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# Developing Modular-Oriented Simulation Models Using System Dynamics Libraries

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# Preface

The development and application of simulations with the purpose to explore systems and their innate, partly dynamic structures has established itself, among others, in the areas of natural sciences, business studies and political sciences. This similarly applies in the field of education to support the understanding of complex relationships, especially in business studies. Both always have a model in common which serves as starting point for the development.

The aim of this book is to introduce the development and practical application of a module-oriented development framework for domain-specific system-dynamic libraries (SDL approach), which can be used in the simulation of multicausal and dynamic relationships on different levels of an industry, as an example the construction industry. The book will enable both academics and practitioners to develop the first systems right from the beginning. The successful conceptual design of this development framework demonstrates that it is quite reasonable and possible to connect the development of simulation models and daily work.

Thereby, knowledge synergies will be created which enable the interdisciplinary development of simulations in the sense of a synergistic knowledge absorption (SKA method). Multidisciplinary research and development teams and scientists from different domains, as well as practitioners, have numerous possibilities to develop SDL units from varying perspectives based on this approach. Compared to other fields, significantly less implementations of simulations exist in the construction industry. Therefore, the approach introduced here provides a valuable contribution to promote further developments, e.g. the explanation of the risk situation of a company, the identification and evaluation of project risks and endangered operational procedures on various functional levels, or to improve the understanding of the decision-making process in detail. Nevertheless, the introduced approach is suitable for any kind of business, independent of decision level and functional area.

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# Contents

- 1 Introduction** ..... 1
  - 1.1 Motivation and Aim..... 1
  - 1.2 Definition of the Term “Simulation” ..... 2
  - 1.3 Characterizing Features..... 3
    - 1.3.1 Model..... 3
    - 1.3.2 System..... 5
    - 1.3.3 Simulation..... 6
  - References ..... 7
- 2 Module-Oriented Modeling Approach** ..... 9
  - 2.1 System Dynamics ..... 9
    - 2.1.1 Background ..... 10
    - 2.1.2 Excursus: Mental and Formal Models ..... 11
    - 2.1.3 Advantages and Limitations..... 13
    - 2.1.4 Graphic Representations and Constitutive Elements..... 15
  - 2.2 System Dynamics in the Field of Construction..... 21
  - 2.3 Domain-Specific Libraries of Simulation Modules ..... 22
    - 2.3.1 System Dynamics Libraries ..... 22
    - 2.3.2 Synergistic Modeling and Simulation Using SDL ..... 24
    - 2.3.3 SDL Process Ontology ..... 26
    - 2.3.4 SDL Notation ..... 27
    - 2.3.5 Unified System Dynamics Modeling Language..... 30
    - 2.3.6 Modeling and Simulation with the SDL ..... 31
    - 2.3.7 Software Selection for the SD Simulation..... 33
  - References ..... 34
- 3 Exemplary Development of a Model Library** ..... 37
  - 3.1 Purpose of the Model ..... 37
  - 3.2 System Limits ..... 39
  - 3.3 Fundamental Cause-Effect Relationships ..... 39
  - 3.4 Identification of the Relevant System Parameters ..... 40
  - 3.5 Atoms ..... 41

3.5.1	Materials .....	42
3.5.2	Storage .....	42
3.5.3	Equipment .....	43
3.5.4	Personnel .....	44
3.6	Molecules .....	45
3.6.1	Operations and Procurement (OP) .....	45
3.6.2	Human Resources and Leadership (HL) .....	49
3.6.3	Finances and Governance (FG) .....	50
3.7	Components .....	57
3.7.1	Costs of Construction Site Setup .....	58
3.7.2	Costs of Earthwork .....	59
3.7.3	Costs Building Shell .....	65
3.8	Project Model .....	72
	References .....	74
<b>4</b>	<b>Implementation of the Model Elements .....</b>	<b>75</b>
4.1	Structure of the Project Simulation .....	75
4.1.1	Project Definition .....	76
4.1.2	Construction Site Setup .....	76
4.1.3	Building Shell Processes .....	79
<b>5</b>	<b>Selected Results of Prototypical Implementation .....</b>	<b>83</b>
5.1	Results of Simulation .....	83
5.1.1	Simulation Experiments .....	84
5.1.2	Discussion of the Simulation Experiments .....	87
	References .....	90
<b>6</b>	<b>Summary and Outlook .....</b>	<b>91</b>
	References .....	93
<b>7</b>	<b>Appendix .....</b>	<b>95</b>
7.1	Quantitative Data for the Simulation Experiments .....	95
7.2	Approximated Cost Functions .....	97
7.2.1	Scenario S1: Basis .....	98
7.2.2	Scenario S2: Vocational Adjustment .....	98
7.2.3	Scenario S3: Experience .....	98
7.2.4	Scenario S4: Overtime .....	98
7.2.5	Scenario S5: Overtime (S4) and Vocational Adjustment (S2) .....	98
7.2.6	Scenario S6: Experience (S3) and Variation of Time for Quality Management .....	99
7.2.7	Scenario S7: Overtime (S4) and Variation of Time for Quality Management .....	99
7.2.8	Scenario S8: Crisis Management of a Bad Case Scenario ....	99
	Reference .....	99
<b>8</b>	<b>Further Readings .....</b>	<b>101</b>
	<b>Index .....</b>	<b>103</b>



