CASE STUDY

Global Society and Integration: To what Extent Is the Triple-Helix-Model of Etzkowitz & Leydesdorff of Use for the Implementation of Smart Governance? – An Analysis Referring on Implemented Triple Helix-Constellations

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The Triple Helix Model, established by Etzkowitz and Leydesdorff, is a model, which copes with different forms of university – industry – government interaction. It reacts on the rising uncertainty and ignorance in society, which are results of the developments towards a knowledge society. The defined organisational frameworks they illustrate, shall be evaluated with regards to their usability in the context of Smart Governance – a type of governance, which demands new, intelligent democratic structures as a foundation for a new way of governing society. Triple Helix constellations in the nanotechnological industry and in the context of different forms of security in society show that these structures are a useful instrument to generate intelligent solutions on certain societal problems. With regard to Smart Governance, Triple Helices are able to increase the intelligence of democratic structures and parts of their processes. In contrast, they lack influence on metarules. The capitalisation of knowledge is an influencing factor, which prevents a more general implementation of Triple-Helices.

Exposition

The Context

The knowledge society, as will be outlined in the following, raises problems regarding the role of politics in society and the way of governing. The rising amount of knowledge and hence uncertainty about the knowledge we deal with (Willke, 2007), the practical as well as the theoretical knowledge, weakens our certainty in making political decisions with regard to specific societal problems. "All knowledge is constructed and contingent" (Willke, 2007, p. 175).[1] Although the sciences should bring clarity with regard to specific issues, the expansion of sciences needs to be identified as a reason for increasing ignorance as too much knowledge is circulating (Beck, 2003). Especially politics suffers from the increase in uncertainty and even ignorance in various fields of competence. One could talk of a mismatch between societal complexities and the models of governance (Willke, 2007).

"Knowledge work"[2] becomes the core element of productivity within a knowledge society. Consequently, we face a "cognitive turn" (p. 44), meaning that "[t]he legitimacy of decisions comes to depend on expertise" (p. 44).

The legitimacy by vote as an exclusive way to delegate legitimacy does not last for adequate decisions in the context of a knowledge society. Expert commissions, NGOs and others are therefore influencing everyday politics.

The question is how to create governance structures so that politics is able to cope with these challenges raised by the knowledge society – uncertainty and a multiplicity of involved actors?

Smart Governance

Helmut Willke, professor for Global Governance, illustrates in his book "Smart Governance" several requirements for a theoretical model, which copes with the challenges of the knowledge society[3] illustrated above. According to Willke (2007), Smart Governance needs to be understood as the "ensemble of principles, factors and capacities that constitute a form of governance able to cope with the conditions and exigencies of the knowledge society" (p. 165). In this way these principles, factors and capacities can be described as intelligent according to the definition of intelligence in Willke (2002), who defines intelligence as the ability to generate problem-solving solutions. Hence, the genome implies the intelligence of organisms, as do social practices of rule systems. As a new form of governance Smart Governance "aims at redesigning formal democratic governance" (Willke, 2007, p. 165).

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Important for being able to cope with the above-mentioned problems, generated by the knowledge society, is a necessary increase of democratic[4] intelligence. The illustrated concept of intelligence by Willke (2002) needs to be adapted here. Democratic intelligence, compared to other types of intelligence, bases on Charles Lindblom's idea of "mutual adjustment" (Lindblom, 1965), which emphasises the ability of democracy to incrementally adjust to societal shifts. In contradiction to the conception of Lindblom, Smart Governance addresses those changing processes which come up abrupt, like those initiated by the knowledge society. This can be achieved by making the democratic subcomponents, in other words its main structures, more intelligent, "including intermediate forms of social associations in democratic decision-making" (Willke, 2007, p. 167). Consequently, different sorts of knowledge from different sources will be combined, which generate solutions that better adjust to the complexity of the problematic field. Further measures are an increasing decision-making architecture, including networks or hybrids of different organisational entities as well as an "inclusion of private actors, [organisations] and PPPs to extend government to governance" (Willke, 2007, p. 168). The term "contextual guidance" (p. 168) describes according to Willke (2007) the combination of the market's self-organising ability and the identification of strategic perspectives as a measure to increase the intelligence of democracy (Willke 1996 as cited in Willke 2007). Contextual guidance demands for resilience as the politics' task (Willke, 2014).[5] Strategic resilience as well as " 'ultra-stable' " (Ashby, 1956 as cited in Willke, 2007, p. 183) structures shall guarantee the anticipation of future challenges (Hamel & Välikangas, 2003 as cited in Willke, 2007, p. 182) and hence 'preventive decision-making' (LaPorte & Consolini, 1991 as cited in Willke, 2007, p. 183). Politics need to address future challenges instead of coping with problems in the past.

