

Industrial Revitalization and Complex Adaptive Systems:

A framework for exploring the context of collaborative planning



Carissa J. Champlin
Timo Hartmann
*Johannes Flacke
Geert P.M.R. Dewulf

Construction Management &
Engineering, VISICO
*ITC

UNIVERSITY OF TWENTE.

Planning Support Systems



Planner's perspective of PSS



IT Developer's perspective of collaborative planning



Gap between planning environment and PSS design environment

PhD Research Aim

Previous research- collaborative PSS design with end user

Suggested research- explore “context of real planning problems” (te Brömmeltoet & Schrijnen 2010, p. 5)



Aim: to explore the context of collaborative planning to inform PSS design

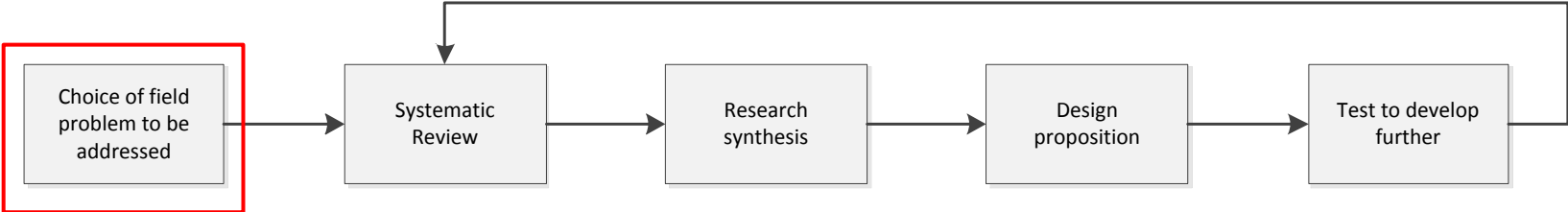
Research Question of Study

Collaborative planning describes a range of planning practices that are dynamic and context specific

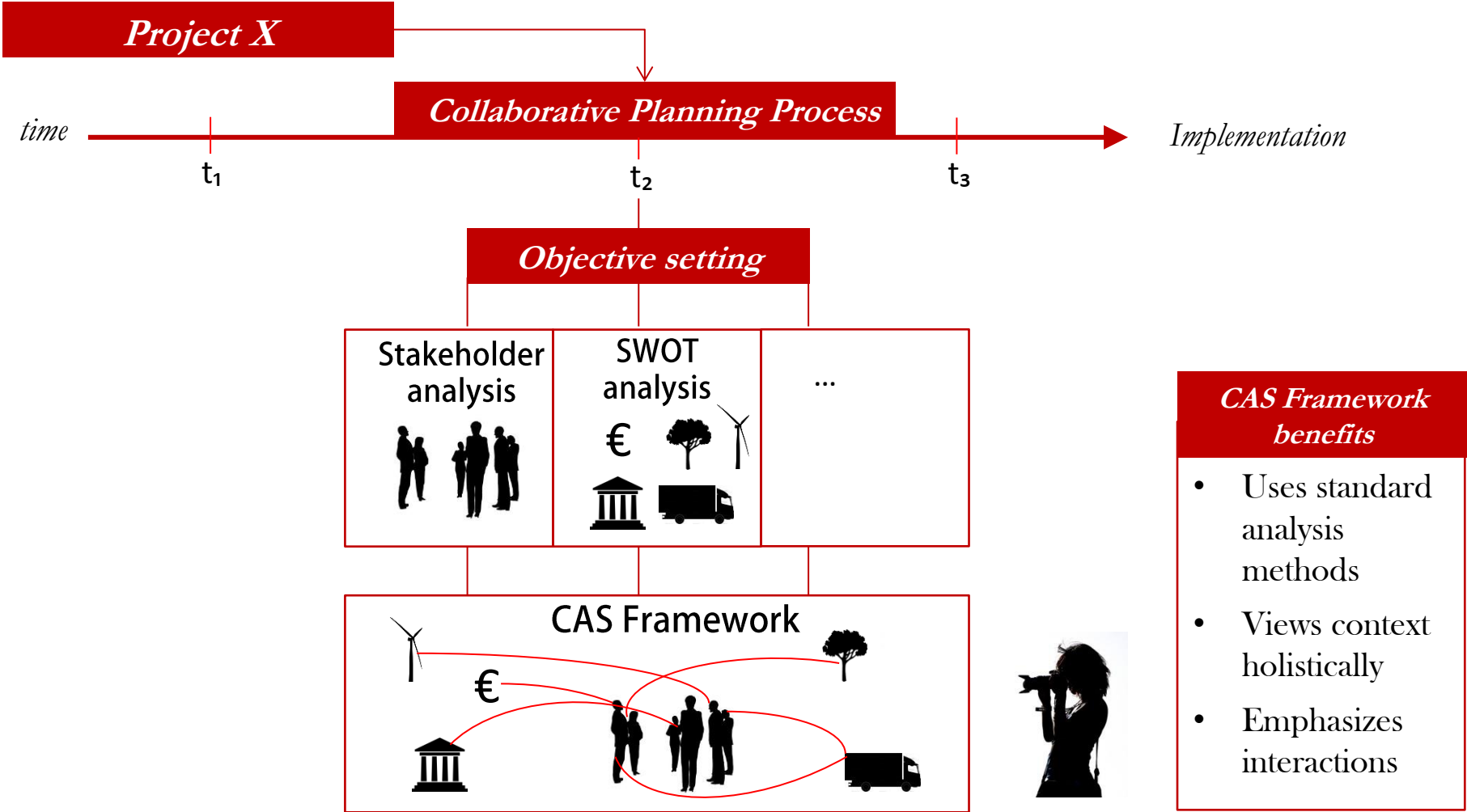
What does collaborative planning look like in practice?



