planning by surprise

complexity and territorial development

Wim Timmermans
Lubbert Hakvoort
Michiel Hupkes

VAN HALL LARENSTEIN

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COMPLEXITY AND TERRITORIAL DEVELOPMENT

COLOPHON

AUTHORS
Wim Timmermans
Lubbert Hakvoort
Michiel Hupkes

EDITOR
Martin Woestenburg

DESIGN
Jos Jonkhof / Jonkhof Onderzoek&Services
Fonts: *Cambria, Minion, Copperplate*

PHOTOGRAPHY
Editing Jos Jonkhof

PRINTED BY
Druk . Tan Heck, Delft, The Netherlands
Paper: *Munken Pure Rough 120gr*. (text) and
Satimat Green 150gr. (photography)

ISBN
XXXX

A publication from Green Living Environment of Cities lectureship,
Van Hall Larenstein University of Applied Sciences.
Velp, The Netherlands, 2013

IN THE PUBLICATION SERIES PLANNING BY SURPRISE

The values of green spaces in towns and cities

De waarden van de groene ruimte in de stad (2012)

Designing for climate adaptation

Ontwerpen aan klimaatadaptatie (2013)

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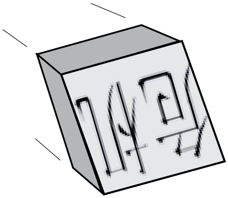


PREFACE

We are living in a complex world. This may seem very obvious, but complexity is currently one of the determining factors in spatial planning – not just of large infrastructure projects, the construction of new residential districts or regional area development, but also of small projects, such as the setup of a social centre or the redevelopment of a square. Project organizations and project managers have to meet stringent requirements, because they not only have to plan out their work, but they also have to take account of all kinds of process-related aspects. Besides technical knowledge, people and organizations must also have a lot of social and organizational skills, cooperation is virtually mandatory, and managers and organizations must be prepared for random and unexpected events.

This book – *Complexity and Territorial Development* – tells the story of how academic staff and students at the Van Hall Larenstein university of applied sciences deal with complexity and planning in education and research. It is intended for everyone who is involved in complex projects, but in particular for current and future students at the university who will be trained in how to handle complex projects. In this book we want to show why planning has become complex, what theories about this subject are relevant, and how this fits in with the practical experience of staff and students.

Complexity is an integral component of the Professional Project and Process Management Master's degree programme at the Van Hall Larenstein university of applied sciences. In

this programme, lecturers with a lot of practical experience prepare students – who have had a number of years of work experience – for working in complex projects. The tutors use the results of the research that has been done within the 'Green Living Environment of Cities' lectureship. In the Farland project, eleven partners from five countries studied public-private partnerships in rural development. Within *F:ACTS!,* thirteen organisations from eight countries are working on regional strategies that focus on adaptation to climate change.
Complexity and Planning is divided into five chapters. The first chapter is an introductory account of how spatial planning has become complex, and why projects like the Zuiderzee Works should currently be tackled in a different way. The second chapter then takes a look at the essence of complexity using the complexity theory as developed in mathematics and the natural sciences. The theoretical developments in project management are discussed in Chapter 3; it also shows what form the complexity of a project takes.
The situation in practice will be discussed after that: the practical process within projects and how complexity is handled within the professional practice of students and lecturers. The fourth chapter distinguishes seven phases in the practical side of complex projects and these phases are illustrated with examples from student research and the practical work of staff. The fifth chapter is the conclusion, in which a brief explanation is given of what the combination of complexity and planning means for the professional practice that Van Hall Larenstein trains people for.

Lubbert Hakvoort
Michiel Hupkes
Wim Timmermans

1 Planning is becoming complex and dynamic

Extensive engineering plans such as the Zuiderzee Works or the Delta Works, with their clear, technical objectives, are no longer appropriate in the current social, economic and political scene. Planning now serves multiple interests, involves multiple scales, ensures the multifunctional use of space, deals with sensitive political issues and strong public pressure, and continually makes changes in what are often long-term and opaque processes. In other words, planning has become complex. This applies not just to large projects, but also to smaller ones.

The history of spatial planning in the Netherlands is a good example of how planning has become complex. In the twentieth century, the Dutch developed an active and ambitious spatial policy, which was carried out with an abundance of spatial plans. Those plans were often ambitious, visionary and all-encompassing, and were characterised by an enormous belief that the landscape could be shaped and planned. Planning was centrally controlled by a powerful Ministry of Spatial Planning, plans were worked out in detail and carried out with technical precision. In mid 2012, people still often look back with a kind of nostalgic awe at these spatial plans, which were therefore called ‘grand schemes’. Well-known examples are the Zuiderzee Works and the Delta Works.

Large projects

The reason that people look back on these grand schemes with a mixture of nostalgia and awe is partly because they realize that such schemes can no longer be planned, organized and carried out in the same way in the twenty-first century. A brief reflection on the Zuiderzee Works and the Delta Works will make clear why. The most striking thing about these grand schemes is the extremely lengthy completion time of several decades. Cornelis Lely's plans for the Zuiderzee Works even go back to 1891. Even today, the hydraulic engineering plan by the engineer Lely determines the way people think about spatial planning for much of the Netherlands. The objective was to provide space for agriculture and housing. The method was a rigid engineering plan that would gradually change the North Sea bay known as the Zuiderzee into a collection of IJsselmeer polders. The first step was taken in 1930, when the Afsluitdijk causeway was built; the last step was in 1975 when the Houtribdijk causeway between Enkhuizen and Lelystad was completed.

The Delta Works also had a long completion time. After the North Sea Flood of 1953, an old plan was resurrected to protect the coast of the islands of Zeeland and Zuid-Holland by a system of closed and permeable barriers. The objective was to make the coastal area safer, but in a cost-effective way. The Dutch coastline was shortened by around 700 kilometres because of the barriers. Only the dykes west of the land had to be strengthened to 'delta height' (the required height according to the Delta legislation). The height of the inland dykes did not have to be increased. Fourteen large hydraulic engineering structures were built, from the construction of the storm surge barrier in the Hollandse IJssel near Rotterdam up to the delivery of the movable Maeslant barrier in the Nieuwe Waterweg. In 2010, the height of the Harlingen Sea Barrier was raised, bringing the process of increasing the height and width of the many sea dykes to an end.