Another possibility to achieve an increase of democratic intelligence aims at its processes. One can differentiate between the process, which deals with the quality of input and an output-concerned process as well as meta-rules. The input concerned process implies mainly the fact that various interests of a multitude of people need to be categorised in a few options out of which, after having passed through different levels of representation, the legislative democratically decides for one of these. Higher intelligence is hence generated by the high influence of local actors,[6] minimised time spans of control in terms of less time that passes until a decision is made, as well as maximised local influence and an optimised fit between present interests and a short term outlook. In contrast, the output-concerned process deals with the problem of "short-sighted" (Willke, 2007, p. 170) results of the political decision-process, which is a consequence of the voter-dependent mechanism of appointing the delegates. Therefore, we face an "accountability deficit" (Willke, 2007, p. 171). As a solution for this deficit, Willke (2007) suggests to "invent additional forms of accounting that instigate a more serious responsibility of decision makers beyond the task of the day" (p. 171). New formats of accounting like expert commissions, conferences and others shall enable midterm or long term policies as they highlight "omissions and faulty strategies" (p. 171) of the government.[7] These institutions need to be legitimised by the parliament. Due to their expertise, the government delegates responsibility to them and hence reduces its own, which means a strengthening and not a reduction of democracy due to the increase of its material basis. They have decision-making competences[8] that suit best the requirements of the knowledge society with its differentiating fields of knowledge and increasing uncertainty. Democracy will be decentralised so that a variety of specialised actors participate in political decision-making. Hence, contextual guidance as the core task of the government comes into play (Willke, 2014; see footnote "five" for more information).

Finally, as a third way, an increase of the democratic processes' intelligence can be achieved by constituting the rules and laws as the result of the political decision-making process themselves more intelligently. For this purpose, they need to imply the possibility to change and to adapt themselves to societal changes and current needs (Willke, 2007). This can mainly be achieved by "meta-rules" (Willke, 2007, p. 172) which regulate the conditions of changing the written law.

As the ideas of Willke (2007) are of a theoretical character, we need to find frameworks which enable us to implement this model to be able to cope with the rising challenges of the knowledge society, illustrated at the beginning. The Triple Helix is a new model which provides new ideas concerning the interaction between various societal institutions of different characters regarding their function and internal constitution. Smart Governance copes with the multiplicity of actors in the political decision-making context as well. Consequently, this paper aims at the examination of the Triple Helix Model as such a framework. At the beginning, I want to introduce the idea of the Triple Helix as well as its institutional requirements. Afterwards, examples of different helix constellations in the nanotechnological industry and the field of security in society shall be outlined. Subsequently, I will mention several arguments that answer the question concerning the usefulness of the Triple Helix Model for the implementation of Smart Governance, before introducing my own position towards the compatibility of these two phenomena.

Synergy of Triple-Helix & Smart Governance?
Background of the Triple Helix Model
The Triple Helix Model describes in general the university-industry-government-interaction. A Triple Helix constellation aims at the improvement of each other's performance, otherwise there would be no reason to create networks (Luna & Velasco, 2010). The relationship is reciprocal. Hence, it is essential that each member has got deficits which can be filled exclusively by a cooperation with other institutions, as these networks would not be needed, "if participants were able to correctly define [problems] in a way that is both scientifically correct and economically useful" (Luna & Velasco, 2010, p. 322).

The Triple Helix emerged together with the "Innovation State" (Etzkowitz, 2005, p. 66), which deals with the regeneration of productivity by including science and technology into the developing process, trying to generate a new source of growth and a possibility to establish new firms (Etzkowitz, 2005). Science is declared to be an important driving force for the economy (Lengwiler & Simon, 2005). The government can be imagined as a partner, participating with private capital, to give support in building up a venture capital industry. The interaction between institutions, which have their origin in these three different spheres, is assessed as the precondition for an innovation increase in a knowledge-based society. The positive historical experience with cooperation projects during the Second World War, developing new weapons, functions as an example for the success of the Triple Helix idea. Contracts between the government and universities concerning research funding were made. This experience led to the maintenance of cooperating structures. Attention for new innovation policies came up with the economic downturn in the 1970s, a new crisis. The government's solution was a reform of the patent system, which was insofar a reorganisation, as intellectual property rights were given to universities in connection with the condition of using this knowledge actively. The function of transferring knowledge into use is realised by companies (Etzkowitz, 2005; Heinze, 2006). Looking at the example of the nanotechnological industry, we will face the fact that economic interests are one of the main drivers for Triple Helix realisations. Etzkowitz & Leydesdorff (1998) describe the cooperation of academia and industry as a "factor of economic growth [and] a source of new products and companies" (Etzkowitz & Leydesdorff, 1998, p. 2).

Types of Organisations

The loss of clear-cut boundaries between the three fields of competence has its origin in the single field's ability to adopt functions of another sphere. While universities can assist in firm formation issues, firms tend to initiate their own research units as well as the ones that are provided by the government (Etzkowitz, 2008). Nevertheless, it is important for them to keep their independence according to their original entity. The exchange of expertise between the different spheres is one of the innovation drivers of the Triple Helix. "Hybridization, invention, and innovation of new social formats" (Etzkowitz, 2008, p. 21) are stimulated. The exchange of expertise is mainly based on the "circulation of individuals" (Etzkowitz, 2008, p. 22), meaning that people introduce ideas in other spheres, and initiating collaborative projects, having dual positions in the industrial as well as in the academic sector or governmental institutions. Interactions are expected to be limited.

