Pushing the envelope – (added) value assessment of combined transport infrastructure and area development

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Introduction

Both in scientific literature and in practice, there is an increasing emphasis on (cross)-linking of spatial and infrastructural developments. A combination of infrastructural and spatial measures may ensure increase of the spatial quality of the area as a whole from the idea that linking interests and functions leads to added value (Elverding, 2008; Heeres et al., 2012). Evaluating this added value requires the use of evaluation methods, but in practice it proves difficult to measure the alleged added value. Given this difficulty, it seems important to work towards an analytical framework to guide the evaluation practice in reducing part of this. In a complex situation with multiple stakeholders, and a time elongated task, evaluative information needs to be suitable for different people, to improve the cognitive fit between multiple tasks by different people (Vessey, 1991). We see great merit in a continuous access of stakeholders during the project planning process to the increasing insight into 'understandable metrics' on the most important value components. Based on literature analysis, we found three key elements for a three step evaluation process through time: 1) *criteria*: values in the area/transport network and criteria on which to evaluate plans; 2) *alternatives*: designing physical changes, plan components and alternatives and their impact on criteria; and 3) *decision-making*: integrated evaluation of, and summary statements on, the added value of different investment plans. Directly related to these are then the three 'understandings' of the combined (added) value in the context of transport infrastructure- and spatial development: 1) *understanding key values of the area* and the infrastructure network; 2) *understanding value changes* per plan component, and; 3) *understanding resulting value tradeoffs* of plans and plan components for decision making. We will address the importance to consistently aim for improvement of a cognitive fit which allows comparison across different spatial projects.

Background

Integration of traditionally separate spatial interventions (i.e. interventions in infrastructure, housing, water or nature) offers opportunities for "scope optimization, with lucrative and non-cost-effective spatial investments at regional level linked together" (Priemus, 2002, p. 461). This trend (Heeres et al., 2016; Litman, 2007), affects the use of ex ante evaluations and related instruments (Sijtsma et al, 2009). Different than in a traditional sectoral, infrastructure-oriented approach, where particularly 'hard' effects as travel time, traffic safety and flood risk play a role, within a more area-oriented approach, additional 'soft' values like environmental quality, social cohesion and cultural history values become more important (Sijtsma et al, 2009; Heeres et al., 2016). These more 'soft' values, with regard to the non-infrastructural land use functions, are often based on broad concepts such as sustainability, livability or spatial quality (Heeres et al., 2016).

There is an assumption that transformation to more integrated evaluation focusing on the creation of synergies between land uses creates ‘added value’ (e.g. Peek & Louw, 2008; Heeres et al., 2012). A combination of infrastructural and spatial measures may ensure increase of the spatial quality of the area as a whole from the idea that linking interests and functions leads to added value (Elverding, 2008; Heeres et al., 2012). Holland (1998) explains, in abstract terms, how added value emerges from the interaction between system elements. This reasoning assumes that the aggregated whole is more than the sum of its parts. Holland describes that such value is not present at the level of individual functions, but only when the systems are looked at as a coherent whole. In transport infrastructure planning, this implies that an integrated strategy combining specific sectoral interests not only leads to sectoral results. It also generates values that cannot be related to a specific sectoral action. Currently, the potential for the creation of synergy effects is expressed mainly through rhetoric arguments, without a more objective evaluation (Beukers et al., 2012).

