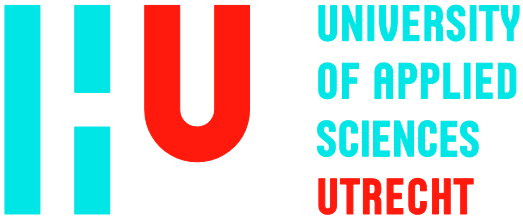

Risk management in chaordic projects

The Uncertainty dialogue

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Research Thesis

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8 September 2016

Abstract

This document is the report of a thesis research at the Hogeschool Utrecht, Utrecht, The Netherlands, for the master Project Management. The starting point was a practical problem: how to manage risks in a chaordic project. Risk management is based on the assumption that there is a relationship between cause and effect; in a chaotic context this relationship does not exist. Giving the increasingly complexity of projects and the enormous amounts of money associated with budgets at risk, the relevance of this problem is obvious.

To end up not only with new scientific knowledge but also with something the project manager in the field can use, the approach of Design Science Research was chosen. Starting from a problem from practice, scientific knowledge is mobilised, an artefact to solve the problem is designed and validated, and the learning - of the process and of the result - is fed back into the body of scientific knowledge.

Based on scientific principles from project management, chaordic projects and ecology, and on knowledge from practice from risk management and Agile programming, an artefact was designed and developed. From ecology the principle is copied that the more complex the web, the more stable the system. The project is part of a Project ecosystem. Relationships in that ecosystem that regard uncertainty form the Uncertainty web. These relationships are built on dialogue and trust. The project manager actively develops the Uncertainty web, moves around in the web and has a set of interventions at their disposal. In this way unexpected events, originating from uncertainties, can be prepared for. Project resilience is preserved.

In a number of workshops, project managers with mainly technical oriented projects were introduced into the artefact and its background. They then were asked to give feedback on the artefact based on a set of requirements and to estimate the anticipated performance level of the artefact. The feedback was analysed using Systematic Text Condensation. This validation of the artefact has to be regarded as an α-test: the researcher is present and so influences the attendants.

It was concluded that most of the attendants thought the artefact to be useful for chaordic projects. There were several topics that needed extra attention, like the overlap with stakeholder management and the relationship with risk management. The performance level did not meet the level set as satisfactory.

It is advised to take more time for the workshops and to better explain the chaotic perspective and what chaordic projects are. Also the way the performance level has been estimated and set needs improvements. A couple of suggestions for improvement of the Design Science Research approach followed have been proposed. It has been suggested to add an extra philosophical type of position is suggested, to explain the position of the researcher on the scale between Determinism and Chaotic thinking. Also a new definition of uncertainty has been proposed, making clear the difference with risk.

Acknowledgements

Please let me thank Marian Bosch-Rekveldt, Joop Halman and Bert Hedeman for their review of the design of the artefact. The feedback of project managers from the NS Competence Center Projectmanagement and from RIDDS on the artefact itself was very useful to validate the artefact. Arjan de Kok, Ordina, has been a help in more than one way to perform this study. Family and friends I thank for their patience and support. Last but not least I want to say thanks to Nicoline Mulder, who as thesis supervisor gave scientific, tactical and personal advice which have been very instrumental to bring the endeavour of converting an idea into conducting research and writing a thesis to a more than satisfactory conclusion.

Table of contents

1. Introduction and background

This document is the report of a thesis study conducted between January and September 2016. The study is part of a Master of Project Management at the Utrecht University of Applied Sciences (HU).

The first part of this chapter contains a couple of background topics that set the conditions for the study. Firstly the philosophical position of the author is elaborated, then ethical aspects related to the research are discussed and finally declarations on funding and conflict of interest are added. Quite often these topics are found in the Discussion chapter. However they are kind of a guide on how to read the document, they set the stage. Therefore they have been added to this chapter. The second part regards the introduction to the research. The research approach is shortly described; based on that, the structure of the thesis is explained and a few words on the character of the research are added. The chapter concludes with the identification of the problem: the research problem, its relevance and the research question.

Background

Philosophical position

'It is difficult to isolate the researcher from the research' (Klakegg, 2015). The philosophical position the researcher holds has implications for the research. Therefore it is important to explicitly mention this position, right at the start.

Klakegg distinguishes four types of positions. The first one is the distinction between theory and practice. This study gives explicitly attention to both; the research approach used has been selected to cover theory as well as practice. The second position is the relationship between theory and research. The position are deductionism (research is meant to validate theory), inductionism (theory is created from research) and abductionism (theory originates from creative ideas). The third philosophical position is the epistemological position: what is the opinion of the researcher on what is true and what is not true. Klakegg mentions three positions: Positivism, Anti-positivism and Realism. The author's stance is Realism: 'a belief that natural and social sciences can and should apply the same approach to the collection of data and explanation, and that there is an external reality …. separate from our description of it'. Within Realism two directions are listed, Empirical or Naïve Realism and Critical Realism. The author's position is best described by the last one: 'this direction recognises the reality of the natural order, and at the same time the events and discourses of social world – they acknowledge and accept our understanding of reality is provisional'. The fourth and last position is regarding how things really are: the ontological position. Klakegg describes two positions, Objectivism and Constructionism. Objectivism is described as 'social phenomena does have a meaning and existence independent of the people associated with it', whereas Constructionism is explained as 'social phenomena and their meanings are continually being accomplished by social actors; they are produced by social interactions and in constant state of revision. . . . Most

constructionists accept that this position cannot be pushed to the extreme'. However, in social sciences Klakegg's remark on constructionists also applies to objectivists: also this position cannot be pushed to the extreme. The author's position best can be described as a moderate Objectivist.

