

Methodology Article

Political Engineering in the Anthropocene Epoch

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Abstract: The term “Political Engineering” has appeared more than 100 years ago. Present development goes ahead according to systemic principles, and political systems engineering can be considered as the design, implementation and validation of systems, composed of integrated subsystem representing parts or functions of complex political reality. This course of development should be oriented towards reality of the 21st century, when Earth has been entered the anthropocene epoch, and the humanity the E-civilization era. Present Information Society needs participatory, networked and AI-assisted political structure not composed of elected rulers and electing subjects but rather of hired managers and principally deciding associates. Two hypothetical projects that meet these demands, one related to local referendum and the other to the UN Security Council, are discussed in the article.

Keywords: Political Engineering, Political Modeling, Referendum, UN Security Council

1. Introduction

Probably first use of the term “political engineering” took place at the Harvard University in the year 1909, in a lecture delivered by Professor James MacKaye. And then the lecture has been published as a book titled “The Happiness of Nations: A Beginning in Political Engineering” [1]. MacKaye defines political engineering in the following way: “As applied sciences are by common consent termed engineering sciences, and the subject to be discussed is an applied, or at any rate, an applicable science, I propose to call it political engineering, which may be defined as the science which treats of the adaptation of the means of society to its end”.

Then the term has been used to refer to designing “political institutions”. The lecture “Political Engineering: The Design of Institutions” delivered at the New York University in 2005 by Professor Steven J. Brams [2] can be an example. Brams discusses institutions “that meet certain “engineering” specifications” - voting procedures and election systems, as well as algorithms and specific procedures used in disputes and negotiations

However, since the years 1950s, a systemic approach, based on general systems theory originated by biologist Ludvig Bertalanffy and cybernetician Ross Ashby, has appeared in the whole area of science and engineering. In the

political domain an initiating work it was the University of Chicago Professor David Easton’s book “The Political System: An Inquiry into the State of Political Science” [3]. The rise of the political system engineering field has been a natural consequence of the systemic approach spreading - institutions were beginning to be designed as parts of systems - and systemic methods and tools having their applications in other fields turn out to be useful for political systems as well. Significant from this systemic point of view is the large and complex field of business – e-business in the 21st century. The aim of business systems engineering “to deliver maximum benefits to stakeholders” is close to political aims. In the European FP6 program there was a Strategic Objective combining both fields: “Networked businesses and governments”.

Thus, political systems engineering is the design, implementation and validation of systems, composed of integrated subsystem representing parts or functions of complex political reality, satisfying “political customers’ and stakeholders’ needs” – in the main stream of political engineering democratic customers and stakeholders.

2. Methods and Aims

The key postulation about methods and aims is that they

should be oriented towards reality of the 21st century. Earth has been entered the anthropocene epoch, and the humanity the E-civilization era. Anthropocene is a period with significant human impact on the Earth's geology and ecosystem, an impact that is strongly dependent on political events and decisions. E-civilization is characterized by its participant's skills to manufacture e-tools and use them in the cyberspace, similarly as skills to manufacture stone tools and use them in the real space characterized the Neolithic civilization; cyberspace is the most complex artifact created by humanity so far. In the E-civilization, information in electronic form can be accessible at the same time in different places, and can be multiplied without limits. Moreover, before the E-civilization, information recorded on clay tablets or on paper was not alive; one has to read it and set in motion some process of its utilization. Information in electronic form potentially is "organic", as information included in genes, meaning that it can immediately activate and control processes - in both a material and informational nature - in which it is utilized. New forms of society organization in the E-civilization are "Virtual Communities" (VCs) – non-place communities based on "computer-mediated communication". The name was coined by Howard Rheingold in his book "The Virtual Community" [4]. It seems to be necessary to take into account in considerations on political systems development also presently arising concepts of "global community" and "global government" that obviously can come to being on the base of the VCs equipped with their essential e-toolkits necessary for functioning in the cyberspace.

