

## Productivity and Democracy in Terms of Theory of Control –Systems Approach

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### Abstract

There are many ideas to explain why democratic societies are more economically and politically stable and more competitive than other forms of government. It was found in the article, that exist dependency between physiological factors of motivation of workforce for increase productivity and democracy (elections, freedom of speech, meetings, etc.). Democracy serves as link between motivation of workforce on level of production and access of workforce to production, distribution and consumption taxes on the level of state. This type of link represents direct dependency and may be considered as positive feedback in terms of the theory of control.

**Key words: democracy, productivity, motivation, systems engineering, systems theory, theory of control**

It was reported in 'Wired' (Friday, 2018) in section of 'Psychology' that experiment in New Zealand showed increase productivity of workforce of 20-30% when shortening the work week from five to four days. This result displays that human behavior reacts positively on any attempt of management to create favorable conditions for workforce. The same article refers to the Ford experiment in 1914 to increase productivity on his factory. Ford established for this purpose fixed payment of hourly rate, limited work week to 40 hours and participation workers in profit of the company. All together it produced expected result in increased productivity. The Hawthorne

experiment, which happened 80 years ago in company Western Electric, lasted from 1924 to 1932 and described in many publications, between them by R. Gillespie (Gillespie, 1993) also produced the same result. For each change of lighting conditions at work on the factory (either an increase or decrease, but announced that change of lighting is intended to improve work conditions) workers reacted with increased productivity. It means that workforce behaves with increased productivity from any positive signals from management in their favor (free time, working conditions or real predictable money reward for results). We refer to the productivity of workforce, based on

experiments mentioned above, as production of goods and services which output could be measured by units of time or quantity of products.

Generalizing, we can determine three major sources of motivation to increase or maintain productivity: financial reward (Ford manufacture), free time (Ford manufacture, New Zealand experiment), improving working conditions (Ford manufacture, Hawthorne experiment). We may consider that those sources of motivation represent psychological factors. Management of the companies received tool to control the productivity on level of manufacturing (production). The results of experiments indicate that motivation to work productively is directly proportional stimulus, which was created by management of companies and scientists, performing experiments.

However, the motivation productivity of engineering and scientific workforce may be different from motivation of workforce on manufactures which was the subject of experiments on production level and could be stipulated by other psychological factors.

To formalize results of those experiments we can apply approach and terminology the theory of control. Because subject of this work more related to complex living, human systems we

will refer to the book of John P. van Gigch (Applied General System Theory, 1978). Psychological factors found during experiments (financial reward for work, working conditions, free time) could be considered, in terms of the theory of control, as input signal, the productivity - output signal and perception workforce (human mind) of input signals could be considered as a converter (black box) from input signal to output. The increase productivity as output signal from input physiological factors described in theory of control as positive feedback. It originates from definition of positive feedback, where increase of input signal generates increase of output signal received in experiments. However, the question arises - are factors found in experiment only affect productivity on level of production system (management company, workforce, productivity) or it is the part of any other system.

The methodology of systems engineering described in the book "A Methodology for Systems Engineering" (Hall,1974) allows us to find it. It requires to analyze all material and informational flows: inputs and output to and from production level which may affect its productivity and find if this system exist.

The output of the production system, along with productivity, goods and services creates

payroll, which is taxable for workforce, and profit for companies which are mainly taxable, and reported to government. Taxes from both sides are accumulated in budget of state, along with other sources. The budget is used to finance security of the state, safety of citizens and all types of social infrastructure (like education, healthcare, pensions, etc.).

The workforce (in experiment and reality) is represented mainly by citizens of the state. Let take in consideration any material and information flows as input to the workforce from state level. Flows of money represents material flow assigned and directed by government from budget to all citizens of country, including workforce. Information flow is represented by decisions of governing bodies about the regulation of budget in form of the law and distribution and consumption of taxes. The law also regulates the relationship between workforce and management on production level.

We observe similarities found above in psychological factors of motivation productivity at level of production and level of state. Company funds of reward to increase productivity are similar to tax budget funds of state distributed for workforce and their families, length of work is stipulated by law regulations, the same as work conditions and

relationships between workforce and management. Consequently, it may affect productivity of workforce as psychological, motivating factors. Those input and output make a valid case to be included in the model of system where the state level also may affect workforce by forming motivation to work productively.

Along with similarities of motivation on production and state levels between input and output in the system there is a difference. The difference appeared in a way how input and output is formed(linked). Company funds and work conditions are formed and applied to workforce by directives of management on production level. But on the level of state there are two ways to form link between input and output to workforce. One of them autocratic, which is quite similar by issuing management directives to control production, another is democratic.