Ambitious spatial programmes

The grand schemes stand for a class of planning with ambitious spatial programmes and usually equally ambitious economic and social objectives. The reasons why these projects had to be carried out were often just as clear and unambiguous as they were indisputable. The reasons for the Zuiderzee Works were the need for new farmland for food production and for new towns and cities to absorb the population growth. The reason for the Delta Works was the guarantee of safety for farmland and towns. Planning also often incorporated a powerful idea of the ability to shape things according to your will, and a purposeful and technically based organization. The objectives were described in unambiguous final images using master plans, maps and other communications and visual resources, as was the planning with all the intermediate steps and the timetable required to achieve the envisaged final result. The plans for many great schemes can still easily be found on the Internet. Another typical feature is the highly technical approach to the planning. The Delta Commission, which supervised the Delta Works, consisted of twelve civil engineers, one agricultural engineer and one economist. Engineers like Lely also played a decisive role in the Zuiderzee Works.

Things are totally different in the twenty-first century. The underlying objectives of the grand schemes - securing economic growth, absorbing population growth and guaranteeing safety - also played a role in 2007, when a new Delta Commission was set up. The archetypal Dutch problem of water management, the struggle against the water, played a role once again, but it was immediately clear that the reason for a renewed approach to Dutch water management – climate change – was far less indisputable. Many people wondered whether the Netherlands should be spending hundreds of millions of euros again on time-consuming, complex projects, all because scientists were warning of the consequences of climate change. It was therefore no surprise that the Delta Commission did not present any plans in 2008, only twelve recommendations without direct organizational implications. Those recommendations were not just about technical interventions by engineers in order to enable urban construction and agricultural production, they were often also about combining safety with nature development and recreation. The commission also made recommendations about the political and administrative organization, the organization of financial resources, and about legislation and regulations.

No longer appropriate

It is also clear now that the grand schemes from the past no longer fit, physically and spatially, with what the Dutch want now. That was already clear for the Zuiderzee Works in 1972, when water sports practitioners, nature lovers, local residents and other stakeholders set up the Vereniging tot Behoud van het IJsselmeer (Association for the Conservation of the IJsselmeer Lake). Its objective was to prevent the Markermeer lake from being drained to create the Markerwaard polder as envisaged in Lely's plans. They kept on fighting even after the completion of the Houtribdijk causeway, demarcating the lake, and were finally successful in 2002: the IJsselmeer and Markermeer would remain open. The ability to shape things as you wished turned out to be less easy to achieve in practice than the engineers had thought in 1953 for the Delta Works too. The original plan to dam the Oosterschelde estuary was replaced by a design for an open surge barrier that could be closed during heavy storms. Since 2004 salt water has been admitted to the Veerse Meer again and there are plans to do the same in the Volkerak and the Krammer, as problems arise in summer with toxic blue-green algae.

But what has changed now? Why can large projects no longer be organized in the same way in the twenty-first century? And why is complexity so important? People say that the world has become more complex, and therefore making plans has too. But at first sight, not so much seems to have changed. Money, legislation, regulations and time currently still form the fixed conditions under which complex projects take place. The long completion time of such projects remains a characteristic feature; the preparations and execution often easily take ten to fifteen years. As a result, projects have to be adapted to changing circumstances. Large projects also still require enormous financial investments that need to be calculated meticulously because of the uncertainty and dynamics of such projects, as the financial risks are huge. There are also still the many permits and changes in land-use designations; they can result in delays, which have financial and organizational consequences. In fact, every large project is actually unique in terms of its duration, financial construction and requirements regarding legislation and regulations. The wheel therefore has to be re-invented for every large project.

Complex dynamics

Yet two things have changed. The first major difference is that, in the twenty-first century, the basic limiting conditions in terms of finance, legislation, regulations and time can be very complex for small projects too. This is because the small-scale projects of the twenty-first century generally involve combining various functions, linking various types of income and costs and the interplay between various types of land use and various economic sectors. The transformation of former farmland into a recreational area and a farm-based care facility requires complex financial constructions involving different public and private parties, separate permits or exemptions in the land-use plan and therefore can easily take five years. The same applies to the conversion of a deserted industrial park into a residential and working environment.

The second major difference is that the social dynamics – not only political, social, cultural and economic, but also technological – are such that there is no straightforward answer to the question of how to tackle major social issues – climate change, for example, as well as issues such as infrastructure and housing. Unlike the large projects of the twentieth century with their clear, unambiguous and indisputable reasons, such reasons are lacking for the current projects or continuously changing. As a result, large projects such as the Zuiderzee Works and the Delta Works cannot be planned, set up, organized and carried out anymore as they were in the twentieth century. The emphasis is currently no longer on the technical and functional objectives of a project, but often on continuously changing, temporary results provided by a project from an economic and social point of view. The exact purpose is therefore unclear and there are always questions being raised about the legitimacy of a project. The planning discussions are more about broad political and social support than about technical aspects. The following chapters will show why.

2 Planning and complexity theory

In abstract terms, current spatial planning can be compared with complex systems in nature. After all, the idea that a butterfly can cause a tornado can also be applied to spatial planning. Spatial planning is also about making connections between physical and spatial systems and social, economic and political systems. Then it becomes clear that communication and power are the determining factors rather than the physical facts.

One of the most compelling examples of systems that change drastically as a result of a small, random change is the idea of the butterfly in Brazil that causes a tornado in Texas. This butterfly effect was used by the American mathematician and meteorologist Edward Lorenz as an example of how a slight change in the air at one location could cause very large deviations at another location. The example shows that meteorological systems are not a closed, segregated entity, but part of a multi-faceted and complex whole comprising many different systems that affect each other at all kinds of levels. Lorenz belonged to a growing group of physicians and mathematicians who approached systems over the course of the twentieth century in terms of deviations, chaos, randomness and complexity.

Complex systems evolve

This led to a new approach to systems also known as complexity theory, in which the natural sciences were linked to social sciences. Systems were now no longer considered as a more or less stable whole that could be reduced to the sum of all its parts. It was therefore no longer possible to stick to the idea that systems only change if that sum of the parts changes and that systems therefore only go through linear developments, growing or shrinking. According to complexity theory, complex systems evolve. Their development process is nonlinear and unpredictable and they change irreversibly over time. Small changes can have large consequences. In 1986, the Belgian-Russian physical chemist and philosopher of science Ilya Prigogine was the first person to emphasize the importance of complexity theory for social sciences. He claimed that the creativity of people leads to unpredictable and irreversible changes in complex social systems, which have social, physical and intellectual consequences that are just as unpredictable and irreversible.

Complexity theory emphasizes the interaction and interdependence of systems. Systems are all embedded or nested within larger systems and all systems and subsystems are interrelated and interact with each other. This is a very dynamic whole, but it can also be stable for a long time. Systems can go through largely stable developments for a long period of time in a state of attractive equilibrium, i.e. one during which small changes take place that ensure the system remains in a certain form or state. A shock can jolt the system out of its state of equilibrium, though. Systems can also gradually grow towards an unstable state, where just a slight change may be enough to cause a radical change in the entire system. Such a change will take place rapidly, its progress will be nonlinear and chaotic, and the result unpredictable. Other systems, in states involving more or less attractive equilibria, will play unknown and unpredictable roles.

