A MULTI-LAYER ANALYSIS OF EFFECTIVE CLUSTERS IN REGIONALDEVELOPMENT POLICY. A CASE STUDY ON POLAND [*]

Peter NIJKAMP[*]
Karima KOURTIT[*]

Abstract
Regional development policy in the past years is increasingly dominated by cluster strategies.This means a dedicated orientation towards selective industrial initiatives (often of a high-tech and cognitive nature). In the present study the notion of effective cluster – characterized by intense social and human capital is introduced as a systematic framework for assessing regional development policy. The paper presents a specific tool, viz., a Balanced Dashboard, to offer an operational evaluation instrument based on a multidimensional policy perspective. The relevance of this approach is illustrated by means of a multi-layer application of the proposed analytical framework to the Aviation Valley in the Podkarpackie region in South-East Poland.

Keywords: regional development; regional clusters; strategic regional position.

1. Introduction

Regional development policy has already a long tradition in Europe. Starting from the concept of industrial districts (Marshall) designed more thana century ago, various dedicated strategies to address spatial equity concerns have played an important role in post-WW II regional growth policies, as is witnessed in well-known concepts like industrial complexes, growth centres, development poles, growth corridors and the like (Kourtit and Nijkamp, 2017). In recent times, the notion of industrial clusters has gained much popularity as

a tool to favour spatially and sectorally concentrated growth initiatives (Porter, 1998). The idea of a cluster suffers however from some ambiguities regarding its precise scope and the underlying critical success factors. Hence, recently the related concept of effective clusters has recently been introduced, to highlight the fact that a successful concentration of advanced industrial activities does not only need a satisfactory cognitive and high-tech base, but also a strong social and human capital base, so as to unite all growth efforts from both an individual and collective perspective on the region concerned.

The present paper aims to present a new policy assessment tool for a multidimensional analysis of the performance of effective industrial clusters aspart of an ambitious regional development strategy, based on a merger of a high-tech orientation and the presence of social and human capital. The analytical tool for evaluating a cluster performance is based on a so-called '*balanced dashboard*' which finds its origin in a balance score card approach. This evaluation mechanism will be concisely presented in this paper and illustrated by means of an empirical application to an ambitious regional development project in Poland, viz. the Aviation Valley in the Podkarpackie region in South-East Poland. This analysis is based on a multi-layer approach, with different geographical scale levels, ranging from individual firms to local and regional scale levels.

1.1.   A Decision Support Tool: *Balanced Dashboard*

In this section we will present a useful and interactive policy tool for regional development in the form of a '*Balanced Dashboard*'. A Dashboard is an operational navigation tool for policy makers for assessing regional or urban performance criteria outcomes under varying conditions, ranging from the macro-level (e.g. effects of spatial clusters and agglomerations) to the micro-level (e.g. impacts of entrepreneurship).

A thorough assessment of the broad, multidimensional performance ofregions and cities should be based on appropriate judgment criteria which

– with varying degrees of policy priorities attached to these yardsticks □ can be employed to evaluate the competitive position and attractiveness of these regions and cities in terms of broadly defined socio-economic achievements (Nijkamp and Kourtit, 2011, 2013; Arribas-Bel et al. 2013). These criteria are captured under the heading of the XXP (maximum performance) framework seeking to maximize the performance of these stakeholders or decision-makingentities (comparable to the 'XXQ' (maximum quality) principle in Nijkamp, 2008; Kourtit 2015, p. 358). The Dashboard mechanism serves to help the region or city to be on course, and to intervene timely, if the socio-economic direction of development is not according to a priori specified targets. This method presupposes sufficient data (including 'big data') on past and actual development patterns.

In the same vein, much interest has in recent years arisen in efficient and operational spatial and urban Strategic Performance Management (SPM) and Performance Measurement Systems (PMS), especially for urban areas or regions. Consequently, their use by local and regional authorities hasdrastically increased in recent years. Such policy tools are particularly important, given the tendency to assess a region's and city's relative performance level not only from a traditional economic perspective but also from a broader, partly non-economic, valuation perspective, so as to propose affective strategies for regions and cities in order to achieve a competitive position in a global and open economy (Nijkamp and Kourtit, 2011, p. 22).

There is nowadays in the decision literature an increasing interest in a broad and multidimensional set of strategic performance indicators and policytools that are mutually linked and can be judged against each other, in order to provide a comprehensive view on the socio-economic 'health' conditions of cities and regions. This new approach is essentially based on a combination of traditional and modern measures integrated in a systematically structured andinterconnected four-pillar analysis framework (see Figure 1): (1) economic vitality; (2) smart logistics and sustainable mobility; (3) social participation and social capital; and (4) ecological sustainability (see Nijkamp, 2008; Nijkamp and Kourtit, 2013, p. 302). A focus on the mutual linkages between these four distinct cornerstones is a *condition sine qua non*. Thus, a critical feature of a '*Balanced Dashboard*' is to offer an interconnected perspective on regions and cities. In order to link the

regions' and cities' long-range strategies to short- and medium-range performance actions, a user-oriented interactive dashboard has to be developed as a learning tool (see the cornerstones described in Figure1).