The scientific community emphasises several different types of organisations that build the framework for the operational work of Triple Helices. Firstly, we need to mention research centres. The centre unifies researchers, working in a common field, to have more research opportunities out of a financial as well as a human resources perspective. Besides scientists, centres may also include industrial members. The research centre is used by the government as an instrument for infrastructural and economic improvements in regions with weak research infrastructure (Etzkowitz, 2008). In comparison to research centres, technology transfer offices, as the second type of organisations, function as an "internal search mechanism to identify commercializable technology and as an external search mechanism to identify potential customers" (Etzkowitz, 2008, p. 91). They "facilitate the commercialization of research" (Etzkowitz, 2008, p. 31). As they tend to secure their financial base, the transfer office is less dependent on continuous success in the commercialisation of research results (Etzkowitz, 2008). A core function of technology transfer offices is the licensing of academic research results to firms, which is how knowledge is made utilisable. The latter two types of organisations are complemented by science parks, which are basically a conglomerate of buildings which host "two types of research oriented forms: companies that have grown out of the university and wish to maintain close ties, and firms that wish to locate an R&D unit, or [. . .] their entire laboratory, to a quasi-academic site" (Etzkowitz, 2008, p. 98). Moreover, one of their original functions was to recruit students from universities nearby. Meanwhile, a reformulation of their entities leads to the aim of founding new universities as well as firms. While science parks are the location where research units of firms operate, centres build a connection between these units and researchers from university, providing decision-making structures (Etzkowitz, 2008) with transfer offices connecting the research units with potential customers.

Another important type of institution is the "entrepreneurial university" (Etzkowitz, 2008, p. 28ff.). It can be described as the leading institution of putting knowledge into use and of enhancing the academic knowledge production (Etzkowitz, 2008). Due to the "entrepreneurial culture" (Etzkowitz, 2008, p. 28), faculties have to evaluate their research always concerning commercial as also concerning academic standards. However, the entrepreneurial university has a strong degree of autonomy in defining its own direction as well as cooperating with other institutional spheres in several projects. Having these relations with other institutional spheres like the industry or public institutions is necessary for the entrepreneurial university. These three qualities describe already three of five norms that the entrepreneurial university has to fulfil – capitalisation, independence and interdependence. As the institutional relations across the different spheres change regularly, one speaks of reflexivity as a quality of the entrepreneurial university. By founding hybrid organisations, the entrepreneurial university wants to cope with the functional splitting into commercial and academic interests. Etzkowitz (2008) speaks of Hybridization. He does not explain the latter two qualities in more detail.

Implementation of Helix-constellations
The nanotechnological industry
The nanotechnological science is organised interdisciplinary, combining aspects of several different technological and natural sciences. This quality automatically leads to an increasing interorganisational activity of

nanotechnological researchers as well as industrials. Inter-organisational networks are a popular institutional framework for science and the technological industry as the former institutions get access to funding, while the latter get access to knowledge which enables them to exploit competitive advantages within their market (Heinze, 2006). They are part of the basic double-helix structure, which corresponds to the second step in the process towards a Triple Helix illustrated by Etzkowitz and Leydesdorff (1998) – "the influence of one helix upon another" (Etzkowitz & Leydesdorff, 1998, p. 3). Interorganisational networks come into being if companies try to cooperate with other institutions in terms of finding production alternatives or solutions for problems (Kämper & Schmidt, 2000 as cited in Heinze, 2006, p. 75). Thus, interorganisational networks generally describe collaborative ties between research institutions and companies. The intensity of collaboration is the highest between very research intense companies and research organisations with applied research focus. In contrast, the intensity is the lowest between companies in technology markets with low research intensity and research organisations with fundamental research focus (Heinze, 2009). The organisational structures of interorganisational structures differ according to the institutional landscape of the conflict area.

In his analysis of the funding structures, Heinze concentrates on nanotechnological research units on German research related institutions. The industrial landscape provides us several examples of companies having an intense exchange with universities or even a conglomerate of universities. This constellation is called "Clique" (Heinze, 2006, p. 194). Examples are the following: Wacker Siltronic AG together with the University of Munich and the *Max-Planck Institut* for biochemical science in Munich, the Robert Bosch GmbH together with the *Max-Planck Institut für Festkörperphysik* and the *Institut für Neue Materialien* in Saarbrücken. Heinze, who published various paper on the nanotechnological industry as well as nanotechnological science, highlights the fact that still more than fifty percent of the publications made in nanotechnological science are produced by universities (Heinze, 2006). This underlines the central position of universities in terms of knowledge production as Godin & Gingras (2000) highlight, although they take the increasing knowledge production in "government laboratories, industries and think tanks" (p. 273) into account. Heinze found evidence for the fact that the patenting activity of companies increases with their intensifying collaboration with public research institutes. This is an indication for the benefit companies have from their scientific collaborators (Heinze, 2006 as cited in Heinze, 2009).