Process management and scenarios for the future

Lorenz's butterfly effect is explained in two ways in complexity theory and this has consequences for the way that complexity theory can be used in spatial planning. In the first explanation, the bifurcation point – the point at which a system tips from one equilibrium state to another – plays an important role. The things that trigger the transition can often be incredibly small, whereas the transition itself has huge consequences. As a result, the system will move from a relatively simple and balanced state into a much more complex and chaotic state, which opens up a large number of possible development paths. Researchers have managed to record bifurcation points for ecological systems, such as a clear lake that suddenly turns cloudy, but they expect to observe these points in social, economic and political systems too. Within the practice of spatial planning, this theory of complex social processes is important for process managers and planners of spatial processes.

Within physical systems, the changes in complex systems are also explained by the concept of 'deterministic chaos', in which chaos has the technical meaning of a state of apparent disarray that can be determined exactly. This sounds like a contradiction in terms, but the point is that a system in a certain state can be determined exactly within a certain statistical margin of certainty, and that the changes in the system can also be determined relatively exactly using a calculation rule or numerical model. Meteorologists, for example, can predict tomorrow's weather using the deterministic chaos of today's weather. This type of complexity theory is frequently used in spatial planning to develop scenarios for the future.

From facts to communication and power

The application of complexity theory to spatial planning is new. It can be explained by the strong tendency to control things in spatial planning. However, since the 1970s, thinking about planning has changed from a technical, value-free, objective and goal-driven approach to planning to a more process-oriented and communicative approach, focusing more on the expanding role of the many stakeholders. Planners are increasingly convinced that planning is a long-term process, one that may have the unexpected result of leading to uncertainty, a process that is characterised by obscurity, and a process that can bring out the worst in people. The emphasis in spatial planning is therefore more and more on communication and power as the determining factors in the planning process rather than the technical and value-free facts that were formerly used as arguments.

Meanwhile, over the past ten years a great deal of research has been performed into the way that complexity theory could be used in spatial planning. For instance, research is being performed into the connection between the spatial concept of ‘space’ and the social concept of ‘place’: this too is a connection between the natural sciences and the social aspects. Complexity theory is also one reason for using models differently in planning. For instance, models that focus on individuals allow us to look at the actions and interactions between the various individuals in a system, and to study the spatial effects of clearly defined and relatively simple social developments. In addition, researchers no longer only use models as a representation of reality, but also as a source of ‘geographical stories’, and they use these location-based stories to study differences in opinions and interests.

3 Managing complexity

Complexity is therefore one of the fundamentals of spatial planning. Nearly all spatial projects have become complex. The many interests, functions, sectors and profit models and the combination of all kinds of financial, planning, cultural, historical and ecological preconditions lead to both problems and opportunities at the same time. These days, considerable attention is therefore given to this complexity in project management. A distinction is made between different types of complexity.

In this chapter we will discuss six types of complexity as distinguished in the literature on project management: time, finance, legislation and regulations, technology, organization and social aspects.

A subdivision can be made for spatial projects between the more or less basic and relatively fixed prerequisites in terms of time schedules, finance and legislation and regulations, and the more process-based and dynamic technical, social and organizational aspects of a complex project. At the end of Chapter 1, we have already concluded that the basic prerequisites of time, finance and legislation and regulations are becoming more and more complex, but that the big change in planning lies particularly in the dynamics and complexity of the technical, social and organizational aspects.

This fits in with the conclusion in Chapter 2, that power and communication are much more important in complex planning. In this chapter we will therefore particularly be discussing the last three types or aspects of complexity in detail. After all, they are a complicating factor in smaller projects too.

New interests, wishes and insights

Every complex project is actually unique in terms of the duration, financial construction and requirements imposed by legislation and regulations. This always used to be the case for large projects, but now it is also the case for smaller projects, as we have already seen in Chapter 1. Projects often have a lengthy time to completion. The preparations and execution can often easily take ten to fifteen years, as a result of which projects have to be adapted to changing circumstances. Even the smaller projects often require complicated financial constructions. The uncertainty and dynamics of complex projects require accurate calculations to ensure a fair allocation of the benefits and disadvantages, while the financial risks of large projects remain considerable. Complex projects also have problems with complex legislation and regulations, which may result in delays and therefore lead to financial and organizational consequences.

Both larger and smaller spatial projects often use the latest, most state-of-the-art technology. Any such project can then often be unique and involve risks because that technology has not been used before. This was already the case back in the time of the Zuiderzee Works and the Delta Works, but the history of those large projects also shows why technology is a complicating factor. What were advanced techniques in the twentieth century can now sometimes seem outdated, not just from a technical point of view but especially because new interests, wishes and insights have emerged in society. One example is the plan for bringing the Afsluitdijk causeway back up to ‘delta height’. All of a sudden, the cultural and historical value of the engineering skills of Lely and his colleagues played an important role: they ought to be preserved. On the other hand, people were thinking about using the transition from fresh to salt water for sustainable energy production and nature development: a technological innovation for a new, social market.

Advantages and disadvantages

Spatial projects have to take account of political and social support much more now than in the past. The number of social segments and stakeholders has increased considerably since the days of Lely and the Delta Commission. For instance, nature now plays a socially significant role, to the extent that the presence of small animals like the European hamster can be a reason for putting construction projects on hold. The Malta Convention also means that construction projects have to take account of any archaeological finds, as turned out to be the case for the Betuwe Route, the freight railway from Rotterdam to Germany. The range of parties involved in thinking about a project and its execution, organization and funding has therefore increased enormously. Consequently, ensuring a fair allocation of the benefits and burdens has also become more complicated. Furthermore, government policy has been devolved to local authorities so central government does not automatically take the leading role anymore, as was the case in the Zuiderzee Works and the Delta Works. The provinces, municipalities and regions are responsible for managing things, but those organizations often still have to get used to this new responsibility. In addition, the relevant advantages and disadvantages are now more difficult to quantify: for example, everybody wants to live in a green environment, but who will pay for the construction and maintenance of this oh-so-cherished nature, and who will benefit from it?

Hundreds of decisions

This increased social complexity has considerable consequences for the organization of complex projects. Both internally and externally, such projects now involve a growing number of parties, interests, tasks, subprojects, specializations, etc. A complex project often consists of a large number of formal organizational units at various hierarchical levels, and the division of tasks and specializations is often complex. They are all interrelated, which results in interlinked structures. That makes it even more complex. Complex projects often do not follow a linear, planned and irreversible process either; they typically have an ongoing iterative process with a lot of interaction between the various scales and parties. Dozens or even hundreds of decisions have also to be made in the decision-making process, and all the interested parties have opportunities to delay or block the decision-making.

