

# Collaborative Networked Teaching at CEFET/RJ Brazil

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**Abstract** – In the current scenery of markets opening and economical globalization, the enterprises have been facing great challenges to increase their efficiency levels and, like this, they maintain if competitive. In that context, the concepts of collaborative networked appear. The notion of network is nowadays a central issue in many fields including social sciences, communications, computer science, physics, sociology, anthropology and biology. A collaborative network is constituted by a variety of entities (e.g., organizations and people) that are largely autonomous, geographically distributed, and heterogeneous in terms of their operating environment, culture and goal. A large variety of collaborative network have emerge during the last year as a result of the challenges faced by both the business. Nowadays, several courses in the area of Collaborative Networked are already being taught or organized at different universities worldwide. In the long term, the role of education in this field may be relevant towards the establishment of the common knowledge and terminology required for the proper deployment of reference scenarios. In fact, during the last three decades, the information and communication technologies have been playing growing role in organizations, namely as an instrument to support integration and flexibility that collaborative networked need. A discipline of collaborative networked shall focus on the structure, behavior, and evolving dynamics of network of autonomous entities that collaborate to better achieve common goals, that is, Social Network, Virtual Enterprise, Virtual Organization, Extended Enterprise, etc.

*Index Terms* – Collaborative network, Virtual enterprise, Virtual organization.

## INTRODUCTION

The “term” network is nowadays a central issue in many fields like: social sciences, communications, physics, computer science, virtual organization, virtual enterprise, etc. Among the various types of network, of special relevance are collaborative networks. A collaborative network (CN) is constituted by a variety of entities (e.g., organizations and people) that are largely autonomous in terms of their: operating environment, culture, social capital and goals.

Nevertheless these entities collaborate to better achieve common of compatible goals, and whose interactions are supported by computer network [1].

The implementation of collaborative processes has accelerated in recent years as a consequence of both the new challenges posed to companies and organizations by the fast changing socio-economic conditions and the new developments in ICT sector.

In fact during the last three decades the information and communication technologies have been playing a growing role in organizations, namely as an instrument to support integration and flexibility. As a result of these developments, new scientific disciplines emerged or where consolidated, as in the case of Collaborative Network [1].

Nowadays, several courses in the specific area of Collaborative Network are already being taught or organized at different universities worldwide. For instance, The New University of Lisbon (Portugal) offers a 1 semester course on Virtual Enterprise to the 5<sup>th</sup> year students of Electrical and Computer Engineering since 2002 [2]. Similarly, the Federal University of Santa Catarina (Brazil) offers course of Automation and Systems Engineering and the Costa Rican Institute of Technology [3] started offering Virtual Organization courses to their students, as well as, on February 2007, Federal Center of Technological Education – CEFET/RJ started a pilot course.

In the context, the objective of this paper is describe the experience with a pilot initiative of teaching a complete course on Collaborative Network (EDA 3022) at the Federal Center of Technological Education – CEFET/RJ in the Master Technological Program in first trimester of academic year of 2007. The proposal of this course is presented later on.

## COLLABORATIVE NETWORK

The word “net” is very old and it comes from the latin “retis”, meaning interlacement of threads with regular openings that form a type of cloth. Starting from the interlacement notion, mesh and reticular structures, the word net went winning new meanings along the times, passing to be used in different situations.

Leaving of defined concept for [2], “nets are organizational systems capable to gather individuals and institutions, of democratic form and shared, around similar causes. Flexible structures and established horizon, the work

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dynamics in net suppose performances collaborative and sustained by the will and likeness of their members, being characterized as a significant organizational resource for the social structuring."

In agreement with [4], enterprise network are formed initially with objective of reducing uncertainties and risks, organizing economical activities starting from the coordination and cooperation among companies.

Most of the authors study the perspective of Nets and her use, as road to study the organizations, appears to the organizations as social nets and they should be analyzed as such. A social net has there to be with a group of people, organizations, etc., linked through a social relationships group of a specific type. In this perspective, the structure of any organization should be understood and analyzed in terms of multiple nets of internal and external relationships. In that sense, the organizations are nets and the organizational form depends on the characteristics, interests and needs participant companies [5].

The organizational nets can be considered a consequence of concepts and beginnings of social nets and they can be divided in intra and inter-organization.