Indeed, the amount of money spent on nanotechnological research, coming from public institutions totals 153,1 Million Euros, which are 70,4% of the whole funding. The *Bundesministerium für Bildung und Forschung* contributes with 54,1 Million Euros, while the *Bundeswirtschaftsministerium* provides 6 Million Euros, in addition to other research institutions contributing with 93 Million Euros. The numbers mentioned refer to the amount of spending in 2001. Meanwhile, within the sixth

development program (2003–2006) nanotechnological science got institutionalised. The funding increased up to 1,3 Billion Euros. It can be concluded that nanotechnology is weighted as more and more important. An indication for this development is the increase of inventions since the eighties of the last century (Heinze, 2006).

Security in society
Furthermore, the context of security in various facets shall be outlined briefly. The Netherlands' initiative to develop a "National Innovation Agenda for Security" (NIAS) bases on the *Ministry of Security and Justice* and *The Hague Security Delta* (HSD). The main responsibility of the NIAS' draft goes to the HSD, which is the umbrella organisation for still other institutions in the context of security initiatives like the "Twente Safety & Security" (TS&S) and the "Dutch Institute for Technology Safety & Security" (DITSS). It is HSD's aim to make "optimal use of the innovative strength of businesses, government and knowledge institutions" (Elias & Bekkers, 2014, p. 9). Will Franken and Michael Fabri from ISACA Netherlands, a global non-profit association, which is "engaged in the development, adoption and use of [. . .] knowledge and practices for information systems" (Franken & Fabri, 2014, p. 2), underline in their report of 2014 – "Governance of Cybersecurity" – the governments' "significant role [. . .] in ensuring a free and safe cyberspace", while the private sector "has to recognize its leading role in maintaining the reliability and interoperability of the public Internet" (p. 6).

The declared aim of the HSD is to provide security solutions in different sectors like Cybersecurity, Critical Infrastructure, National Security and Urban Security and to achieve economic development using the innovativeness in the addressed fields (Elias & Bekkers, 2014, p. 9).[9] The National Security section deals with national crisis situations, caused by environmental catastrophes and others, while Urban Security implies general security in urban, public areas especially during public events.

The core sections, which are closely related to each other, are Cybersecurity and the Critical Infrastructure (CI). The "The Hague Centre for Strategic Studies" (HCSS) provides a report on cybersecurity research from 2015, which summarises the 23 research projects, funded by the "Netherlands Organisation for Scientific Research" (NWO) and addressing cybersecurity issues. Key areas of research are, among others: "Malware and malicious infrastructures" (Frinking, Gehem & Castellon, 2015, p. 12), aiming at the development of "effective defences against malware threats" (p. 12) and "Cybercrime and the underground economy" (p. 12), trying to identify the motivations and organisational structures of the various participating actors in the underground. Furthermore, the project "Risk Management, Economics and Regulation" (p. 12) develops concepts for risk management strategies as well as concepts which outline "the role government(s) [. . .] in national and international context" (p. 12) regarding cybersecurity. The main beneficiaries of these research projects are governmental actors and the private sector. About half of all projects within the different domains of cybersecurity are connected to the sector of Critical

Infrastructure (Frinking, Gehem & Castellon, 2015), which will be introduced in the following.

The different sectors of the Critical Infrastructure section are divided in Category A and B. While category A implies the national transportation and distribution of electricity, natural gas production, oil supplies, water management and the sector of storage, production and processing of nuclear materials, category B addresses for example the flight and airplane management, the financial sector, the maritime and inland shipping management as well as police mobilisation and others (Castellon & Frinking, 2015). Especially the distribution of electricity and the financial sector are endangered by cyberattacks. Testbeds are platforms, which enable "CI operators and manufacturers [to] test their hardware and software in a protected simulation environment" (Castellon & Frinking, 2015, p. 19) and consequently build the basis for an implementation of their technological developments. Using "testbed[s]" (Castellon & Frinking, 2015, p. 17), "the government and the private sector can learn [. . .] how to improve safety and security, also leading to improved policy making and regulation" (p. 17).

Frinking, Gehem and Castellon (2015) highlight that almost half of the initiated projects are structured interdisciplinary, combining social – and technological- / natural sciences and again half of all projects "involve collaboration between knowledge institutes, the government and the private sector" (p. 22).

The HSD is a national initiative of the Netherlands, having partnerships with the main security clusters in the USA, Canada, Singapore and South Africa and a variety of international partnerships. The HSD shows that Triple Helix structures are not bound to national borders.[10] Triple Helices can be well realised on the international and the supranational level.