Research Method

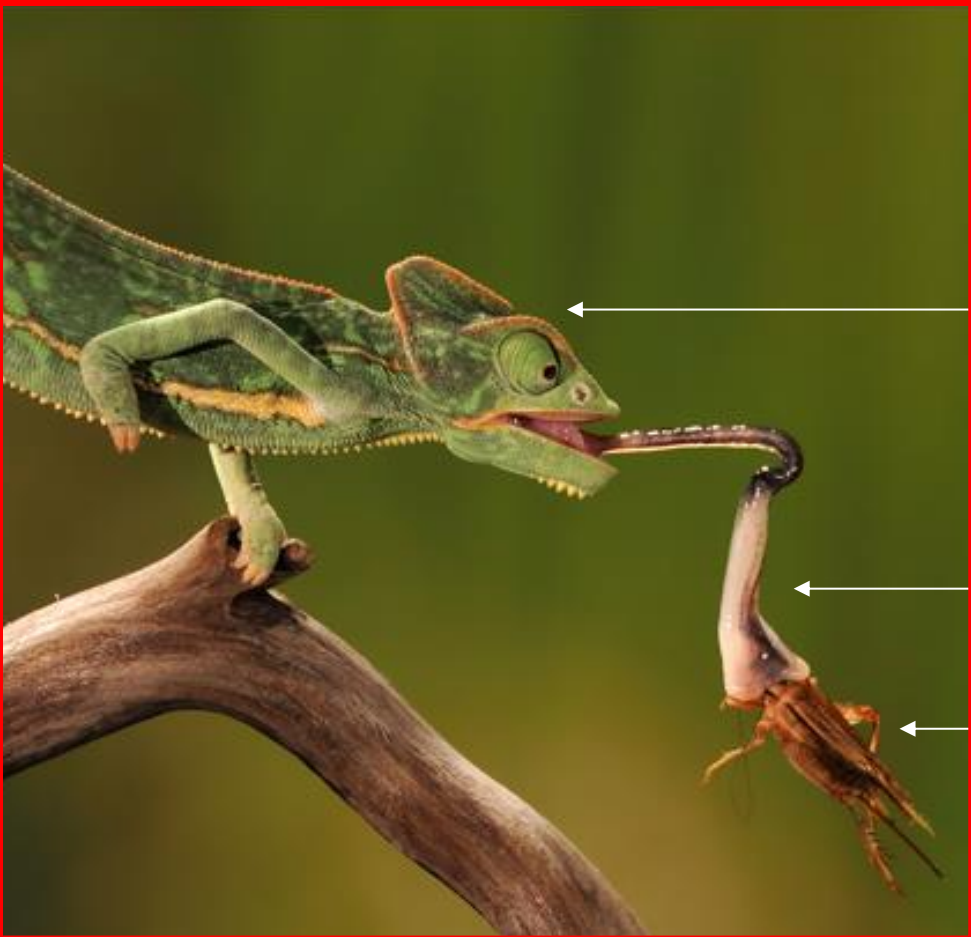


Exploring the Collaborative Planning Process



Complex Adaptive Systems Theory

Lizards with sticky tongues will catch more insects. Insects with slick feet will do better to avoid predators.
(Lansing, 2003)



ENVIRONMENT

- Determined by CAS
- Introduces complexity

AGENT 1

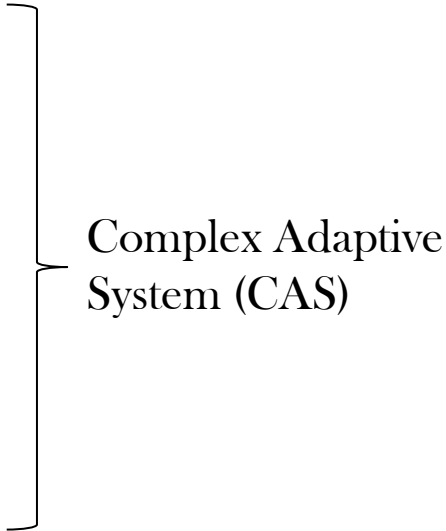
- Attribute: sticky tongue
- Behavioral rule: eats insects