It became clear in Chapter 2 that even smaller spatial projects are often complex. Also, the social dynamics in particular have changed enormously and therefore constitute an extra complicating factor. Based on complexity theory, the conclusion in Chapter 3 was that power and communication play a more significant role in complex projects than technology, for instance. The conclusion of this chapter is in line with that. Of the six different types or aspects of complex projects, the time, legislation and regulations and finance provide a relatively stable (albeit far from straightforward) basis that underlies the projects. It is particularly the dynamics from a technical, social and organizational point of view that makes things complicated for project managers and stakeholders in complex projects. However, there are theories based on complexity theory that shed light on how the dynamics of complex processes work. Based on this, we will highlight seven phases in the process of complex projects – or systems – in the following chapter. We will also pay attention to the decisive role that individuals can play, because planning remains a people business.

4 practice

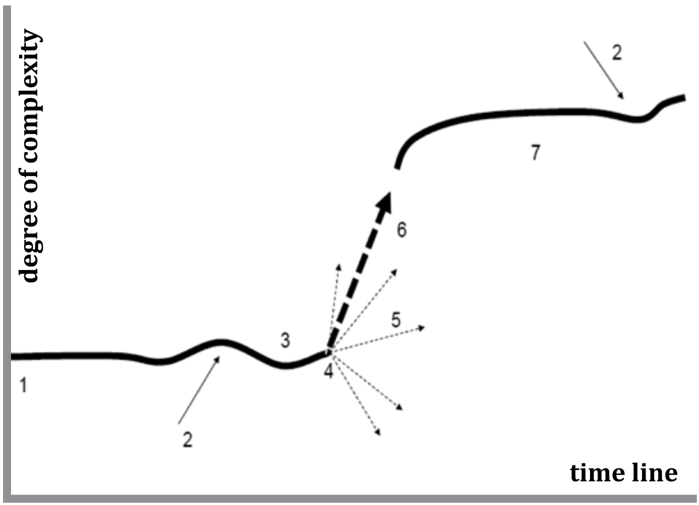
The assumption of the theory of complex systems is that those systems have a tendency to evolve towards stable situations. It seems as if they are looking for routine, for a rut. However, small changes can disrupt a pre-existing routine, as a result of which the system becomes unstable and eventually no longer fits in with that routine. Complex systems thus evolve from one, old routine into another, new routine in seven phases (see figure), a process in which the same dynamic elements keep reappearing.

Starting from the context of the stable situation under an old routine (phase 1), changes develop, usually externally (phase 2). Initially attempts are made to retain the old routine as much as possible through small modifications, yet the system still starts to become unstable (phase 3). This puts the system under extreme pressure and creates chaotic dynamics that no longer fit in with the old routine: a crisis arises (phase 4). External and abrupt events in that crisis will cause the first cracks in the structure of the old routine (phase 5). A very minor, random event can then have enormous consequences: it changes the system and causes a transition that is reminiscent of the butterfly that causes a hurricane (phase 6). This creates a new routine (phase 7).

Seven phases of complexity

We will discuss the seven phases in the development of complex systems below, using examples from the practice of students and lecturers at Van Hall Larenstein. As a theme running through this chapter, we will also present an analysis of the way that the Ecological Main Structure (a network of ecologically significant areas in the Netherlands) has developed since 1990. This is not a scientific or all-encompassing analysis. The seven phases are not a method for predicting how things will be in the future either, but they may generate perspectives that will lead to a better understanding of why certain things went as they did. The example of the Ecological Main Structure (EMS) is therefore mainly present for illustrative purposes.

The seven phases



Phase 1: the old routine

The complex system is running according to a certain routine that ensures a stable situation.

EMS • In 1990, the Nature Policy Plan determined that an ecological main structure of 750,000 hectares of continuous nature areas had to be in place by 2018. This network of nature areas became the new routine for nature policy and for a long time it functioned as a stable basis for nature management. The underlying idea was that nature would be more robust if plant and animal species could travel from one nature area to another using the network of connecting nature zones. It fitted in with the usual system approach taken by ecologists, in which ecosystems as a whole were considered essential for the protection of the individual plants and animals. Even today, EMS is considered to have been a successful policy, in part because of its clear objectives, which should not only protect nature but also provide it with the opportunity to develop further.

Grand schemes • The planning regarding the Zuiderzee Works and the Delta Works are also examples where systematic, gradual, deliberate planning was used to implement the old, stable routine.

As mentioned earlier, the objectives of these hydraulic engineering works were clear and unambiguous: the Zuiderzee Works were about land reclamation for agriculture and housing, and the Delta Works were defences against flooding of parts of the Netherlands that are very important from an economic point of view. The underlying routine was clear: ensure economic growth and greater prosperity.

Phase 2: initial changes

Changes in the environment of the complex system force you to make changes to the old routine.

EMS • The routine behind the EMS was simple: purchase areas, set them up as nature areas and then manage them as a continuous network of nature zones. But this was not without problems. There was a lot of resistance, in particular from farmers, to the top-down approach to nature policy. A well-known example is the rebellion of farmers in Gaasterland in response to the transformation of 550 hectares of farmland into nature by the Dutch nature preservation society Natuurmonumenten. Farmers and residents set up the Worried Gaasterland Residents initiative group and lobbied media and politicians through protest meetings, protest signs and petitions. Recreation companies and the cultural and historical sector also started to criticize the EMS.

Blauwestad • From 1989 to 2000, project developers, the province and municipalities developed a plan to transform farmland in East Groningen into a recreational nature area with a lake and around 1,500 construction plots for the new, luxurious Blauwestad residential district. The objective was to improve and strengthen the socio-economic vitality of the Oldambt region. However, sales of the plots did not start until 2005, at a point when the situation in the housing market had deteriorated considerably. This put pressure on the original plan of attracting wealthy people from the west of the country. This led all the parties involved to think about alternative opportunities in the housing market. The objective remained the same, but the direction of the project changed.

Phase 3: the first signs of instability

Small-scale modifications in the complex system are used to try and find changes that fit in with the old routine.

EHS • Attempts were made during the 1990s to tackle the criticisms of the top-down nature policy. These were still based on that policy. For example, agricultural and private nature management were introduced as measures that would enable the EMS to be set up in collaboration with farmers and private individuals. A method was even developed in Gaasterland that allowed the farmers to measure the ecological progress of their agricultural nature management. The ministry also developed a policy for improving the promotion of EMS among the general public. The memorandum *Natuur voor mensen – Mensen voor natuur* (Nature for the people – People for nature) was published in July 2000. The original goal, namely the realisation of 750,000 hectares of nature by 2018, remained intact.

