

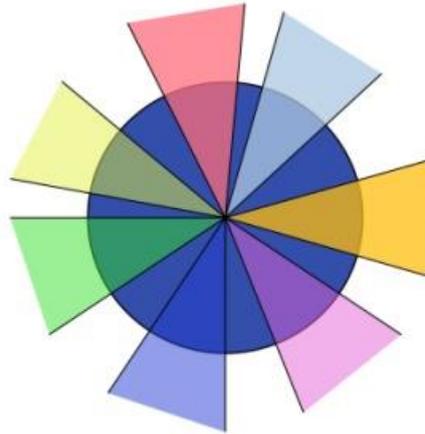
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Methodology of Societal Complexity (MSC)

Volume 33

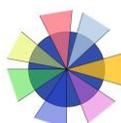
Dorien DeTombe (Ed.)





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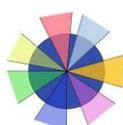
[The subject of Methodology of Societal Complexity \(MSC\)](#)

The Field of Methodology of Societal Complexity focuses on methodologies, methods and tools for analyzing, structuring, guiding and evaluating complex societal problems. Complex societal problems are often policy problems that can occur in many fields, like in the Agro-industry (Fowl Plague), in the transportation sector, in healthcare, in Water affairs, terrorism and in economy (credit crisis). It focuses also on handling local safety problems like large city issues and natural disasters as flood and hurricanes and on global safety problems like war and terrorism. Although many of these issues have different causes, they have so much in common that they can be approached in the same way.

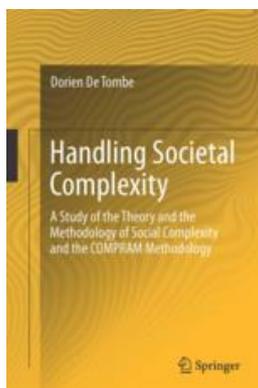
Complex societal problems are unstructured, dynamical, constantly changing and have a large impact on society on macro, meso and micro level. Handling complex societal problems needs a special multi-disciplinary approach. The content knowledge comes from content experts. The process knowledge comes from facilitators. The power is in the hand of actors. The attention of the research of Methodology of Societal Complexity is on the methods and tools facilitators need for guiding these kinds of problems. The facilitators use methodologies specially created for the field of societal problems combined with methods and insights derived from fields like medicine, law, economics, societal sciences, methodology, mathematics, computer sciences, technology, engineering sciences, socio-cybernetic, chaos theory and operational research combined with content knowledge. Often a combination of methods is needed.

The set of lectures presented in the track of Methodology of Societal Complexity focuses on methodology of handling real life complexity with an emphasis on global safety, sustainable development, healthcare and economy.

Keywords: Methodology, Complex Societal Issues, Decisions, Sustainable Development, Healthcare, Economy, Terrorism



In the field of the International Research Society on Methodology of Societal Complexity a Handbook is published in 2015



Handling Societal Complexity: A Study of the Theory of the Methodology of Societal Complexity and the COMPRAM Methodology with Examples of Applications on Global Safety, by Dorien J. DeTombe is a handbook on the Theory of the Methodology of Societal Complexity. The book describes the theoretical development of the Field of the Methodology of Societal Complexity and provides the foundation for the application of the Compram Methodology, a methodology for policy making on handling complex societal problems.

Interesting for:

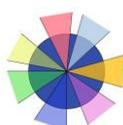
The book is meant for scientists, practitioners, politicians, master and PhD students in the field of Methodology, Social Sciences, Operational Research, Management and Political Sciences, as well as people who are professionally involved in handling complex societal problems. Complex societal problems are the problems on the front page of the quality newspapers. Complex societal problems have a huge impact on society, involve many phenomena and actors, and are therefore difficult to handle. The structured Compram Methodology gives guidelines to handle real life societal complex problems in a democratic, sustainable and transparent way based on a scientific methodology.