The Dashboard designed here is a strategic management tool that employs Critical Success Factors (CSFs) and Key Performance Indicators (KPIs)for transforming a region's or city's mission and future strategy into a coherentpackage of integrated performance indicators (Ho and Chan, 2002; Brignall, 2002). Such performance measures offer a balanced picture of a region's or city's achievement in terms of its mission and goals (Ho and McKay, 2002).

The '*Balanced Dashboard*', an increasingly popular method, is based on amultidimensional set of performance tasks and indicators as a mix of *non-financial* measures (sometimes coined 'leading' indicators) and *financial* measures (sometimes coined 'lagging' indicators), that are systematically integrated according to the four above mentioned policy perspectives, viz., economic vitality, smart logistics and sustainable mobility, social participationand social capital, and ecological sustainability. Figure 1 offers now a concise presentation of such a coherent, transparent and focussed strategic analysis framework in the form of a policy arena.

Figure 1. Policy Arena of the '*Balanced Dashboard' Source*: Nijkamp and Kourtit (2013, p. 302)

1.2. Mechanism of the Balanced Dashboard

The *Balanced Dashboard* follows essentially a linear straightforward approach (Kaplan and Norton, 1992) and contains the following sequence: it starts with a learning, innovation and future perspective and ends up in financial results or tangible outcomes (Brignall, 2002), so that the performance of an organization can be assessed from a multidimensional angle.

The effectiveness of the Dashboard is then defined as the degree of achievement of financial and non-financial goals, the improvement of skills and competences, and the enhancement of stakeholders' care and process quality (de Waal, 2007). In order to obtain a useful approach, the region or city at hand need to think in terms of strategy and related operational activities. They should also recognize the necessary detail to understand precisely what they are doing (their national and international position), what they want to achieve and how they want to do this (a logically structured strategic framework). The mechanism of the Balanced Dashboard can be described as follows:

1. Articulating the mission and strategy of the region or city

The region or city has to put forward a mission and to decide on a suitable strategy; they need to ask the question: "*what do we want to do and to accomplish*"; and "*how can we achieve that mission*?"

2. Formulating long-term strategic objectives

To make a region's or city's strategy operational, strategic future-oriented objectives have to be formulated; then it becomes evident which activities have to be undertaken in order to implement the region's or city's strategy.

3. Monitoring through Critical Success Factors (CSFs) and Key Performance Indicators (KPIs)

In the last stage, the achievement of goals and value creation (by guiding and improving all the region's or city's functions within the spatial system) have to be monitored using indicators expressed as *Critical Success*

Factors (CSFs) (essential or necessary factors which define their success), and are operationalized by *Key Performance Indicators (KPIs)*. Thus, the region or city needs to ask the question: "w*hat is the empirical measure for a given objective?*" and "*how can this objective be measured*?" The use of CSFs and KPIs allows the measurement, and thus the management and control, of strategic objectives and value creation of a region or city. Figure 2 provides a pedagogical illustration of the development and usefulness of this approach.

Thus, the Balanced Dashboard involves a practical performance measurement at five successive levels: mission, strategies, objectives, *Critical Success Factors (CSFs),* and finally, *Key Performance Indicators (KPIs),* so as to establish a clear link between performance and strategy.
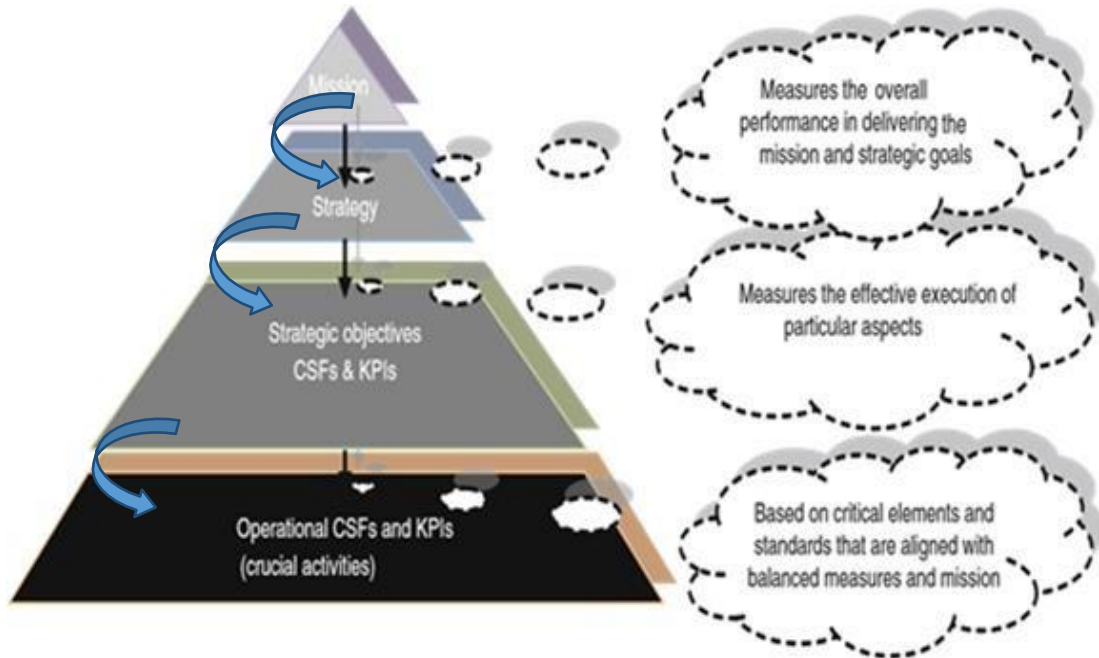

