GLOBE – Cognitive and Social Competence Development by Virtual Collaboration and Simulation Games

Markus Bresinsky and Sophia Willner(✉)

Department of General Science and Microsystems Engineering,
Ostbayerische Technische Hochschule Regensburg (OTH-R),
University of Applied Sciences, Galgenbergstraße 30,
93053 Regensburg, Germany
markus.bresinsky@oth-regensburg.de,
sophia.willner@web.de

Abstract. This paper first examines a variety of conceptual contemporary challenges and cognitive shortcomings of public policy makers, entrepreneurs and other practitioners in Germany as a knowledge-based economy. Systems thinking, digital competencies and several modern leadership skills are identified as possibilities to meet contemporary challenges in fast changing and complex environments. Modern leadership skills and promising working styles imply the ability to manage agile processes, flexibility and diversity, and the modus operandi as self-organizing networks. After that, the simulation game GLOBE Exercise at the OTH Regensburg is introduced as an innovative and transformative learning method. In its concept, the GLOBE Exercise combines virtual collaboration with Action Learning, and thus contributes to skills development and transfer both concerning digital competencies and analytical skills.

Keywords: Virtual collaboration · Action learning · Problem-based learning
Interactive and collaborative learning · Systems thinking · Leadership
Digitization · ICT · Simulation games

1 Introduction

Globalization and digitization and their respective consequences have created an unpredictable and more than ever complex world [1]. Forecasts become increasingly unreliable and growing dynamics and intertwined processes further reduce predictability. Different organizations, corporations or public institutes react in similar ways to these changing external conditions. Therefore, certain general implications for young professionals can be derived and have to be incorporated in higher education systems.

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A. L. Brooks et al. (Eds.): ArtsIT 2018/DLI 2018, LNICST 265, pp. 331–342, 2019.
https://doi.org/10.1007/978-3-030-06134-0_37

2 Contemporary Challenges and Cognitive Shortcomings

Among scholars and practitioners there is a consensus concerning contemporary challenges and the respective shortcomings in competencies that organizations and individuals on the international level show [1, 3, 7, 10]. Challenges range from cognitive abilities to grasp complex systems, to lacking digital skills and competencies, and insufficient leadership capabilities.

2.1 Systems Thinking and Wicked Problems

A system is generally defined as a set of elements that are related or interconnected and interact in such a way that they can be considered as a task, sense, or purpose unit, a structured, systematic whole [1].

The twentieth-century philosopher and professor Karl Popper, whose theory of critical realism made a major contribution to scientific philosophy, provides a clarification of the nature of complex systems that policy makers confront [2]. Popper introduced the concept of a continuum that illustrates different types of systems. At one end he imagined a clock with regular and predictable features, similar to the mechanics of a bike for example. The functioning of such a mechanical entity is linear and clear, whereas at the other end, Popper imagined a cloud that had neither regular nor predictable properties. Many of today's problems faced by public policy makers, as well as corporations, are more like a cloud system [3]. These kinds of problems, situations or systems are characterized by multi-layered, complex interdependencies, mutual influences and fast-changing underlying dynamics that make such phenomena immensely difficult to grasp.

The notion of situations or problems that are dynamic, intractable, unpredictable and open-ended, was already introduced by Churchman (1967) [4] and by Rittel and Webber [5] in the field of urban planning (1973). What they refer to as "wicked problems" constitutes a "*class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing*." [4]. Furthermore, suggested solutions which are mostly based on conventional problem-solving often worsen the situation [6]. Innovative thinking and a comprehensive approach are necessary to meet the challenges of modern world problems. In the perspective of systems theory, dealing with one aspect of a wicked problem only is as ineffective as tackling solely one part of a complex system [4, 7]. Therefore, system thinking combined with the notion of a wicked problem pose a promising and practical approach to current issues faced by practitioners in complex environments.

System thinking as a tool to make sense of a situation with intertwined processes has been recognized by multiple actors and organizations ranging from policy makers to military instructors, scholars or entrepreneurs.