We started to detail the several types of formations of nets below:

- Social Network: focus on relationships among social entities, is used widely in the social and behavioral sciences, as well as in economics, marketing, and industrial engineering;
- Virtual Organization: comprising a set of (legally) independent organizations that share resources and skills to achieve its mission/goal, but that is not limited to an alliance of for profit enterprises. A Virtual Enterprise is therefore, a particular case of Virtual Organization;
- Virtual Enterprise: a temporary alliance of enterprises that come together to share skills or core competencies and resources in order to better respond to business opportunities, and whose cooperation is supported by computer networks;
- Extended Enterprise: a concept typically applied to an organization in which a dominant enterprise "extended" its boundaries to all or some of its suppliers. An Extended Enterprise can be seen as a particular case of Virtual Enterprise;
- Agile Enterprise: is the ability of an organization to adapt proficiently in continuously changing, unpredictable business environment;
- Joint Venture: is an entity formed between or more parties to undertake economic activity together. The parties agree to create a new entity by both contributing equity, and they share revenues, expenses, and control of the enterprise;
- Cluster: geographical concentrations of interlinked companies that act in a same section of specialized suppliers, providers services and associated institutions, tends in common, besides the location, the contribution for development products of region. They are orientated by beginnings as cooperation, complementarities, community's sense and competition.

In that sense, Collaborative Network course is being implanted, trying to give an approach of concepts mentioned above.

## DISCIPLINE STRUCTURE

Collaborative network was included in 2007 as an optional discipline in the Master Technological Program at the CEFET/RJ. During a period of 12 weeks, each week includes 4h theory, these lectures comprised a presentation of the main concepts, state of the art and supporting technologies, and discussion of major trends and challenges. Although an optional discipline, this attracted 10 students in summer 2007, which is a significant number considering that was the first time that discipline was offered.

Offering this discipline, the Master's degree in Technology of CEFET/RJ answers directly to the student's longings, i.e., offers possibility the same ones know and learn on the emerging organizational concepts that will face in his professional life. The next section describes in general terms the structure of Collaborative Network discipline.

### *The structure of Collaborative Network discipline at CEFET/RJ*

The specific contents of the course are described bellow. For each subject the main bibliographic references that may be used.

In general, the contents and readings can be dynamically adjusted depending on the interest and skills of the specific group of students.

1. Network
  - a) Introduction and concepts [1,2,3].
2. Network Models
  - a) Social Network: definition, application and examples [1,4,5] ;
  - b) Intra-organization Network: definition, application and examples [6];
  - c) Inter-organization Network: definition, application and examples [6];
  - d) Interpersonal Network: definition, application and examples [6].
3. Virtual Organization [7,8];
  - a) Agile Enterprise [9,11];
  - b) Virtual Enterprise [8,10,11];
  - c) Extended Enterprise [12];
  - d) Life cycle [13,14];
  - e) Contracts in Virtual Organization (Legal form) [15];
  - f) Broker in Virtual Enterprise Formation. [11,16];
  - g) Teams in Virtual Enterprise [11,16].
4. Cooperative Network
  - a) Joint Ventures [18];
  - b) Cluster [19].

### *Objectives of the Course*

Collaborative network discipline has how main objectives to do the students are capable of:

- In-depth study of the CN paradigm focusing on related information technologies and concrete applications;

- Identify and develop possible subjects for pos-graduation theses/projects;
- Explore the application of CN concepts within a national context;
- Develop in the student basic skills to carry out applied research and publish the corresponding scientific results;
- Aim at the establishment of a research group on CN at the Collaborative Work Nucleus.

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### CONCLUSION

Introduction of Collaborative Network discipline in the Master Technological Program at CEFET/RJ, although an optional discipline, is being successful and contributing to preparation of a new generation of engineers and researches able to play a major role in the deployment of the Collaborative Networked concept in the Brazilian university.

The assertiveness of result this experience is in the number of students that intend to include concepts of collaborative network as theoretical establish (or regarding analysis) in their themes of dissertation research.

As a result, the course is planned to be given again in coming semesters in this program.

Regarding future horizon, the possibility of offering a Virtual Course on Collaborative Networked in Spanish (using e-learning techniques) aiming at integration Universities and Institutes of Technology of Latin America and Caribbean countries, can be evaluated.

Finally, it is clear more textbooks in this area are necessary in order to facilitate education tasks.

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