Figure 2. The development of CSFs and KPIs
(illustration)
Source: Kaplan and Norton (1996b)

Thus, the region or city needs to have a meaningful starting point for viewing, monitoring and measuring its performance. In this way, a city or region can improve its performance at all levels. Clearly, all stakeholders need to appreciate the strategy and their role in it. Thus, this is clearly an interactiveprocess starting with an understanding of the present position of

the region orcity (positioning), the direction it needs to choose, the targets that should be set, and the resources necessary to achieve those ambitions. Clearly, this supports the region or city in continuously anticipating its changing circumstances and in developing a proper capacity for smart adaptation of their region and city.

We will now address the link between a Balanced Dashboard use and the development and performance of the region and city, with a view to an application to the Podkarpackie region in Poland.

2. Application to the Podkarpackie Region in Poland

The Podkarpackie area in South-Eastern Poland is a rather peripheral region, with a traditionally below-average economic performance. This voivodship is one of the major administrative units in the Polish system and issubdivided into several counties (powiats), which in turn contain various gminas (municipalities). Its main administrative and cognitive centre is Rzeszow. Consequently, to assess and monitor regional development strategies and efforts a multi-layer approach may be needed.

One of the major spearheads of the Podkarpackie regional economy is the aviation industry. After a severe dip in the 1990s, it is now starting to boom again. And therefore, it is an interesting challenge to assess its performance. To evaluate and monitor how a powiat performs in the Podkarpackie region, according to a long list of criteria (CSFs and KPIs) extracted from the four distinct cornerstones in the 'Balanced Dashboard', a great deal of statistical information has been collected on the powiats' profile and development in thePodkarpackie region, the home base of the Aviation Valley in Poland.

Table 1 shows a summary of the long list of indicators that were used to assess three of the four components with regard to the vision and performance of the powiats in the Podkarpackie region in Poland.

Table 1. Assessment indicators of important components with regard to the strategic regional position of powiats in the Podkarpackie region in Poland.

Perspectives	Criteria
• Smart Logistics and Sustainable Mobility	*Population connected to wastewater treatment plants* *Distribution network*
	Gas supply system *Accessibility* *Function* *Transportation*
• Innovation & EconomicVitality	*Economic climate* *Workspaces and activities (sectors)* *Employment* *Business climate* *Quality of life and sustainability* *Learning*

• Social Participation and Social Capital	*Demography* *Quality of urban life* *Cultural amenities* *Low rent* *Urban design and architecture* *Urban land use* *Criminality*
• Ecological Sustainability	*Environmental indicators*

Source: The authors' elaboration.

The Podkarpackie region calls clearly for new strategic public governance systems that enhance its economic potential. To evaluate the 'competitive advantage' (à la Porter) of appropriate spatial governance systems, it is desirable to develop a relevant and practical indicator system that depicts the multilevel creative and financial resources of this regional district (see for an applied example, Table 1). These indicators were collected from the official sources (Podkarpackie voivodship, powiats, gminas 2014 [*]).

This is also a step that is necessary for a benchmark performance analysis of the success and failure factors of urban or spatial policy. Furthermore, such indicators of four important perspectives and the related indicators (criteria) in Table 1 should be transparent, manageable, measurable, testable, comparable, representative, and policy-relevant. These CSF examples in the Balanced Dashboard contain information from both smart-physical and immaterial infrastructure. All these components are directly related to a

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[*] http://rzeszow.stat.gov.pl/en/publications/statistical-yearbook/podkarpackie-voivodship-subregions-powiats-gminas-2014,2,8.html

spatially integrated force field for the Aviation Valley that shapes the competitive capacities and opportunities of all stakeholders in that region.

