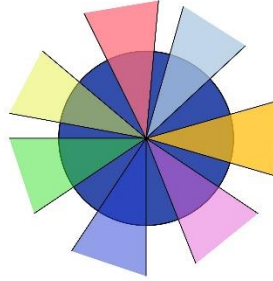


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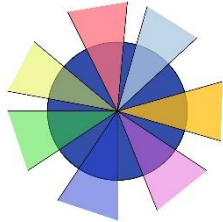


2^e E-Conference **Societal Complexity**
Amsterdam
Book of Abstracts, Papers and Power Points Volume 37a

2021

Dorien DeTombe & Gerhard-Wilhelm Weber (Eds.)





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The second E-Conference Societal Complexity Amsterdam

Introduction

This conference organized by Prof. Dr. Dorien DeTombe and by Prof. Dr. Gerhard-Wilhelm Weber takes place in the times of the second year for the Lock-Down for SARS-CoV-2.

This books contains the abstracts of the presentations on the conference, including some of the Power Points of the presentations and an article.

In 1993 the *EWG Methodology of Societal Complexity (MSC)* is created as a part of the International International Research Society on Methodology of Societal Complexity (MSC), founded and chaired by *Prof. Dr. Dorien DeTombe*. The International Research Society on Methodology of Societal Complexity (MSC) and the EWG Methodology of Societal Complexity (MSC) has since 1993 organized many conferences in all continents all over the world and published many books and articles in scientific journals; see <http://www.complexitycourse.org>

The previous EWG Methodology of Societal Complexity (EURO – now international - Working Group) is since 2018 merged the EWG OR and Ethics at the occasion of the EURO Operational Research Conferences and as part of IFORS (International Federation of Operational Research Societies) conferences.

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 (water pollution by too much manure, and fowl plague), in the transportation sector, in healthcare (SARS-CoV-2, Malaria, HIV/Aids, Flu), in Water affairs and in economy (credit crisis). The field focuses on handling local safety problems like large city issues and natural disasters as flood and hurricanes and 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 by using the Compram methodology, a methodology based on the use of experts and actors and the voice of the people in a democratic way.

Complex societal problems, as such, 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 as is prescribed by the Compram methodology for handling complex societal problems.

EURO Working Groups related to Societal Complexity are:

EWG OR and Ethics and OR

EWG EUROPT - EWG on Continuous Optimization

EWG OR for Development

EURO MCDA

Keywords: Methodology, Complex Societal Issues, Decisions, Sustainable Development, Healthcare, Economy, Environment, Operational Research

Amsterdam,

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We like to dedicate this book of abstract to our dear beloved friend Prof. Dr. Stephen Taylor.


Prof Dr Stephen Taylor PhD 31 January 1945 Boston USA - 9 August 2021 Montreal Canada
Prof Dr Stephen Taylor was a great scientist and teacher. His ideas of collaborated student teaching is very fruitful for learning and should be followed everywhere. His creative ideas in science inspired many of us. Steve was a great supporter and advocate of the field of Societal Complexity and the Compram methodology of D. DeTombe. He dedicated a lot of time to this work. But above all Steve was a very dear and good friend. We and our dear friends will miss him terribly. The world won't look the same now after he is gone.

2e E-Conference Societal Complexity Amsterdam

Program 2^e E-Conference **Societal Complexity**

3 June 2021 Amsterdam time on Zoom

	<p>Opening 9.00-9.15</p> <p>Prof. Dr Dorien DeTombe</p> <p>Prof Dr Willi Weber</p>	<p>9.15-9.40</p> <p>Prof Dr Herman Mawengkang</p> <p>Designing a Dynamic Model of Waste Management to Get a Sustainable Living Condition</p>	<p>9.40-10.05</p> <p>Prof. Dr Hamidreza Alipour & Seyedeh Nesa Rafkhahi</p> <p>Estimation of Tourism Demand Function In A few Cities In Iran</p> <p><i>Dr Hamidreza Alipour, Rafkhahi</i></p>	<p>10.05-10.30</p> <p>Moein Khazaei</p> <p>A new business model for women's empowerment based on shared value creation: Stakeholders and system complexities</p>
<p>B R</p>	<p>10.30-10.45</p>			

