Chapter 5

# Multi–Methodology Approach:
## Using Soft Systems Methodology and Simulation Modeling

## ABSTRACT

*The pluralistic approach in today's world needs combining multiple methods, whether hard or soft, into a multi-methodology intervention. The methodologies can be combined, sometimes from several different paradigms, including hard and soft, in the form of a multi-methodology so that the hard paradigms are positivistic and see the organizational environment as objective, while the nature of soft paradigms is interpretive. In this chapter, the combination of methodologies has been examined using soft systems methodologies (SSM) and simulation methodologies including discrete event simulation (DES), system dynamics (SD), and agent-based modeling (ABM). Also, using the ontological, epistemological, and methodological assumptions underlying the respective paradigms, the difference between SD, ABM, SSM; a synthesis of SSM and SD generally known as soft system dynamics methodology (SSDM); and a promising integration of SSM and ABM referred to as soft systems agent-based methodology (SSABM) have been proven.*

## INTRODUCTION

Multi-methodology can be considered as a challenging area of research because it combines methodologies from different paradigms which are disproportionate for some researchers (Holm et al., 2013). Mingers and Gill (1997) define multi-

methodology as the general or partial combination of more than one methodology, often belonging to different paradigms. It can also be considered a kind of mixed-methods research (Niglas, 2004), which is a more accurate word to refer to it.

In their research, Mingers and Gilles (1997) outlined five of the different approaches to combining methodologies. The first approach is whether more than one methodology should be used at all. The second approach determines whether the combined methodologies should be of different paradigms. The third approach determines whether these methods are used in a single intervention, and the fourth and fifth approach determines whether all or part of the methodology is used and whether a single methodology provides overall control, respectively. Mingers and Gill (1997) also give different names to different types of methodological combinations. If methodologies from different paradigms are used in an intervention while one methodology does not have full control but the two approaches are intertwined to form a single situation-specific methodology, this is called the multi-paradigm multi-methodology approach.

According to Behl and Ferreira (2014), engineers need holistic approaches to deal with today's workplace with complex challenges. Using holistic system perspectives, systems thinking provides ways to think about a problem and its solutions. Kotiadis (2007) believes that because of answering the questions such as what, why and how about modeling the system in question at this stage of problem structuring, conceptual modeling is a critical part of the simulation methodology.

The present chapter examines the methodologies combination using soft systems methodology (SSM) and simulation methodologies including discrete event simulation (DES), system dynamics (SD), and agent-based modeling (ABM). To this end, a multi-methodology is developed combining the SSM and DES, developed by Holm et al. (2013), soft system dynamics methodology (SSDM) as a synthesis of SSM and SD presented by Rodriguez-Ulloa and Paucar-Caceres (2005), and soft systems agent based methodology (SSABM) as a combination of SSM and ABM introduced by Novani and Mayangsari (2015). Using the ontological, epistemological and methodological assumptions underlying the respective paradigms, this chapter demonstrates the difference between SD, ABM, SSM, SSDM, and SSABM.

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