Modularity in Health and Social Services: A Systematic Review

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ABSTRACT

Modularity is a common concept in manufacturing. In recent years it has been increasingly applied to service production. Higher expectations of efficiency and demand-based services but also the availability of multiple providers gives reason to study its potential relevance to health and social services. A systematic literature review helped to clarify the content of the relevant concepts when modularity is applied in practice. Multidisciplinary databases were consulted in order to find out how the concept is perceived and used in this context. The analysis of the material was based on the theoretical literature on modularity. The results revealed that although the need for joint delivery and service coordination is recognized, there is no description of modular partnerships or interfaces on the organizational level. Modularity theoretically has the power to meet the challenges of social and health service provision, but more research is needed, particularly on the organizational level.

Keywords: Healthcare, Modular, Modularity, Service Provision, Services, Social

INTRODUCTION

Although modularity has been used in the manufacturing context for decades it has not been widely utilized in health services. A modular system allows independent components to be mixed-and-matched flexibly with no loss of functional performance (Schilling, 2000). Interfaces play the key role in this mixing-and-matching. Interface standardization entails high independency among the modules, but also guarantees their compatibility in larger but unique service packages. A modular structure thus enables the simplification of complex systems, larger product variety, improved flexibility and bigger cost savings (Clark, 1999). It allows the development of critical parts of the service chain without negatively affecting the whole system (Clark, 1999; Sanchez & Mahoney, 1996). Furthermore, a modular structure makes it possible for multiple producers to successfully combine separate services into packages and thus to create service families that meet the customer’s heterogeneous needs (Pekkarinen & Ulkuniemi, 2008; Schilling, 2000).

The benefits of modularity listed in the literature on operations management are the characteristics that are required from social and health services. Economic decline, an ageing population and an increasing need for social
and health services force producers to introduce innovative changes in order to increase the effectiveness of the service system. The call for user-driven and demand-based services also forces producers to respond to users’ individual needs (Commission of the European Communities [CEC], 2009). Extensive care provision and multiple producers from the public, the private, and the third sector are needed in order to meet these challenges. Increasing diversity among services and providers makes coordination inevitable. Thus far the discussion has focused on fluent care or service paths, which carries an assumption of combined integral services forming fluent pathways. Yet, as Vanhaecht et al. (2006) state, the literature reveals that problems occur in integral processes.

Modularity has been applied in manufacturing for almost five decades (Starr, 2010), and information technology, for example, is considered very modular in structure (Voss & Hsuan, 2009). There is extensive literature on modular product construction and design. Clark (1999), for example, describes the design of modular products in detail. Increasing competition for customers drives service-operation managers to take advantage of modularity (Starr, 2010). The idea of modular services has been of interest to researchers for the last ten years, yet the theory development and the use of concepts is rather uncoordinated (Pekkarinen & Ulkuniemi, 2007). Currently there is a wider interest in applying modularity to information systems (Starr, 2010) – also in service-oriented architectures (Bask et al., 2010), and modularization has also been studied in areas such as logistics (Pekkarinen & Ulkuniemi, 2008; Bask et al., 2010) and the cruise business (Voss & Hsuan, 2009). Only recently has there been growing interest in whether modularity could also be the solution in health and social services. Modularity or related concepts also feature in disciplines other than those mentioned above, such as biology, mathematics, psychology, American studies (Schilling, 2002) and organization studies (Weick, 1976). In most of these cases it is presented somewhat differently than in operations management, although there are similarities in some characteristics. This study relies on the definitions used in operations management (e.g., Clark, 1999; Sanchez & Mahoney, 1996; Schilling & Steensma, 2001).

This article is based on a systematic review of the literature on modularity in health and social services, the aim being to find out how it is perceived and used in this context. I describe the characteristics and their application, identify the current deficiencies, and point out future needs. I consider the potential advantages and restrictions of modularity when applying it to multiple providers in the context of social and health care. Finally I propose avenues for further research related to its implementation in health and social services.

**THE CHARACTERISTICS OF MODULARITY**

The key elements in modularity are independent components that are loosely connected to other components (Schilling, 2000). It is essentially a question of interdependence within and independence across modules, meaning that the internal structural elements are strongly connected with each other but weakly connected with elements in other modules. Modules are independent units, but act together to create a larger system (Clark, 1999; Bask et al., 2010; Sanchez & Mahoney, 1996). The typical characteristics of modularity include decomposable architecture (Sanchez & Mahoney, 1996; Schilling & Steensma, 2001), hidden design rules (Clark, 1999), and standard interfaces that enable interchangeability, substitution (Bask et al., 2010; Starr, 2010), and variability of choice (Schilling & Steensma, 2001; Starr, 2010; Mikkola, 2000).

**Decomposability and Hidden Design Parameters**

Modularity entails the decomposition of services into smaller units, which makes complex systems more manageable (Clark, 1999). This can be done in various ways depending on the architecture. Modular architecture could have...
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