	<p>10.45-11.10 Prof. Dr Amin Padash</p> <p>Creating shared value to redesigning IT-service products using SYRCS; Diagnosing and tackling complex problems</p>	<p>11.10-11.35 Prof. Dr Dorien DeTombe</p> <p>Corona more complex than expected, use the Compram methodology</p>	<p>11.35-12.00 Prof Dr Cathal Brugha</p> <p>Time to Confront Bad Governance</p>	<p>12.00-12.25 Prof. Dr Cor van Dijkum</p> <p>Some Questions To Answer About The Covid19 Crisis As A Complex Societal Problem.</p>
	<p>12.25-1.00</p>			
	<p>1.00-1.25 Prof. Dr. Alexander Makarenko</p> <p>Transformation of social systems and their reflection in the concepts and models of the corresponding processes</p>	<p>1.25-1.50 Prof. Dr. Sana Essaber</p> <p>Is climate change a Complex Societal Challenge? Example of climate change risk chain of Agriculture sector</p>	<p>1.50-2.15 Prof. Dr. Gerhard Wilhelm Weber¹</p> <p>Novel Aggregate Production Planning under Overtime, Outsourcing and Uncertain Seasonal Demand with various Human Factors</p>	<p>2.15-2.40 Prof. Dr. Stephen G. Taylor</p> <p>Education In A Post Covid World</p>

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BREAK	2.40-2.50			
	2.50-3.15 Prof Dr Stuart Uempleby Laws of Physics and Cybernetics	3.15-3.40 Prof. Dr. Nina Kajiji and Prof dr Gordon Dash Advances in Modeling Complex Prosocial Behavior: An animal experiment measuring neural activation by sex and trait-bred anxiety post-exposure to a novel environment.	3.40-4.05 Closing session Prof. Dr Dorien DeTombe Prof. Dr. Willi Weber	

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Stakeholders and system complexity

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Designing a Dynamic Model of Waste Management to Get a Sustainable Living Condition

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2 Universitas Bumigora, Mataram, Indonesia

In big cities, it is common to say that waste management had turned up as a serious problem. The activities involved in waste management would be collecting, then transporting or disposing then processing the garbage materials. In general waste comes from the activities carried out by humans, an increase in the number of waste generation is closely related to population, the higher the population growth garbage production will be higher, so the amount of landfill waste is directly proportional with population growth. Most waste management activities are decided upon and carried out in a public, semi-public area typically involving the waste management organization, one or more regulators and other stakeholders and members of the public. The management of waste is not only the responsibility of governments, but also an individual's duty. The management process has to be dealt with daily in order to control the huge amounts of waste occurred in a city. There are several aspects considered in this paper, such as, economic, environment, technology, social, and health. A software Vensim PLE was used to run the system dynamic model to grasp the concept of waste management system. The model developed can be of use the waste managers in decision making regarding waste management.

Keywords: waste management, sustainable development, system dynamic, mathematic

Power points

[Designing a Dynamic Model of Waste Management to Get a Sustainable Living Condition](#)

Prof. Dr. Hamidreza Alipour & Seyedeh Nesa Rafkhai, IAU, Iran

Estimation of Tourism Demand Function in World

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Tourism as an economic sector with high profitability allocates an important place to itself in the current state of the world that will be remembered as the tourism industry. With regard to tourist attractions in Iran, should be considered that the industry is able to single products out the dependence on petroleum. Therefore, the author intends in this article to show some effective factors on demand of tourism and share of each factor in Esfahan province that is one of the tourist province in our country and has an important role in this field. In this case, 8 tourist cities in a period of 2005 to 2011 were studied. By linear logarithm function and its estimation in panel data method, it was determined that variable number of hotels (TH) is the most efficient variable in the total demand for tourism. Meanwhile, the coefficient of this variable (TH), in addition, coefficient of variable of total tourism attractions (TJ) and total tourism and travel agencies (TA) is positive, showing direct relationship between number of passengers and three mentioned variables in that city. And the only negative variable factor is price of hotel(GH) and shows hotel prices are negatively relationship of number of tourists and this variable (GH), it can be justified in both foreign and domestic tourists, which caused the hotel prices have not significant effect on attract tourism.

Keywords: Tourism - Demand Function - Panel Data - Price Index - Tourist Attractions
Classification GEL: R58, R23, F22, D12, D11, C23, C33.