There are various ways to represent the powiats' score in the context ofa Balanced Dashboard. We will illustrate this here mainly for the indicator: *Social Participation and Social Capital* (SC). The findings shown in Figure 3 indicate clearly that in regard to the overall performance score, given the long list of criteria related to *Social Participation and Social Capital* as one of the CSFs, the powiat of Przemyski outperforms the other powiats in regard to Social Participation and Social Capital, followed by the powiats m.Rzeszow and powiat Brzozowski; it gets a relatively high performance score (although the latter two powiats are also high performers) (see Appendix A for the data used).
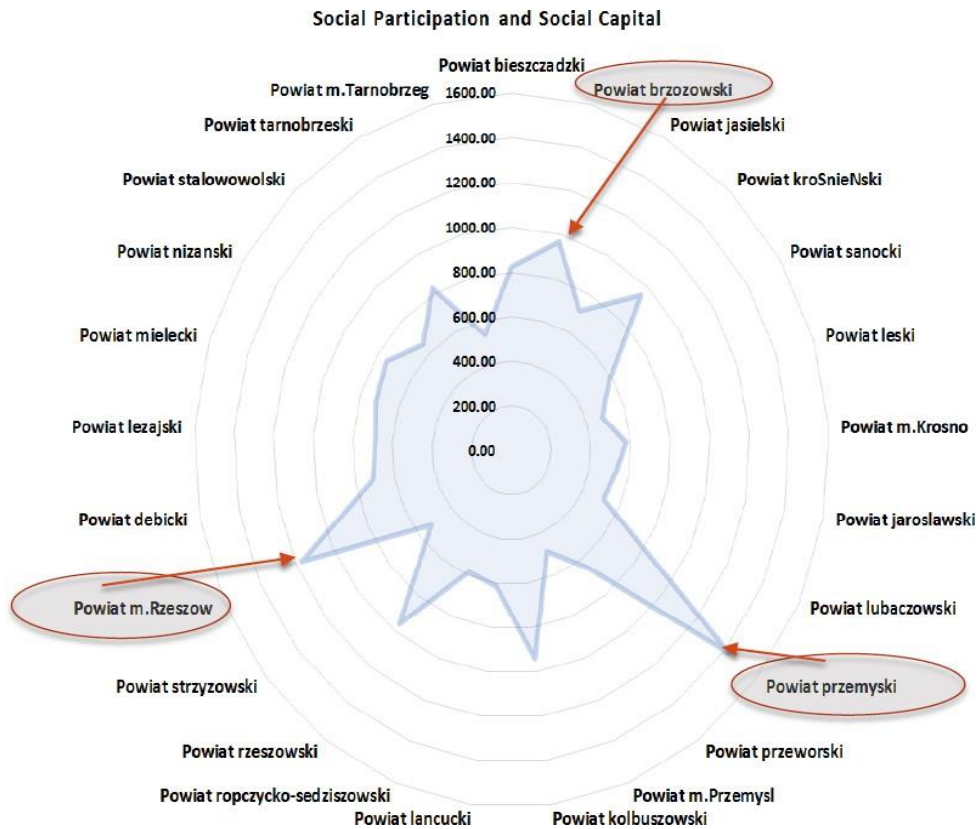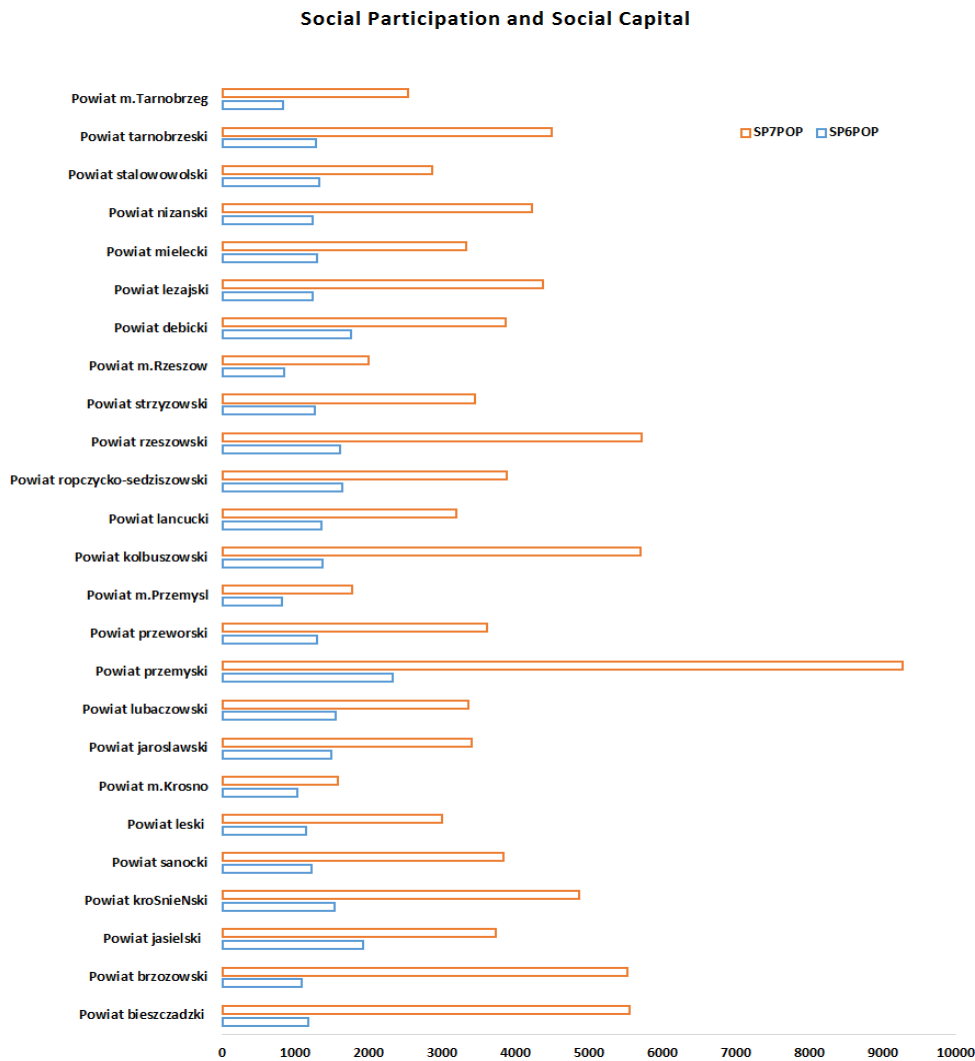