In February 2010 NATO replaced its "Allied Command Operations Guidelines for Operational Planning" (GOP) [8] with a trial version of "Allied Command Operations Comprehensive Operations Planning Directive" (COPD) [9] and paved the way for a more holistic method in international operations. This renewal emphasized the comprehension that military means must be accompanied by the inclusion of all involved actors in a conflict or a crisis [10]. Collaboration is thus the key to meet the challenging

requirements of complex planning processes outlined in the COPD manual. However, it can be argued that these processes are overall orientated towards systems theory since the revised planning methods in the manual are intended to be used to manage volatile fast changing systems by means of comprehensive and collaborative operations. Consequently, a cognitive gap between conventional planning processes in the military and the conceptually different methods in the COPD can be observed, as several practitioners face challenges in applying the manual. Thus, an effective way to tackle shortcomings in conceptual understanding is to equip students and young professionals with adequate cognitive competencies to manage complex planning processes.

Also in the peacebuilding domain, systems thinking is perceived as a necessary approach to achieve long-lasting change. Among peacebuilding practitioners, adaptive ways of managing projects in conflict transformation are emphasized, which promotes systems thinking as an essential method when engaging in interventions [7].

Concerning complex systems in which peacebuilding missions in international environments operate, certain characteristics have been detected:

- *"The whole is greater than the sum of its parts.*
- *Relationships between the parts of complex systems are nonlinear and therefore unpredictable.*
- *Complex systems "self-organize" in response to systemic problems.*
- *Complex systems are "emergent"; local-level changes can produce global effects.*
- *There is no one objective reality of a system."* [7].

Bearing these characteristics in mind, systems thinking in peacebuilding focuses on taking complexity into account when working towards long lasting conflict transformation. Especially in fast changing contexts and dynamic conflicts with convoluted underlying root causes, no single aspect can be understood detached from the others [11]. However, complex systems and in particular changing circumstances can, by their very nature, in no way be completely captured and depicted in a static way as the human mind would prefer it [7]. Thus, incompleteness, imperfection and fragmentariness of the analysis result in the risk of retreating into the illusion of certainty instead of actively dealing with the unease generated by the complexity.

Nevertheless, the ability to make sense of fast changing environments and intertwined systems is strongly needed in the context of a globalized world, be it at government level, in non-governmental organizations, military forces or in the corporate landscape. Thus, innovative and transformational learning approaches are essential to equip the next generation of managers, analysts and leaders with the cognitive abilities to grapple with modern day challenges.

2.2 Information and Communication Technologies Skills

Not only the changing international order and the increasing complexity, but also new technological developments illustrate the need for digital capacity building.

The European Union encourages its members to actively work towards the accomplishment of digital literacy as adequate knowledge of and skills concerning information and communication technologies (ICT) are vitally important for multiple aspects within the European Union [12]. Especially concerning socio-economic growth

and competitiveness for Europe as a knowledge-based economy, e-skills constitute a crucial factor, as the Europe 2020 strategy highlights [13].

Shortages and gaps in digital competencies pose a great risk to economic development, innovation and social cohesion, and must be addressed urgently. Not only must digital key competencies be provided, but e-skills also have to be kept up-to-date constantly. Technological development tends to outpace individuals who do not further educate themselves permanently [12]. Hence, innovation and creativity with regards to the development of new concepts to face this challenge are essential. This has also been identified by a recent study carried out for the European Commission [14] which emphasizes that "*As part of the new global sourcing models, different skill sets are required in different regions, and new technologies keep demanding changes in the type of skills required. These new technological trends are likely to act as further drivers of increased demand for ICT practitioners over the coming years*." Digital literacy therefore serves as an essential mean to utilize the full potential of ICT in the European Union and must be included in the educational curriculum to ensure smart growth [14]. However, a conceptual change can be observed within the European Framework for Key Competences as it highlights the provision of competencies in contrast to teaching knowledge [15]. This must be taken into consideration when designing innovative digital learning methods.

2.3 Successful Organizations and Leadership Skills

Organizations and corporations active in international multi-cultural contexts are confronted with dynamic environments, fast changing conditions, and rapidly developing technology. Globalization with all its symptoms already engenders profound transformations in these organization in every aspect [12].

Governments and public institutions for instance succeed at pursuing policies and providing public services as long as the activities are to a certain extent standardized, high-volume and part of a routine [16]. However, public institutions appear to be less well prepared when they face unexpected, nonroutine and more complex challenges, as several public officials confirm [16].

Not unexpectedly, organizations (corporations, public employers, associations, etc.) almost never fail due to external problems. Most of them fail because of internal conflicts, leadership problems and their inability to effectively react to changing conditions [1]. According to multiple recent studies, leaders are usually insufficiently prepared for their tasks [1].