Discussion

With the following paragraph I want to illustrate arguments for and against the usefulness of the Triple Helix Model concerning the implementation of Smart Governance. Hence it makes sense to verify in what way the Triple Helix Model, as described above, fits to the requirements suggested in Willke (2007). An ideal implementation of the Triple Helix is meant to let the three spheres interact and exchange roles, with "initiatives arising sideways as well as bottom up and top down" (Etzkowitz, 2005, p. 78). This as a framework, the Triple Helix as such achieves a higher structural intelligence of democracy as the knowledge base increases in correspondence with the inclusion of intermediate actors (Willke, 2007). All of the abovementioned institutional arrangements, the interorganisational networks in the nanotechnological industry and the various projects that were initiated in the context of the HSD, realise an inclusion of intermediate actors due to their hybrid organisational constitution. As a result to this knowledge exchange, we can expect the result to be thought through by different intellectual perspectives – by academics of the field, industrial actors which contribute out of an economic perspective and finally by political or public actors. Public actors of the executive – like

ministries as it is the case at the HSD – can provide specialised knowledge concerning the problems the helix deals with. In the context of the Nuclear Security Summit 2014, the Ministry of Defence for example focuses on innovation during exercises and tries to make possible or even necessary improvements visible (Meines, Dechense & van Vliet, 2015). In general, ministries but also legislative actors can show support with the translation of the generated knowledge into an official policy draft as well, which the parliament is afterwards able to decide about, so that the generated expertise based solution gets implemented and used by society. The need of a parliament's decision is obvious with regard to new regulations concerning cybersecurity in terms of data protection for example.[11] Looking at the introduced example of helix constellations within the nanotechnological industry, the involved companies are immediately able to use the new developments and create marketable products. Their developments are consequently of use for society as products on different markets but not as new regulations that were manifested in a legal context for example.

Looking at the political process, an increasing efficiency might be established, as the result of a Triple Helix cooperation can be an official draft, including concrete advices for politics. Due to its Triple Helix background, various perspectives are already taken into consideration, so that the need for discussions on the side of various interest groups like NGOS, labour unions and others, which participate at the political process, might decrease. This fits to the requirements of the input concerned process, which demands the influence of different, as well as local actors and minimised time spans of control (Willke, 2007).

The HSD, as a research centre with its broad range of collaborations with public and governmental institutions and actors from the private sector, is able to cope with core societal problems besides those related to (nano-) technological industries. While scientific institutes are able to develop technologies, companies know best about possible ways of implementation and utilisation of these technologies in the business context. They are able to improve them and provide them to other companies in terms of protecting their digital, technical infrastructure for example. Public institutions contribute to this as well from another perspective, as can be illustrated in the context of urban security. The aim of improving camera surveillance to prevent crime (HSD, 2015) demands the expertise of public institutions concerning the conditions of usage in the public sphere, while companies and other knowledge producers are again those who provide the applicable surveillance technology. Thus, the interaction between the three parties is necessary due to their exchange of expertise.

The next paragraph addresses the output concerned process as well as the aspect of structural resilience. Triple Helices are not by nature initiated or legitimised by the parliament – neither the interorganisational networks in the nanotechnological industry or the Dutch Security cluster, nor the Triple Helix in its theoretical conception according to Etzkowitz and Leydesdorff. This does not

signify an impossibility to have this legitimisation by the parliament, but an implementation of these legitimising structures would demand a major reorganisation of the political system as a whole, as it is not only about initiating a committee of experts which presents a policy advice, but this committee needs to have the power to make decisions. Institutions like science parks and research centres are long term initiatives which follow long term strategic perspectives. Especially the activities of the HSD in the field of cybersecurity, regarding the development of measures to cope and prevent cybercrime and the corresponding underground economy, as well as measures in the context of the protection of critical infrastructure, imply policy decisions, which will influence companies, privates and institutions in their rights and obligations. This might imply new regulations for companies and public institutions concerning their internal operations as well as control mechanisms. Consequently, they improve the resilience of democracy but they do not have decision-making competence in a democratic sense at their disposal. One can conclude that Triple Helices are not able to function as the demanded "forms of accounting" (Willke, 2007, p. 171)[12] according to their original constitution suggested by Etzkowitz and Leydesdorff in their above-cited publications.

Another counterargument which questions the usefulness of the Triple Helix for the implementation of Smart Governance is the Triple Helix' tends to commercialise research. This is well represented by the nanotechnological industry, which profits from interactions with scientific institutions in terms of a higher output (Heinze, 2006). As the collaboration between the industry and the academic sphere can "be identified as a factor of economic growth [and] a source of new products and companies on the one hand, and of flows of knowledge to existing firms, on the other" (Etzkowitz & Leydesdorff, 1998, p. 2), economic interests influence the research that will be done as well as the framework in which it will be done. Elias and Bekkers (2014) state as well that the "Dutch top sector policy [which the HSD addresses] is a structure built around economic sectors" (p. 39). As illustrated above, the different types of Triple Helix organisations maintain this impression. Furthermore, referring on Elias and Bekkers (2014) one can add:

> [I]nvestments in innovation only make sense when there is a possibility of return on investment. On the demand side, this means solutions that remain effective in the future. On the supply side, there needs to be a reasonable chance of the investments turning into products and services that generate sales and return within a foreseeable timeline (p. 10).

