Chapter 3
Investing in Excess Capacity: Combining Real Options and Fuzzy Approaches in a Co-Opetitive Network

Pierluigi Argoneto
University of Basilicata, Italy

Paolo Renna
University of Basilicata, Italy

ABSTRACT

The cooperation among firms allows them to focus on their core products, improving efficiency and competiveness. The emerging paradigm of co-opetition, considering at the same time cooperative and competitive aspects, seems to be the most promising approach both in traditional and electronic network. This chapter investigates the excess capacity issue for independent plants operating in a co-opetitive network. Two models have been proposed: the first without any information exchange, based on classical real options approach, and the second characterized by a certain degree of information sharing: in here the real options methodology is combined with a fuzzy engine. A simulation environment based on Multi Agent Architecture has been developed in order to test the proposed models. The simulation results show that the innovative combined approach drastically reduces the investment, maintaining a high level of profit.

INTRODUCTION

Market globalization and aggressive economic competition have gained a manufacturing tendency toward the adoption of flexibility features in order to better react to changes related to customer needs, process technologies and government directives. Many research efforts have been made in order to really understand which of such flexibility features are critical in achieving the particular business tasks and how or when to implement them. This issue has great relevance from an entrepreneur point of view. Investments in manufacturing systems including flexibility features are perceived as high risk decisions in a very uncertain and complex environment. This perception is principally due to the following reasons: (a) flexible manufacturing systems require higher investment if compared with other manufacturing investments; (b) flexibility enlarges

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the investment scenario making the investment uncertainty higher; (c) the competitive scenario evolution needs to be also evaluated in order to carry out a correct investment planning and timing. Enormous research efforts have already been devoted to the analysis and valuation of investment projects (De Reyck et al., 2008). Traditional financial theory proposes the Net Present Value (NPV) concept, using a cost of capital based on the inherent project risk. The NPV framework has been criticized because it is claimed that it cannot cope with the potential flexibility that comes with investment projects, resulting in changes in the original cash flow pattern. Trigeorgis (1996) claims that traditional capital budgeting methods or discounted cash flow approaches cannot cope with the operation flexibility options and other strategic aspects of various projects but that the application of option techniques results in the correct solution. These critiques to the NPV methodology, see Brealey and Myers (2000), for valuing projects have led to the emergence of Real Options Analysis (ROA) for valuing managerial flexibility in projects. The contingent claims analysis approach to ROA uses market-priced securities to construct a portfolio that replicates the payoffs of the project and determines the project value using a no-arbitrage argument. Moreover, it is well known that entrepreneurial firms, characterized by a lack of internal resources and other start-up handicaps can use external resources through inter-firm networks to overcome these liabilities. In this context, inter-firm networks are considered an important model of organization development to enable an entrepreneurial firm to grow and survive. These strategic networks are composed of inter-organizational ties that are enduring and include strategic alliances, joint ventures, long-term buyer-supplier partnerships and a host of similar ties. When a rapport among firms includes elements of both cooperation and competition, i.e. these firms can compete and cooperate simultaneously, the relationship is called *co-opetition*. The rising question is: how ROA for valuing managerial flexibility, particularly considering investments in excess capacity, can be influenced by such kind of relationship among firms? In this chapter, we present an innovative approach to this issue: the added value for each firm, deriving from the co-opetitive network, is evaluated by a fuzzy engine and utilised to ponder the results obtained by the traditional ROA to overcome the weaknesses of the traditional approach. Specifically, the chapter is focused on planning the capacity of:

- a set of plants that do not share information and
- a set of plant that, differently, share information.

Specifically we highlight:

- the applications of the co-opetition paradigm at an electronic network of plants willing to exchange their productive capacity and, in a defined period (periodic review approach), able to evaluate the opportunity of expand their productive capacity;
- the estimation of the added value, for each firm, in re-modulating the ROA output considering the added value coming from the co-opetitive network (information sharing);
- the schematization and simulation of the proposed model by using a Multi Agent System.

The chapter is structured as follows. Section 2 presents the literature overview. Section 3 describes the research context. The benchmark model with a brief introduction to the real options approach is reported in Section 4. The proposed model is reported in Section 5, while the negotiation mechanism is presented in Section 6. The developed simulation environment and results are respectively presented in sections 7 and 8. Finally, summary and conclusions are withdrawn in section 9.