Concept for the Research Seminar "Complex Systems and Co-Operative Action"

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1 Aim and methodology of the seminar

The concept of a *system* plays a prominent role in computer science when it comes to database systems, software systems, hardware systems, accounting systems, access systems, etc. In general, computer science is regarded by a majority as the "science of the *systematic* representation, storage, processing and transmission of information, especially their automatic processing using digital computers" (German Wikipedia). Also certain relevant professions such as the *system architect* are in high esteem by IT users.

However, the significance of the concept of system extends far beyond the field of computer science – it is fundamental for all engineering sciences and as *Systems Engineering* with the ISO/IEC/IEEE-15288 standard "Systems and Software Engineering", it is also the subject of international standardisation processes. Even more, the concept of systems also plays an important role in the description of complex natural and cultural processes – for instance in the concept of an *ecosystem*.

While classical TRIZ focuses strongly on instrumentally feasible engineering solutions, Systems Engineering "is an interdisciplinary field of engineering and engineering management that focuses on how to design, integrate, and manage complex systems over their life cycles. At its core, systems engineering utilizes systems thinking principles to organize this body of knowledge. The individual outcome of such efforts, an engineered system, can be defined as a combination of components that work in synergy to collectively perform a useful function." (English Wikipedia).

In the winter semester 2019/20, we had already studied more intensively the concept of system and, in particular, examined its application in complex socio-ecological, socio-economic and socio-technical contexts, see [3]. The central concepts of transition management and activity management stood for two different perspectives on structural change processes. In the *transition management* approach, the structural-transitional challenges are in the foreground, the *activity management* approach studies the access to structural changes via the actions and co-actions of actors and stakeholders.

In both approaches, however, the focus was on a holistic-structural and analytical view of a decision preparation rather than on procedural management approaches of decision-making and decision implementation in complex and contradictory real-world situations.

The WUMM project[1] aims at a better understanding of such management processes. The starting point is TRIZ as a systematic innovation methodology derived from engineering experience with contradictory requirement situations. Today, similar demands for an experience-based systematic approach are being made in the field of management, which means that engineering approaches and admissions are also on the agenda there.

With the field of "Business TRIZ", which has been unfolding for about 20 years, this transfer of experience is being actively promoted, which is embedded in older management cultures and approaches. In recent years, co-operative action by differently specialised experts has become increasingly important. In such interdisciplinary work contexts, the development of *common conceptual systems* of sufficient performance proves to be a difficult problem that can be supported by digital semantic technologies. Parallel to these challenges agile approaches play a major role in recent years, not only in the field of management, but also increasingly in the solution of socio-technical and engineering problems concerning ongoing co-operative actions in multi-stakeholder contexts – for example with the concept of *technical ecosystems*.

In the seminar, we want to learn more about traditional appoaches to management theories (F. Taylor, R. Ackoff, P. Drucker, H. Mintzberg) and relate this to developments in the area of Business TRIZ. We are particularly interested in the connection between the dialectical resolution of contradictory requirement situations in the sense of TRIZ methodology and the emergence of common conceptual and notational worlds as result of the application of suitable semantic web technologies. A special emphasis will be put on the work of the *Methodological School of Management* and the Moscow Methodological Circle around G.P. Shchedrovitsky.

The seminar is a **research seminar** in which we jointly explore different aspects of co-operative action in different management concepts.

The students are expected to actively participate in the seminar through seminar discussions, presentations and last but not least by reading the relevant materials. For the successful completion of the seminar, a topic has to be presented as discussion leader and a paper of 2-3 pages on the topic has to be submitted in advance.

All materials and seminar reports that can be made publicly available, will be published in the github repo

`https://github.com/wumm-project/Leipzig-Seminar`

in the `Summerterm-2021` folder.

2 Seminar Organisation

The seminar will be held weekly on Tuesdays 9-11 am (Leipzig time) synchronously online. Prior to each appointment participants have to study the assigned reading to be in a position to discuss the problems in the seminar. The seminar is moderated by a *discussion leader*, who prepares a short workout of 2-3 pager and makes it available to the participants in advance *before the seminar* (by Sunday evening).