Hence, doubts can be raised that these circumstances do not align with the idea of Smart Governance. With regard to specific issues like nanotechnologies in which companies are included as actors to put knowledge into use, the economic point of view dominates the work of the Triple Helix so that non-economic issues can hardly be addressed, which indicates limitations of the Triple Helix to be part of a general governance model.

Looking at the last requirement for the increase of democratic intelligence, the meta-rules, the Triple Helix does not seem to be of much relevance in this concern. According to my point of view, they are influenced exclusively by the legislative.

Evaluation

Thinking about the question whether the Triple Helix Model is a useful method to maintain the implementation of Smart Governance, we cannot find a clear cut answer. While the Triple Helix Model includes a variety of different societal actors into the political decision making process, so that the structures of democracy are made more intelligent, it faces the danger of being exclusively implemented in economy related contexts, as it is one of the aims to generate economic development with these hybrid organisational structures. With regard to the intelligence of the processes, the input concerned process is endangered in its intelligence by an economic shift due to Triple Helix influence, but benefits in terms of efficiency of the political process. In contrast, an increase in intelligence of the output-concerned process is only possible when being consciously initiated and legitimised by the parliament. Hence, the Triple Helix Model contributes according to its traditional conception only in a limited sense to the implementation of Smart Governance.

The commercialisation of research is a danger for science in general. Faculties in entrepreneurial universities will look at the "commercial as well as [the] intellectual potential" (Etzkowitz, 2008, p. 28) of research. Marketability seems to become more and more a condition for its legitimacy of research. Researchers, who are involved in projects of the Netherlands organisation for Scientific Research that cope with cybersecurity, argue as well against the participation of the private sector "as it would lead the results of the research too much to the needs of the private partner rather than to the broader research agenda" (Frinking, Gehem & Castellon, 2015, p. 23).

As Smart Governance is a general concept, which tries to offer new ways of governing society as a whole, the Triple Helix concept would need to be able to address all facets of societal conflicts. The domain of security in society with the above-mentioned fields of Cybersecurity and Critical Infrastructure, as well as Urban- and National Security includes areas of knowledge where social scientists like sociologists, political scientists and economists are of great relevance. Frinking, Gehem and Castellon (2015) mention in the HCSS report on cybersecurity research further problems which need to be addressed besides the technical aspects: Behavioural aspects answering on "How can awareness of cybersecurity be raised?", the organisational domain which asks for the right governance model that is most effective to the various subsystems of cyberspace and finally legal problems dealing with the constitution of cybercrime and existing bodies of international law that are applicable to the cyberspace (p. 19). The interaction between science, business and the

public/governmental partner shall be shortly illustrated. While sociologists research on reasons for urban criminality and measure how to decrease criminality rates, companies and researchers from a technological field provide the technology to cope with the current situation and the responsible ministry for example contributes with its practical knowledge concerning the implementation as illustrated before. In the meantime, Frinking, Gehem and Castellon (2015) demand to consider other sciences like the communication sciences, philosophy, criminology and others as well "to address issues more comprehensively" (p. 21). There are other subjects like interdependencies between the climate change and the societal development, the refugee crisis and integration, demographic subjects, the minimum wage and many others which would need to be addressed.[13] To cope with these, one would need to have a more abstract idea of the Triple Helix, concentrating on its principles – the exchange of knowledge between different fields of expertise – rather than their organisational structures – the interaction between economic actors, producers of knowledge and public institutions. Instead of companies, the inclusion of labour unions or NGOs might be an effective as well as an efficient alternative in the latter case. Willke (2007) mentions NGOs as important institutions in terms of self-governance experience and their combination of expertise and authority. By involving other actors than companies, more challenges can be addressed.[14]

Reflection

Finally, thinking about the requirements of Smart Governance, the Triple Helix Model can be evaluated as an optional institutional framework for the realisation of the core Smart Governance idea of increasing democratic intelligence – firstly by making the democratic subcomponents, the structures, and secondly the democratic processes more intelligent – as this it is already widespread in different economic sectors. Although the HSD is an example for a Triple Helix where social sciences are included, a more abstract implementation of helix structures is needed so that a broader range of socio-scientific questions can be asked and a broader range of problems can be addressed as illustrated in the evaluation. In fact it does not last to have models which define relations between institutions. Society needs to be aware of the fact that an exchange of expertise within new institutional structures is a useful and needed measure to cope with ignorance and uncertainty, and hence needs to show the willingness to realise new forms of governance. The intentions of different actors to come together will always differ. It is part of the Triple Helix' idea that each participating party benefits of the others according to their expertise. The primary intention is hence not necessarily to challenge societal problems or to develop new technologies that suit best societal needs, but to achieve solutions in a way that they suit the interests of the included actors. This might not be the best perspective based on which we face future challenges, but at least the framework for new forms of governance which prove their ability to be successful.