INTERACTION

Dynamically (evolution)

AGENT 2

- Attribute: (no) slick feet
- Fitness: better at avoiding predators



Complex Adaptive System (CAS)

CAS Application: Gaxel case study

Symposium participation



documentation review

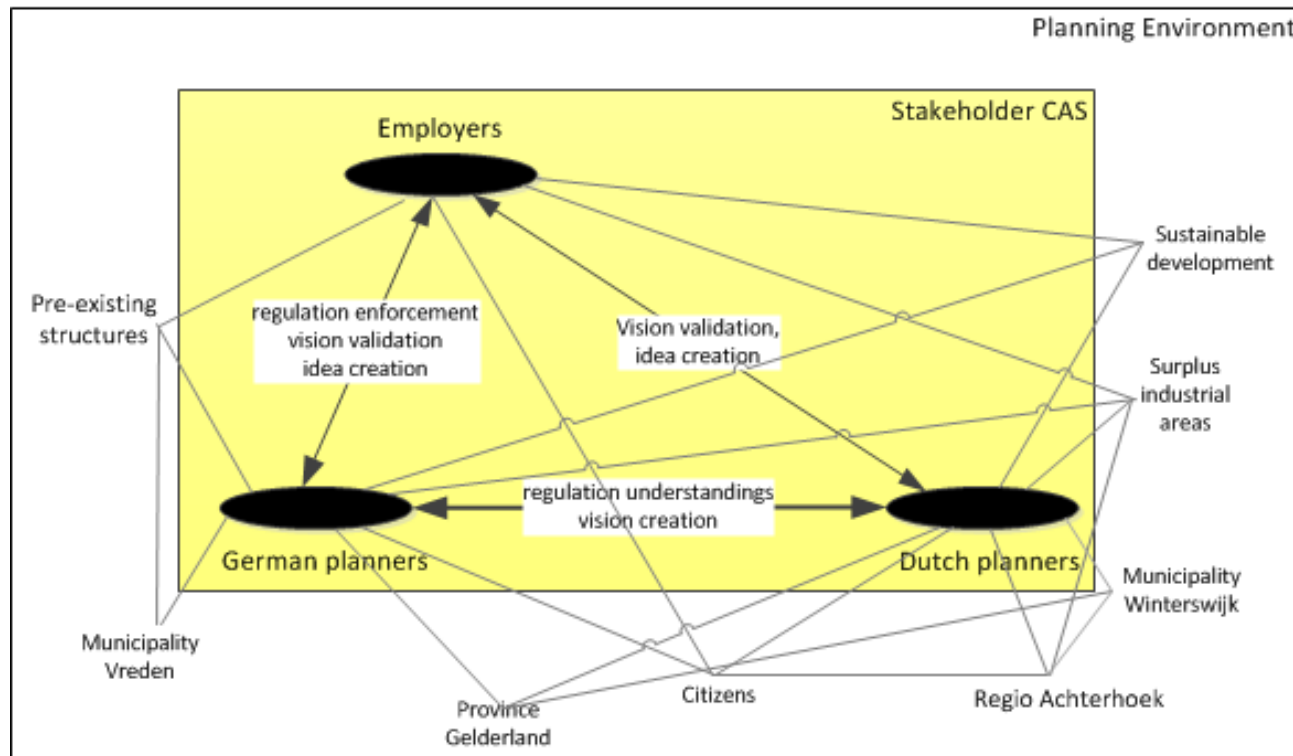


Sketch planning workshops

Planner interviews



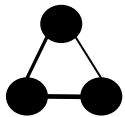
Framework Parameters and Findings



Step 1: Identify and select contextual variables & interactions

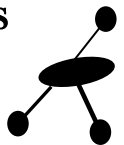
Step 2: Define central CAS using *intensity* and *symmetry* of interactions

Internal interactions



Step 3: CAS interactions define the environment

External interactions



CAS Framework Implications & Future Research

Framework Implications:

- Method of exploring both content and process of a project
- We can better identify *when* and *where* to engage *which* stakeholders
- Supports communication between planners and IT developers
- Behavioral rules can be easily transferred in projects and also into IT environments

Future Research:

- Longitudinal studies are needed to observe stakeholder interactions during future planning tasks
- Explore application of framework in more case studies

Bibliography

Choi, T. Y., Dooley, K. J., & Rungtusanatham, M. (2001). Supply Networks and Complex Adaptive Systems: Control versus emergence. *Journal of Operations Management*, 19, 351-366.

