The complex planning of innovation

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Abstract

Planning processes of nature bridges in densely populated urban fringe areas in the Netherlands have been studied. They are seen as highly innovative; therefore more insight is necessary in their planning processes. As the planning processes are considered as dynamic open complex systems, they have been redescribed using terms and graphs of Complexity Theory in order to better understand the processes. The Breda urban corridor has been described in depth using data gathered by open in depth interviews following a Grounded Theory approach. The redescription showed that the innovation was an unexpected result of a complex planning process. It is discussed that this example is not anecdotic. Unexpected results are part of the development of complex processes. A narrative can be constructed looking back in time. Looking forward the only possible prediction can be that unexpected results can occur in every complex planning process.

Keywords: Complexity Theory, urban planning, planning processes, innovation, nature bridge, Grounded Theory, narrative.

1 Introduction, innovative nature bridges

In an earlier paper published at the 2004 Sustainable City Conference the innovative idea of nature bridges in densely populated urban fringe areas has been described [1]. So far the idea of nature bridges (ecoducts) had only been applied in the Dutch larger nature areas to enable deer and other large mammals to safely cross major national infrastructure. An example near the Dutch new town Almere is a planned office duct. An office is crossing the A6 highway; its roof includes a forested area connecting nature area on both sides of the A6. At the same time three comparable projects were going on in the Netherlands. The National Green Innovation Network advising the Dutch government on the strengthening of innovation processes in the Netherlands became interested in

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the topic. Nature bridges in densely populated areas can help to establish green and recreation networks in city areas. However at first sight they are extremely expensive.

The Innovation Network asked the question: 'what are the factors limiting the chances for the realization of nature or green bridges in urban fringe areas?' The hypothesis was that Complexity Theory can bring us a better understanding of the planning process of innovative nature bridges. This understanding was thought to be important for policy makers to enable them to better support innovative processes.

2 Complexity and innovation

In Complexity Theory the world is considered as built up of numerous dynamic open systems. At first sight these systems look rather stable usually being under the influence of a so-called attractor. In this situation the open systems seem to develop in a linear way. However certain developments in or outside these systems can result in dramatic and unpredictable changes. Planning processes are interpreted as dynamic open or complex systems.

Initially complexity literature stems from biophysical sciences [2, 3]. Now Complexity Theory has become adapted in a range of human and natural sciences [4–8]. Also rich literature in product and organization life cycles is connecting innovation theory with complexity theory. Ayres [9] describes non linear processes of innovation distinguishing periods of stable product development and rapid break troughs. Kash and Rycroft [10] find radical and dramatic changes in product development. In governance literature more and more evidence reveals that unpredictable bottom up processes or peripheral developments can have an important influence on decision making and planning [11, 12].

The question is: can we describe the planning processes in terms of Complexity Theory, so that we can consider and study them as dynamic open or complex systems? For this paper one study has been selected and will be discussed in depth.

3 Methodology

Research was carried out by literature search and case analysis. Literature search was done in innovation and complexity literature starting with the work of Prigogine [13] and Prigogine and Stengers [14]. Case analysis was done for four projects (nature bridges in urban fringe areas) using Grounded Theory focussing on the innovation process. Grounded Theory has been developed by Glaser and Strauss [15] to do qualitative in depth research. Cases were analysed by open interviews with key persons acquiring rich data from the field. Following Charmaz [16] directive and interpretative questions resulted in perspective knowledge on the practical cases and in better and joined understanding [17] Then the information on the planning process has been redescribed considering

them as complex open systems following Geldof [18] and Timmermans [1] distinguishing seven phases of development of a complex system:

1. The current routine of a complex system.
2. Changes in the environment of a complex system resulting in pressure to change its routine.
3. Micro scale developments within the complex system to adapt to changes within the current routine.
4. Chaotic phases in the complex system where pressure becomes so large that current routines are no longer appropriate.
5. Triggers from outside the complex system which are sudden occurrences resulting in rapid changes.
6. Sudden and rapid changes of the routine of the complex system.
7. New routine of the complex system.

An attempt was made to better understand the innovation processes using the Prigogine diagram of the 'evolution of a complex system'.