Competing Interests

The author declares that they have no competing interests.

Notes

[1] Willke (2002) outlines the embeddedness of "knowledge" within a scheme of three steps: data, information, knowledge. While data, defined as "documented differences" (Willke, 2002, p. 15), is based on "observations" (p. 15) – everything you are able to observe is data – information can be described as "relevant differences" (p. 16) – identified by an observing system – which make a difference. Hence, information is selected data which is of relevance in a certain context. Knowledge is in contrast the integration of information into a context of experience.

[2] Knowledge work is briefly defined: "work based on specific and specialized knowledge that is acquired in long years of organized professional training and experience" (Willke, 2007, p. 36; for more details see Willke, 1998, p. 19ff.).

[3] Willke (1998) illustrates that one can talk of a knowledge society, if the structures and processes of the reproduction of society are in their core aspects influenced by knowledge dependent operations, so that information processing, and the integration of experts become key factors of the before-mentioned reproduction of society (Willke, 1998; see as well Willke, 2007, p. 109). The knowledge society faces "a supremacy of cognitive decision-making, [hence,] the belief that decisions about future states of societal affairs must and can be based on knowledge and cognitive considerations" (Willke, 2007, p. 35f.). The position of Helmut Willke can be assigned to the tradition of Daniel Bell, who calls the post-industrial society a knowledge society (Bell, 1973 as cited in Stehr, 1994, p. 6; see as well Willke, 1998, p. 356).

[4] The basic idea of democracy, which Willke refers to, is the concept of a representative democracy. He underlines the important role of experts within the democratic system, talking of a "legitimacy based on expertise" (Willke, 2007, p. 47, as cited in Willke 2013, p. 124). Willke (2013) demands the implementation of autonomous legitimated institutions, where experts cope with specific issues. The ideas of Willke need to be distinguished from concepts like "Strong Democracy", published in 2003 and written by Benjamin R. Barber, who suggests a variety of participatory structures to strengthen the civil society's possibilities to actively participate in democratic decision-making processes.

[5] Contextual Guidance is a concept from a systems theory perspective, which describes the fact that functionally differentiated systems in society need to be managed by coordinating their context, while the systems themselves keep their autonomy. It is all about coping with negative externalities of the systems' operations by changing the contextual conditions of the system's environment (Willke, 2013). This means, managing the legal conditions based on which these instances like NGOs and other organisations or institutionalised communities operate.

6 "The obvious counter-argument is, of course, that the influx of organizations and organized interests diminishes the influence of the individual voter and of the voter as individual. [. . .] It indicates [. . .] a fundamental power shift within modern societies from individuals to organizations, reflecting the mode of these societies as 'societies of organizations'" (Willke, 2007, p. 170).

7 The scientific community differentiates between accountability as "a process of control" (Lupia, 2006, p. 35) and accountability as "a type of outcome" (p. 35). Willke refers to the latter, which implies the ability of a civil servant to act according to the preferences of a minister without being actively controlled (Lupia, 2006). Willke refers as well on Keohane's distinction between internal- and external accountability (Keohane, 2003 as cited in Willke, 2007). Internal accountability describes the fact that the principal and the agent are institutionally linked as the principal provides legitimacy or financial resources to the agent. In contrast, external accountability refers to the people which are affected by the accountable actors (Keohane, 2003).

8 As these expert institutions have decision-making competences they need to be distinguished from those, which are only included into the process of "policy making" (Willke, 2007, p. 167).

9 Forensics and Security Talent are two further sections which are excluded, as they are of less relevance with regard to the concern of this paper.

10 The question whether cybersecurity should me managed on an European, international or global scale is not the question of this paper. Thus, it can/will not be answered at this point.

11 Regulations of the European Union (EU) need to receive attention here when talking of European countries. A more detailed differentiation of regulations which would need to be passed by the parliament and which would not cannot be done within this paper.

12 Furthermore, the question concerning possible levels of governance that are able to legitimise Triple Helices needs to be raised. In fact, the reach of the generated solution concepts, developed by the Triple Helix, is bound to the borders of the legitimising parliament. Are as a consequence only those able to be included into the Triple Helix structure, which are part of the electorate of the legitimising institution? This question cannot be answered in this paper but it might be a relevant aspect for future work on this subject.

13 I mention these subjects to highlight current societal conflicts as well as the horizon and the challenges of new governance structures like Smart Governance tries to provide. If the Triple Helix is an instrument that supports the implementation of Smart Governance it would need to cope with these subjects, too.

14 The funding of Helix constellations, which do not include companies, could be provided by foundations as Etzkowitz (2008) suggested. All HSD activities of the different focus areas are financed by the participating/ engaged partners within these areas themselves (Elias & Bekkers, 2014, p. 11).

References

Barber, B R 2003 *Strong Democracy*. Berkeley [u.a.], CA: University of California Press.