**A new business model for women's empowerment based on shared value creation:
Stakeholders and system complexities**

Amin Padash, Farnaz Majidi, Moein Khazaei, Iran

Creating shared value (CSV) is a management strategy in which businesses find their business opportunities in social problems. Despite social responsibility that focuses on non-strategic and unconnected ways to the core competencies of companies, CSV seeks to maximize competitive values to solve social problems through the core activities of the company. One way to create shared value is to strengthen and activate local clusters. In this study, the main purpose is to design a model for creating shared value based on women's empowerment. It should be noted that in this study, local clusters are not just geographical divisions and it defines as a cluster of women suppressed in tyrannical societies and cultures. This model also created some future opportunities for women, especially in entrepreneurship and technology. Considering the key stakeholders, the unfair structures of the employment system in Iran, and the existing cultural complexities, a business model has been designed that can strengthen the sectors related to women in technology and entrepreneurship. This concept model is currently being implemented in Pelle-Be-Pelle startup in Iran

Keywords: Creating shared value, Complex Systems, Women Entrepreneurship, Business Model, Local Clusters

**Creating shared value to redesigning IT-service products using SYRCS;
Diagnosing and tackling complex problems**

Prof. Dr. Amin Padash

- [Moein Khazaei](#),
- [Mohammad Ramezani](#),
- [Amin Padash](#) &
- [Dorien DeTombe](#)

Information Systems and e-Business Management (2021) [Cite this article](#)

The existence of different stakeholders in a system, the actual and potential contradictions that may not be identified, and the long-term consequences of each decision are significant challenges in the process of developing a system. Information technology-based services are among the systems that usually interact with users and have a significant impact on their environment. The present study attempts to properly understand and develop the services of an intercity payment system in Iran. After recognizing the problem step by step, an innovative methodology was designed to structure the problem. In the early stages, using one of the critical frameworks after identifying stakeholders, research on the system was conducted, and interviews were identified, which are involved and affected people by the system. Critiques of stakeholders became to viable option during the specified process. Additionally, inspired by the soft operational research (OR), the obtained results were examined in terms of the executive contradictions, and then to evaluate and select the correct options, the long-term consequences of each decision were identified using Multi Attribute Decision-Making. Moreover, the evaluation of options for different stakeholders was done by their representatives using their related criteria to select the best options from the opposing options. Ultimately, the presented methodology is designed to provide a slow movement from qualitative to quantitative form. Consequently, based on creating shared value, the product has been redesigned to satisfy all stakeholders.

Keywords: Shared value. IT-service products, SYRCS, Complex problems

Corona more complex than expected, use the Compram methodology

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In the year 2020 and far into 2021 the whole world was under the spell of the Corona virus, SARS-CoV-2. Governments struggled in trying to decrease the contamination in order to prevent their citizens to become ill. The main measurements were distance of 1.5 meters and wearing a mouth cap. When the contamination could not be controlled with these measurements the governments ordered a semi or total lock-down. With a lock-down many parts of the society were closed. Virtual all places where people could meet each other were closed, such the work place, cafes, theaters, non-essential shops and even schools. This has an enormous impact on the economy and on the wellbeing of people. People suffered from isolation and deprivation. Some people lost their jobs. One can wonder if this was an optimal policy. Was it necessary to close down so many essential things as only a very small percentage of the population was getting so ill that they have to be treated in a hospital. At a closer look at the population for which an infection would be so serious that they would need a treatment in the intensive care unit, we see that these are people with underlying serious diseases, people over eighty, and mortally obese people. For all the other people, the younger and the healthier people, the virus causes only minor disturbances. They are hardly getting ill. So one can wonder whether the policy of the governments was necessary and fruitful. The Corona pandemic is more complex than expected. It is a complex societal problem, not only a medical problem. It affects all people and all phenomena in the society. Therefore the methodology of the field of societal complexity the Compram methodology (DeTombe, 2015) should be consulted in order to handle the complexity. Using the Compram methodology to reflect the Corona crisis could give a different view of the problem by combining the aspects of many fields. This would lead to another approach which could result in a less suffering of society.

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DeTombe, Dorien (2015) Handling Societal Complexity. A Study of the Theory and the Methodology of Societal Complexity and the COMPRAM Methodology. Heidelberg: Springer Verlag. ISBN /EAN 978-3-662-43916-6.

