

Chapter XXI

The Use of GERAM for Design of a Virtual Enterprise for a Ship Maintenance Consortium

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ABSTRACT

This chapter describes the key elements in the application of GERAM to the analysis of the virtual enterprise of a ship maintenance consortium, the ANZAC ship alliance. The ANZAC ship project built 10 ANZAC class guided missile frigates for the Royal Australian Navy and the Royal New Zealand Navy. The ships have a service life of 25 to 30 years in which changes are required to keep up-to-date with latest warfare. In this study, VERA was adopted as the generic enterprise reference architecture to guide the systematic study of the anatomy of the virtual enterprise. The issues of creating and managing the logistics and information infrastructure that are necessary to support successful operation of the virtual enterprise are examined. Particular models were created according to GERAM for the timely support of the projects as the virtual enterprise grew.

INTRODUCTION

The generalised enterprise reference architecture and methodology (GERAM) describes a set of principles that can be used for the design, management, continuous improvement, and operation of enterprises (ISO, 2000). It was developed by the IFIP-IFAC Task Force (Williams et al., 1994)

and adopted as an Appendix of ISO 15704:2000. GERAM defines a complete methodology that captures the engineering and integration requirements for any organisation to develop a fit-for-purpose enterprise model supporting its business (Bernus & Nemes, 1996). GERAM encompasses essential enterprise concepts of life cycles, life history, partial models, and generated views (Noran,

2005). It distinguishes the functions of modelling framework, modelling languages, and modelling tools in the process of design, implementation, and operation of enterprise architectures.

Business enterprise is inherently a complex entity. The application of GERAM is not a straightforward task. The generality of GERAM helps the enterprise engineers to encapsulate the wide range of functions and processes that may exist within the business enterprise when it interacts with its clients. However, continuous innovation and changing business conditions drive enterprises into a dynamic ever-evolving environment. Many enterprises have gone through a number of organisational changes, not only within its own authoritative boundaries, but also involving external entities. Typical changes are growth through the absorption of outside business entities and the consolidation of key projects leading to loss of corporate knowledge and expertise (Nousala, Miles, Kilpatrick, & Hall, 2005). The matter gets messier as the business entities that are involved in the merger processes bring along their heritage resulting in disparate process assets, a varied understanding of process value and disjoint actions and reactions to industrial requirements within the enlarged enterprise (Hall, Dalmaris, & Nousala, 2005). Furthermore, customers are seeking solutions that are reliable and flexible (Syntera, 1998). The sophistication of the products and services demanded by customers requires a wide variety of expertise and integrated specialisation that almost no one enterprise can handle the business alone. Companies increasingly need to seek collaboration opportunities with other organisations. A new concept known as virtual enterprise has added another level of difficulty in the application of GERAM to the new paradigm (Bernus, Baltrusch, Tolle, & Vesterager, 2002).

The virtual enterprise concept captures the fact that many manufacturing, industrial, service, and commercial activities are organised into collaborative teams in networked organisations (Beckett, 2003). The operating conditions of the

business environment are characterised by frequent changes in products, services, processes, organisations, markets, supply, and distribution networks (Tharumarajah, 2003). They form a temporary alliance to deliver a project or product and they dissolve when the job is completed. The teams work together as an entity for a goal but the relationships among themselves and the individual companies they come from often rely on trust and industry practices. Success for achieving the goal therefore demands well-coordinated agility in all internal and external aspects of the virtual enterprise. This level of agility can only be achieved if the partners share common views and models, which represent the relevant parts of their operations within the virtual enterprise. Furthermore, these models have to be linked to represent the dynamic relations allowing key performance indicators to be established on compatible platforms. To provide the required inter-operability, the models have to adhere to a common representation for both model enactment and human understandability (Kosanke & Nell, 1999). GERAM has been developed by the IFIP-IFAC Task Force after investigating a number of enterprise architectures including PERA (Williams, 1994), GRAI-GIM (Chen, Vallespir, & Doumeings, 1997), and CIMOSA (Kosanke, 1995). The outcomes are recommendations for achieving a “complete” architecture by selecting and combining the best features of the available architectures. Hence, GERAM is adopted as the basis for modelling the virtual enterprise.

This chapter describes the key elements in the application of GERAM to the analysis of the virtual enterprise of a ship maintenance consortium. The adoption of an appropriate generic enterprise reference architecture (GERA) to the investigation is critical to the success in the systematic study of the anatomy of the virtual enterprise. The issues of creating and managing the logistics and information infrastructure that are necessary to support successful operation of the virtual enterprise are examined. Particular

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