Blauwestad • In 2009, Blauwestad was relaunched when the original plan to build luxurious homes in a green environment turned out to be unfeasible. The focus shifted from residential housing to the development of recreation and tourism, and encouraging businesses and creating recreational nature. However, this fitted in seamlessly with the original plans to create a socio-economic impulse for the Oldambt region using finance from outside the region, only now through tourism and recreation rather than housing. That objective remained intact, even though the substance of the project changed considerably

Phase 4: crisis

The complex system becomes chaotic and the pressure becomes so great that the old routine no longer fits in with the dynamics within the system.

EMS • During the first decade of the new millennium, the EMS was not only controversial among farmers and rural people. Even ecologists criticized the technocratic manner of assessing the nature areas created against types of nature objectives and the associated measures and financing. At the same time, there was criticism of the agricultural and private nature management, which turned out to be hardly effective at all from an ecological point of view. It seemed as if nobody knew anymore what kind of nature policy and nature management would be effective. But the EMS policy was still valued highly as a clear-cut policy.

Galicia • The land in Galicia is owned by a lot of smallholders as a result of inheritance patterns, but this fragmentation of land use seemed to be under control. During the 1980s, many people left their smallholdings and migrated to the towns: the farmland was hardly being maintained and became overgrown. This caused a lot of forest fires in a region where rain falls 300 days a year. Various attempts to draw up legislation and regulations in order to prevent the deterioration of rural areas had little success. Until 2006 that is, when enormous forest fires caused a shock in the Galician community. Every Galician now realized that the fragmentation of land use was not under control, that the many measures taken had not helped and that the economic and social damage was enormous. Nobody knew what had to be done, but they were sure that something had to be done. The situation was very serious.

Phase 5: external events

Abrupt external events cause the system to change rapidly.

EMS • The economic crisis hit the country in 2008. It put the EMS, which had been developed during an economically optimistic period in the 1990s, under even more pressure. Purchasing large tracts of farmland in order to transform them into nature areas did not fit in with the required frugality of an economic crisis. At the same time, ecologists began to point out the major, external factors that could affect the success of the EMS in the future. They believed that the fixed network of nature areas was not suitable for providing plant and animal species the opportunity to migrate to the north, if climate change were to lead to higher temperatures in the future. They felt that the EMS ought to be transformed into a dynamic network of nature areas, which exacerbated the already complex debate about nature policy even more.

Sint Annabos • In 2007, the central government started discussions with farmers about the Sint Annabos area near Uden. Thirty-five hectares had to be purchased, voluntarily or otherwise, for nature development in an area covering seventy hectares of choice wetland nature as part of the ecological main structure. Farmers had to be bought out by paying the land price and compensation, if necessary. Two farmers remained hesitant, because hardly any alternative land was available. Until it turned out in 2011 that there was no money left to purchase EMS land. The farmers then made the best of a bad job and offered their land to the government, because it still had an obligation to buy. As these were voluntary sales, the government only had to pay the land price, with no compensation. Sint Annabos is a nature area.

Phase 6: the routine is altered

The routine of the complex system undergoes abrupt changes.

EMS • In 2010, the new cabinet presided over by Mark Rutte took up office: it was a minority cabinet that could only be formed thanks to the unofficial support of the far right Partij voor de Vrijheid (Party for Freedom) of Geert Wilders. That party had little interest in nature and the money invested in it, calling the EMS 'a left-wing hobby'. The new government therefore decided to make big cuts in expenditure on nature policy. As a result, the EMS suddenly ended up in a crisis. Nature organisations started looking for alternative sources of income and ways to reduce the effects of the cutbacks in nature management.

IJburg • The planning for the new residential district near the IJmeer in Amsterdam had originally been divided into two phases. Three islands were to be constructed in the first phase and another three in the second phase, including a shopping centre on the Centrum island. After the first phase had been completed, the question rose whether the second should be implemented at all. Meanwhile, the economic situation had changed and the shopping centre plan was therefore dropped. A rigid urban grid was designed as a basis for the infrastructure and the green space, which also served as a guideline for future development. The final image of three residential islands was no longer the ultimate goal.

Phase 7: a new routine

The complex system is in a new routine - a new and stable situation, ensuring new certainties.

EMS • There may not be a new routine in nature policy at present, in 2013. But it is certain that there will not be a nature network of 750,000 hectares in the Netherlands by 2018. The second Rutte cabinet reversed some of the cutbacks in nature in the new coalition agreement, but the nature organization Staatsbosbeheer (the national forestry agency) had already developed plans to cope with its budget being halved by operating with fewer staff and generating income from sustainable energy production, for example. It seems as if everyone is preparing for a new reality that is still too uncertain to be called a new routine.

IJburg • The urban design grid of phase 6 was the basis for persuading parties to build cheap housing within this grid in the future. The new routine no longer focuses on building on three islands systematically until they are full, but on providing an urban design basis that allows parties to start building if this is makes commercial sense. Investments in utilities, infrastructure and green public spaces are only made if there are commercially appropriate construction plans. This created a new routine of just-in-time management.

Individuals and complex systems

Individuals can play a decisive role in the development of complex systems. This can be seen in large companies, for example Steve Jobs who made Apple enormously successful almost on his own. Individuals play a significant role in all the seven phases of complexity.

EMS • Various individuals have played highly significant parts in the development of the plans that eventually resulted in the EMS. For example, the group of people behind the Ooievaar Plan, which was released in 1985, were present at the very start of the development of water-based nature, such as the Millingerwaard. That in turn became the template for the way that EMS was intended to connect up nature areas. The ministers for nature have all had significant influence on the development of the EMS. Towards the end, politicians like Henk Bleker and Geert Wilders played a significant role in the enormous changes that are now being reflected in nature management.

Overijssel mooi licht & donker (Overijssel: attractive in the light & dark) • *"Every Dutch person can encourage desirable changes in our living environment, even if this seems impossible."* In 2002, Friso van Nijkerk used this simple idea to set up a complex project from out of nowhere, with the aim of improving the use of artificial lighting in the Netherlands by using less but more targeted lighting. It went entirely against the grain of the usual idea that more lighting would be safe, attractive and useful. After assessing the support for his idea, he developed a powerful message that said exactly the opposite. Thanks to the support of his colleagues he managed to set up the *'Overijssel mooi licht & mooi donker'* project in 2006, gaining a lot of publicity after the Overijssel provincial representative Gert Ranter saw with his own eyes, from a plane, how much artificial light was used. This made everyone aware of the issue of artificial light in Overijssel. A study was made to determine the baseline situation in order to monitor lighting and a wish-list was drawn up for lighting around built-up areas, in rural areas and in nature. Van Nijkerk wrote a thesis about his experiences for the Professional Project and Process Management Master's degree programme at Van Hall Larenstein university of applied sciences.