Keywords: Corona virus, SARS-CoV-2, Policy Making, COMPRAM Methodology, Societal Complexity

Time to Confront Bad Governance



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Why confront bad governance? The reason is Global Warming. Our planet is warning us that we cannot continue the way we are going, long-term into the future. Is there a good time when we should confront bad governance? People have the sense of sooner would be better than later. It will be more difficult for the next generations, if we don't start now. Whither might good governance bring us? Up to now governance has focused on institution-led competition for resources. The future will be about communities engaging in their own sustainability.

Whether we might be bothered, is the question that some people are addressing at the moment, and others are not. Signs of this include references to complacency. And to pride: increasing protestations that 'we are great'. And anger: protests against Covid-19 lockdown.

So much is strange and new about this pandemic that many may have missed that Covid-19 is one of the manifestations of the coming Global Warming. It so focuses our attention that we have already forgotten some of the other signs: fires in Australia, floods, refugees moving continents, droughts. There may come a time when Covid-19 could become a similar memory. Or people may look back on it, and see it as having been a blessing, because it gave an early warning to the need for better governance for the future, when things will get a lot more difficult.

What specifically about bad governance did the Covid-19 pandemic uncover? It is the inability, or unwillingness, of governance institutions to protect other than the privileged wealthy minorities, despite numerous warnings. Given that the pandemic is minor compared to the problems that climate change is bringing, we would do well to evaluate our approach to governance, and the business model on which it is based.

This paper will describe the two governance models, the current one and its proposed replacement.

Keywords: Governance, Bad Governance, Covid-19, protestation

Some questions to answer about the covid19 crisis as a complex societal problem

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The world is confronted with an urgent complex societal problem: the fast spreading of a virus originated in China with severe consequences. It is a prototype of a complex societal problem the world will face in the future more and more. From the framework of the methodology of handling complex societal problem such as is developed in the COMPRAM methodology one can set a methodological and scientific perspective on this question. The scientific and societal question is how different actors handled this problem and how successful they were at last. We can look on open access data that are available for different countries: expressing confirmed cases of contamination, people that became sick, deaths, recovered patients that became immune. But we also have to look at societal side-effects data showing: consequences in economy, the spread of information in social media about the disease, the way people react and organize themselves on the spread of disease. And we have to look at data showing the way different central institutions in our world, such as governments, non-governmental organizations, intergovernmental organization such as the WHO and scientific organizations handled the problem. How are those different variables balanced by those actors, what ethical aspects are taking into account and what were the effects of those acts of balancing?

Keywords: societal complexity, Compram methodology, spread of a disease, medical facts and variables, societal effects and variables.

Power points

Some questions to answer about the Covid19 crisis as a complex societal problem

Sustainable development and principles of social systems modeling.

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The paper deals with the transformation of social systems and their reflection in the concepts and models of the corresponding processes. New models of socio-economic systems are described earlier [1]. The ways of transforming systems are explained based on proposed approach: revolutionary, evolutionary and with a special trajectory of transition. The classes are considered, into which the internal (mental) variables of individuals are divided. The problem of sustainable development of education and science systems is considered.

1. Generis Publisher, 2020. 173 p.

Keywords: OR in Development, Complex Societal Problems, Sustainable Development

Power points

[Sustainable development and principles of social systems modeling.](#)

Novel aggregate production planning under overtime, outsourcing and uncertain seasonal demand with various human factors

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Aggregate production planning (APP) is a medium-range production and employment planning that deals with the main challenges of manufacturing industries, such as production and outsourcing quantities, hiring and lay-off rates and inventory levels. On the other hand, sustainable development plays a key role in the problem based on global issues, particularly in environmental aspects. This study develops a novel multi-objective mixed-integer linear programming (MILP) model to formulate the sustainable APP problem with overtime and outsourcing options under interval-valued or fuzzy seasonal demand. The objectives are to concurrently minimize total cost of the production system, minimize total environmental pollution and maximize customers' satisfaction level. To deal with the multi-objectiveness of the model, the augmented epsilon-constraint technique is implemented. A numerical example is then investigated to test the performance and validity of the proposed mathematical model. The behavior of the objective functions is evaluated against the fluctuations of key parameters based on unstable real-world situation and managerial insights and decision aids are suggested. A particular novelty of our study is the rich involvement into our APP of Human Factors and additional goals of Workforce Satisfaction. Especially, our new "matrix questionnaires: are very much enlightening.