Figure 3. Spider web for the *Social Participation and Social Capital* (SC) of powiats (Sources: Authors' own calculation using data of different powiats in the Podkarpackievoivodship from the Statistical Office in Rzeszow Statistical Office in Rzeszow 2014)

Next, if we take a closer look at a few key indicators in the *Social Participation and Social Capital* category, such as "*health care*" and "*generally available pharmacy*", we can see from Figure 4 that the powiat Przemyski is indeed scoring very high on many of the specific sub-criteria, followed by the powiat in Rzeszowski on the criterion "*generally available pharmacy*" in the

Podkarpackie region in Poland (see Appendix B for data used).

Figure 4. Presentation of the powiats' performance score for two criteria: "*health care*" an "*generally available pharmacy*" (Sources: Authors' own calculation using data of

different powiats in the Podkarpackie voivodship from the Statistical Office in
Rzeszow Statistical Office in Rzeszow, 2014)

The powiat Przemyski, however, has some clear drawbacks with
regard to other criteria and has a clear scope for performance improvements,
as is witnessed by its high scores, for example, on *delinquents in ascertained
crimes and safety*. We will next illustrate the Balanced Dashboard functions
by referring to Territorial Capital (TC) handles or policy criteria in the 25
powiatsin the Podkarpackie region (see Figure 5). In our analysis, TC is an
'umbrella' indicator composed of Human Capital (HC), Infrastructural
Capital (IC) and Social Capital (SC) (see Appendix C for data used).
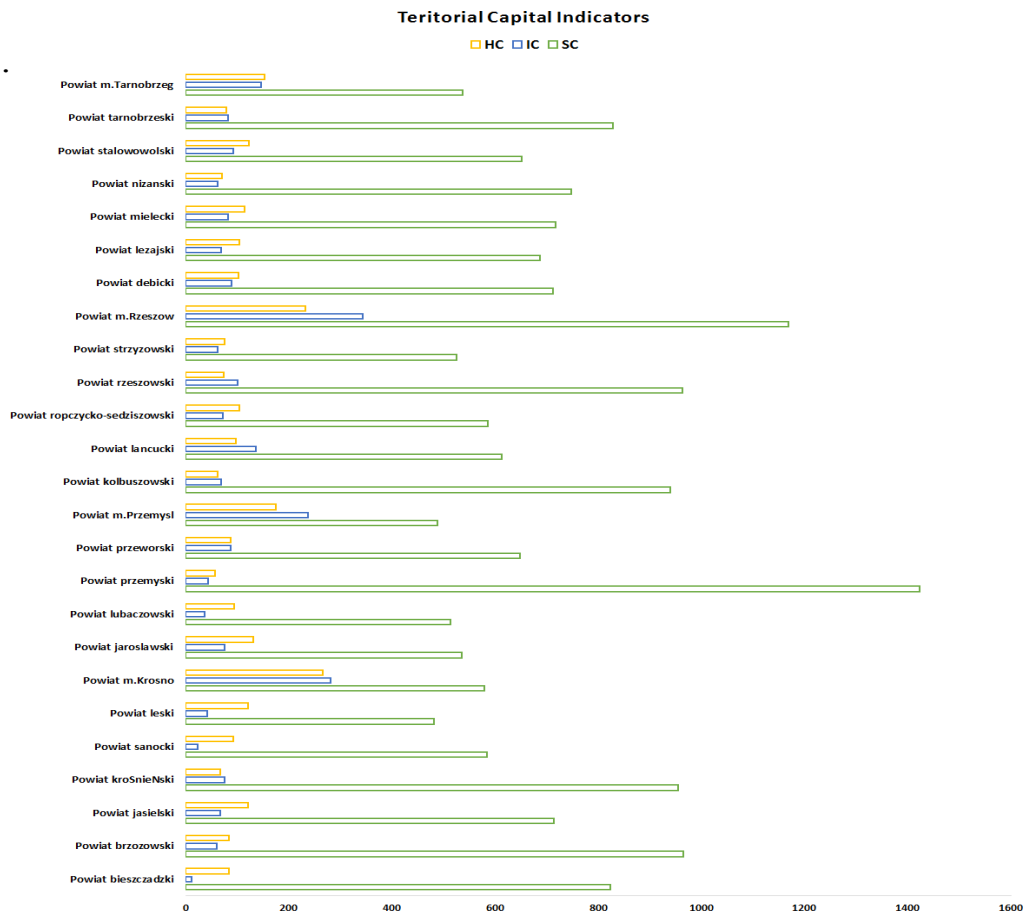
Figure 5. Presentation of the powiats' performance score on the Balanced Dashboard
for *Territorial Capital (TC)* (Sources: Authors' own calculation using data of different

powiats in the Podkarpackie voivodship from the Statistical Office in Rzeszow Statistical Office in Rzeszow 2014)

