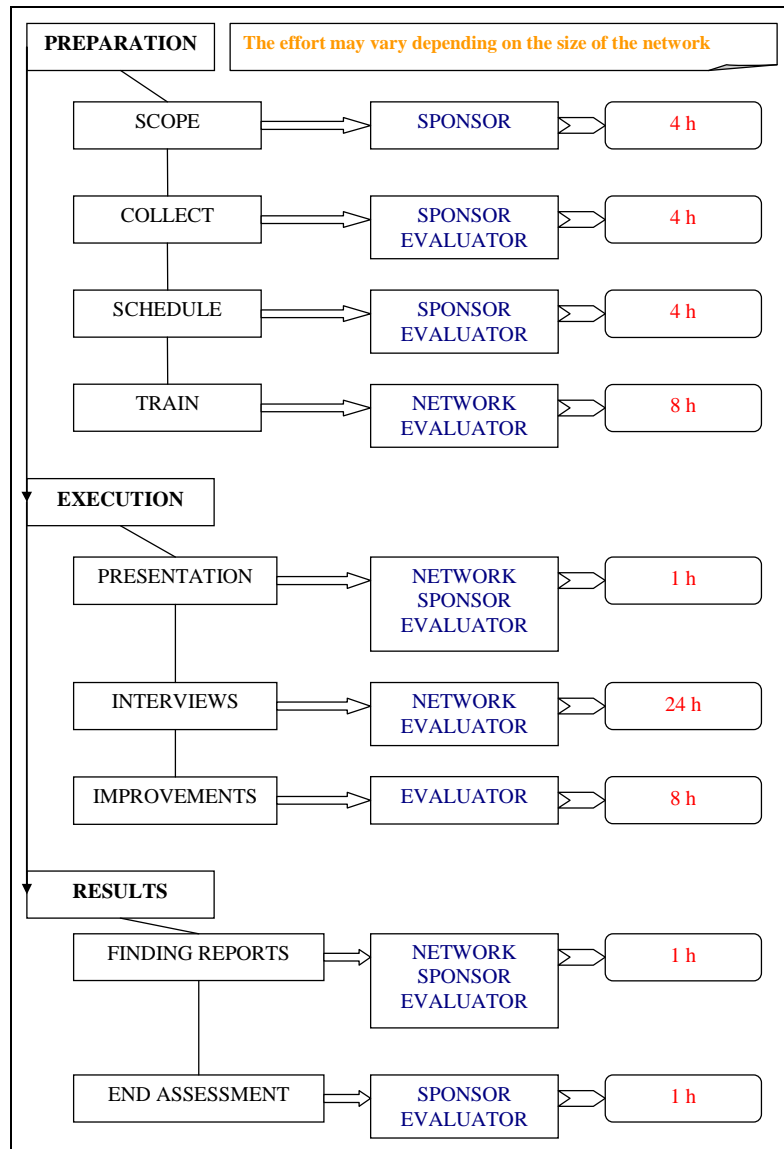
Fig. 1. Assessment method process

1.3 Conclusions and Future Challenges

This paper has presented the research, basis and structure of the Enterprise Collaboration Maturity Model (ECMM) developed in the context of the COIN IP project during its first two years. The maturity model showed in this paper is based

on other excellence frameworks and models that are standardized in today's industry.

The work carried out in this timeframe has allowed us to establish the initial content, structure as well as a stable definition of specific goals and practices of each of the identified process areas. Simultaneously, the assessment method has been defined, as well as the initial set of questions needed to be asked during these assessments.

Future work includes the validation of the model in enterprises belonging to a CNO, a supply chain or a virtual business ecosystem. As the validation of the complete ECMM is not viable, pilots will focus on a predefined set of process areas that the enterprises select as critical for their business. These piloting activities will allow us to update and improve our model based on the input received in the assessments following an iterative approach.

1.4 Acknowledgement

1.5 References

[1]   COIN Consortium (IP-216256). Collaboration and Interoperability for Networked Enterprises. Anex I-Description of work, 2007
[2]   Li, M., Crave S., Grilo, A., van den Berg, R Unleashing the Potential of the European Knowledge Economy: Value proposition for Enterprise Interoperability. Version 4.0, European Communities, 2008.
[3]   ECOLEAD Consortium (IP-506958). A reference Model for Collaborative Networks. Deliverable D5.2.3, 2007.
[4]   ATHENA Consortium (IP-507849). Guidelines and Best Practices for Applying the ATHENA Interoperability
[5]   ARICON Project
http://cordis.europa.eu/data/PROJ_FP5/ACTIONeqDndSESSIONeq112242005919nd DOC eq1905ndTBLeqEN_PROJ. htm, 2008.