

SYSTEM THINKING IN SOCIAL SYSTEM MODELLING

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ABSTRACT

This article deals with selected quality of life (QL) evaluations analysis done by means of System Thinking (ST). This evaluation is executed by using various indicators developed by the Economist Intelligence Unit Limited, by Eurofound Foundation and by the Organisation for Economic Co-operation and Development. The relevant case study works with data that are available for individual Visegrad Four (V4) countries. For these countries, values of partial indicators are discussed in relation with: the EU average value, the dynamic of these indicators for the given years and the utilization of objective and subjective indicators for the complex QL evaluation.

KEY WORDS

Evaluation, Indicators, Quality of life, System thinking.

INTRODUCTION

When solving problems it is essential to work with the category “system”. It is essential to see problems in a complex manner, in their external and internal contexts with the goal to create a model of a system. To understand the model and to identify problem areas we can use mental models. These models generally represent knowledge, familiarity with and notions of a human being, however depend on his/her acquired way of thinking. This subjective element in a model can be minimized by using ST. The substance of ST is stated in (Mildeová et al., 2011), which is based on the Feedback concept as known in cybernetics and servo-mechanism theory. Differences between ST and a classic managerial approach (Command and Control Thinking) are stated in (Middleton, 2010). It is possible to say that:

- ST is a specific view of the world. It is a view that has its specific methods and tools and that strives to overcome our mental models that we ourselves create (Bureš, 2009)
- ST is a holistic approach to analysis which focuses on the way how a system's constituent parts interrelate and show how systems work over time and within the context of the system as a whole (Forrester, 2007)
- In system thinking, system behaviour results from the effects of self-reinforcing (positive) and balancing (self correcting or negative) processes. A reinforcing process (positive loop) leads to an increase of some system component (Nakiyimba, 2014)
- The usage of system thinking is driven by the effort to explain and reason the behaviour of real objects by means of systems whose integrity is defined by a set of interrelated elements. (Bertalanffy, 2003)
- One of the prominent characteristics of system thinking is the ability to see system dynamics and to recognize relations (including the feed-back ones) that exist between the elements of the system and its environment (Exnarová, Exnar, 2013).

In social research it is essential to accept paradigms of social/society research as well as concrete methods and processes for collecting data acquired during a concrete research. Here system approach and integration approach are substantial (Loučková, 2010) quoted in (Křupka et al., 2013). One area of social research is the topic of QL, both on regional and national levels. On the European level this issue is influenced by the European Social Charter. On the national level it is influenced by the White Book of Social Services. Results from these types of research can be used for e.g. social policy planning and related services, for grants planning and so on. QL is a notion that is very broad and hard to define and it is defined by a number of definitions (Mederly et al., 2004; Šanda, Křupka, 2014), e.g. according to (Heřmanová, 2012; Mandys et al., 2009; Payne, Mühlpachr, 2005; Phillips, 2006; Qlru, 2011; Rapley, 2003; Svobodová, 2012; Vaďurová, Mühlpachr, 2005) quoted in (Křupka et al., 2013).

QL is evaluated by use of indicators. The evaluation of QL is a difficult thing. Number of similar opinions and approaches (Křupka et al., 2010; Šanda, Křupka, 2014) exist regarding the relevant set of indicators and the concrete evaluation tools used for this area. In the Czech Republic (CR), the Czech Statistical Office (CSO) includes among the QL indicators (Csu, 2011) “changes in demographic developments” (natality/birth-rate, mortality/death-rate, the impact of foreigners in the CR, divorce-rate, share of persons in post-productive age in relation to age-distribution of the population), “security of inhabitants” (expenses on keeping public order and security, the intensity and structure of criminal behaviour in the CR, the relation between discovered and perceived criminality and the prison service in the CR (Csu 2011). Other QL indicators used by the CSO (Csu, 2013) are: GDP per inhabitant, revenues per inhabitant, level of employment/unemployment, housing, security and health expenditures, culture expenditures and expenditures for travelling as free-time and aging related activities (Šanda, Křupka, 2014).

The objective of this article is to analyse the possibilities of QL evaluation on the European level based on selected indicators. The countries that are evaluated are the V4 countries, including the possibility to evaluate dynamics and complexity as the important attributes of ST.