There appears to be a great variety in TC performance among the powiats, as well as between the HC, IC and SC performance indicators making up for TC. This variety can be mapped out in a way which is similar to the previous Dashboard in Figure 6.

Figure 6. Presentation of the overall Balanced Dashboard

The aim of the examples provided above was to exemplify and test the Balanced Dashboard potential using interactive visualisation techniques – on the basis of a bench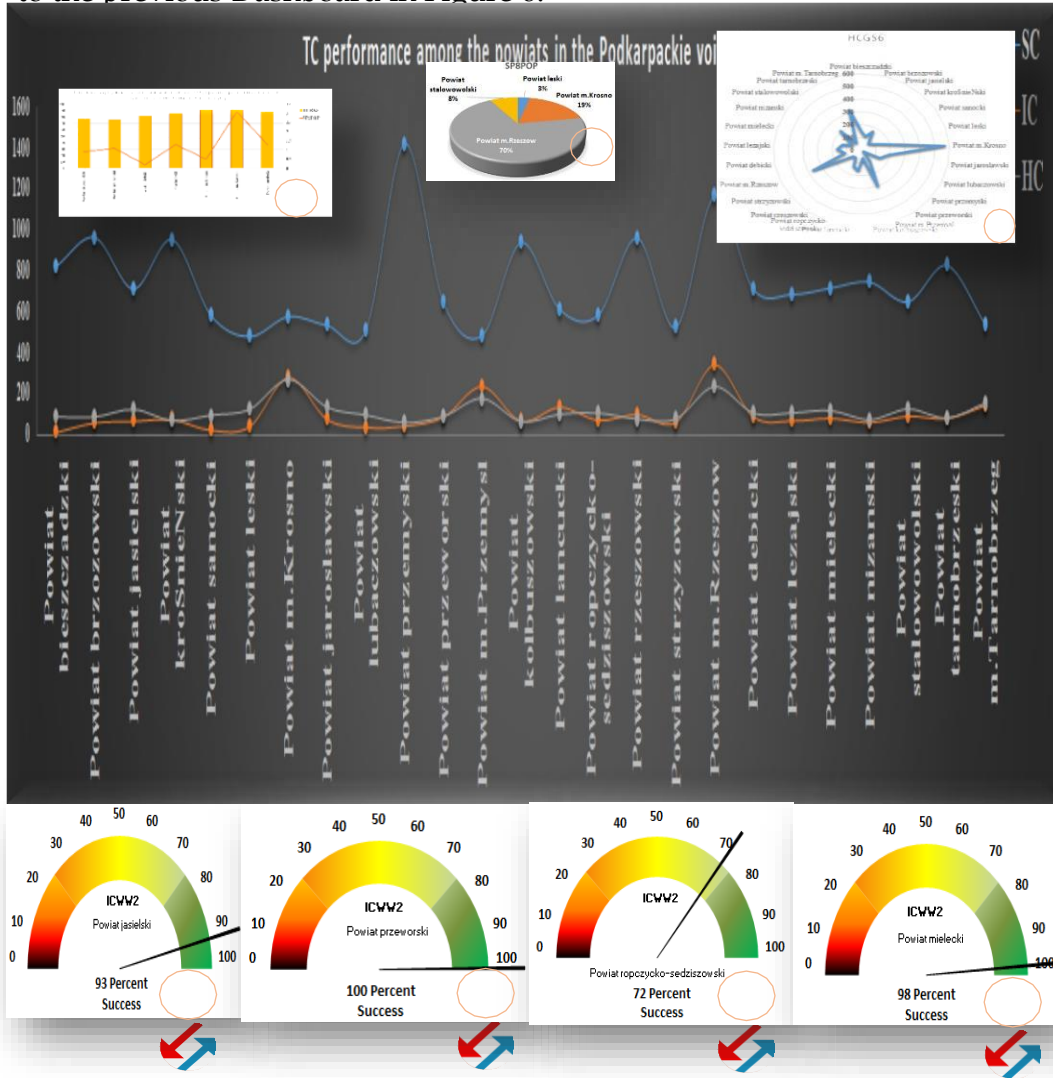mark performance method for assessing the success and failure conditions of the Podkarpackie regional development – in particular, for governance challenges emerging at the interface of fast global dynamics regarding HC, SC and IC (see Figure 5 and Figure 6) for the Aviation Valley. Our examples presented above on the Dashboard strategy have demonstrated the feasibility and usefulness of this planning tool for the Aviation Valley in Podkarpackie. Our specific results for this area in Poland illustrate the significance of intensive economic revitalisation as a core cluster approach. The robustness test carried out in this paper has shown that it is feasible to develop resilient spatial development alternatives, even in the presence of conflicting policy goals and different sets of stakeholders.