Politically oriented e-tools have arisen and develop for e-government and e-democracy methods. In the e-government bracket there are mainly government portals and gates delivering information and online services to citizens, businesses and organizations. E-democracy kit includes methods and tools both specific for political activity, and finding their application in other areas – in business first of all. A specific one is the method of Citizen Juries, developed in the 1970s by Professor Peter. C. Dienel of the Wuppertal University as *Planungszellen* (present status one can find at <https://jefferson-center.org/citizens-jury/>), very well known and having hundreds successful applications in different countries. A case of the method of no-political origin is computer-assisted group work technology, developed for business needs, initially enabling only the substitution of face-to-face meetings, and then augmented about collaborative decision making with making the most of group intelligence in order to increase meetings' productivity. Other case is the online dispute resolution, enabling resolution of contentious issues in an alternative way - outside of the official process - with the use of online methods of negotiation and mediation; today it is possible to run multi-party negotiations/mediations in a secure manner, and to work on a number of cases simultaneously. E-government and e-democracy tools are offered by many sources of different provenance. Thus, one can find them as the United Nations recommendations [5], as European Union

projects' themes [6], as commercial companies' offers [7], and of course at numerous social media websites (e.g. "50 Tools for Online Public Engagement" [8]).

The prospective aim of political systems engineering in the beginning of the 21st century is to build a democratic system with global horizon, based on VCs having political competences. Churchill's saying "democracy is a bad system but nobody have invented anything better yet", related to parliamentary democracy of territorially organized communities in pre-cyberspace times, isn't justified now. Information Society in E-civilization era needs participatory, networked and artificial-intelligence-assisted structure not composed of elected rulers and electing subjects but rather of hired managers and principally deciding associates. Political ballots, of the character of referenda rather than elections, will be almost everyday routine. Recurrent ballots subject it could be collective counter-signature for managers' crucial decisions (for the appointment of a manager his backing by a certain percent of VC's members, in the form of giving him such signatures in advance, will be necessary; then each individual backing could be withdrawn for an unwanted decision which needs counter-signature – more in the book "Cyberdemocracy" [9]). Representatives will be elected for carrying out defined missions only, not for making every possible political decision in a certain time period.

The assistance of artificial intelligence tools is practiced already now. But, in the parliamentary "partycracy" conditions, this assistance serves political marketing first of all. Individual electors' inclinations and preferences are tracked and the best fitting individualized persuasion means – with use of obtrusive rhetoric and post-truth - are used for obtaining desirable votes in elections. This brings polarization of the society, formation of like-minded "tribes" in which people grow more extreme and resistant to change. Desirable assistance is to facilitate collective problem solving in conditions of permanent coexistence of virtual communities of different orientation. A hypothetical intelligent application *Advocatus Diaboli* can be an example of such assistance fighting against post-truth. As a person in the role of "Devil's Advocate" has to argue against a candidate in canonization process, so the application has to search out and to present evidences against statements given as truth.

The core procedure in democratic political systems is voting. At the turn of the century electronic voting methods - with use of electronic devices instead of paper voting cards - have developed. At present more than one billion of people cast their political ballots electronically; India, Brazil, and the U.S.A. are the biggest electronic voting users. However, majority of these voters use electronic voting machines installed in voting stations. Internet voting that enables to cast votes by means of individual devices from not limited places any time in a given period – so just in accordance with the VCs needs – so far is less widespread. And yet several hundred thousand of people cast their votes in political ballots in this way. Estonia was the first country in the world to hold an election allowing voters nationwide to cast ballots

via the Internet – after local referendum and local elections in 2005 [10] in the 2007 national parliamentary election [11].

In the last years a new trend in the internet voting development has appeared, namely the use of block chain technology - proposed for “Bitcoin” digital currency in 2008 by Satoshi Nakamoto [12]. By means of this technology votes are casted as transactions in peer-to-peer network of voting participants - thus being members of their VC - with use of tokens being in their disposal. Blockchain voting has been tested in an informal plebiscite of Colombia’s Diaspora, related to peace agreements reached by the Colombian government and the Farc guerrillas, conducted in 2016 by a not-for-profit organization Democracy Earth. The plebiscite wasn’t a traditional yes/no voting because each voter was given 100 token-votes for allocating them freely across the seven “aspects” of the peace agreements. Blockchain voting is still in its early development stage, but holds promises even on blockchain-voting-oriented “liquid democracy system” recommended just by the Democracy Earth [13].