Keywords: Aggregate production planning, Overtime, Outsourcing, Uncertain demand, Human factors

Power points

Novel aggregate production planning under overtime, outsourcing and uncertain seasonal demand with various human factors

Is climate change a Complex Societal Challenge?

Analysis of Tunisian agricultural sector risk chain

Dr. Sana Essaber

LEGI- Polytechnic School of Tunisia, University of Carthage, and Higher Institute of Accounting and Business Administration (ISCAE), University of Manouba, Tunisia

In Tunisia, a Southern-Mediterranean country, the agricultural and fisheries sector remains of great economic and socio-political importance because of its contribution to the achievement of national objectives in terms of food security, income generation, employment, regional balance and natural resource management. The Tunisian agricultural production system is characterized by a certain specialization in cereals, especially durum wheat and barley ; and in arboriculture, especially olive cultivation, phoeniculture (dates) and citrus fruits. Tunisia is experiencing climate-related changes at an alarming pace and intensity. In fact, companies in the agricultural value chain face a range of climate change risks: risks related to water availability, risks related to water quality, temperature and drought risks, fires, sea level rise, mudflows, floods and soil erosion. These different risks have important consequences on the core of the Tunisian value chain which is production. In this work and by analyzing its effects on Tunisian agriculture, we conclude that the climate change is a real life problem, a dynamic problem, is difficult to handle, consists of many phenomena complicatedly linked with each other, is interdisciplinary and requires knowledge and data from many fields, numerous parties are implicated and each has a different influence on the solution, and finally the problem frequently leads to much emotion in the society. Therefore, climate change is a complex societal problem as defined by DeTombe (2008). Indeed, the analysis of the agricultural sector's risk chain with regard to the complex societal problem reveals that the solution to the impacts of climate change will be social. Any transition process may involve disruptions and conflicts. The role of models is to initiate a debate by identifying the dynamics, constraints and fragilities. It is suggested to consider them in the emergence of the new policy that should respond to climate change.

Keywords: Climate change, Complex societal challenge, Agricultural sector, Risk chain

Article Dr. Sana Essaber

[**Is climate change a Complex Societal Challenge? Analysis of Tunisian agricultural sector risk chain**](#)

Power points

[**Is climate change a Complex Societal Challenge? Analysis of Tunisian agricultural sector risk chain**](#)

Education in a post Covid world

Prof. Dr. Stephen G. Taylor, PhD

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Across the world most people are longing for a return to the pre-Covid situation of 2019. However, the Covid health crisis which is still raging in spite of the roll-out of mass vaccination programs in certain countries has awakened us to the reality of a more complex set of problems. The survival of the human species, *Homo sapiens sapientia*, is now in question. While the emergence of the corona virus has raised havoc with the various health protection systems, it may also be interpreted as evidence of the global ecological crisis. In turn, this opens our awareness to the major social crisis as a growing world population approaches eight billion, the third doubling in 100 years. Then, there is a growing economic crisis within certain countries as governments have spent huge amounts of money trying to abate their local crises at a time when tax resources have been shrinking. In addition, there are threats of war on several fronts. The situation may also be interpreted as a spiritual crisis as world religions no longer provide ethical guidance and comfort to their people. For the past 150 years the education system across Western society has been tailored to the maintenance and economic growth of the industrialized capitalist society. The early developments of massive public schooling imitated the factory system and prepared children to work in those factories. As the industrialized system grew so did the need for office workers, managers, researchers, designers and developers. Other fields also expanded following a similar model in providing goods and services to the growing populations. An advertising industry grew to condition the individuals of the society to be consumers of its merchandise. Through all of this time the education system grew to provide more than reading, writing and arithmetic as it trained the complicated professionals to work in the society.

Now that the world finds itself in the present complex of crises, we need a new approach to education. Schools no longer imitate the modern work world where more people work from home. We must teach our children to be resilient and more adaptable to rapidly changing conditions. There must be more knowledge disseminated about the natural world, health, and interpersonal relationships. There needs to be a softening of historic training that develops super nationalism at the expense of the global perspective. If our species is to survive, we must develop a new ethical system that includes care of the planet and its resources. There is a serious need to rapidly retrain the adult population to live in a new reality. There are new approaches to education that draw on the strengths of various media that may extend education beyond the traditional institutional bounds. The presentation will ask more questions than can be answered in a short session. It is

hoped that attendees will leave with open minds to go forth to contribute to meeting the great challenges of our troubled times.

