GLOBE – Learn and Innovate Digitization by a Virtual Collaboration Exercise and Living Lab

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Abstract. This paper presents an advanced interactive learning platform .dot that implements the GLOBE exercise, using innovative information and communication technologies to enhance learning and development of management and leadership skills in a complex organizational setting. GLOBE on the one hand focuses on competences around ICT and virtual collaboration, and on the other hand on digital transformation, technologies and tools at higher education institutions. By this applied science, learning and developing on the real-world platform, analysis and drive of digital innovation and transformation can be fostered. The main goal is to co-create knowledge and solutions in the following focused subjects: Management and leadership of multidisciplinary, multinational and multicultural virtual and real collaboration in a complex organizational environment. GLOBE uses real world scenarios (e.g. United Nations mission) and involves real world actors.

This comprehensive educational approach should enhance learning techniques and leverage learning progress with hands-on experiences and applied science in the context of ICT and virtual collaboration, and the embodied dynamics of behavior to support innovation and development.

Keywords: Human factors · ICT · Virtual collaboration · Experiential learning
Problem-based learning · Interactive and collaborative learning
Open innovation · Living Lab · Digitization

1 Introduction

Digital transformation is shaping organizations as well as societies in a rapid and comprehensive manner. Until today scope and extent of the upcoming changes are not fully understood or even known. In recent years, researchers, authors and decision-makers have shown an increased interest in the causes and consequences of digitization for economies, states and societies [1]. One common denominator in the discussion about the possible consequences is the urgent need of skill and competence development, e.g. digital literacy, data analytics or virtual collaboration, for future employees

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and decision-makers. In this context two different but interdependent developments can be identified: on the one hand innovations in digital technologies drive the need for transformation and adaption in organizations, but on the other hand digital innovation is also shaped by the changing demands and requirements of users implementing these innovations. Thus, to understand the impact it is necessary to address both sides of digital transformation, new technologies and tools as well as changing user requirements through digital innovations. Higher education institutions as universities of applied sciences play a crucial role in this context. Not only they are specifically oriented to practical science based problem-solving in a digital world but also provide a platform for teaching and learning skills for the digital world.

Therefore, the aim of this paper is to outline and discuss a concept that incorporates the idea of digital innovation and competence oriented learning in one single platform. OTH Regensburg together with the partner universities Federal University of Applied Science Mannheim and TEI Heraklion has developed a unique exercise platform called .dot (digital organizational training). Within this .dot-platform one training instance is the GLOBE exercise, which provides a real world scenario based learning and training environment. Powered by the platform, GLOBE can be used for analyzing and driving digital innovations and transformation of organizations.

Digital Innovation and Transformation of Organizations

Digitization will comprehensively change the way how organization will be managed and led [2]. Especially, for highly digitized organization it is crucial to understand and manage digital innovations. Domains in which these organizations are rapidly and comprehensively innovating are virtual collaboration and data analytics. This implies for management and leadership not only to scout, assess and plan the implementation of new technologies but also to take into account the impact of these innovations on members of the organization. Hence, digitized organizations need to focus on both technology domain and social domain for a successful transformation.

A lot of research has been carried out on innovation management [3, 4]. Up to now, there exists an elaborated concept for digital innovation called Living Lab (LL) [5]. The LL concept incorporates Cooperative or Scandinavian Design processes [6], the European Social Experiments with IT [7] and the Digital or Smart City Initiatives [8]. The LL approach is combined with the underlying methodologies of Soft System Thinking, Appreciate Inquiry, Action Research, Open and User Innovation, Co-Creation, NeedFinding, or User Centered Design among others. This concept of LL cooperates all stages of a development process – ideation, conceptualization, testing, prototyping, validating, developing, exploiting and commercialization – in a participatory real-world context network approach, bridging the gap between exploration & exploitation and knowledge & solutions. LL is an evolvement indicating an in-situ nature of Research & Development & Innovation, combining multi-stakeholder, multi-method, multi-context and real-life approach with clear user focus on co-creation. One main idea of Living Lab calls for involving all stakeholders of an innovation, private and public actors and as well as people in a real world setting, which is called the Quadruple Helix Model [9]. By this, Living Lab tries to exploit the opportunity of co-creation; i.e. innovations are not only driven by companies and organizations behind closed doors of laboratories, but also by involving users in a real world setting and

utilizing their feedback for improving innovations. This concept can be seen as a testbed or experimentation platform, to experiment and validate innovations for, with and by all participants of a Quadruple Helix. Therefore, Living Lab can be seen as a concept to support both innovations and social learning for a sustainable transformation.