Evaluating this added value requires the use of evaluation methods, but in practice it proves complex to measure the alleged added value. Given this complexity, it seems important to work towards an analytical framework which guides the evaluation practice in reducing part of this complexity and this is what we will do in this paper. In a complex situation with multiple stakeholders and a time-elongated task, which may stretch several years (often 5 to 10 years), evaluative information needs to be both accessible through time and suitable for different people. We will argue that the concept of cognitive fit is essential in this process (Vessey, 1991). Cognitive fit focusses on the combination of information and tasks. If you drive to Paris, your TomTom tells you: ‘turn to the left here’, and you turn left. Information matches the task. If you decide whether you want to go to Paris or Rome for a holiday, the TomTom information may hold little value. Tourist guides may fit the decision task far better. The same holds for our subject, the evaluation of complex spatial plans. The idea of aiming for a good cognitive fit means that the evaluative information we provide in different stages to different people has to match their tasks to allow for successful deliberative and decision making support. The challenge of reducing complexity in the process of evaluation of combined transport and area investments is to optimize the cognitive fit between multiple tasks, both deliberative and evaluative tasks, by different people (Vessey, 1991).

Therefore, in this paper we strive for an improvement of the cognitive fit of evaluation tools that support intersubjective spatial planning. Comprehensive plans are only feasible if potential synergies and added value can be made clear to planners and decision-makers from different sectors and organisations (Heeres et al., 2012). According to Reichert et al. (2015), successful implementation of spatial plans requires that the concepts used are understandable to the decision makers and stakeholders and that the decision process is well structured and moderated. This implies a search for consensus-based assessment in which meaningful and manageable information is essential. We need to move beyond only measurement or only process consensus: we need both measurement and interaction. As Zeleny clearly states, decision making is a function beyond measurement and search, aimed at managing, resolving or dissolving the conflict of trade-offs” (Zeleny, 2011; p. 79).

Methodology

Assessing added value involves linking functional interrelatedness and multi-level governance (Heeres et al., 2012). Added value development is the driver of the link between network and areas of different (spatial) scales. In other words, the network provides the link between the areas, and is also the driver for creating added value in, and of the areas. Moreover, it is of importance to make spatial quality, with all of its characteristics, more manageable for visioning and planning processes. So the intrinsic multidimensionality of spatial quality means that we need an intersubjective, consensus-based context dependent framework to stimulate thoughts, but also to arrange and order them.

The theory of cognitive fit, a special case of cost-benefit theory (Vessey, 1991), describes decision-making that primarily involves information acquisition and well-defined evaluation. According to Vessey (1994), cognitive fit results when the processes required to act on the problem representation are similar to (i.e., match) those required to solve the problem. The theory of cognitive fit provides a way of examining the use of a Decision Support System (DSS) to reduce effort. The concept of cognitive fit readily encompasses the notion that a simulation tool or decision aid will best serve the decision maker when it also supports the processes required to solve the problem. An extension to the simple model of cognitive fit therefore offers a way to view the use of a decision aid (see figure 4). To apply cognitive fit to the use of a DSS, we need to identify the type of information emphasized in the task and choose a problem representation and a DSS that emphasize the same type of information. Vessey and Weber (1986) and Sinha and Vessey (1992) provide support for the notion that performance effects result when any tools or aids used match the task to be solved.

This approach seems useful in the context of transport infrastructure and area development since the notion of fit spans both micro to macro perspectives. Venkatraman (1989), for example, presents the degree of specificity of the fit relationship (micro to macro) and on the presence or absence of *criteria* for fit. Some of the macro concepts of fit offer a way of viewing the design of more complex DSS that support task solution. The theory of cognitive fit applies to *decision-making* in the context of transport infrastructure and area development on fairly simple tasks of information acquisition and simple evaluation. Certain strategies (in this case problem-solving 'processes') will dominate *alternatives* when the *problem representation* matches the nature of the *decision-making task* (see figure 1).