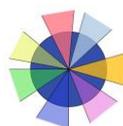
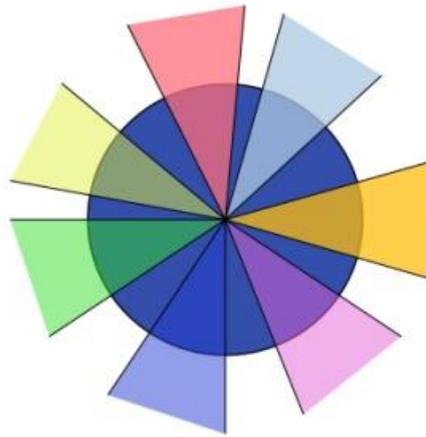
Examples of the use of the Compram Methodology are given in the domain of Global Safety on the subject of Healthcare, Economics, Climate Change, Terrorism, Large City Problems, Large Technological Projects and Floods.

Content of the book

The theory is explained in chapters one to seven. Global safety is the central theme of the examples of how to use the Compram methodology in real life. The chapters eight to thirteen deal with different aspects of Global Safety: the HIV/Aids Problem, Sustainable Development, Climate Change, Credit Crisis, Large City Problems, Large Technical Projects and Floods. These chapters show how the Compram methodology can be used to analyze and handle Complex Societal Problems. Each chapter emphasizes different aspects of the Compram methodology.

Keywords: Complex Societal Problems, Compram, Methodology





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Working Group Methodology for Societal Complexity (MSC)
Chair Prof. Dorien DeTombe

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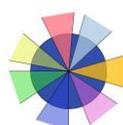
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I METHODOLOGY OF SOCIETAL COMPLEXITY AND ECONOMY

Chair Prof. Dr. Dorien DeTombe

I-1 Optimizing Public Governance. Requirements for Handling Complex Societal Problems

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Governance conveys basically the administrative and process-oriented elements of governing. Good governance is an indeterminate term used in international development literature to describe various normative accounts of how public institutions ought to conduct public affairs and manage public resources. The World Bank defines governance as “the manner in which power is exercised in the management of a country’s economic and social resources for development” (World Bank, 1991). Countries and their governments are confronted with local, national, continent wide and global problems. Local problems centered in a geographic area include traffic jams and road design, hurricanes, tsunamis and pollution. National problems such as the organization of healthcare, and educational programs effect larger areas and more individuals. The distribution of resources such as water and energy are more often continental problems, and examples of inter-continental problems include the migration of refugees and asylum seekers, spread of diseases such as bird flu, terrorism, financial crises and climate change. Most of these problems threaten the local or global safety and the quality of life for large numbers of individuals (DeTombe, 2016). These problems are referred to by DeTombe as Complex Societal Problems (see, for instance, DeTombe, 2015; DeTombe 1994). These problems require government and inter-government interventions.

In our article optimization is defined as a methodology of making something (as a design, system, or decision) as fully perfect, functional, or effective as possible.

The theory of the methodology of societal complexity and the COMPRAM methodology based on it are ways to optimize the handling of complex societal problems through governance (see, for instance, DeTombe, 2015). She uses as a new indicator for the evaluation of a society the National Quality of Life (NQL) (see DeTombe, 2015, p. 334). She pleads for governments to be stimulated to establish a democratic socially based society (DeTombe, 2015, p. 338).

Over the last decades efforts have been made to assess and measure the quality of governance. One of these efforts is the Worldwide Governance Indicators project (Worldbank, 2006). The Worldwide Governance Index (WGI) has been developed with the following indicators: peace and security, rule of law, human rights and participation, sustainable development and human development.

In *Power Kills*, Rummel offers a realistic and practical solution to war, democide, and other collective violence. As he states it, "The solution...is to foster democratic freedom and to democratize coercive power and force. That is, mass killing and mass murder carried out by government is a result of indiscriminate, irresponsible Power at the center."



Rummel observes that well-established democracies do not make war on and rarely commit lesser violence against each other. The more democratic two nations are, the less likely is war or smaller-scale violence between them. The more democratic a nation is, the less severe its overall foreign violence, the less likely it will have domestic collective violence, and the less its democide. Rummel argues that the evidence supports overwhelmingly the most important fact of our time: democracy is a method of nonviolence.

Optimizing governance means that governments are supported in handling complex societal problems in a more effective and efficient way. The COMPRAM methodology is specifically developed to support governments in handling complex societal problems. In this article we want to make a link between the COMPRAM methodology and the indicators and requirements of good governance, especially the requirements of democracy and rule of law.

References

Democracy Watch www.dwatch.ca

DeTombe, D.J. (2016). Societal problems more complex than presumed: the field of Methodology of Societal Complexity and the Compram Methodology.