Whilst some research has been carried out on digital innovation, best practice by which required skills and competencies for the digital transformation can be identified and trained have not been fully established. The LL concept offers opportunities to connect innovation management and organizational transformation. GLOBE can be seen as one use case how this connection can be implemented successfully.

Connection of Learning and Innovation in a Real World Scenario

GLOBE focuses on the management and leadership of a multinational operation headquarter implementing (1) a forward response team acting in a complex crisis scenario and (2) a supporting headquarter component which cooperates also with (3) associated headquarters. All three elements use virtual collaboration and data analytics to conduct, control and support time sensitive operations in a complex mission environment. By this organizational scenario different digitized processes and technological tools are used and scrutinized under real world conditions.

For example, GLOBE uses the scenario of a United Nations Mission in crisis countries, depicting the organizational structure of a country team managing projects in the area supported by the United Nations Headquarter and associated partner organizations. Time sensitive crisis developments triggered by the scripted scenario, multinational actors shaped by organizational roles with different intentions and digital technologies challenged by users result in a stress test for the comprehensive organizational setting. By modular architecture and adaptive steering GLOBE is flexible and dynamic to address both specific training and analysis needs. GLOBE can easily and quickly be adapted to other scenarios, e.g. entrepreneurial and societal transformation.

In the past, main objective of GLOBE was to offer advanced training for students in virtual collaboration and data analytics. However, GLOBE advanced and offers now the opportunity to implement digital innovations and to analyze the impact of those innovations on different organizational settings in several modularized scenarios. Interestingly, by the combination of learning and innovation it tackles the above mentioned interdependent feedback between digital innovation and skill development and provides a framework to investigate the mutual impacts.

In sum, GLOBE is used twofold: (1) to provide a learning environment for students not only to familiarize with real world scenarios like multinational crisis management but also to advance their skills in project management, leadership, and digital competencies (2) to investigate the interplay of human factors [10], under psychological and management aspects. Both use cases together can be implemented in the Living Lab concept. By that, innovation by co-creation and experiential learning go hand in hand for the purpose of organizational transformation.

2 Implementation of the GLOBE Project

From Teaching to Testing

The GLOBE exercise was developed by a cooperation of the Federal University of Applied Administration Mannheim (FUM) and Prof. Dr. Bresinsky at the OTH-R in the year 2013. Since then, the exercise was conducted twice a year in total nine runs. Firstly, the idea and goal was to train and teach virtual collaboration, management and leadership of a multinational Humanitarian Aid Mission. Therefore, GLOBE uses real world scenarios like the United Nation Assistance Mission Afghanistan.

In the first runs of GLOBE 40 to 60 students at the partner university in Mannheim and 20 student in OTH-R participated.

Through the years, a development to a comprehensive exercise through the semester with project management, real-world networking and simulation exercise has been established. With a total number of 45 students formed of the OTH-R, the stable partner TEI Crete, and the new partners University of Dubrovnik, Charles University Prague and the University of Glasgow additional to the 40–60 students of the FUM, the GLOBE exercise changed its character from a pure training to a test and experimentation platform. Not only the scenario was enriched by incorporating subject matter experts like data analysts, security advisers, psychologist, and real word non-governmental as well as governmental organizations.

The following list shows the specific implementations of GLOBE (Table 1):

Table 1. Specifications of GLOBE

Year and name of GLOBE exercise	Scenario	Partners and participants	Character
2013 ADRESS/BYWAYS	United Nations Mission with headquarter (HQ) and deployed country team (CT); 6 h time shift between HQ and CT; comprehensive approach with GO, NGO and other actors; scripted real life role play, incidents and injects; time pressure, crisis development and complex problem-solving tasks;	Federal University of Applied Science Mannheim (FUM) Total: 60	Training virtual collaboration (VC) in multinational missions
2014 COMPREHENSIVE/DEPLOYED		FUM Total: 80	and application of digital analysis tools
2015 ENGAGED/FACILITATE		TEI Heraklion (TEI), FUM Total: 90	Test of different HQ structures, IT platforms
2016 GO/HORIZON		University of Dubrovnik (DIU), TEI, Subject Matter Experts (SME) Total: 120	Test of different HQ processes, IT tools
2017 IMPACT/JOINT		University of Glasgow, FUM, TEI, DIU, SME Total: 160	Controlled quasi experiment of different HQ processes