More about the seminar (for students of Leipzig University) can be found in OPAL[2]. The

[1] WUMM stands in German for "Widersprüche und Managementmethoden" (contradictions and management methods).

[2] `https://bildungsportal.sachsen.de/opal/` – Course S21.BIS.SIM.

primary source for the seminar plan is the file `Seminarplan.md` in the `Summerterm-2021` folder of the github repository *Leipzig-Seminar*.

Upon request, for external seminar participants, access to internal materials will be provided that cannot be made publicly available in the github repo *Leipzig-Seminar*.

3 Examination. Topics for seminar papers

In order to be admitted to the examination, the seminar must be successfully completed, one of the seminars has to be moderated as discussion leader and for this seminar a short workout has to be prepared and made available to the participants.

Students who are enrolled in the 10-LP module "Semantic Web" must also successfully complete the TRIZ lab and then take an oral examination (30 minutes) about the acquired knowledge of concepts of systematic innovation methodologies and Semantic Web.

Students who are enrolled in the 5-LP seminar module "Applied Computer Science" have to prepare a seminar paper as examination. More detailed topics will be announced in the second half of the summer term. The seminar paper has to be completed until the end of the semester on September 30, 2021.

4 Privacy

We follow an Open Culture approach not only theoretically, but also practically and make course materials publicly available. This also applies to the course materials you have produced (presentations, seminar papers) as well as to (annotated) chat sessions of the seminar discussions, in which your names are also mentioned. We assume your consent to this procedure if you do not explicitly object. The seminar discussions themselves are **not** recorded.

To simplify the further use of the materials and texts, the papers are asked to be compiled using LaTeX. Also the LaTeX source should be provided under the terms of the CC-0[3] license in order to create a corresponding corpus of texts that can be used to accompany similar efforts in the OpenDiscovery project. Of course, this cannot be "decreed". **Please inform the seminar instructor if you do not wish to make your work available for this exchange**.

5 Seminar plan

The exact topics and themes will be defined at the beginning of the seminar, when the number of participants can be estimated more precisely. So far interest was expressed in including the following seminar topics:

- Gräbe: Methodological School of Management [5, 10]. A compact presentation of the approaches of the Moscow Methodological Circle to questions of a systematic management methodology, which had considerable influence on the shaping of the TRIZ approaches.

[3] `https://creativecommons.org/publicdomain/zero/1.0`

- Gräbe: Co-operative Action [2, 7]. From Krug's abstract: "Charles Goodwin is considered one of the pioneers of social interaction research. In his latest book he rearranges his previous publications in terms of a concept that could lead to a radical turn in anthropology, because his conception of co-operative action covers not only the practices of moment-by-moment actions in face-to-face interactions. Rather, his approach also encompasses actions with so-called absent predecessors, whose previous actions in the form of materiality or bodies of knowledge left behind have an impact on the actions of the interactants in the here and now. ..."

- Gräbe: Schematization of an inventive situation [6]. The classical systems approach of TRIZ[4] is not very well developed to grasp hierarchies of system abstractions. This is attempted to be tackled anew with the approach of schematisation in the context of management approaches, since in the management field especially methods of indirect control have to work with such abstractions. The basic concepts are also closely related to approaches of the Moscow Methodological Circle.

- Kleemann: Development of the concept of a philosophy of technology in the historical media discourse. Ernst Kapp [4], Ernst Cassirer [1], Marshall McLuhan [9], André Leroi-Gourhan [8].

- Laue: Goal-Models and the i* modelling method, see `http://www.cs.toronto.edu/km/istar/` and [13]. "Much of the difficulty in creating information technology systems that truly meet people's needs lies in the problem of pinning down system requirements. This book offers a new approach to the requirements challenge, based on modeling and analyzing the relationships among stakeholders. Although the importance of the system-environment relationship has long been recognized in the requirements engineering field, most requirements modeling techniques express the relationship in mechanistic and behavioral terms." (From the summary in [13])

- Lautenschläger: Management of socio-ecological transformations.