3. Political Modeling

In general, political modeling relates to use of formal models in political science. Thus formalisms of game theory find their applications in voting strategies determination, bargaining and coalition building. Other example it can be the use of Monte Carlo methods for risk analysis and worst-case and best-case estimation.

At systemic and engineering approach the MDE (Model-driven Engineering) method is particularly helpful. MDE consists in use of models as “primary engineering artifacts” in systems development. For the computer-based e-tools MDE is a method of development of appropriate software – such view is presented e.g. in an Elsevier publication [14]. So, modeling languages designed for this aim have developed. Very popular one is the Unified Modeling Language (UML) defined by ISO/IEC standard [15] that “offers a standard way to write a system’s blueprints, including conceptual things such as business processes and system functions, as well as concrete things such as programming language statements, database schemas, and reusable software components”. Promising for political systems modeling seems to be a family of modeling languages named IDEF (Integration DEFinition). IDEF developed under funding from the U.S. Air Force as a tool for building systems of “integrated computer-aided manufacturing” but turned out to be helpful for computer-aided business engineering, enterprises modeling particularly. The most-widely applied component of the IDEF family is IDEF0, a language for function modeling, defined by IEEE standard [16] that “may be used to model a wide variety of systems, composed of people, machines, materials, computers, and information of all varieties and structured by the relationships among them, both automated and non-automated”.

The reality of modeled entity – enterprise, business or political creation – is presented by a set of particular models

representing particular aspects – or views – of this reality. Particular models can be expressed by means of different formalisms. Moreover, in the modeling process, initial models are transformed into derived models and such transformation can be vertical one, between different abstraction levels, and horizontal when e.g. only formalisms or languages are different. And at last particular models have to be integrated. Both transformation and integration needs particular models that are consistent i.e. their application to a given subject can’t lead up to contradictory results – it means results, which can be expressed by such pair of propositions, that one of them is the negation of the other. There are practically proven ways to carry out above procedures and to achieve consistent, working models of business-like entities (an example in the article [17]). So, the way to move these methods and tools to the political systems domain is open. Development of dedicated modeling language for political systems can turn out to be helpful.

Application of political systems modeling would be necessary for creation of two e-tools for political systems engineering discussed in hypothetical projects presented in the next item.

4. Hypothetical Projects

4.1. Local Project – Improvement of Local Referenda Mechanism

There are three most popular types of local referenda: obligatory (in Poland related to the matter of local taxes - self-taxation – only), recalling (of holder of public office), and facultative with the subject of “every other matter important” for local community; the last two types should result from the citizens’ initiative. Facultative referenda – anyway in Poland – are the less advanced and practiced ones. There are many ambiguities in the law (related among others to limitations of the formulation “every other matter” that leads to controversies with competences of local administration), and effects of the NIMBY syndrome (NIMBY = Not In My Back Yard) i.e. interest of very small groups as a catalyst of activities. Moreover, low turnout is a weak point of local referenda.

The postulated improvements are considered on the assumption that the referenda will be electronic ones, conducted via the Internet (what doesn’t take place at present, anyway in Poland).

First postulated innovation relates particularly to facultative referenda. Almost free subject of referendum, so with possible multiple connections to different threads, with different aspects, makes difficult for a voter to form his opinion and to take decision how to vote. The innovation consists in introduction of smaller forums, and dedicated rather to particular aspects, on which the debate will develop and mattering decisions will be taken. For obtaining these aim different formally organized sub-communities – organizations, societies, unions - operating within a given local community, are to play roles of dedicated forums; this

forums will be presumably electronic ones, so the sub-communities can be considered as VCs. Iron rule that individual person is entitled to only one vote has to be observed, but all the votes will be counted once for the overall number, and separately for each sub-community. And problem to solve is how casted votes of individual persons and sub-communities should be aggregated to yield final result of the referendum. In Switzerland, in the case of vote a citizens' initiative as well as in the case of an obligatory referendum, the principle of double majority is in force – i.e. all the votes cast are counted twice, once for the overall number, and then for each separate canton. The proposal passes if a majority of those who voted, and a majority of the cantons is in favor. Double counting is sufficient for simple two-level structure of strictly separated cantons and their federation. In the case of VCs cases of membership of the same person in more than one VC can appear. Thus, more sophisticated aggregation of votes in some dedicated multiple-counting system should be introduced. It's possible to design different systems for choice, just like in the case of electoral systems - e.g. D'Hondt and Sainte-Laguë.