Training Objectives for Digital Competencies

So far, a systematic investigation what digital literacy implies and how it is achieved is missing in the scientific literature. Therefore, it is rather understudied which specific skills and competencies are needed for highly digitized organization [11]. From a more general perspective and based on analysis of the GLOBE exercise it can be said, that there are at least four important skill and competence domains relevant: (1) the domain of communication, (2) the domain of situational awareness, (3) the domain of information and knowledge management, and (4) the domain of data analytics. Under these domains we can identify several specific and shared skills and competencies. It is important to note, that in each domain digital hard- and software is the common factor and various digital systems, tools, and application are used for the management of the organization at all.

The following skills and competencies are of upmost relevance, regarding their specific domains:

(1) In the domain of communication:

- Synchron and asynchrony digital communication methods;
- Prioritize, sustain, and moderate communication channels;
- Affective and emotional communication management in restricted and poor communication channels; Utilization of language and text codes;
- Target and client oriented communication;

(2) The domain of situational awareness based on the domain of communication:

- Perception management and perceptual bias avoidance;
- Maintenance of individual and team situational awareness; Prediction of developments; Implementing and administrating alert and warning system

(3) In the domain of information and knowledge management:

- Platform management; Data storage management;
- Version control and management; Deconflicting and synchronizing;

(4) In the domain of data analytics:

- Management of search algorithms; Assessment of references and research results; Critical thinking and analysis
- Management and application of tool based data analysis;

The above list of skills and competencies is not comprehensive. Nevertheless, based on this list the GLOBE exercise can be adapted in a flexible manner to address special objectives. The following sample provides some specific examples to illustrate the possible features in design and scenario of the GLOBE exercise:

(1) Communication domain:

- Time shifts, availability of actors; Task overload and urgency response;
- Mixing, denying or scramble communication channels;
- Intercultural incidents, foreign languages, stress and time pressure;
- Restricting vocabulary, volume or bandwidth;

- Multiple stakeholder and social networks;

(2) Situational awareness:

- Intercultural incidents, fake news, white noise;
- Organizational changes and task management; crisis development;

(3) Information and knowledge management:

- Multiple platform requirements;
- Data corruption and loss; System downtime;

(4) Domain of data analytics:

- Big data, statistics and scenario technique;
- Heterogeneous, unreliable and missing sources;

From Experiential Learning to Testing and Experimentation in a Living Lab

From the beginning, the main trigger for the implementation and development of GLOBE was providing a learning and training platform. GLOBE uses the experiential learning approach developed by KOLB [12]. Through experiential learning as a multidisciplinary approach, comprehensive learning and understanding can be implemented. The learning process is an iterative cycle of active experimentation, concrete experience, reflective observation and abstract conceptualization [12]. The combination of different dimensions and levels of learning is increasing the effective learning outcomes of all participants. The participatory, problem-based learning puts the learner in the focus, and combines existing knowledge with their application to (co-) create solutions [13]. One important finding is, that the concept of experiential learning seems similar to the Living Lab approach. LL is a user-centered, open innovation and social learning process in real-life context to mediate and transfer knowledge and technology by engaging all participants in a process of learning, development and co-creation of pre-commercial demand [14, 15]. GLOBE utilizes both approaches experiential learning and LL in a combined concept.

The concept GLOBE offers the possibility to analyse non standardized management and leadership processes in multinational operations in a real world scenario. Furthermore, it aims to test tools and technology utilized in virtual collaboration and digitization. The LL concept serves as a test and experimentation platform, enabling all participants to be actively involved and empowered in the development and learning process for creating products and innovations, with the essential elements [16]:

(1) Infrastructure and technology
(2) Organization and legal entity
(3) Lifespan, involvement of public authorities, companies, academia and people
(4) Context (real-life)
(5) Concept of experimentation and testing
(6) Method and Activities: Co-creation, exploration, experimentation, evaluation, retention, exploitation and commercialization
(7) Principles: Continuity. openness, realism, empowerment, spontaneity.