Democracy came a long way from ancient times to modern as a tool to govern society. It includes freedoms like: free elections of governing bodies, free speech, meetings, freedom of media, freedom of religious beliefs, etc. Democratic society is characterized by the power of elected officials. They represent all citizens of a country, all groups of population, including workforce and their families. They

create budget and maintains mechanism to control its execution, issues the laws, governing the state. Creates and maintains legislative, justice system which performs the execution of law. In this case democratic freedoms on a level of state create mechanism of forming motivation factors which are similar factors of motivation to control productivity on production level. The difference is that democratic freedoms on level on state produce the same psychological, motivation effect, as the directives of management of company. More important that main component of this process - workforce itself participate in creation of rules forming motivation via democratic freedoms.

We can formulate this observation that productivity is directly proportional access of workforce to production, distribution and consumption taxes in form of state budget. Input from state, as motivation factor forms productivity and correlated economic grows, the same as input of production system, in experiments.

Dependency productivity and access workforce to taxes is mutual, productivity affect value taxes - access to production, distribution and consumption taxes affect grows of productivity, and democratic freedoms link these entities.

As it was found before this type of dependency of output of system from input factors, and flow information back to control part of system (in our case workforce) creates positive feedback when output signal is increased on each increase of input signal.

It looks like democracy does not exist as a standing alone entity, to serve abstract human quest for freedom but also serves extremely important needs of democratic societies to survive economically and prosper in a competitive world. It makes a democracy functional and very practical element of the development human societies on current stage of history. Because of this second nature of democracy (economical) - name democratic freedoms as democratic principles or principals of democracy, in the sense of forming positive feedback as the way to control productivity.

In publications 'Worker democracy and worker productivity' (Levin, 2006), it was shown that there exists dependency between some kind of democracy and motivation for increased productivity in the workplace.

The access workforce to taxes, mainly realized by the legislative and legal system as informational and executional mechanism of feedback. Legislative and judicial system and law enforcement exists in two entities: as tool providing access to taxes and serving all other

functions of society. It is functioning on all stages of access: production, distribution and consumption – using all means of legal and law enforcement systems, which include creating the law, its implementation, and execution. We can conclude that productivity is directly affected by efficiency of those systems.

As it follows from theory of control the ratio between input and output signal called multiplier. With positive feedback of control system, the multiplier for output greater than 1.0 and it will create the system instability, because multiplier between output and input may grow indefinitely, on each iteration of control loop by John P. van Gigch “Applied General system theory”, 1978. However, there are the ways of control positive feedback - if control signals in the system being filtered, limited or it can be cancelled or reduced by adding negative feedback in the control loop.

Let find out which input signal mainly psychological nature may create negative feedback in terms of productivity to include in model. Between them are: physical and mental limits of humans, educational and cultural level of workforce on level of production. On level of state, we need include psychological factors which may create negative(affect) feedback for productivity grows like: unequal distribution of budget funds, problems of functioning of

legislative, judicial or law enforcement system and execution of law which may create perception of injustice in society, and as result - suppression factors of motivation productivity. Also, problem with functioning of health care system, personal insecurity and mortality rate because of criminal activity in society, which affects psychological state of workforce by shifting focus from production productivity to psychologically suppressive factors. All those factors create a negative feedback which may decrease grows of productivity. It explains why, it never happened in reality, that productivity don't grow indefinitely when production level implements positive factors of motivation, having so much negative factors on state level. Democracy working on the way to negate negative feedback of psychological factors which contribute to decrease of productivity. Because of this, implementation of democratic principles allows workforce keep under control negative factors of motivation and the same time allow to activate factors on workplace of increasing motivation to work productively and having more access to tax money.

The most outstanding value of democracy consist that workforce being the same time the subject and object of control may provide grows of productivity and consequently provide economical grows and political stability of the society.

Van Gigch, also considered election process as element forming feedback loop between different groups of society to control state.

Model, which was developed above, allows to explain the collapse of Soviet Union, as one of the most significant causes between other, by psychological factors such as unwillingness of workforce to work productively. That nullified economical grows in situation of failed “democracy” (with call for openness and perestroika), which brought political instability of state and eventually it collapse. The opposite example is explanation of Brexit, when democratic institutes of Great Britain were successfully realized as a quest of workforce to control access to own taxes and economical grows independently from other members of the EU. In their opinion the bureaucrats of EU government voluntarily distributed unjust share of Britain taxes to less productive members of EU.

This model allows to find a reasonable corridor of growth productivity, which would not be contrary to the needs of all groups of society to access taxes, which have competitive nature. Conclusions made in this article allow to find justified and comprehensive approach, to increase productivity by implementation of actually working principles of democracy.

All considerations and conclusions made above come from assumption that democracy in meaning discussed above can apply only in society with normal/regular flow of life. It does not apply to situations of war or major outbreaks in life of state or any other long-lasting emergency or extreme situations which supposedly generate the different type of motivation of the workforce in terms of productivity.

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