DeTombe, D.J. (2015). *Handling Societal Complexity. A Study of the Theory of the Methodology of Societal Complexity and the COMPRAM Methodology*. Heidelberg: Springer.

DeTombe, Dorian J. (1994) *Defining Complex Interdisciplinary Societal Problems. A Theoretical Study for Constructing a Cooperative Problem Analyzing Method: The Method COMPRAM*. Amsterdam: Thesis Publishers, ISBN 90 5170 302-3.

Muntjewerff, A.J. & K.E. van Loo (2016). Fundamental Rights and the Rule of Law. Rule of Law as Argument for Interference. To appear in *Proceedings of the International Conference on Legal Argumentation and the Rule of Law*. Eleven International Publishing.

Muntjewerff, A.J. (2015). Societal Complexity and Legal Problem Solving. In DeTombe, Dorian (Ed.) (2015) Book of Abstracts Volume 30 of the 27th Euro Conference of Operational Research Glasgow 2015 Euro Working Group *Methodology of Societal Complexity* (MSC) Greenhill & Waterfront: The Netherlands, Amsterdam; UK, Guilford; North-America, Canada, Montreal: Greenhill & Waterfront, ISBN/EAN 978-90-77171-49-3 Nur 916.

Rummel, R.J. (1997). *Power Kills: Democracy as a Method of Nonviolence*. New Brunswick, N.J.: Transaction Publishers.

Rummel (1997). <http://www.hawaii.edu/powerkills/PERSONAL.HTM> en http://en.wikipedia.org/wiki/Rudolph_Rummel

WikiPedia(2016). <https://en.wikipedia.org/wiki/Governance>

WorldBank (1991). Managing Development. The Governance Dimension. *A Discussion Paper*.

WorldBank (2006). A Decade of Measuring the Quality of Governance. Governance Matters 2006. *Worldwide Governance Indicators*.

Zolo, D. (1992). *Democracy and Complexity. A Realist Approach*. Cambridge: Polity Press.

Keywords: Optimization, Good Governance, Complex Societal Problems, Handling Societal Complexity, Compram methodology, Quality of Life, Democracy, Rule of Law.



I-2 The refugee problem in Europe: a complex societal problem

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The refugee problem in Europe is a complex societal problem which can have many unexpected effects. Since 2014 many refugees and asylum seekers, coming from the African and Arabic countries enter Europe. With thousands people, enter Europe without visa or permission. Mostly young men but also families. They enter often by sea in vulnerable boots to Greece and Italy and from there continue over land by foot, train or car to the Northern states of Europe where there is a high standard of living. These refugees and asylum seekers provoke much emotion to politicians, and to European citizens. Although the Schengen contract dismissed the interior borders in Europe, now borders are being closed by several European countries to prevent refugees to enter. Politicians are confronted with thousands of illegal refugees, mostly with a Muslim religion, who want to have houses, social security, money, food, healthcare and a job. Some European citizens are protesting against this, some welcome the refugees. Some states (Germany in 2015) welcome the refugees, some states refuse the refugees (Romania). It is time that politicians stop making emotional and ad hock decisions and take the time to analyse the problem seriously as well as the consequences on the long run. The Field of Methodology of Societal Complexity deals with problem analysing and finding possible changes based on the use of the Compram methodology. In the article the use of the Compram methodology will be described in relation with the refugee problem dealing with the knowdge, power and emotional aspects of the problem.

Keywords: societal complexity, Compram methodology, refugee problem



I-3 Playing with order and chaos using Stella Simulation Software

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To understand complex societal problems you need a mind shift in thinking about systems. With user-friendly software researchers and students in natural and social sciences can experience this mind shift themselves.

The first step in this mind shift is that you have to think in dynamic systems. Researchers such as Forrester, Meadows, Sterman and Richardson have introduced this way of thinking in dynamic systems and developed the software Stella to facilitate this step. With this software you can handle the differential equations that describe the dynamics of systems.

The next step was made, not such a long time ago, by natural scientists such as Lorenz using computers to simulate phenomena in nature such as the developing of the weather. As a surprise the outcomes of those simulations, determined by non-linear differential equations, were chaotic. It was the start of the science of chaotic and e.g. complex systems.