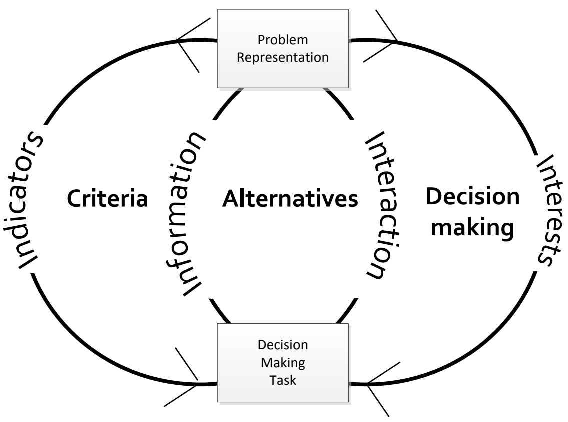

Figure 1: Towards improvement of a cognitive fit of evaluation tools

Expected results

Based on our literature analysis towards improvement of a cognitive fit of evaluation tools we come up with a three step evaluation process through time to come to assessment of combined (added) value in the context of transport infrastructure- and area development. Here we work with the three understandings which have been elaborated on in paragraph 4: *1) understanding key values of the area and the infrastructure network*; *2) understanding value changes per component, and*; *3) understanding tradeoffs between values for decision making.*