5 Conclusion

The spatial projects of the twenty-first century are open, dynamic processes. The people and the organizations working on these projects must have different skill sets to Lely's engineering skills. Organizations have to become 'ambidextrous', project managers must be self-reflective and everyone should avoid tunnel vision. It is also important to tell big stories with simple messages. But that is not easy.

Complex systems demand an awful lot from organizations and individuals. As we saw in Chapter 3, people and organizations involved in complex projects will have to focus more and more on controlling the technical, social and organizational aspects of the project management. Engineering skills alone, as in Lely's time, are no longer enough. Complexity requires other qualities, particularly behavioural and contextual skills. People and organizations will have to deal with complexity as an integral aspect of spatial development and will have to take particular account of the soft values that play a role within complex projects, the behavioural and contextual aspects of a process.

The pitfall of tunnel vision

This is easier said than done. Project management involves people and often they turn out to be only too human. Complexity in planning imposes high demands on people, often going against their natural inclinations. People are conservative by nature and generally do not like changes or randomness, whereas complex projects are full of interactions, changes and random events. It is therefore easy to understand why managers often work on the assumption that their project is a closed system with a fixed objective, the traditional approach of scheduling to achieve the final objective. This may cause people to develop tunnel vision. That means that they stick rigidly to hard data and figures based on the complex content, that they commit themselves to an old or changed social or political reality, or that they rely on a legal or policy situation. Take these two examples. First, people can become fixated on their technical knowledge and information. When tunnels were being drilled for the new underground, the Amsterdam North/South Line, there were two occasions when houses in the neighbourhood started to subside; people were seriously shocked because windows popped out of their frames. If the technical project manager then responds by saying that everything is in order according to the technical estimates, it is hardly surprising that this causes a bit of a stir. People may also not want to modify plans. The plans to extend the urban railway line Metro 51 from Amsterdam to a number of business parks to be constructed in Amstelveen were cancelled in February 2012. A new political wind was blowing after a new municipal executive took up office, and the much gloomier economic climate made clear that the office blocks would not be built for the time being. These changes in the context hardly filtered through to the project organization: people kept sticking to the original plan.

From closed to open frames of reference.

Dealing with complexity requires a different way of thinking to Lely's engineering view of things. The approach to management will have to change too. Management methods used to be tailored to closed systems that were easy to control, and project managers used to work in a familiar context. An example of such a closed system is the frame of reference used by Lely and his engineers for the development of the plans to drain the Zuiderzee. Chapter 1 showed how this closed system is reinvented time and time again, in a different way every time, depending on the spirit of the age, the economy, politics or public opinion. In this way, closed frames of reference evolved into open ideas about which everyone can have their say. The closed systems of the nineteenth century have become open systems in the twenty-first century.

Currently, spatial projects are usually open, complex systems, where everyone can join the discussion and different contexts are created every time. Steering the process becomes more difficult for the organizations and the people who are involved in project management. They have to switch strategies, because there are various types of complexity. They have to develop flexible frames of reference in order to manage the various types or aspects of complexity. The technical complexity can be expressed in concrete numbers and figures describing the money, hectares and cubic metres, and ecological facts. The social complexity is about unpredictable politicians, shifting social interests and exogenous factors such as the economy and the climate change. The organizational complexity is about all kinds of social issues and interests, about agriculture, nature, cities, recreation, etc

Ambidextrous organizations

Complex systems make stringent demands on management. Organizations and people involved in complex systems will have to relinquish their tunnel vision and reinvent themselves time and time again. Because there is no longer a single closed frame of reference, as was the case for Lely, the frame of reference does not play the leading role; rather it is the process, the broad underlying objective and its unpredictable result. As was made clear in Chapter 3, power and communication in particular are therefore the determining factors in that process. As a result, the managers of large, complex spatial projects often have to deal with shifts in the relationships of power and the emotional rationality of the media and the PR business. There are multiple frames of reference that determine the process.

Managing multiple frames of reference requires a change in the way of thinking as reflected in the organization of the management and the personality of the manager. Management organisations have to be ambidextrous: besides the core business, they have to be open to new routes and different frames of reference. The Dutch Directorate-General for Public Works and Water Management for example has used integral project management for years; besides technocratic management, there is also room for managing the surrounding context. Teams with five types of manager are set up in

integral project management: the project manager, the project control manager, the context manager, the technical manager and the contract manager. There is also a project controller who functions as the client and the general project manager.
Another way of managing multiple frames of reference is to assume organic area development rather than the traditional planning to reach the final objective. A good example of this is the development of offices in the Zuid-As (Amsterdam's business district) along the A10 motorway. The original plan was to build offices on either side of the motorway and to connect them to each other later on by tunnelling underneath or a roof construction. Delaying the discussion about that connection until the need became urgent made it possible to build two separate business parks in the meantime. They would be connected with each other by tunnelling underneath the motorway later on. In this way, the area development adapted to the environment instead of the other way round.

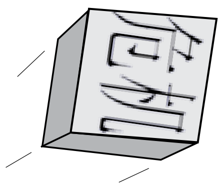
Self-reflective people

The personality of the managers of complex processes is very important. Such people must be able to switch rapidly between the frames of reference of content, procedures, process and emotion without developing tunnel vision. They have to fully support the project, indeed have to 'be' the project, and must be able to convince others by ensuring that the process is their interest. This requires curiosity, sensitivity, enthusiasm, analytical ability, creativity and broad thinking, but in particular a well-developed feeling for transitional points in the process that are related to content, procedures, processes and emotions.

Self-reflection is essential for this. Switching between the various frames of reference requires the ability to analyse all aspects of the entire process, including all the roles that the manager plays. People who are good at self-reflection are able to imagine sitting down on a chair nearby to observe themselves in action and to analyse themselves from a distance. They often start with a bigger story than the story of the project that they are managing. Choosing a more abstract, vaguer and in particular more remote perspective gives them a bird's-eye view of the projects that they are working on. It makes it easier for them to analyse the various types of complexity in such a project.