In Germany, multiple studies on how organizations in highly dynamic environments can be successful have been conducted. One of the most recent is "Führungskultur im Wandel" (Leadership Culture in Transition) of the "Neue Qualität der Arbeit" initiative, funded by the Federal Ministry of Labor and Social Affairs in 2013 [17]. The aim of the survey was to make the immanent knowledge of managers visible and to show which value patterns influence their leadership. The results show that most executives recognize the need for change and confirm that there is a deficit in implementing novel leadership and working methods. Executives face a dynamic and interconnected working environment that requires high levels of autonomy and cooperation but in many cases individuals in leadership positions do not feel capable to meet the challenge.

Thus, several parameters to render future leadership concepts more successful have been identified in the study, and the ones with the greatest potential for innovative learning and to be integrated in the framework of higher education will be elaborated in the following [1, 18].

2.3.1 Competence to Manage Agile Processes

Process competence constitutes a form of agile professional ability [17]. The vast majority of the interviewed executives consider the ability to effectively design open-ended processes and to utilize agile methods a key competency. In view of unstable market dynamics and decreasing predictability, a gradual step-by-step approach and adapting processes quickly to changing external conditions promises more success than following rigid procedures that might not be adequate to the new environment anymore.

2.3.2 Flexibility and Diversity

Flexibility in its essence means adaptability [17]. Being able to quickly and easily adapt oneself and the work force to changing circumstances and thus to respond to new requirements.

Diversity describes the ability to constantly acquire new knowledge. As stated by the interviewed executives, a wide applicability of knowledge and not the restriction to a special field is required. Few professionals are able to provide this mental adaptability, but it is essential for a working environment characterized by dynamic changes.

2.3.3 Self-organizing Networks

Self-organizing networks are the favored future model to meet the challenges of the modern professional world [17]. The collective intelligence of self-organizing network structures fosters creative impulses, innovation, simplification of processes and thus complexity can be reduced. Self-organizing networks are characterized by the fact that they continue to work even without further specifications on tasks by superordinate entities. The communication between the parts occurs in a direct way and resources and tasks are managed collaboratively.

Self-organizing networks are furthermore characterized by several aspects [17]:

1. Autonomy: there is little or no external control.
2. Dynamic Operation: resources and tasks can be added, modified or removed in a dynamic way without disturbing operating processes. Also, the behavior of the participants and the structure of the network are modifiable.
3. Adaptivity and self-maintenance: the network is able to react to disturbances and to repair itself.
4. Feedback: between the elements occur positive (effect-enhancing) and negative (effect-weakening) reactions.
5. Emergence: the whole is more than the sum of its parts (Aristotle). The interaction of the elements leads to the formation of new properties or structures within the system. The emerging properties of the system cannot be traced back to the characteristics of isolated elements.

6. Criticality: this term describes the critical state of the system, which can lead to a chain reaction. Even small changes can then have a big impact.
7. Stigmergy: this is a method of indirect communication in a decentralized system with a large number of individuals with the environment being modified. An example for this is could be ants. What has been created in a collaborative way becomes the trigger (see emergence) of follow-up activities and general instructions for how to proceed with them.

These characteristics account for of well-equipped organizations and leaders able to understand a complex environment and to respond effectively to drastic changes [1]. However, it can be assessed as highly critical that the development of personal characteristics and qualities of a human being is currently not a part of the German educational system [1].

3 Practical Approaches at Innovative and Transformative Learning

Consequently, the development of effective ways to foster learning which harness innovative, interactive and technology-based methods must be encouraged. This article argues that one possible concept of innovative and transformative learning can be achieved using Action Learning developed by REVANS [19] and simulation games [20] with respect to training of digital competencies.

Action Learning constitutes a method initially introduced by Reginald Revans in 1980 [19]. The term describes a concept where an individual or a group of individuals within a corporation or organization develop concrete and relevant products for existing projects. Simultaneously or shortly after, participants reflect on their own learning process. Action Learning is based on the assumption that practitioners best learn while developing solution approaches to challenges that actually exist within the organization. Furthermore, the method aims at enabling participants to access the knowledge and the competences that they already possess, thus encouraging them to change their perspective and use their abilities in an innovative way.