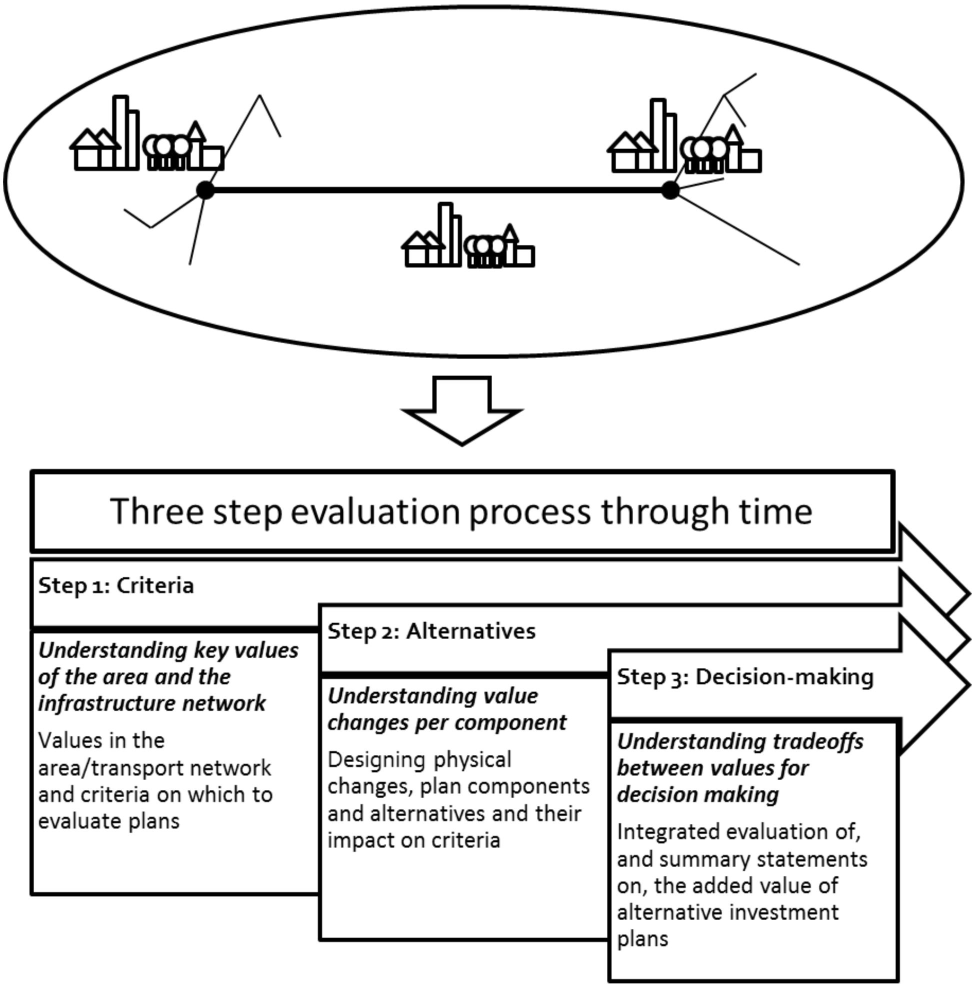

Figure 2: Three step evaluation process through time

The three step evaluation process serves as a comparison across different spatial projects through a better intersubjective underpinning to express synergy effects. The challenge is to optimize the cognitive fit between multiple tasks, both deliberative and evaluative tasks, by different stakeholders. A continuous access of stakeholders during the project planning process benchmarks the increasing insight into 'understandable metrics' on the most important value components. The concept of cognitive fit is essential in this process. When the types of information emphasized in the evaluation process match, the decision maker can use processes that also emphasizes the same type of information.

References

- Beukers, E., Bertolini, L., & Te Brömmelstroet, M. (2012). Why Cost Benefit Analysis is perceived as a problematic tool for assessment of transport plans: A process perspective. *Transportation Research Part A*, *46*(1), 68-78.
- Boardman, A., Vining, A., & Waters, W. G. (1993). Costs and Benefits through Bureaucratic Lenses: Example of a Highway Project. Journal Of Policy Analysis And Management, 12(3).
- Heeres, N., Tillema, T., & Arts, J. (2012). Functional-Spatial Sustainability Potentials of Integrated Infrastructure Planning. Procedia - Social And Behavioral Sciences, 48, 2533-2544.
- Heeres, N., Tillema, T., & Arts, J. (2015). Overcoming Lock-In: Instruments for Value Creation and Assessment Early in the Infrastructure Planning Process. In book: Place-Based Evaluation for Integrated Land-Use Management, Chapter: Overcoming Lock-In: Instruments for Value Creation and Assessment Early in the Infrastructure Planning Process, Publisher: Ashgate, Editors: J.Woltjer, E.Alexander, A.Hull, M.Ruth, pp. 225-247
- Heeres, N., Tillema, T., & Arts, J. (2016). Dealing with interrelatedness and fragmentation in road infrastructure planning: an analysis of integrated approaches throughout the planning process in the Netherlands. *Planning Theory & Practice*, *17*(3), 421-443.
- Keeney, R. L., Raiffa, H., & Meyer, R. F. (1976). *Decisions with multiple objectives: Preferences and value tradeoffs* (Wiley series in probability and mathematical statistics; Wiley series in probability and mathematical statistics). New York, NY etc.: Wiley.
- Priemus, H. (2002). Public-Private Partnerships for Spatio-economic Investments: A Changing Spatial Planning Approach in the Netherlands. *Planning Practice And Research*, *17*(2), 197-203.
- Reichert P., Langhans S.D., Lienert J., & Schuwirth N. (2015). The conceptual foundation of environmental decision support. *Journal Of Environmental Management*, *154*, 316-332.
- Runhaar H., Driessen P.P.J., & Soer L. (2009). Sustainable urban development and the challenge of policy integration: An assessment of planning tools for integrating spatial and environmental planning in the Netherlands. *Environment And Planning B: Planning And Design*, *36*(3), 417-431.
- Sijtsma, F. J., Farjon, H., Van Tol, S., Van Kampen, P., Buijs, A. E., & Van Hinsberg, A. (2012). Evaluation of landscape impacts: Enriching the economist's toolbox with the HotSpotIndex. *The economic value of landscapes*, *26*, 126-136.
- Venkatraman, N. (1989). The concept of fit in strategy research: Toward verbal and statistical correspondence. *Academy of management review*, *14*(3), 423-444.
- Vessey, I., & Weber, R. (1986). Structured tools and conditional logic: An empirical investigation. *Communications of the ACM*, *29*(1), 48-57.
- Zeleny, M. (2011). Multiple Criteria Decision Making (MCDM): From Paradigm Lost to Paradigm Regained? Journal Of Multi-Criteria Decision Analysis, 18(1-2), 77-89.
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