It was a result social scientist tried to understand with logic reasoning, but also with their intuition, as a *deja vu*, that human behavior sometimes is unpredictable, chaotic and complex. Playing with this software such as Stella can support the intuition you need to handle complexity and at last perhaps complex societal problems when you embed this intuition in the Compram methodology. A methodology in which the knowledge and skill of the social sciences is also incorporated.

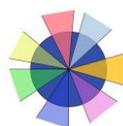
Some references:

- DeTombe, D. J., & van Dijkum, C. (Eds.). (1996). *Analyzing Complex Societal Problems: A Methodological Approach*. Rainer Hampp Verlag.
- DeTombe, D. J. (2002). Complex societal problems in operational research. *European Journal of Operational Research*, 140(2), 232-240.
- Dijkum, C. van (1997). From cybernetics to the science of complexity. *Kybernetes*, 26(6/7), 725-737.
- Dijkum, C. van (1999). *Validation of simulation models*. D. de Tombe, & E. van Kuijk (Eds.). Siswo.
- Dijkum, C. van (2001). A methodology for conducting interdisciplinary social research. *European Journal of Operational Research*, 128(2), 290-299.
- Dijkum, C. van (1999). *Validation of simulation models*. D. de Tombe, & E. van Kuijk (Eds.). Siswo.
- Forrester, J. W., & Forrester, J. W. (1971). *World dynamics* (Vol. 59). Cambridge, MA: Wright-Allen Press.
- Lorenz, E. N. (1963). Deterministic nonperiodic flow. *Journal of the atmospheric sciences*, 20(2), 130-141.
- Meadows, D., Randers, J., & Meadows, D. (2004). *Limits to growth: The 30-year update*. Chelsea Green Publishing.
- Richardson, G. P., & Pugh III, A. I. (1981). *Introduction to system dynamics modeling with DYNAMO*. Productivity Press Inc.



Sterman, J. D. J. D. (2000). *Business dynamics: systems thinking and modeling for a complex world* (No. HD30. 2 S7835 2000).

Keywords: Keywords: systems, complexity, mind shift, complex societal problems, Compram methodology



II METHODOLOGY OF SOCIETAL COMPLEXITY AND HEALTHCARE

Chair Mr. Dr. Antoinette Muntjewerff

II-1 Variable structure optimal control problem with delay and its application in Compram methodology

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This study relates to optimal control problem for two stage variable structure control system and its application for handling complex societal problems in a transparent and structured way. Handling in this case means analyzing, policy making, decision making and guiding and evaluating the interventions. We consider optimal control problem where law of movement on the both stage is described by ordinary differential equations with delay arguments. These two stages are connected by the continuity initial condition. For this the finite conditions of the first stage are the initial conditions for the second stage, which unites them into a unique system. Optimal control is also the transition moment from one stage of system to another one.

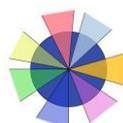
Using Compram methodology often arise such a situation, when we need to pass the mentioned stage of investigation and go to the next one or change the decision inside the stage. It is important to determine the optimal moment such change so, that at the end the whole process optimally conduct the study.

Transition between stages of the studies, in Compram method, we call the set of information about the structure changing of the process, and the moment of time, when we should change the decision based on changes in the set of information, we call the structure change moment of decision-making process. It is also necessary to make into consideration the time delay factor of receiving the information and decision transmission.

The task is the following: to manage set milestones and methods in Compram method and the entire process so, that each stage of the decision, overall, with the decision to be optimal and at the same time from one stage to the second stage of the transition moments are optimally be identified.

1. Introduction

Change of the structure of a system means that the system at some beforehand unknown moment may go over from one law of movement to another. Moreover, after changing the structure the initial condition of the system depends on its previous state. This joins them into a single system with variable structure. Assume that the change of the system structure has to take place at an a priori unknown moment of time. Such problems are important for various practical applications. For example, in economics the need arises to change invested capital at some unknown moment [1, 2]. Confirmed that the change of the structure may occur also using Compram method, when we need to pass the mentioned stage of investigation and go to the next one or change the decision inside the stage [3]. Investigation of variable structure

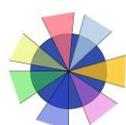


optimal control problems with delay is one of the important directions of the optimal control theory. The delay factor may arise in many practical problems in connection with time spent on signal transmission. The present paper deals with the optimal control problem for systems which change their structure only once. In the present paper, the necessary conditions of optimality are obtained: for the optimal final and structure changing moments in the form of equality; for optimal control in the form of point-wise maximum principle. Moreover, general results are concretized for a linear variable structure time-optimal control problem. An illustrative example is considered.