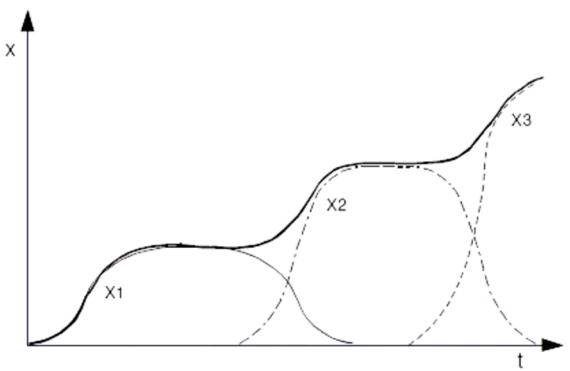

Figure 1: The evolution of a complex system. The level of complexity (x) rises or declines in time (t). After Geldof [18] and Prigogine and Stengers [14].

4 Case description: the Breda city ecoduct

4.1 Introduction

Four cases studies have been executed in the research:

- The Breda urban corridor is a newly developed green urban park corridor crossing the A16 highway and the High Speed Train railway [1]
- The Almere office corridor was meant to be an office crossing the A6 highway. Its roof was designed as a green area connecting natural areas on both sides of the highway [1]. It was not realized.

- The Craailo nature bridge is crossing agricultural land, a working area, a railway and a highway connecting two natural reserve areas for small mammals and recreational services [19].
- The green bridge of Rotterdam should connect Rotterdam city with its surrounding rural land crossing railroads, highways and a large waste land. It was not (yet) realized.

In this paper the decision making process of the Breda urban corridor will be considered in depth, as a narrative and then in terms of Complexity Theory.

4.2 Narrative

West of Breda between the municipalities of Breda and Prinsenbeek the A16 highway was planned to be upgraded from four into six lanes. A high fly-over near housing areas was included. In spite of large societal unrest the plans were ready for execution in 1996, however then suddenly on national level the decision was taken that the new railway of the High Speed Train connecting Paris with Amsterdam, had to be developed along the A16. Both processes were a responsibility of the same ministry, although two different departments were both in charge of one of the two. In the beginning attempts were made to let the two plans not interfere which resulted in an extra new and higher fly over near the housing area to let the railway cross the A16. However both planning processes started to interfere in such a way that the execution of the A16 work was delayed. Public unrest in Breda rose again, so that the municipality of Breda decided that they did not want to cooperate with the new High Speed Train plans. This attitude changed when the municipality boundaries were redrawn: Breda and Prinsenbeek became one municipality. Now the large new infrastructure became a threat because the new municipality was divided into two parts. So cooperation with the Ministry was started. After a massive carnival celebration protest in the Prinsenbeek village the national government offered extra money so that the High Speed Train could be a 'societal embedded' project. After some brainstorm meetings, with more than a hundred policy makers joining, the outcome was a new Shuttle station for Breda connecting it to the High Speed Train (which will not be the focus here) and two large green urban park corridors crossing the A16 and the railroad and thus connecting Breda and Prinsenbeek with each other.

4.3 Redescription

Now the Breda urban corridor case will be redescribed from the point of view of the High Speed Train project leader using the terms and graphs of Complexity Theory. These are the terms of the seven phases of a complex system as described earlier this paper and the Prigogine diagram of the 'evolution of a complex system' (figure 1).

The decision that has been made to plan the High Speed Train west of Breda leaves the project leader with the start of a complex process with a given rate of complexity (1). Soon he is confronted by a wide variety of external influences (2), like interference with the A16 process, the societal unrest and Breda refusing

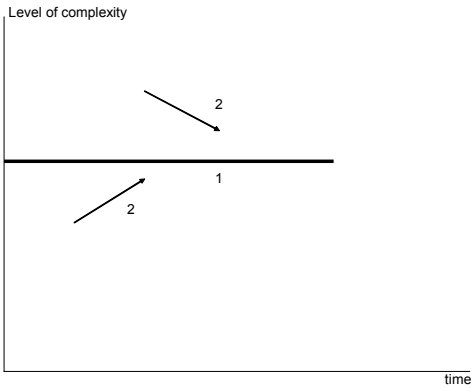

Figure 2: The current attractor or current routine of a complex system of railway planning (1) undergoing external influences (2).