3. Conclusions

Modern evaluation tools like the Balanced Dashboard appears to be among the important methods for evaluating and identifying differences and conflicts among distinct groups of stakeholders, future long-range visions and operational actions plans in a dynamic or regional context. Clearly, frictions between e.g. cultural heritage and technological progress in regions and cities deserve due attention and call for appropriate modern evaluation tools. The present study has shown the potential of the dashboard approach in assessing spatial-economic development strategies in the Podkarpackie region in Poland. This approach enables us to take into consideration the varied stakeholders' points of view and to combine these into a decision-making system on conflictual spatial land-use options. Clearly, many new advances still have to be implemented.

A focused Dashboard study on the Aviation Valley in the Podkarpackie region in Poland may provide, on the basis of structured interviews with stakeholders, insight into experiences and findings that consider and favour the socio-economic impacts of the Aviation Valley, with an alignment to the Podkarpackie region policy, in a broader setting. In reinventing the Aviation Valley, the urban Facebook framework, first developed in Kourtit and Nijkamp(2013), may help to distinguish successful strategic policies, and to combine different expertise to balance tensions between the interests and priorities of a multiplicity of stakeholders on the one hand, and economic growth combined with socio-economic needs and the conservation of eco-systems on the other hand. Clearly, a systematic preference elicitation exercise may have to be

organized among the main focus group or stakeholders in the Aviation Valley. Such systematically collected information may then be analysed within an urban Facebook evaluation framework ('Facebook Dashboard'), which may include a visual support tool (*i.e.*, Spatial Faces, Scenarios, Images, Scorecards, etc.). This novel framework to be developed adopts the same general idea as sketched above, but extends it by emphasizing the importance of the visual image of the spatial ambience and spatial future pictures and views of relevant historic and modern areas, based on a stakeholder-oriented approach (a bottom-up approach related to regional policies).

In this framework, visual features and values may be combined in a set of long-range spatial images, which map out various critical aspects of urban planning on the basis of relevant evaluation criteria derived from the Balanced Dashboard for the Aviation Valley in the Podkarpackie region. Thus, this framework may become a useful action platform that provides social benefits to connect relevant people who work and live together (social capital), supported by high-quality visualisation methods, for mapping original and feasible redevelopment initiatives in an interactive stakeholder-based approach.

Based on the stakeholders' preferences and points of view regarding the relevant domains, the above described decision support tool may serve to attract and keep creative minds living and working in the area to favour flourishing, dynamic local and regional economies. Clearly, each stakeholder has specific priorities and viewpoints. This diversity will help to design more integrated and accurate future images of the region concerned. Thus, a promising facelift aim of the Aviation Valley (ranging from little to strong) is to select and retain creative, high-skilled actors, and innovative firms in order to achieve a balanced sustainable development supported by all stakeholders involved in this process.

A *sine qua non* for a favourable development policy is that the Aviation Valley is in a position to develop highly innovative strategies to advance sustainable development and planning in an open and global economy, taking account of ecological conservation and favouring effective local management that does integrate a cluster development with place-based development. Indeed, both the organizational and economic development potential of a region is needed to enhance areal resilience of a cluster system, and thus its integrated sustainability of the region concerned.

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Appendix A: Data: Social Participation and Social Capital of powiats in the Podkarpackie region

Powiats	Social Participation and Social Capital
Powiat bieszczadzki	823.34
Powiat brzozowski	964.54
Powiat jasielski	713.27
Powiat kroSnieNski	954.48
Powiat sanocki	584.01
Powiat leski	480.87
Powiat m.Krosno	578.93
Powiat jaroslawski	535.03
Powiat lubaczowski	513.10
Powiat przemyski	1423.34
Powiat przeworski	647.76
Powiat m.Przemysl	487.39
Powiat kolbuszowski	939.97
Powiat lancucki	613.60
Powiat ropczycko-sedziszowski	586.34
Powiat rzeszowski	962.87
Powiat strzyzowski	525.57
Powiat m.Rzeszow	1168.80
Powiat debicki	711.79
Powiat lezajski	686.66
Powiat mielecki	717.79
Powiat nizanski	746.86
Powiat stalowowolski	650.90
Powiat tarnobrzeski	828.56
Powiat m.Tarnobrzeg	536.30

Source: Authors' own calculation using data from Podkarpackie Voivodship.
Subregions, powiats, gminas 2014:
http://rzeszow.stat.gov.pl/en/publications/statistical-
yearbook/podkarpackie- voivodship-subregions-powiats-gminas-
2014,2,8.html

Appendix B: Data: Social Participation and Social Capital for the powiats in the Podkarpackie region based on two criteria: "health care" and "generally available pharmacy"