Beck, U 2003 Entgrenzung der Politik: Zum Verhältnis von Politischer Steuerung und Technisch- Ökonomischem Wandel in der Risikogesellschaft. In *Risikogesellschaft. Auf dem Weg in eine andere Moderne*. Frankfurt am Main, Germany: Suhrkamp Verlag, pp. 300–374.

Castellon, N and **Frinking, E** 2015 *Securing Critical Infrastructures in the Netherlands. Towards a National Testbed.* Den Haag, The Netherlands: The Hague Security Delta.

Elias, P and **Bekkers, F** 2014 *National Innovation Agenda for Security 2015*. Den Haag, The Netherlands: The Hague Security Delta.

Etzkowitz, H 2005 Meta-Innovation: The Optimum Role of the State in the Triple Helix. In: Lengwiler, M and Simon, D (Eds.) *New Governance Arrangements in Science Policy, Discussion papers // Wissenschaftszentrum Berlin für Sozialforschung (WZB), Bei der Präsidentin, Projektgruppe Wissenschaftspolitik, No. P 2005-101*, pp. 65–80. Retrieved from: http://hdl.handle.net/ 10419/50767.

Etzkowitz, H 2008 *The Triple Helix. University-Industry-Government in Action*. New York, NY: Routledge Taylor & Francis Group. DOI: http://dx.doi.org/ 10.4324/9780203929605

Etzkowitz, H and **Leydesdorff, L** 1998 The Endless Transition: A "Triple Helix" of University-Industry-Government Relations. *Minerva, 36*(8): 203–208.

Franken, W and **Fabri, M** 2014 *Governance of Cybersecurity*. Naarden, The Netherlands: ISACA Netherlands.

Frinking, E, Gehem, M and **Castellon, N** 2015 *NWO Funded Cybersecurity Research: A Bird's Eye View of the Current Research Portfolio*. Den Haag, The Netherlands: The Hague Centre for Strategic Studies.

Godin, B and **Gingras, Y** 2000 The Place of Universities in the System of Knowledge Production. *Research Policy, 29*(2): 273–278. DOI: http://dx.doi.org/10.1016/ S0048-7333(99)00065-7

Heinze, T 2006 *Die Kopplung von Wissenschaft und Wirtschaft: Das Beispiel der Nanotechnologie*. Frankfurt am Main, Germany: Campus Verlag.

Heinze, T 2009 Institutional Interfaces of the Science System and the Economic System. In: Bechmann, G and Stehr, N (Eds.) *The Social Integration of Science : Institutional and Epistemological Aspects of the Transformation of Knowledge in Modern Society.* Berlin, Germany: Edition Sigma, pp. 67–84. DOI: http://dx.doi. org/10.5771/9783845271125-67

Lengwiler, M and **Simon, D** 2005 Shifting Boundaries between Science and Politics – Recent Work on New Governance Arrangements in Science Policy. In: *New Governance Arrangements in Science Policy, Discussion papers // Wissenschaftszentrum Berlin für Sozialforschung (WZB), Bei der Präsidentin, Projektgruppe Wissenschaftspolitik, No. P 2005-101*, pp. 5–9. Retrieved from: http://hdl.handle.net/10419/50767.

Lindblom, C E 1965 *The Intelligence of Democracy.* New York [u.a.], NY: Free Press. PMid: 4956282.

Luna, M and **Velasco, J L** 2010 Knowledge Networks: Integration Mechanisms and Performance Assessment. In: Viale, R and Etzkowitz, H (Eds.) *The Capitalization of Knowledge: a Triple Helix of University-Industry-Government.* Cheltenham, England: Elgar Publishing, pp. 312–334.

Lupia, A 2006 Delegation and Its Perils. In: *Delegation and Accountability in Parliamentary Democracies.* Oxford [u.a.], England: Oxford Univ. Press, S. 33–54.

Meines, M, Dechesne, M and **van Vliet, C** 2015 *Innovation During the Nuclear Security Summit 2014. Lesonns Learned from the Department of Innovation During the NSS in The Hague.* Den Haag, The Netherlands: The Hague Security Delta.

Stehr, N 1994 *Knowledge Societies.* London [u.a.], England: Sage. PMCid: PMC1567189.

The Hague Security Delta (HSD) 2015 The Hague Security Delta. Retrieved from: https://www.thehaguesecuritydelta.com/urban-security [Last Access: January 11th, 2016].

Willke, H 1998 *Systemisches Wissensmanagement.* Stuttgart, Germany: Lucius und Lucius.

Willke, H 2002 *Dystopia.* Frankfurt am Main, Germany: Suhrkamp. PMCid: PMC120044.

Willke, H 2007 *Smart Governance: Governing the Global Knowledge Society.* Frankfurt am Main, Germany: Campus.

Willke, H 2013 *Regieren.* Wiesbaden, Germany: VS Verlag für Sozialwissenschaften.

Willke, H 2014 *Demokratie in Zeiten der Konfusion.* Berlin, Germany: Suhrkamp.