PROBLEM FORMULATION

Number of world institutions follow and evaluate QL and human development. These institutions are: The World Bank, UN Development Program, European Environment Agency, Eurostat and other institutions (Novák et al., 2010; Šanda, Křupka, 2014). QL is also related to subsistence level that can be defined as the rate of material and non-material needs and desires satisfaction for individuals and for groups. The most commonly used indicators for subsistence level description and expression are the following: HDI, Index of Sustainable Economic Welfare, Quality of Life Index, Legatum Prosperity Index, Happiness Indicators etc. These indicators are based on very similar elements (ecologic, economic and social) that have been developed for estimation of sustainable development of individual countries, regions and undertakings (Křupka, Provazníková, 2014; Šanda, Křupka, 2014).

Also organizations such as the Economist Intelligence Unit Limited (hereinafter EIU), foundation Eurofound (hereinafter EF) or the Organisation for Economic Co-operation and Development (OECD) have their QL evaluations. The EIU evaluation evaluates, annually, cities from world-wide view: which are the most suitable cities for life. The EF evaluation compares information on life and work conditions across the entire European Union. The OECD executes evaluation of primarily member states by means of OECD Better Life Index (BLI), where the evaluation of QL (OECD, 2013) is a part of sustainable and inclusive growth (OECD360, 2015).

The EIU evaluation has a large scale of usage, such as perceived level of development comparison. The EIU evaluation quantifies problems that could be presented to inhabitants regarding life style in a given area. The EIU evaluation makes possible direct comparison between individual places. The result of this evaluation can be also used for e.g. decision about allocating subsidies or grants for an individual city for its further development and support. Five basic attributes are evaluated: Stability (weight in the total evaluation is 25%), Healthcare (weight is 20%), Culture and Environment (weight is 25%), Education (weight is 10%), and Infrastructure (weight is 20%) (EIU, 2015). Each of the areas uses a set of indicators.

Indicators (EIU, 2015) of Stability are: Prevalence of petty crime, Prevalence of violent crime, Threat of terror, Threat of military conflict, Threat of civil unrest/conflict. Indicators of Healthcare are: Availability of private healthcare, Quality of private healthcare, Availability of public healthcare, Quality of public healthcare, availability of over-the-counter drugs, General healthcare indicators). Indicators of Culture and environment are: Humidity/temperature rating, Discomfort of climate to travellers, Level of corruption, Social or religious restrictions, Level of censorship, Sporting availability, Cultural availability, Food and drink, Consumer goods and services. Indicators of Education are: Availability of private education, Quality of private education, Public education indicators). Indicators of Infrastructure are: Quality of road network, Quality of public transport, Quality of international links, Availability of good quality housing, Quality of energy provision, Quality of water provision, Quality of telecommunications.

The EF has developed three regularly repeated surveys to contribute to the planning and establishment of better living and working conditions. The European Quality of Life Survey (EQLS), implemented in 2003, 2007 and 2011-12, provides a comprehensive portrait of living conditions in European countries. It contains a broad range of indicators on different dimensions of quality of life, both objective and subjective (EF, 2015).

The EU evaluation works with seven basic areas (Grijpstra et al., 2014): Subjective well-being; Living standards and deprivation; Work–life balance; Family and social life; Home, housing and local environment; Health, healthcare, education and other public services and Quality of society. Each of the areas uses a set of indicators. Indicators of Subjective well-being are: Life satisfaction (1 is very dissatisfied, 10 is very satisfied), Happiness (1 is very unhappy, 10 is very happy). Indicators of Living standards and deprivation are: Proportion of households with both rent or mortgage and utility arrears, (Based on responses to: Has your household been in arrears at any time during the past 12 months, that is, unable to pay as scheduled any of the following? Rent or mortgage payments for accommodation, b. Utility bills, such as electricity, water, gas), Satisfaction with standard of living, (Based on responses to: Could you please tell me on a scale of 1 to 10 how satisfied you are with ...? Your present standard of living.). Indicators of Work–life balance are: Proportion of employees coming home from work tired at least several times a month, (Based on responses to: How often has each of the following happened to you during the last 12 months? I have come home from work too tired to do some of the household jobs which need to be done.), Proportion of employees having difficulties at least several times a month fulfilling family responsibilities, (Based on responses to: How often has each of the following happened to you during the last 12 months? It has been difficult for me to fulfil my family responsibilities because of the amount of time I spend on the job.), Proportion of employees having difficulty concentrating at work at least several times a month, (Based on responses to: How often has each of the following happened to you during the last 12 months? I have found it difficult to concentrate at work because of my family responsibilities.).