The seminar starts on April 13 with a kick-off meeting (in German). At subsequent appointments concepts of the Methodologial School of Management will be presented. We plan that student's presentations start at the beginning of May with more detailed explanations of traditional management theories and approaches as

- Russell Ackoff. System Thinking and Management.
- Russell Ackoff. Interactive Planning.
- Peter F. Drucker (1975). The Practice of Management.
- Henry Mintzberg (1991). Mintzberg on Management.
- Frederick W. Taylor (1911). The Principles of Scientific Management.
- MBO – Management by objectives.
- The SMART approach – specific, measurable, achievable, realistic, time-based.

[4] A *system* is a set of elements in relationship and connection with each other, which forms a certain integrity, unity. The need to use the term ≪system≫ arises when it is necessary to emphasize that something is large, complex, not fully immediately understandable, yet whole, unified. [...] the concept of a system emphasises order, integrity, regularities of construction, functioning and development. `https://triz-summit.ru/onto_triz/100/`

and continue with more advanced topics as

- Business TRIZ and systematic management apporaches [11].
- Schematization [6].
- Goal-Models and the i* modelling method.

The up to date and continuously updated seminar plan can be found in the github repo of the seminar[5].

References

[1] Ernst Cassirer (1930). Form und Technik.

[2] Charles Goodwin (2018). Co-operative Action. Cambridge University Press. ISBN 978-1-108-71477-8.

Available as e-book `https://doi.org/10.1017/9781139016735` at UB Leipzig using your shibboleth credentials at UL.

[3] Hans-Gert Gräbe, Ken Pierre Kleemann (2020). Seminar Systemtheorie. Universität Leipzig. Wintersemester 2019/20 (in German). Rohrbacher Manuskripte, Heft 22. ISBN 9783752620023.

[4] Ernst Kapp (1877). Grundlinien einer Philosophie der Technik.

[5] Viktor B. Khristenko, Andrei G. Reus, Alexander P. Zinchenko et al. (2014). Methodological School of Management. Bloomsbury Publishing. ISBN 978-1-4729-1029-5.

Available as e-book at UB Leipzig
`https://ebookcentral.proquest.com/lib/leip/detail.action?docID=6159470`

[6] Anton Kozhemyako (2019). Features of TRIZ applications for solving organizational and management problems: schematization of an inventive situation and working with models of contradictions (in Russian). Dissertation for application for the degree of a TRIZ Master. `https://matriz.org/kozhemyako/`

An English translation is in preparation.

[7] Maximilian Krug (2019). Review: Charles Goodwin (2018). Co-Operative Action (in German). Forum Qualitative Sozialforschung, 20(1), 1-7.
`https://doi.org/10.17169/fqs-20.1.3197`.

[8] André Leroi-Gourhan (1993). Gesture and speech.

[9] Marshall McLuhan (1964). Understanding media. The extension of man.

[10] Georgi P. Shchedrovitsky (1981). Principles and General Scheme of the Methodological Organization of System-Structural Research and Development.
`https://wumm-project.github.io/Texts/Principles-1981-en.pdf`

[5] `https://github.com/wumm-project/Leipzig-Seminar/blob/master/Summerterm-2021`

[11] Valeri Souchkov (2010). TRIZ and Systematic Business Model Innovation. In: Proceedings TRIZ Future Conference 2010, Bergamo, Italy. Available at ResearchGate.

[12] Vladimir I. Vernadsky (1936-38): Scientific Thought as a Planetary Phenomenon. https://wumm-project.github.io/Texts/Vernadsky1938-en.pdf

[13] Eric Yu, Paolo Giorgini, Neil Maiden, John Mylopoulos (2010). Social Modeling for Requirements Engineering. MIT Press. ISBN 978-0262240550.

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https://ebookcentral.proquest.com/lib/leip/detail.action?docID=3339201