3.1 GLOBE Exercise as an Innovative and Transformative Learning Method

As part of the study program 'International Relations and Management' at the University of Applied Sciences OTH Regensburg, the GLOBE Series is a unique set of exercises in cooperation with the Federal University of Applied Administrative Sciences in Mannheim. It consists of a series of simulation games, where several teams of students are responsible for both the organization and the participation of the exercise. In 2013, the concept has been introduced to the academic context by Professor Dr. Markus Bresinsky and has since then taken place bi-annually with various additional partners, for example the Technical Educational Institute of Crete, Libertas International University in Dubrovnik, or the Charles University in Prague, as it can be observed regarding the preceding editions of the simulation:

- Address GLOBE (2013)
- Byways GLOBE (2013)
- Collaborate GLOBE (2014)
- Deployed GLOBE (2014)
- Engaged GLOBE (2015)
- Facilitate GLOBE (2015)
- Go GLOBE (2016)
- Horizon GLOBE (2016)
- Impact GLOBE (2017)
- Joint GLOBE (2017)
- Key GLOBE (2018)

The scenario in the simulation is based on the ongoing conflict in Afghanistan with focus on the United Nations Assistance Mission in Afghanistan (UNAMA) and the NATO-led Resolute Support Mission (RSM) in which German troops take part with up to 1,300 soldiers [21].

3.2 Training Objectives

This article argues that the concept and the methodology of the GLOBE Exercise accomplishes to impart competencies that enable students to cope with previously described challenges of the modern working environment. This is achieved by utilizing and adapting the principle of Action Learning [19] and conveying competencies within the framework of a simulation game. The practical approach of a simulation game harnesses the potential of both the students' already existing skills and serves as an experience-oriented form of teaching and learning, which is rather marginally used higher education or schools in Germany [20]. Furthermore, the learning outcomes of the simulation exercise, are oriented towards level 6 of the European Qualifications Framework (EQF) to ensure international comparability [21].

(1) Knowledge	(2) Skills	(3) Responsibility and autonomy
Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles.	Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study.	Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups.

3.2.1 Systems Thinking

Considering the structure of the exercise and the elaboration of the real-world scenario, the simulation game fosters the ability to better comprehend volatile complex systems. Both the training audience consisting of participating students, the whole structure of the simulation game including the organizing entities and the partners, and the corresponding elements within the scenario represent systems in which individual parts interact in a highly dynamic and mutually influencing way. The students find themselves in an environment where they represent parts of a collective entity, where

influence can be exerted only through collaboration and cooperation with other parts of the system. In accordance with the scenario, the students learn that even small changes on a local level can entail large-scale consequences. Thus, in case of changing environments, the characteristics of the team must be adapted accordingly, e.g. restructuring of the team, prioritizing of different tasks, etc., all while maintaining the functioning of the system.

3.2.2 Digital and ICT Competencies

The use of ICT runs through the entire concept and all stages of the GLOBE Exercise. Starting with the planning phase, successful virtual collaboration between the different international partners is essential for a sound preparation of the simulation game. Also, during the actual run of the exercise and the evaluation afterwards, acquiring and applying e-skills represent substantial success factors to make the simulation game a valuable experience for all participants.

In a previous analysis of the GLOBE Exercise [23] several digital competencies that are deepened within the simulation game have been identified: (a) communication and collaboration, (b) situational awareness, (c) information and knowledge management, and (d) data analytics. Possible examples of knowledge and digital skills include:

(a) Communication and virtual collaboration:

- Synchronous and asynchronous digital communication methods; Prioritize, sustain, and moderate communication channels; Use of innovative soft- and hardware to foster collaboration.

(b) Situational awareness based on the domain of communication:

- Implementing and administrating alert and warning systems; Prediction of developments.

(c) Information and knowledge management:

- Platform management; Data storage management.

(d) Data analytics:

- Management of search algorithms; Assessment of references and research results; Critical thinking and analysis; Use of data analysis tools.

Due to the exemplary involvement of ICT within the simulation game, the GLOBE exercise has been included in the Digital Learning Map [24] where educational learning scenarios that explicitly use digital tools are collected and publicly displayed. A wide variety of interactive information-management instruments (e.g. an interactive map), adaptive management tools (e.g. a constantly self-updating collection of tasks) and communication technologies (e.g. video transmission to share information) is used extensively during the exercise. This enables the students to acquire digital competencies under real-world working conditions and to test various digital tools in the context of a simulation game.

3.2.3 Leadership Skills and Modern Working Styles

Concerning the leadership skills and working concept with a high success potential as they have been defined by the study "Führungskultur im Wandel", the GLOBE Exercise achieves to impart and train management and leadership competences on multiple levels.