The importance of local referenda improvement results also from the anthropocene epoch challenges. E.g. necessity of air pollution limitation and renewable energy use require hard decisions afflicted all members of the society and the best solution will be for them to make decisions with participation of all interested, via referenda.

It's necessary to assume that e-voting will be conducted by such services' professional providers - internet-companies - and the second innovation is focused on rising of e-voting security, so on increasing voting result credibility. Security can be raised by introducing redundancy to the system. A set of parallel board computers is applied in avionics systems to ensure flight security. If there is a difference between computing results of usually four computers (quadruple redundancy), a proper action is undertaken. Similarly, the voting procedure can engage more than one service provider in the system, and in the case of intolerable differences between parallel systems' outputs the ballot could be repeated.

Blockchain voting development produces a chance of other way to voting security rising.

4.2. Global Project - Admission of World Community into the UN Security Council as Its Permanent E-Member

The idea is: to admit legally into the Security Council (SC) a "Structure" of non-governmental organizations (NGOs), acting as VCs, in such a way that a vote of the new SC's permanent member is formed by specific aggregation of votes of these NGO/VCs' members. The right to veto for this new member rather oughtn't to be granted – anyway in the initial period of its membership.

The enrolment of interested NGO/VCs at the Structure will be conducted similarly as the enrolment of non-permanent members at the SC – via submitting applications by them. In this exact case each application will be accepted if a given NGO/VC meets established criteria. The criteria should be of

political and technical character. Political criteria ought to embrace first of all the demand of conformity of activities of a given NGO/VC to the Universal Declaration of Human Rights / International Bill of Human Rights. The NGO/VC's ability to carry out reliable e-voting should be a key technical criterion-demand.

Two political systems engineering problems to solve, already presented for the local referendum mechanism, should be solved here in the same way. So, multiple-counting system for votes aggregation, and redundancy by engaging more than one service provider in voting procedure – or blockchain voting use – have to be applied. The problem of sharing of responsibilities and costs of the system – both of bringing the system into being and its exploitation – between UN and participating NGO/VCs, will need consideration.

The structure of NGO/VCs won't have any representative to take part in the SC meetings. But in principle, according to its Rules of Procedure (Rule 48), the SC shall meet in public, "rapporteurs" for specified questions can be appointed, and "proposed resolutions, amendments and substantive motions" shall normally be placed in writing. Of course, these rapports and written documents in electronic form should be accessible for members of the Structure. Moreover, affairs threatening international peace and security that are key subjects of interest and work of the SC are also leading subject of reports and comments in public media. And let's spot that the anthropocene epoch challenges can appear in this field also – peace and security can be threaten not only by armed conflicts but by ecological dangers triggered off intentionally what can be a subject of interest of the SC as well. So, one can be convinced that members of the Structure will be well informed, from different sources, about a subject of voting at the SC forum. Taking into account that the Structure offers its members excellent possibility of e-debate, one can surely expect their votes based on knowledge of facts and possible after-effects.

Admission of a new, collective member into the CS will essentially widen its base of judgment what contributes to taking better decisions, less dependent on particular interests. And it can be obtained without fundamental changes in organization and rules of procedure of the existing SC, only by connecting with it some additional mechanism created outside.

5. Conclusion

Political engineering serves self-organization of humanity. Self-organization process in cybernetic depiction (origins in an Ashby's article [18]) begins with positive feedbacks that amplify initial changes and increase deviations, what leads to accelerated development and new configurations arising. Then, in the next phase, negative feedbacks find their expression what leads to stabilization. In complex processes – and humanity self-organization is a complex process indeed – aftermath and interplay of positive and negative feedback cycles can appear. E-civilization with its global cyberspace brings promise of the negative feedbacks cycle coming, and

political engineering of the 21st century has a chance to build proper system supporting sustainable development. At present, two new e-tools for political systems engineering can be postulated. A system - in different variants - of multi-counting of votes for obtaining final results of a ballot is one of them. The system should make possible aggregating of votes of VCs and individual persons belonging to more than one of these VC. The other e-tool it is based on redundancy voting system with parallel participation of several providers of this internet service, and/or on blockchain voting application.

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