

## Chapter 13

# On the Relationships between Connection Modes and Workgroup Performance: The Moderating Role of Group Size and Task Complexity

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### ABSTRACT

*Notwithstanding the central place covered inside organization science and the economic theory of the firm, organization design theory still lacks sound building blocks concerning the effects that some fundamental variables have on workgroup performance. In this chapter a contribution to fill in this gap is given with reference to the relationships between connection modes and performance. In particular, through an agent-based simulation model a number of experiments have been done respect to the moderating role played by group size and task complexity. Results confirm current (but not really scientific) knowledge, and bring forth our understanding of these fundamental (and mostly nonlinear) relationships. Among the main results, it can be underlined that the best combinations between connection modes, task complexity, and workgroup size occur when complex tasks are connected by mutual adaptation and run by a small number of agents, or when less complex tasks are connected by parallel or sequential interdependence and performed by a large number of agents. Moreover, when a modules volume to be worked out is heterogeneous in terms of connection modes between module's tasks, and thus, a multi-mode group should be issued, respect to the corresponding choice of issuing specialized groups there is a general decrease in efficacy.*

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## INTRODUCTION

The objective of this paper is to contribute to build an organization design theory by studying tasks interdependence within a workgroup, and to understand how its performance (in terms of efficiency and effectiveness) depends on different aspects of technological interdependence and contingent variables, namely workgroup size and task complexity. We are therefore focusing on a very micro-organizational level, because the whole organization or inter-group relations are not investigated, as well as leadership styles and workers' skills, and other behavioral aspects<sup>1</sup>. As regards the role played and effects produced by connection modes, here we exploit definitions and results of an earlier work (Biggiero & Sevi, 2009), which uses the same COD Model applied here, and that describes it in more detail.

As it will be seen, it is just a contribution for building a consistent, complete, and satisfactory organization design theory (Miller *et al.*, 2009), but nevertheless it is a fundamental piece, because any such theory cannot avoid to face with the basic problems of a theory of interdependence and coordination (Burton, 2013), explaining which connection mode is more complex, and how different combinations between connection modes and coordination mechanisms, group size and task complexity can affect performance. It is not a coincidence that these are the key questions faced by almost every micro-organizational approach to design theory (Baligh, 1986; Baligh & Burton, 1981; Burton, 2013; Burton & Obel, 1998). Even if in a simplified context, our model provides significant and reliable answers to some of these problems. Finally, without much additional effort, it could serve as a basis for testing the validity of theoretical approaches appeared so far.

The next section presents the key concepts and theoretical architecture, introducing precise definitions of technological interdependence, and discussing their implications for the assessment of their degree of complexity. In Section three model structure, methodology, and agents behavior are described, while the following section examines workgroup performance when it is characterized by only one connection mode. Performance is measured by the number of completed tasks after 1000 working days (1000 iterations of the program). This way the effects of connection modes, group size and task complexity on performance can be analytically examined. However, since in reality a same workgroup should face more often with a mixture of connection modes, in Section five the performance of groups with mixed interdependence is analyzed, while again taking into account and distinguishing the effects of group size and task complexity.

## A Brief Theoretical Background

A central theme in management and organization sciences – and more recently in organizational economics (Williamson, 1981, 1985, 1996) and organizational engineering too (Babic, 1999; Eppinger *et al.*, 1994; Suh, 1990, 2001) - is undoubtedly that of organization design (among the many, Baligh, 1986, 2006; Baligh & Burton, 1981; Burton, 2013; Burton & Obel, 1998; Burton *et al.*, 2006; Galbraith, 2012; Grandori, 2001; Van de Ven & Joyce, 1981), i.e. that is finding rational criteria, key variables, and decision-making processes to design an effective and efficient organizational structure or to change (re-design) an already existing one<sup>2</sup>. This (re)design theme is, in its essence, also common to economics, because it concerns how to divide and coordinate work within (intra) and between (inter) organizations, which was one of classical economists (Smith, Ricardo and Marx) central problems. However, during what could be called “the neoclassical economics era”, approximately lasting one century from Jevon's and Walras' foundational contributions, economists' attention to strict organizational or technological

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