Indicators of Family and social life are: Satisfaction with family life, (Based on responses to: Could you please tell me on a scale of 1 to 10 how satisfied you are with each of the following items ...? Your family life.), Satisfaction with social life, (Based on answers to: Could you please tell me on a scale of 1 to 10 how satisfied you are with each of the following items ...? Your social life. Indicators of Home, housing and local environment are: Mean number of rooms (Based on responses to: How many rooms does the accommodation in which you live have, excluding the kitchen, bathrooms, hallways, storerooms and rooms used solely for business?), Satisfaction with accommodation, (Based on responses to: Could you please tell me on a scale of 1 to 10 how satisfied you are with each of the following items ...? Your accommodation.). Indicators of Health, healthcare, education and other public services are: Satisfaction with health (Based on answers to: Could you please tell me on a scale of 1 to 10 how satisfied you are with each of the following items ...? Your health.), Perceived quality of healthcare (Based on responses to: In general, how would you rate the quality of each of the following public services in [COUNTRY]? Please tell me on a scale of one to 10. Health services.), Satisfaction with education (Based on responses to: Could you please tell me on a scale of 1 to 10 how satisfied you are with each of the following items ...? Your education.), Perceived quality of educational system (Based on responses to: In general, how would you rate the quality of each of the following public services in your country? Please tell me on a scale of one to 10. Education system.), Perceived quality

of public transport (Based on answers to: In general, how would you rate the quality of each of the following public services in your country? Please tell me on a scale of one to 10. Public transport.), Perceived quality of state pension system (Based on responses to: In general, how would you rate the quality of each of the following public services in your country? Please tell me on a scale of one to 10. State pension system.) (Grijpstra et al., 2014).

Quality of society is represented by tension index. It use scale of 5–15, where 5 is no tension and 15 is a lot of tension. Respondents could indicate on a scale from 1 to 3 (1 is no tension, 2 is some tension, 3 is a lot of tension) how much tension they perceive between the following groups: 1) poor–rich; 2) management–workers; 3) men–women; 4) old–young; 5) different racial and ethnic groups. The tension index is the sum of these variables, which gives a tension index score for each respondent that ranges from 5 (no tension) to 15 (maximum tension) (Grijpstra et al., 2014).

The OECD BLI evaluation works with eleven basic areas (OECD.Stat, 2015): Housing, Income, Jobs, Community, Education, Environment, Civic engagement, Health, Life Satisfaction, Safety and Work-Life Balance. Each of the 11 topics of the Index is currently based on one to three indicators. Within each topic, the indicators are averaged with equal weights. The indicators have been chosen on the basis of a number of statistical criteria such as relevance (face-validity, depth, policy relevance) and data quality (predictive validity, coverage, timeliness, cross-country comparability etc.) and in consultation with OECD member countries. These indicators are good measures of the concepts of well-being, in particular in the context of a country comparative exercise. Other indicators will gradually be added to each topic. (OECD.Stat, 2015).

Indicators of Housing are: Dwellings without basic facilities, Housing expenditure, Rooms per person; indicators of Income are Household net adjusted disposable income, Household net financial wealth; indicators of Jobs are Employment rate, Job security, Long-term unemployment rate, Personal earnings; indicator of Community is Quality of support network; indicators of Education are Educational attainment, Student skills, Years in education; indicators of Environment are Air pollution, Water quality; indicators of Civic engagement are Consultation on rule-making, Voter turnout; indicators of Health are Life expectancy, Self-reported health; indicator of Life Satisfaction is Life satisfaction; indicators of Safety are Assault rate, Homicide rate; indicators of Work-Life Balance are Employees working very long hours, Time devoted to leisure and personal care.

DISCUSSION

The above-stated indicators/evaluations (the EIU, the EF, the BLI) can be used for the evaluation of the V4 countries-the Czech Republic (CZ), Hungary (HU), Poland (PL) and Slovakia (SK).

Table 1 shows the evaluation of the EUI QL indicators executed in year 2015 in %. In (EUI, 2015) there are demonstrated also the “Average regional performances of Central and Eastern Europe“ where the value of Stability is 66.87%, the value of Healthcare is 71.1%, and the value of Culture and environment is 70.1%, the value of Education is 76.2%, the value of Infrastructure is 68.2% and the EIU total ranking is 69.7%. In Table 1 there is also stated the average value for the EU countries (EU).

Indicators	CZ	HU	PL	SK	EU
Stability	85.0	85.0	90.0	90.0	84.3
Healthcare	79.2	91.7	70.8	75.0	88.1
Culture and environment	87.3	90.0	80.3	80.3	89.5
Education	83.3	100.0	75.0	75.0	90.5
Infrastructure	87.5	83.9	82.1	82.1	87.5
EIU total ranking	84.7	88.9	80.7	81.5	87.6

Tab 1 – The EIU Evaluation (Processing based on (EUI, 2015))

Table 2 shows the EF QL evaluation from year 2011 in %. In Table 2 there are stated values for the V4 countries and the EU average value.