DNL, & DhV, R. H. (2013). Grenzenlo(o)s Gaxel: Sprungbrett zwischen Deutschland und den Niederlanden: Gemeente Winterswijk Stadt Vreden.

Healey, P. (1997). Collaborative Planning: Shaping place in fragmented societies. London: MacMillan.

Hartmann, T., Bonenberg, B., & Voordijk, H. (2010). *From Soft to Hard: A two-round workshop format to develop custom tailored indicators for sketch planning support systems*. Paper presented at the CIB W78 International Conference,

Hartmann, T., Fischer, M., & Haymaker, J. (2009). Implementing information systems with project teams using ethnographic-action research. *Advanced Engineering Informatics*, 23(1), 57-67. doi: <http://dx.doi.org/10.1016/j.aei.2008.06.006>

Innes, J. E., & Booher, D. E. (1999). Consensus Building and Complex Adaptive Systems: A Framework for Evaluating Collaborative Planning. *American Planning Association*, 65(4), 412-423.

Lansing, J. S. (2003). Complex Adaptive Systems. *Annual Review of Anthropology*, 32, 183-204.

Nan, N. (2011). Capturing Bottom-Up Information Technology Use Processes: A complex adaptive systems model. *MIS Quarterly*, 35(2), 505-532.

Te Brömmelstroet, M., & Schrijnen, P. M. (2010). From Planning Support Systems to Mediated Planning Support: A structured dialogue to overcome the implementation gap. *Environment and Planning B: Planning and design*, 37, 3-20.

van Aken, J. E., & Romme, G. (2009). Reinventing the future: adding design science to the repertoire of organization and management studies. *Organization Management Journal*, 6(1), 5-12. doi: [10.1057/omj.2009.1](http://dx.doi.org/10.1057/omj.2009.1)

Partly funded by:



Ministerium für Wirtschaft, Energie,
Industrie, Mittelstand und Handwerk
des Landes Nordrhein-Westfalen



Appendix: CAS Framework for Industrial Environments

Table 2. Framing Revitalization Environment as A Complex Adaptive System

CAS Principles	CAS Description	Application to Revitalization Environment
Agents	Basic entities of action who act or react to other agents and the environment	The Stakeholders: <ul style="list-style-type: none"> • Dutch and German municipal planners and aldermen who are the key decision makers on the project • There are more than 120 employers either already active in the industrial terrain or interested in investing
<ul style="list-style-type: none"> • Attributes 	Individual differences that determine fitness	<ul style="list-style-type: none"> • Planners have high influence throughout the process and possess comprehensive knowledge of the planning environment • Employers have high influence on specific issues and have tacit knowledge of the planning environment
<ul style="list-style-type: none"> • Behavioral rules 	Schema that determine agent behaviors and attributes	<ul style="list-style-type: none"> • Planners take decisions on ideas according to strategic vision and regulatory frameworks; seek to maximize system fitness • Employers support or reject ideas according to self-interest; seek to maximize personal fitness
Interactions	Mutually adaptive behaviors between agents	These are the interrelations between stakeholders that constitute the stakeholder network (or Stakeholder CAS)
<ul style="list-style-type: none"> • Linkages 	Paths of resource movement and level of connectivity it provides	<ul style="list-style-type: none"> • High-intensity connections between Dutch planners and German planners via frequent telecommunication, meetings and objective setting workshops • Planners host employers to periodic workshops/symposia; German planners and employers interact on regulatory/economic matters
<ul style="list-style-type: none"> • Flows 	Movements of resources through agent networks and through system interactions with the environment	<ul style="list-style-type: none"> • Knowledge flows between Dutch and German planners to gain common understandings of regulatory frameworks and to agree upon strategic objectives • Knowledge is expressed by employers in terms of interests and level of demand for planner ideas; during workshops they also engage in idea creation and strategic objective validation
*System fitness is measured by the ability of agents in the stakeholder network to build a strategic vision and create new ideas		
Environment	Is external to the CAS of focus and consists of other interacting agents and contextual variables that influence the CAS	The stakeholder CAS defines this environment which consists of external stakeholders and their networks, physical structures socio-political norms and regulatory instruments
<ul style="list-style-type: none"> • Dimensioning effect 	The freedom of variation that the environment provides	NL land use plan- flexible process, rigid tool, DE land use plan- rigid process, flexible tool.
<ul style="list-style-type: none"> • Complexity factor 	Optimal fitness of the CAS is reached through high interdependence. The reverse is often the case for the environment as a whole	Through frequent interaction, the planners and employers have established a set of strategic objectives. However, complications as the result of regulations and agreements to other networks have complicated and slowed the process