During the organization and planning phase of the exercise, the students in the steering and in the scripting committee can encounter multiple obstacles, be it in the recruiting of possible participants, the development of the scenario, or when acquiring partners. Depending on the characteristics of each situation, the next steps in organizing the exercise must be adapted accordingly. Agile management of the processes to effectively plan the whole exercise must be implemented. Students constantly learn how to react to dynamic external conditions and how to create innovative processes to still be able to continue their work.

Also, during the run of the exercise itself, students in the training audience are permanently confronted with the symptoms of highly volatile conflicts within the scenario. Especially in emergency situations, the continuation of working processes and the functioning of the team is of upmost importance. Thus, students learn how to create new processes if the prevailing conditions do not permit a continuation by conventional means anymore.

Flexibility as one of the essential competencies to face complex challenges is highly stimulated before and during the exercise as the students may face changing circumstances and consequently new requirements. Diversity as the ability to constantly acquire new knowledge is trained both during the preparation, especially during the scripting of the scenario, and during the exercise. As several tasks consist of gathering information and presenting them in customized way for the demands of the recipient, students acquire and train the competency to look for reliable sources and to process high amounts of previously unknown information.

Particularly during the exercise, students learn how to form self-organizing networks and how to sustain their network, as it can be observed in the following examples:

1. Autonomy: The team of students is entirely controlled by itself, there is no outside source of control.
2. Dynamic Operation: Constant modification and adaption of tasks (prioritizing in times of crisis) and resources (students might be missing due to other mandatory lectures) takes places without disturbing working processes.
3. Adaptivity and self-maintenance: The team is able to react to disturbances in a protective way and recover from disruptions of the operating processes.
4. Feedback: Individual sub teams support each other, e.g. by dividing the work or by protecting the working elements from outside disturbances.
5. Emergence: The interaction of sub teams leads to the formation of new properties or structures within the whole team, e.g. the team structures intend briefings twice per day to the head of the team, or every product must be checked and adapted by a research sub team before being submitted to the head of the team.
6. Criticality: An essential part of the team (e.g. head of the team, large amount of team members) ceases due to unforeseen circumstances, which results in a

drastically reduced working capacity of the team as a whole. this term describes the critical state of the system, which can lead to a chain reaction.
7. Stigmergie: Operating processes in case of emergency have been created and have to be internalized by every member of the team. In case of an occurring emergency, the team follows the instructions that it has created beforehand.

4 Conclusion

The potential of simulation games that particularly aim at teaching competencies rather than solely knowledge is still not fully exploited in the German higher education system [1, 20].

Concerning the provision of analytical competencies, deeper understanding of complex real-world international processes, and leadership skills consistent with new requirements of the modern working world, the GLOBE Exercise continues to make large contribution in the education of young professionals.

With regards to the technical aspects, conceptual research shows that there is still no common understanding of terms but that the versatile aspects of digitization are reflected in colorful diversity of notions surrounding digitization [25]. Thus, despite the immense potential of technological developments, a systematic approach to digitization in the German higher education system still has to be generated [26]. However, there is a general consensus among German policy makers that the potentials of new technologies in the context of higher education can only be seized if practitioners are even better prepared and equipped with adequate digital skills – achieved through initial training as well as in lifelong learning [27].

With the GLOBE Exercise the OTH Regensburg contributes to fostering innovative and transformative learning, combining theoretical knowledge and practical competencies. In the domain of virtual collaboration, participants acquire digital competencies and practice successful leadership in a multicultural context. Due to the classification of the learning outcomes in the EQF, the possibility of international expansion of the exercise is ensured, which further contributes to the sustainability of the exercise.

In every round of the exercise, an evaluation is implemented where multiple aspects of the exercise are covered. Participants' performance, personal improvement and the organization and implementation of the exercise are evaluated by a team of students who observe all aspects of interest during the run of the simulation game. Thus, before-and-after states can be compared within one round of the simulation, and the respective conclusions can be drawn, which differ from exercise to exercise.

In September 2018, a general management concept which can be used in each future run of the GLOBE exercise has been developed. This general concept can be applied by participants, establishing a basis of comparability between different rounds of the simulation game. Consequently, future evaluation of the effects of the GLOBE exercises can be conducted based on a consistent exercise concept ensuring constant improvement and a sound basis for further research.

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