A big story with a simple message

The guiding principle in managing complex processes is the longer term and the wider story behind the process. Project managers and management organizations must be able to translate the objectives of a project into a simple message. The higher the level of abstraction, the simpler the message. Ask someone what they want for their children, and they will answer: a sustainable society. Ask someone where wind turbines should be installed and it already starts to get more difficult for them to answer that. Project managers and project organizations therefore have to use this higher level of abstraction of the sustainable society as their benchmark all the time. The question might then be as follows: Does a wind turbine at that location ensure a sustainable society? Asking such a question lets you create your context regarding the complex process, and this will give you a picture of all aspects of that process.



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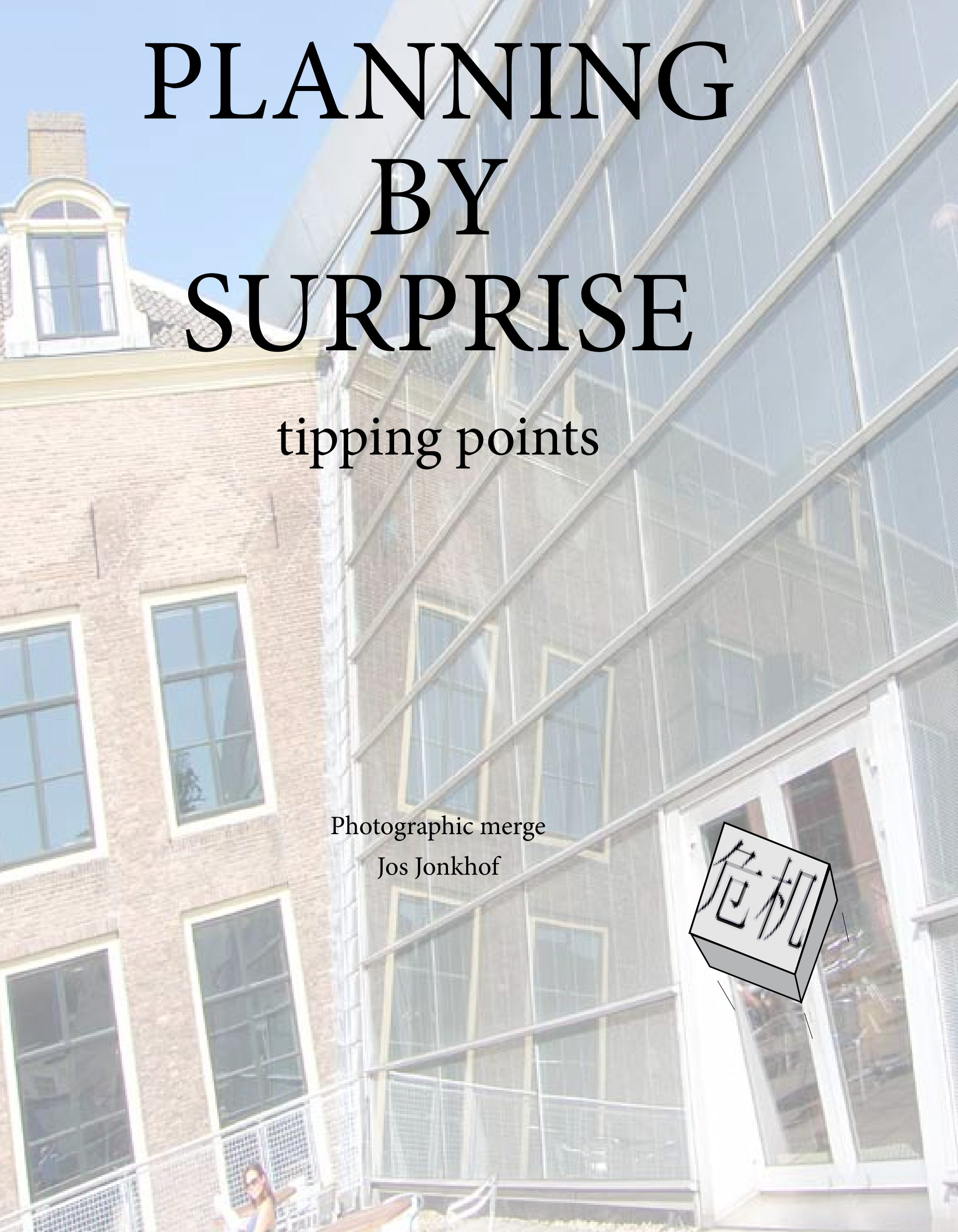
Unlike the large projects of the twentieth century with their clear, unambiguous and indisputable reasons, such reasons are lacking for the current projects or continuously changing. As a result, large projects such as the Zuiderzee Works and the Delta Works cannot be planned, set up, organized and carried out as they were in the twentieth century. The emphasis is no longer on the technical and functional objectives of a project, but on continuously changing temporary results provided by a project from an economic and social point of view. The exact purpose is therefore unclear and there are always questions being raised about the legitimacy of a project.