# List of Figures

Fig. 1.1	Simulation models .....	6
Fig. 2.1	Relationship between mental and formal models .....	11
Fig. 2.2	Example of a causal loop diagram .....	16
Fig. 2.3	Example 1: Wall construction work.....	18
Fig. 2.4	Example 2: Production output wall construction.....	18
Fig. 2.5	Example 3: Example 2 including gained experience.....	19
Fig. 2.6	Example 4: Example 3 including additional workforce and end of project.....	20
Fig. 2.7	Concept of system dynamics libraries (SDL) .....	24
Fig. 2.8	Possibilities of analysis with the SDL approach .....	25
Fig. 2.9	SDL process ontology .....	27
Fig. 2.10	SDL model cases .....	29
Fig. 2.11	Overview of notation USDML .....	30
Fig. 2.12	Modeling and simulation with SDL .....	32
Fig. 3.1	Structure of the CDL .....	38
Fig. 3.2	Fundamental project model .....	39
Fig. 3.3	Rough operation chart of project model .....	40
Fig. 3.4	OP models for loosen and transport.....	46
Fig. 3.5	OP model concreting .....	47
Fig. 3.6	OP model number of cranes.....	48
Fig. 3.7	FG model of one item of construction equipment (example excavator) .....	53
Fig. 3.8	FG model for disposal, storage and reutilization of earth.....	54
Fig. 3.9	FG model concreting .....	56
Fig. 3.10	FG models construction containers .....	58
Fig. 3.11	Components of construction site setup costs .....	60
Fig. 3.12	Component costs of earthwork excluding storage .....	63
Fig. 3.13	Component costs of earthworks including storage.....	64
Fig. 3.14	Standard component of a building shell process .....	68
Fig. 3.15	Component for formworks (system) .....	70

Fig. 3.16	Component concreting.....	71
Fig. 3.17	Project model (USDML illustration) .....	73
Fig. 4.1	CPFS user interface in Vensim .....	77
Fig. 4.2	Project definition of the CPFS .....	78
Fig. 4.3	Construction site setup of the CPFS .....	80
Fig. 4.4	Formworks ground plate of the CPFS .....	81
Fig. 5.1	Simulation results .....	87

List of Tables

Table 2.1 Definitions and examples for relationships in CLD..... 15

Table 2.2 Example of a stock-flow-diagram ..... 17

Table 3.1 Resources of construction site setup..... 41

Table 3.2 Resources earthworks ..... 41

Table 3.3 Resources building shell ..... 42



# Nomenclature

AMCA	Atom-molecule-component approach
BIM	Building information modelling
BRTV	Federal Collective Agreement for the Building Industry (Bundesrahmentarifvertrag für das Baugewerbe)
CCD	Construction company dynamics
CD	Construction dynamics
CDL	Construction dynamics library
CLD	Causal-loop diagram
CMD	Construction market dynamics
CPD	Construction project dynamics
CPFS	Construction project flight simulator
ERM	Entity relationship model
GUI	Graphical user interface
LC	Lean construction
MIT	Massachusetts Institute of Technology
MLA	Multilevel analysis
PGM	Probabilistic graphic models
PLE	Personal learning edition
PO	Process Ontology
SD	System dynamics
SDL	System dynamics library
SFD	Stock-flow diagram
SKA	Synergistic knowledge absorption
SMP	Shared modelling platform
UML	Unified modelling language
USDML	Unified system dynamics modelling language
VDI	Association of German Engineers (Verein Deutscher Ingenieure e.V.)