References

- A.И.Арсенашвили. Сообщения Академии Наук Грузии (Bulletin of the Academy of Sciences of Georgia), 113, №3, март, 1984, 481-484.
- A. Arsenashvili, I.Ramishvili , and T. Tadumadze. Mem. on Differential Equations Math. Phys. 39 (2006), 1-34.
- DeTombe, Dorien. (2015) Handling Societal Complexity. A Study of the Theory and the Methodology of Societal Complexity and the COMPRAM Methodology. Heidelberg: Springer Verlag. 2015

Keywords: Optimization, variable structure, delay, control, system, Stage of investigation, Decision change moment, Structure of decision, Transition moment.



II-2 Compram Methodology of Societal Complexity approaching and analytical enhancing the Human & Social Peace and Security Capabilities by ‘Science-Religion Dialogue’

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The study considers on three research stages:

a. The experience on the beyond time approach to complexity by the Roman philosopher Boetius’ Consolation of Philosophy 523 AD, and Professor Dorien DeTombe’s COMPRAM Methodology;

b. The Knowledge Transfer from the structural nexus within COMPRAM Methodology toward the contemporary (re-)structuring of the ‘Science-Religion Dialogue’;

c. The Knowledge Transfer from the above two research stages to the analytical enhancing the Human & Social Peace and Security Capabilities.

Keywords: Complex Societal Problems, Social Networks.



II-3 Complexity of Integrating Simulation Modeling Results with a Conceptual IMPACT Model for Mitigating Harmful Algae Toxins

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A three dimensional hydrodynamic ecosystem and IMPACT mitigation coupled model was employed to simulate algae transition and toxin produced ability under the nutrients limited conditions and their mitigation strategies. Numerical simulation was carried out for the four years of the period 2005–2009. Algae have shifted seasonally and annually between 2005 and 2009, between three major algal: *Microcystis* spp., *Planktothrix* spp., and *Cyclotella* spp. The model reproduced well the transitions of dominant algae in the four years by calibrating ecological parameters. The biomass of *Planktothrix* spp. suddenly increased in the summer of 2008, and *Planktothrix* spp. became the dominant species. Longer periods of stratification, lower concentration of dissolved oxygen, and higher concentration of dissolved nitrogen were observed in 2008, while the sudden increase in *Planktothrix* spp. biomass in 2008. We also found that the toxin production is made by *Microcystis* spp., and is proportional to the growth of algae, while it depends on whether phosphorus or nitrogen limits the algal growth. The toxin remains in the cell for respiration. Harmful algae toxin is released with extracellular release and mortality, and advects and diffuses with the surrounding current and turbulence. The degradation of toxin was taken into account by the decay coefficient which crosses the concentration of toxin. Numerical simulation was also tried under the assumption that phosphorus or nitrogen always limits the algal growth. Harmful algae bloom is generally the result of two major factors natural processes and human interferences. Both factors have an extreme influence on the generation of cyanobacteria toxins within aquatic ecosystems. To address these factors, we propose two concepts for mitigation. The first concept is intended for examining the natural process of toxin production behavior within the lake and the second concept is used for evaluating inflow of wastes and nutrients from human activities that form toxins. This study examined IMPACT (Integrating Mitigation Policies for Aquatic Cyanobacteria Toxin) model for diminution strategies of harmful algal blooms and their toxins. The findings suggest that successful mitigation of cyanobacteria toxins is highly dependent on multi-functional, multi-stakeholder involvement, and relevant intergovernmental policy. Without integrating approaches among different stakeholders, diverse socioeconomic activists, local-national policymakers and effective policy measures, prevention of cyanobacteria toxin production within lakes becomes extremely complex and difficult. The proposed IMPACT model could be a decision framework for identifying suitable policies that mitigate cyanobacteria impacts.

Keywords: Societal complexity, simulation, algae, transition, toxin, mitigation, eutrophic lake