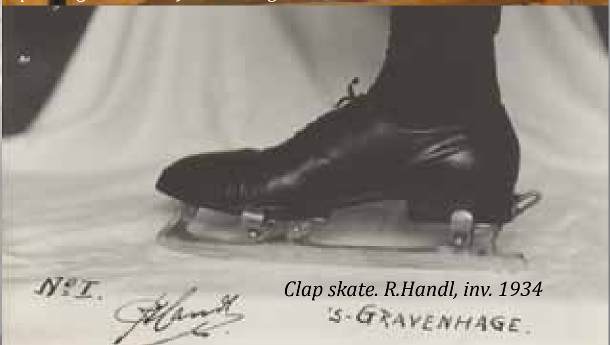
PLANNING BY SURPRISE

tipping points



Photographic merge
Jos Jonkhof

Spinning machine. James Hargraves, inv. 1764



Clap skate. R.Handl, inv. 1934

Differential. André Citroën, inv. ca 1920

Douglas DC3-201, Eastern Air Lines. 1936

INVENTIONS / OBJECTS

Telescope. Newton, inv. 1672

INVENTIONS / SYSTEMS

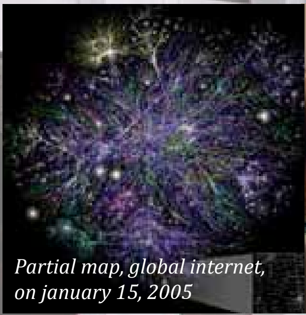
"Il vient de loin". Paul Gabriel, 1887

TGV-NET, sncf. from 1981
Gare du Nord, Paris 1846


Henry Ford. Assembly line, 1931

Dr Martin Cooper, 1973, cell phone inventor

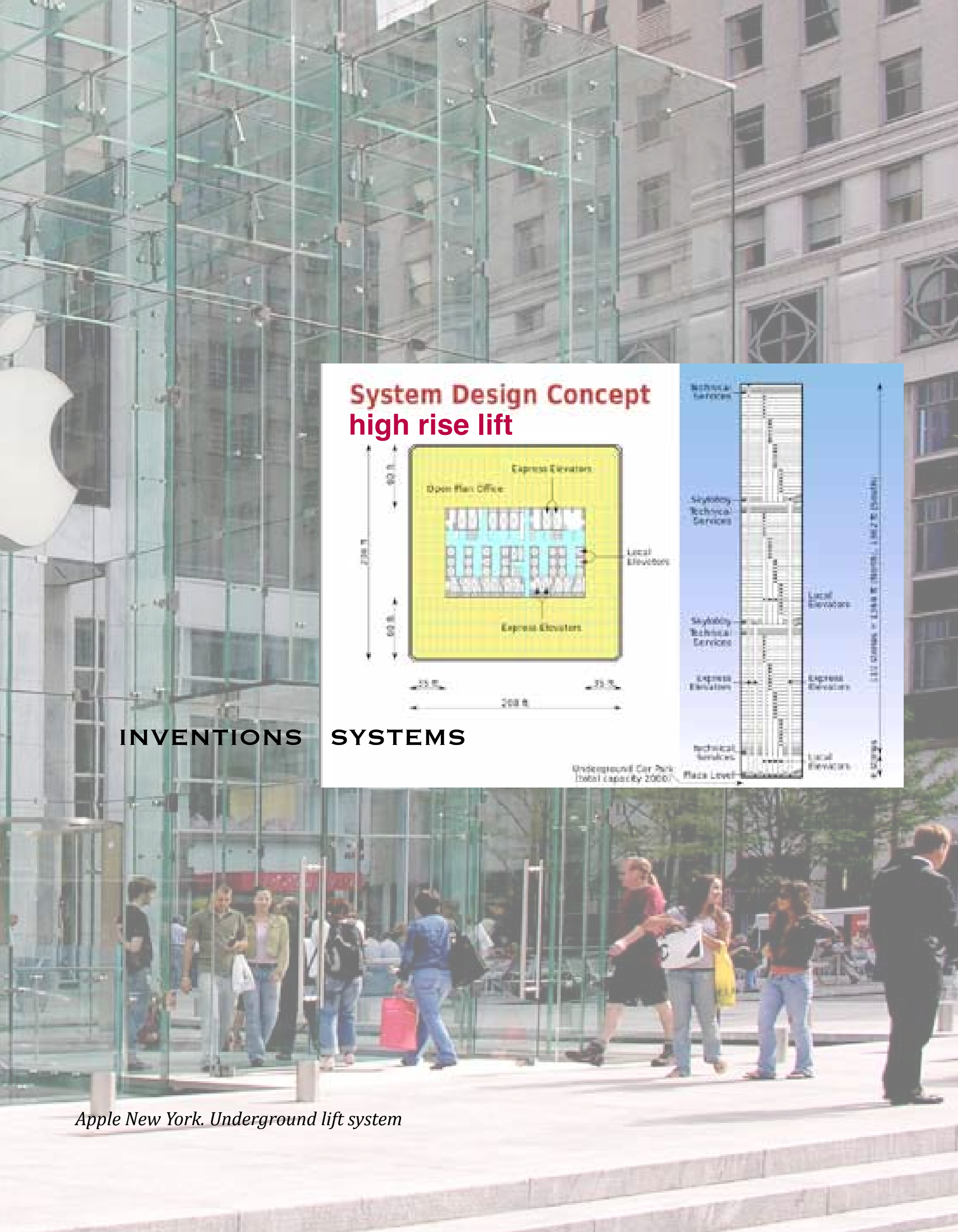
Sony Erisson, video call, 2007



Partial map, global internet, on january 15, 2005

ICT desk, dual monitor and touch screen, 2007

In January 2012 it was reported that Microsoft is investigating reports of a mass suicide threat taking place at one of its Chinese plant over a pay dispute with Foxconn, the plants owner. Foxconn produces electronics for both Microsoft and Apple. The dispute took place at its Wuhan factory (photo) which produces Xbox consoles



INVENTIONS SYSTEMS

Apple New York. Underground lift system

Albania, 1944

Praça da Fortaleza, 1821

Paris, 1871

Moskow 1849

Barcelona, 1842

REVOLUTIONS / HISTORY

Albania, 1924

Brussels 1830

Moskow 1905

REVOLUTIONS / HISTORY

Budapest 1956

OttomaN Constitution, 1876

Bueno Aires, 1810

Prague, 1989

Tunis, 2011

DISASTERS AND EVENT


Delft explosion. Delft, 1674


The Great Fire. Londen, 1834

New Orleans, Katrina. 2005

TS

Fokker escape to The Netherlands from Schwerin, Germany, 1919

New York Black Out. Sandy, 2011

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mento, 1821. Praça da Fortaleza, depois Praça da Constituição, 28 de Janeiro de 1821. Museu Quinta das Cruzes, Viseu, Portugal. Na pintura representam-se, por certo, o comerciante João Nunes Viseu, em cuja casa, no dia anterior, foi redigida a representação ao governador, efetuada pelo padre Gregório Nazianzeno Medina de Vasconcelos e, pelo menos, os capitães Diogo Dias de Ornelas e Vasconcelos, João Agostinho Figueirôa de Albuquerque Freitas e Francisco João Moniz Escórcio Drumond da Câmara. Na guarita aparece o governador. Public Domain US.

- The Great Fire London1666.JPG 2.531×2.043 pixels. The City is depicted on September 4th, the third day of the fire. Such terrifying destruction is on a par with the firestorms after World War II bombings. The narrow streets, timber-framed, thatched houses would later be replaced by brick, stone and tiled buildings to prevent such a tragedy happening again. Oil on board. Rita Greer, 2008.
- Microsoft plant, Wuhan, China. 2012. In January 2012 it was reported that Microsoft is investigating reports of a mass suicide threat taking place at one of its Chinese plant over a pay dispute with Foxconn, the plants owner. Foxconn produces electronics for both Microsoft and Apple. The dispute took place at its Wuhan factory (photo) which produces Xbox consoles. In 2010 there was a spate of suicides, prompting Foxconn, a main Apple supplier in China which employs some one million people, to install nets around the edges of some buildings to prevent people jumping off the roof, The Guardian reported.
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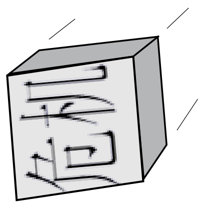
- Explosion of the gun powder house in Delft. View on Delft after the “Delftse Donderslag” (Delft explosion day) of october 12, 1654, heavily damaging greatest part of the city. Egbert van der Poel. National Gallery, Londen.


危机