Keywords: Covid-19, Societal Complexity, Public Health.

Power points

Education in a post Covid world

Laws of Physics and Cybernetics

Prof. Dr. Stuart Umpleby

Dear Lowell, thank you for your notes on the Laws of Cybernetics. Since I was an undergraduate I have wanted to contribute to a science of cybernetics that is similar in style to physics. I imagined cybernetics as a science of the informational domain while physics is a science of the material domain. Here are some current thoughts.

Physics started with Newton's Laws:

1. Inertia – an object at rest (or moving in a line) remains at rest (or moving in a line) unless disturbed by a force.
2. Force is equivalent to mass times acceleration.
3. Action equals reaction. Surprisingly, throwing out hot gas with sufficient force is able to send a rocket to the moon.

In cybernetics we have Ashby's Laws:

1. LRV – The amount of regulation that can be performed is limited by the amount of information available, or, the variety in a regulator must be at least as great as the variety of the system being regulated. For example, if one basketball team is missing a player, probably the other team will win.
2. Ashby's theory of adaptation. A system capable of adaptation must have two feedback loops, one inside the other. The first feedback loop operates frequently and makes small corrections, for example a person learning how to drive from home to office. The second feedback loop makes less frequent but more fundamental corrections. For example, a driver learning a new route to the office when the road used earlier is under construction. In other words, when the environment changes, engage in learning again. The first feedback loop enables learning. The second enables adaptation.
3. Ashby's principle of self-organizing systems. In a system containing numerous parts or actors, every isolated, dynamic system obeying unchanging laws will develop "organisms" adapted to their "environments." Change the interaction rules governing the actions of the parts and the system will move to a different equilibrium. The rules can be descriptions of how species in a forest interact, the way employees in a company interact, or the way citizens in a society behave. Other examples are the way iron ore and coke interact in a furnace in order to produce steel and slag; the way a teacher and students in a classroom interact with the result that students learn to read and write.

Hence, we have a beginning for a science of control and communication similar to our science of matter and energy. In physics there are laws of electro-magnetism and pressure, volume and temperature. In cybernetics we now have a multi-disciplinary theory of how to change social systems (ideas, groups, events, variables). In both physics and cybernetics adding the observer to previous considerations created a fundamental change in the science.

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Advances in modeling complex prosocial behavior: An animal experiment measuring neural activation by sex and trait-bred anxiety post-exposure to a novel environment.

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Research advances continue to innovate the next generation of machine learning algorithms that seek to identify meaningful relationships in unstructured data. A contributor to this acceleration of advances is the synergetic effect brought about by the intersection of neuroscience and artificial intelligence (AI). With a focus on prosocial human decision-making, this research builds on these synergies. In this paper, the complexity of prosocial behavior is translated from an animal experiment of trait-bred anxiety in Long Evans rats. As in the human model, anxious animals exhibit anxiety disorders leading to anti-social behaviors. Following acute exposure to the open field novel stress test and a dose of amphetamine, we measure neural activation along the reward and fear circuitry by capturing c-fos protein levels in seven left-and-right brain regions. The c-fos measurements were subjected to an exploratory factor analysis to identify the orthogonality of latent relationships of the emotions expressed in the different brain regions. Group-mean differences are obtained using a MANOVA procedure. To achieve the primary objective of the research, we employ a multivariate shallow-learning artificial neural network to map nonlinear (regression) weights. Implicated by rearing environment – isolated v/s small-group – the AI estimation reveals the propotional interconnectedness of sex and trait-bred anxiety across the various decision-making regions of the animal brain. The research design allows for investigating the chemical reaction in the animal brain as they transfer their learned behavior to decisions on how to navigate the novel environment. We find that the sex effect is most evident in the episodic, working, and continual memory regions. Both trait and environment dominate the working and continual memory regions. We close the research by translating the synergetic findings to various complex policy issues facing municipal and state leaders. Namely, we demonstrate using the animal model to promote health and wellness when setting a policy to control apartment allocation within high-rise and high-density subsidized housing (i.e., urban projects).

Keywords: Prosocial behavior, Societal complexity, Neuroscience, Artificial intelligence