

Chapter 1

Simulation: Body of Knowledge

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ABSTRACT

This chapter attempts to define the knowledge body of simulation and describes the underlying principles of simulation education. It argues that any programs in Modelling and Simulation should recognize the multi- and interdisciplinary character of the field and realize the program in wide co-operation. The chapter starts with the clarification of the major objectives and principles of the Modelling and Simulation Program and the related degrees, based on a broad business and real world perspective. After reviewing students' background, especially communication, interpersonal, team, analytical and critical thinking skills, furthermore some of the additional skills facilitating entering a career, the employer's view and possible career paths are examined. Finally, the core knowledge body, the curriculum design and program related issues are discussed. The author hopes to contribute to the recent discussions about modelling and simulation education and the profession.

INTRODUCTION

Since the 70s, simulation education has been in the focus of attention. The growing acceptance of modelling and simulation (M&S) across different scientific disciplines and different major application domains (e.g., military, industry, services) increased the demand for well-qualified specialists. The place and recognition of modelling and simulation,

however, is not very well recognized by academics; M&S as scientific disciplines are “homeless”. This reflects and underlines the interdisciplinary and multidisciplinary nature of M&S and at the same time causes special problems in educational program and curriculum development.

Recognizing controversial developments and the fact that actions are necessary, different stakeholders of the international simulation community started to attack the problems. As part of the actions, Rogers (1997) and Sargent (2000) aimed to define M&S

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as a discipline, describing the characteristics of the profession, while Oren (2002) aimed at establishing its code of professional ethics. As a consequence of these efforts, questions were raised by Nance (2000) and Crosbie (2000) about the necessity, characteristics and content of an internationally acceptable educational program of simulation for different levels of education (undergraduate, graduate, and postgraduate). The first steps triggered a new wave of discussions by Szczerbicka (2000), Adelsberger (2000), Altiok (2001), Banks (2001), Nance and Balci (2001), followed by Harmon (2002) and Fishwick (2002) around the 50th anniversary of the Society for Computer Simulation and these discussions are not finished yet (e.g., Birta (2003a), Paul et al. (2003), and others). At the turn of the century, 50 years after the professional field was established, special attention was devoted to the subject of the simulation profession and the professional “simulationist”, as well. Definition of the profession, along with possible programs and curricula were published, as were attempts to define the knowledge body of simulation discussed (e.g., Birta, 2003b and Oren 2008).

The growth of simulation applications in industry, government and especially in the military in the US, led to a growing demand for simulation professionals in the 90's. Academic programs have been introduced and standardization efforts undertaken; moreover, new organizations have been established to maintain different aspects of simulation. Europe has been following these trends with a slight delay. The Bologna Process is a European reform process aimed at establishing a European Higher Education Area by 2010. It is a process, driven by the 46 participating countries in cooperation with a number of international organizations; it is not based on an intergovernmental treaty. “By 2010 higher education systems in European countries should be organized in such a way that:

- it is easy to move from one country to the other (within the European Higher Education Area) – for the purpose of further study or employment;
- the attractiveness of European higher education is increased, so many people from non-European countries also come to study and/or work in Europe;
- the European Higher Education Area provides Europe with a broad, high quality and advanced knowledge base, and ensures the further development of Europe as a stable, peaceful and tolerant community.” (Bologna Process, 2008)

These facts and developments call for action and international efforts to introduce changes in higher education based on the Bologna Process. As a result of the globalization of business, science and also education, it is expected that fundamental questions of educational practice will be regulated within the framework of or in compliance with the Bologna principles.

The model curriculum for graduate degree programs in M&S, which is the focus of this paper, is based on the typical degree structure, which is in compliance with the Bologna principles. Nevertheless, a number of U.S. higher education organizations (around 20% of the graduate schools) still resist accepting bachelor degrees of countries that signed the Bologna Treaty and deny that there are implications for the U.S. (see Jaschik 2006 and CGS Report 2007). The author's opinion is that progress cannot be stopped, especially not without viable alternative program(s). Because of the identical degree structure applied in the Bologna Process regulated countries, the US and Canada, the presented suggestions can be widely applied.

This paper attempts to define the knowledge body of simulation and the underlying principles of M&S education in relation to a Master's Degree program. The content representation intends to

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