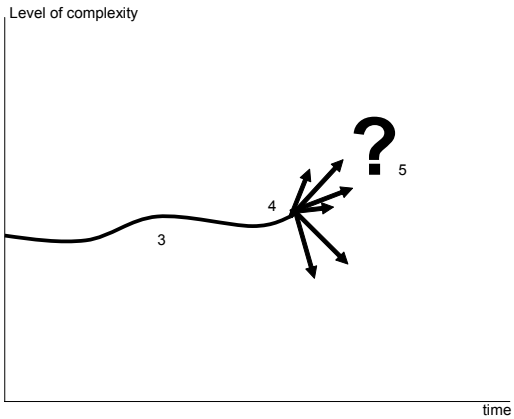

Figure 3: The attractor becomes less stable (3) and becomes in a chaotic phase (4). The triggers force the system to move to an unknown other attractor (5).

to cooperate. In figure 2 the planning process as initially planned is considered to be the current attractor (1) under pressure (2).

As a result he tries to adapt his planning process to incorporate the influence without really changing his ongoing routine process of railway planning (3). However, finally this happens to be impossible. He has to cooperate with the A16 process. His process becomes more and more complex and finally he faces the problem that the traditional process, the current routine is no longer appropriate for the situation (4). Especially the redrawing of the municipal boundaries and the visit of the Parliament resulting in the extra money to solve the problems are unforeseen and unpredicted new triggers which bring new and

formerly unknown and unplanned possible solutions within his scope (5). In figure 3 the current attractor becomes more and more unstable (3); it becomes in a chaotic phase (4), where strong triggers (5) move it to an unknown new attractor.

Suddenly a new process is started, which combines railway planning; A16 planning; the influence of the redrawing of the municipal boundaries and; the extra money that is available (6). In a three day workshop with all stakeholders and policy makers involved a completely new more complex plan is made which was executed (7). In figure 4 suddenly and rapidly (6) a new stable attractor (7) with a higher rate of complexity occurs.

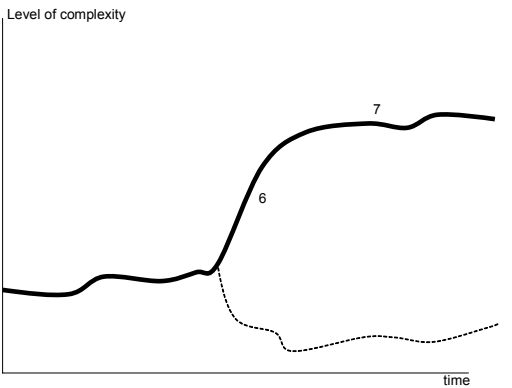

Figure 4: Suddenly (6) the planning process moves to an unpredictable higher level of complexity (7), which could have been a lower level as well.

5 Conclusion

In Breda the planning process that finally lead to the innovative green bridge, the urban corridor crossing the A16 highway and the High Speed Train railway has been investigated. Can the planning process be considered as a complex system? Figure 5 shows that we can.

The initial planned High Speed Train railway development process was a current routine (1) and in terms of Complexity Theory it was a given attractor. The project leader however faced serious pressure (2) at the local Breda level. His project interfered with other complex projects; the overall planning process became much more complex. He tried to let his project adapt with the external pressure within the current routine (3). However, due to the external pressure the initial planning process came into a chaotic phase (4). The interference of his planning process with the A16 planning process, the redrawing of the municipality boundaries and the carnival resulting in extra money became the triggers (5) for a jump. The triggers caused that his project jumped unplanned,

rapidly (6) to another unknown attractor (7) with a higher complexity. In this process the outcome was not only a High Speed Train railway as planned. The planning process did behave like a complex system and developed according Complexity Theory patterns as illustrated in figure 5. Completely unexpected an innovative nature bridge, the Breda urban corridor, became a logical result of his planning process as well.

