Chapter 2.5
Enterprise Modelling in Support of Organisation Design and Change

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ABSTRACT

Enterprises (business organisations) are increasingly operating under uncertain conditions arising from: governments that introduce new regulations; a market place which is shaped by ongoing change in customer requirements; change in capital markets that orient overall market directions; an advancing base of technology; and increasing competition which can arise from a growing number of sources (Monfared, 2000). Consequently, organisations are expected to change rapidly in response to emerging requirements. Classical theories and more recently 'method-based' organisation (re)design and change approaches have been proposed and tried with varying degrees of successes. This chapter contribution discusses the role of enterprise and simulation modelling in support of organisation (re)design and change. The capabilities and constraints of some widely acknowledged public domain enterprise modelling frameworks and methods are reviewed. A modelling approach which integrates the use of enterprise modelling (EM), causal loop modelling (CLM), and simulation modelling (SM) is described. The approach enables the generation of coherent and semantically rich models of organisations. The integrated modelling approach has been applied and tested in a number of manufacturing enterprises (MEs) and one case study application is described.

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COMPLEXITY OF ORGANISATIONS AND THE NEED FOR MODELLING

From a systems engineering perspective an 'organisation' is an entity which consists of functional parts or members that contribute to the achievement of that purpose (Blethyn & Parker, 1990). Farnham & Horton (Mullins, 2005) state that organisations are social constructs created by people to achieve specific purposes by means of planned and co-ordinated activities. Organisations deploy people that work in association with other resource systems to realise well ordered sets of activities that lead to achievement of specified objectives. Martin (2005) identified four common aspects of any organisation:

- a system of coordinated activities
- a group of people & other resources that realise those activities
- defined goal(s)
- leadership

Mills et al (2003) describe an organisation as a system of resources that collaboratively execute coordinated routines so as to realise product & services. Siemienuch et al, (1998) suggest that an organisation is configuration of knowledge, embodied in people and machines, which utilises data to create information (e.g. product data models) and their physical manifestations (products for sale). Conventional means of developing an organisation centres on bringing people together and providing them with a structure (action plans) and technology for doing work (Davis, 1982). Here a common requirement is to realised organised association between people (competences) and jobs (related set of activities) (Vernadat, 1996); thereby developing needed behaviour and constraining unwanted behaviour (Weston 1998) . This leads to a unit of society or 'organisations' that function to realise products and services (Drucker, 1990, Warnecke, 1993, Handy, 1993).

With growing uncertainty in the world most organizations need to operate and compete in a volatile environment (Warnecke 1993, Vernadat 1996, Weston 1998 and Mills et al 2003). Successful organisations can take many forms (such as be large or small, centralized or distributed, manual or automated and transactional or transformationally led). Consequently the process of designing and changing organisations is complex and through their lifetime, various 'organisation design and change' (OD&C) projects are needed to maintain alignment between the composition of the organisation and emerging requirements. This paper is concerned with providing improved means of engineering manufacturing organisations, or so called Manufacturing Enterprises (MEs), that typically realise multiple product types in uncertain quantities for various customers. Those MEs can be considered to be complex for the following reasons:

1. they may deploy large numbers and varieties of system components; including people, electromechanical machines and IT systems that execute their many processes, possibly concurrently, to generate values for their customers;
2. causal and temporal dependencies exist between system components such that changes in one component can impact significantly on the entire ME;
3. complexity arises because of need to deploy various philosophies, methods, frameworks and technologies to integrate the operation of ME components;
4. significant uncertainty arises from the environment in which MEs operate, due to increased global competition, rapid technological changes and product customization (that often necessitate changes in product mix, product properties & production volumes).