The iterative cycles of experimentation and learning in GLOBE can be seen as suiting both the process of experiential action learning [12] and the different phases of the LL concept, integrating real-world partners and context in the academic curriculum.

The LL implies a Quadruple Helix, as multiple participants co-creating innovations and knowledge. As Public Authorities, Companies, Academia and People, which are present in the GLOBE concept as external experts from companies and organizations, the students both as Academia and People, and the FUM and experts as Public Authorities. This network provides opportunities for profound research and real-life experiences for students to prepare them for future employability.

The GLOBE concept embodies the essential elements of the Living Lab concept to offer comprehensive learning and development opportunities:

Context: As the environment and testbed infrastructure to test and experiment in real-world context with multiple stakeholders. The multinational approach scenario with the real-world partners FUM and external experts embody crisis management, leadership and management processes and product development around digitization.

Concept: Studies on innovation activities in real-life context with versatile structures, actors and roles to organize innovation, development and learning with the testbed environment. GLOBE offers a diverse set of roles within the scenario to serve as platform to experiment and test. The participants are grouped into the (1) project-management team, with Exercise Management, stakeholder analysis, scripting, documentation and Exercise Evaluation; and the (2) Training Audience as Wide Cell, Exercise Control, and participants.

Method: Within the experiential active learning and co-creation process, users and people are central to generate innovations and knowledge within the whole process. The iterative cycle of ideation, contextualization, conceptualization, development, experimentation, retention, observation, feedback and exploitation creates innovations through hands-on experiences. The GLOBE scenario combines multiple tools, as Role Play, applied project management, simulation game, inverted classroom, data analytics, observation and feedback as a mixture of traditional and innovative experimentation and learning tools in real-life context.

The GLOBE concept as a Living Lab offers the opportunity to create a real-life learning, experimentation and development environment with real-world partners to enhance learning beyond the traditional curriculum. The established concept of innovation hubs, used in technical fields can be applied to social sciences and adapted to various fields of interest to observe, test and validate technology and behaviour. The GLOBE scenario allows to examine and experiment in the urgent fields of digitization and virtual collaboration.

3 Conclusion

The set of needs and tools, as analytics, soft skills, situational awareness, intercultural competences, problem-solving and decision-making [11, 17] are not yet fully integrated in the broad curriculum of German higher education. The OTH-R is one of the first institution of higher education to implement such an integrated exercise platform.

However, trends [18] suggest that concepts like inverted classroom, blended learning and action learning concepts transform and bring benefit to learning results in education. Combination to digitization is with these concepts both necessary and possible, to teach skills towards an interactive, intensive and collaborative collaboration with ICT and personal development [18]. The Globe scenario as proposed concept to integrate these learning approaches could enhance applied learning towards future work and leadership skills. This innovative concept integrates traditional theoretical learning, with activating and collaborating approaches towards a comprehensive concept, stimulating maximum learning results.

Participatory approaches shift the learner from passive recipient of knowledge towards active co-creators and applicants of knowledge. Virtual collaboration and digitization as main part of the scenario are both vehicle to learn and experiment these new skills and tools, and object for further study to develop academic curriculum and academic research of dynamic behaviour within virtual collaboration. Globe focuses on the need of developing a set of skills for the digitization, namely confident dealing with information and privacy issues, complex problem solving, analytical thinking, collaborative and self-organized working in heterogeneous teams, agility, interpersonal, social and intercultural skills [18]. The scenario combines concepts to integration & collaboration, gaming & simulation and blended learning [18] to combine all innovative with traditional approaches for digitization and traditional education. This adaptive and agile concept will suit the complex requirements of modern education.

This combined innovative education project defines a comprehensive learning platform, bridging theory and practice in the fields of virtual collaboration, use of ICT, dynamic social behaviour and basic theories of 'Management and leadership of a multidisciplinary project under guidance of a UN mission'. The virtual and real interaction is addressing the concept of active and experiential learning theories and introduces innovative features for a comprehensive learning environment at Universities of applied sciences throughout Germany.

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