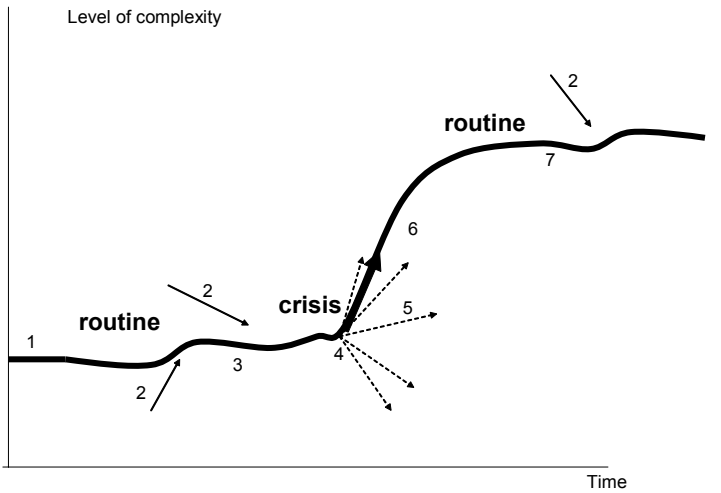

Figure 5: Typical behavior of a complex system changing by outside or peripheral pressure via a crisis from one attractor into another one.

Now what could be the recommendations for policy makers on how to support innovative processes, taking into account the case studies?

6 Discussion

The reason for the Innovation network to ask the question was that they considered it quite unlikely that any proposal to build a green innovative nature bridge crossing major infrastructure in the urban fringe would be realistic and could be successful. If someone would start up a linear project to realize a green bridge in the urban fringe crossing infrastructure and connecting green areas for nature and recreation, the outcome would be that the price was too high. However the Breda urban corridor was not meant for nature reservation or for recreation at all. It was the unexpected result of a complex planning process, which realized the green bridge in a completely different context of interfering infrastructure planning processes; redrawing municipality boundaries making it necessary to build new communities; and the national government supplying extra money to prevent large societal unrest and to arrange societal acceptance of large new infrastructure developments. The lesson is that planning processes

which behave like complex systems can supply us with unexpected and unpredictable innovative solutions, which occurrence would have been highly unrealistic and improbable when they would have been planned as the outcome of a linear planning process.

We should ask ourselves whether this evidence is to be considered as anecdotic or not, as the research has been carried based on case studies. Our examples can be considered as the one and only exception. Now we follow Taleb [20]. He discusses that extreme exceptions, like the totally unexpected innovative green bridge that we find in Breda, are very rare and have a high improbability in statistic based linear thinking. When we find one, it may indeed be the one and only exception, the anecdote. If we would consider planning as a linear process, it brings us the conclusion that unexpected results or even innovations are exceptional and improbable. However, we conclude, that planning processes can be far from linear: they behave like complex systems. This means that external influences on complex planning processes can be the trigger for rapid and unexpected changes in the planning process leading to results which have been unknown so far. In the older, linear context the results can be even unrealistic. According to Taleb these extreme events are part of the natural pattern of complex systems; Complexity Theory enables us to understand this type of processes. We can say that the outcome that we found is not an anecdote; in contrary the possibility of unexpected and earlier unknown outcomes is an important characteristic of the behavior of complex processes. Our interviews with key persons in the four case studies give evidence that daily planning practice and experience from the field support this outcome.

So, finally which recommendations can we give to policy makers on how to support innovative processes?

We studied an existing innovation looking back in time and constructed a narrative. When studying complex systems conclusions on the basis of the narrative should be avoided; we have to be aware that our knowledge of the planning processes or the complex system is limited. A complex system consists of a large number of parameters. Small changes in the parameters can make the whole system behaving completely different [21] with potentially surprising and unexpected outcomes [22]. And that is what policy makers have to be aware of and what they should be able to work with. Although we can make narrative reconstructions all we can predict is that there is always the sudden possibility of unexpected results in spite of our human ambitions to plan and control. These results will sometimes be innovative; however they might be disastrous as well. Their main characteristic is uncertainty. Unexpected occurrences can surprise us every moment. Policy makers have to deal with that.

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