Territorial unit	SP6POP	SP7POP
Powiat bieszczadzki	1169	5551
Powiat brzozowski	1087	5528
Powiat jasielski	1923	3722
Powiat kroSnieNski	1533	4864
Powiat sanocki	1217	3826
Powiat leski	1144	3003
Powiat m.Krosno	1027	1574
Powiat jaroslawski	1489	3393
Powiat lubaczowski	1542	3356
Powiat przemyski	2320	9278
Powiat przeworski	1299	3603
Powiat m.Przemysl	816	1768
Powiat kolbuszowski	1364	5705
Powiat lancucki	1354	3195
Powiat ropczycko-sedziszowski	1634	3871
Powiat rzeszowski	1610	5718
Powiat strzyzowski	1267	3450
Powiat m.Rzeszow	844	1990
Powiat debicki	1755	3862
Powiat lezajski	1228	4374
Powiat mielecki	1299	3327
Powiat nizanski	1228	4220
Powiat stalowowolski	1325	2860
Powiat tarnobrzeski	1284	4493
Powiat m.Tarnobrzeg	831	2538

Source: Authors' own calculation using data from Podkarpackie Voivodship.
Subregions, powiats, gminas 2014:
http://rzeszow.stat.gov.pl/en/publications/statistical-
yearbook/podkarpackie- voivodship-subregions-powiats-gminas-
2014,2,8.html

Appendix C: Data: Territorial Capital for powiats in the Podkarpackie region

	SC	IC	HC
Powiat bieszczadzki	823.34	12.18	84.54
Powiat brzozowski	964.54	59.7	84.66
Powiat jasielski	713.27	66.86	121.14
Powiat kroSnieNski	954.48	74.88	66.34
Powiat sanocki	584.01	23.32	92.91
Powiat leski	480.87	41.48	121.76
Powiat m.Krosno	578.93	281.42	266.59
Powiat jaroslawski	535.03	75.96	131.29
Powiat lubaczowski	513.1	36.96	93.7
Powiat przemyski	1423.34	43.62	57.41
Powiat przeworski	647.76	87.34	86.93
Powiat m.Przemysl	487.39	237.84	174.27
Powiat kolbuszowski	939.97	68.46	62.57
Powiat lancucki	613.6	135.86	97.73
Powiat ropczycko-sedziszowski	586.34	72.52	103.49
Powiat rzeszowski	962.87	100.36	74.59
Powiat strzyzowski	525.57	62.96	75.23
Powiat m.Rzeszow	1168.8	343.04	232.39
Powiat debicki	711.79	89.38	103.39
Powiat lezajski	686.66	69.5	104.19
Powiat mielecki	717.79	82.04	114.9
Powiat nizanski	746.86	61.32	70.86
Powiat stalowowolski	650.9	92.46	122.86
Powiat tarnobrzeski	828.56	81.6	78.74
Powiat m.Tarnobrzeg	536.3	145.88	153.09

Source: Authors' own calculation using data from Podkarpackie Voivodship. Subregions, powiats, gminas 2014:
http://rzeszow.stat.gov.pl/en/publications/statistical-yearbook/podkarpackie- voivodship-subregions-powiats-gminas-2014,2,8.html

Appendix D: Codebook

Social Participation and Social Capital	SC
Smart Logistics and Sustainable Mobility	IC
Human Capital	HC
population per 1 km2	SP1POP
Natural increase per 1000 population	SP2POP
Net internal and international migration for permanent residence: per 1000 population	SP3POP
Rate of detectability of delinquents in ascertained crimes by the Police in %	SP4POP
Beds in general hospitals per 10 thous. population	SP5POP
provider of out-patient health care	SP6POP
generally available pharmacy	SP7POP
Audience in fixed cinemas: per 1000 population	SP8POP
Investment outlays in enterprises according to investment location (current prices): per capita in zl	SP9POP
Water withdrawal for needs of the national economy and population per 1 km² in dam³	ICWN1
Industrial and municipal wastewater treated in % of waste requiring treatment	ICWW2
Population connected to wastewater treatment plants in % of total population: total	ICCW3
Outlays on fixed assets (current prices) per capita in zl: in environmental protection	ICEP4
Distribution network per 100 km² in km: water supply system	ICDWSS6
Distribution network per 100 km² in km: sewage system	ICDNSS7

Distribution network per 100 km² in km: gas supply system	ICDNGSS8
Employed person: per 1000 population	HCE1
Employed person: trade; repair ofmotor vehicles Δ; transportation and storage; accommodation and catering Δ; information and communication - in % of total	HCEPTTSACIC2
Employed persons: financial and insurance activities; real estate activities - in % of total	HCFIA3
Registered unemployment rate ac in %	HCTU4
Registered employment rate ac in %	HCRE5
Pupils and students of schools for childrenand youth per 10 thous. population: general secondary	HCGS6
Pupils and students of schools for childrenand youth per 10 thous. population: technical secondary	HCTS8
Pupils and students of schools for childrenand youth per 10 thous. population: postsecondary schools per10 thous. population	HCPS9