Table 3 shows selected OECD BLI values from year 2015. In (OECD.Stat, 2015) there is always stated only one value for the given area for the V4 countries and for the EU average.

Indicators	CZ	HU	PL	SK	EU
Life satisfaction	6.4	5.8	7.1	6.4	7.1
Happiness	7.1	6.9	7.3	6.9	7.4
Proportion of households with both rent or mortgage and utility arrears	7	11	16	7	9
Satisfaction with standard of living	6.3	5.7	6.2	6.4	6.9
Proportion of employees coming home from work tired at least several times a month	59	58	62	46	54
Proportion of employees having difficulties at least several times a month fulfilling family responsibilities	39	39	46	34	29
Proportion of employees having difficulty concentrating at work at least several times a month	21	23	26	20	14
Satisfaction with family life	7.2	7.6	7.6	7.6	7.9
Satisfaction with social life	6.8	6.7	6.6	6.8	7.3
Mean number of rooms	3.4	2.6	2.8	3.2	3.6
Satisfaction with accommodation	7.5	7.0	6.9	7.7	7.7
Satisfaction with health	7.1	6.7	6.8	7.3	7.3
Perceived quality of healthcare	6.5	5.1	4.6	4.9	6.2
Satisfaction with education	7.3	7.0	6.4	7.0	7.2
Perceived quality of educational system	6.6	5.7	5.9	5.7	6.3
Perceived quality of public transport	6.1	5.5	5.7	5.7	6.4
Perceived quality of state pension system	4.2	3.8	3.4	3.6	4.8
Tension index	10.9	11.8	10.1	9.9	10.5

Tab 2 – The EF Evaluation (Grijpstra et al., 2014)

Indicators	CZ	HU	PL	SK	EU
Housing (Rooms per person) [Ratio]	1.4	1.1	1.1	1.1	1.7
Income(Household net financial wealth) [in USD]	17299	13277	10919	8663	37640
Jobs (Long-term unemployment rate) [in %]	3.12	5.1	3.77	9.46	5.21
Community (Quality of support network) [in %]	85	87	91	90	90
Education (Student skills) [Average score]	500	487	521	472	500
Environment (Air pollution) [Micrograms per cubic metres]	16	15	33	13	18
Civic engagement (Micrograms per cubic metres) [in %]	59	62	55	59	70
Health (Life expectancy) [Years]	78.2	75.2	76.9	76.2	80.1
Life Satisfaction [Average score]	6.5	4.9	5.8	6.1	6.4
Safety (Homicide rate) [Ratio]	0.8	1.3	0.9	1.2	1.0
Work-Life Balance (Employees working very long hours) [in %]	6.98	3.19	7.41	7.02	5.33

Tab 3 – The BLI Evaluation (Processing based on (OECD.Stat, 2015))

CONCLUSION

If we evaluate the dynamics of the stated indicators, then we can see such dynamics in the EU and the OECD BLI evaluations. For the EIU evaluation we have not managed to get more detailed evaluation data for the previous years. For the EU evaluation we have available time series data from year 2007. For the OECD BLI there are available time series from 2013 and 2014 for all indicators from the eleven stated areas (OECD.Stat, 2015).

To answer the question if the individual evaluations use, at the same time, objective and subjective indicators as the criteria of the complexity of the QL evaluation it is possible to observe that under the EIU majority of indicators are evaluated objectively (e.g. Humidity/temperature rating, Level of corruption), however there are also exceptions and subjective evaluation (such as e.g. Quality of telecommunications, Discomfort of climate to travellers). In contrary to this the EF evaluation is subjective in all cases-all data have been acquired by means of questionnaires. For the BLI evaluation in all cases there are used objective indicators based on various statistical data/criteria. The only exception is the Life Satisfaction. Thus for the above-mentioned indicators/evaluations there has been used the approach utilizing both the objective and subjective QL evaluation.

With the individual evaluations there are also stated the average values, e.g. for the EU countries, for the Central and Eastern Europe countries, for the OECD countries or there is stated world-wide average. Thus there exists the possibility to compare the values of the individual indicators.

In future it is possible to use QL values in given areas to delimit "weak" areas in selected countries including the possibility to take this valuation up on the regional level. The objective should be "Sustainable and Inclusive Growth" and an active approach to issues labelled as „Active ageing“.

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