Ethical considerations

Three sources for ethical inspiration are applicable to in this study. Regarding project management, the area of interest, the PMI Code of ethics and professional conduct of the Project Management Institute (PMI) is applicable (PMI, 2006), as the author is certified Project Manager Professional (PMP). Then, from the research perspective, the author's stance on ethics is best described by what Bryman and Bell call Situation ethics (2015, p. 131). To get reliable results from an experiment in social science, this position implies that it sometimes is necessary and thus allowed not to disclose all information and/or use some degree of deception. Sometimes 'there simply is no choice'. As a matter of facts, in this study deception has not been applied. Lastly, this study is conducted under the code of conduct for research at a Dutch university of applied science (Commissie Gedragscode HBO, 2010). One of the consequences is that all data are public. All data gathered in this study can be found in the text or, most of it, in the Appendices.

Funding

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The master course of which this study was one of the components was partly funded by the employer of the author, Ordina, Nieuwegein, The Netherlands.

Conflict of interest

The author declared no conflicts of interest with respect to the authorship and/or publication of this article.

Research introduction

Research approach

This study is conducted at a University of applied science. The word 'science' implies the study should derive its knowledge from the scientific knowledge base and that the results should feedback new knowledge to the base. It also means that the methods used should have scientific rigour. The word 'applied' means that it should start from a problem that is relevant to practitioners and that the result should help to improve these practitioners in dealing with the identified problem. This means that in research at this kind of university, both aspects need to be dealt with: theory and practice, in the words of the first position of Klakegg (2015), as explained above. Design Science Research (Dresch, Lacerda, & Valle Antunes Jr, 2015) is an approach that covers both aspects. Design Science is a 'Science that seeks to consolidate

knowledge about the design and development of solutions, to improve existing systems, solve problems and create new artifacts' (p. 59) . This approach 'seeks to reduce the gap between theory and practice' (p. 71). Its intention is to solve a problem from practice by the development of an artefact - a tool, process, et cetera -, based on scientific knowledge and with methods that have scientific rigour, and to feed the created knowledge back into the scientific knowledge base. An artefact is defined as 'Something that is manmade; an interface between the inner environment and the outer environment of a given system' (p. 59). Therefore in this study the Science Design Research approach has been applied.

Design Science Research are inextricable linked with both positions of Klakegg's first type, theory and practice. Regarding the second type, several positions are taken. A step to propose an artefact is abductive; a series of steps to design, develop and evaluate the artefact are deductive; and a step to generalise the learning is inductive. For a description of the steps, see below. The approach also matches well with the position of the author in the third type of Klakegg, Critical realism. On the one hand the rigor of natural sciences should be applied in social sciences as well - this regards the theoretical aspect- whereas on the other hand by creating an artefact to be used by man the special position of social sciences, where man is subject and object of research, is admitted and accepted - the practice aspect. Lastly the position of moderate Objectivist, Klakegg's fourth type, fits well to Design Science Research. An artefact should be designed and developed objectively but in the evaluation it is recognised that the Constructionist position never is far off.

Structure of the thesis

The following structure is advised for a thesis at the HU: Introduction, Literature Review, Method, Findings and Discussion, respectively Conclusion and Recommendations. In this thesis the first three are followed as is, as chapters. The last two are both split up and described in a slightly different order. Conclusions in natural sciences only are based on findings. Then the researcher gives a critical overview on method, findings and conclusions, resulting in recommendations. These principles apply in this study. The order in this thesis therefore is Findings, Conclusions, Discussion and Recommendations. A small chapter on personal reflection is inserted, before closing the thesis by References and Appendices.

Design Science Research as described by Dresch et al. (2015, p. 119) comprises a number of steps. In Table 1, the steps are shown and for each step the main activities are described. The chapter in which a step can be found is added.

No	Step	Activity	Chapter
1	Identification of the problem	The research problem is described. It has to be relevant for practitioners. Its importance has to be justified. The research question is presented.	1
2	Awareness of the problem	To improve understanding of the problem, data on causes, condition, et cetera, are gathered, from research literature as	2

No	Step	Activity	Chapter
		well as from practice. The requirements that the artefact should fulfil are specified.	
3	Systematic literature review	The consideration of existing knowledge helps the researcher to justify both the importance of building an artefact an why it will work.	2
4	Identification of the artefacts and configuration of the classes of problems	The researcher identifies already existing artefacts in the problem area and in related classes of problems. Literature review is a logical source. The level at which performance of the artefact is deemed to be satisfactorily is defined.	4
5	Proposition of artefacts to solve a specific problem	In a creative process, based on the information from the previous step, a set of artefacts are proposed.	4
6	Design of the selected artefact	One of the artefacts is selected. The functioning of the artefact, limitations, the relationship with its environment and the performance requirements are defined.	4
7	Development of the artefact	In this step the inner functioning of the artefact is developed.	4
8	Evaluation of the artefact	The behaviour of the artefact is measured and compared with the satisfactory performance level defined in step 3. The evaluation is preferably performed in a real-life environment.	4
9	Clarification of learning achieved	The researcher explicitly describes the factors that supported the design success but also the failures that occurred. This regards the product as well as the process.	6
10	Conclusions	Based on the evaluation it is concluded if the artefact is a proper solution to the problem identified in step 1. Limitations are made explicit, which could lead to suggestions for further research.	5
11	Generalisation for a class of problems	The generalisation of the artefact outside the problem area, for a class of problems, is discussed. Here also suggestions for follow-up research can appear.	6
12	Communication of the results	E.g. in conferences, trade magazines and scientific journals.	7

Table 1: Design Science Research steps

The order in which the steps are discussed is the same as the order in Table 1 with two exceptions. Firstly Step 2, Awareness of the problem, and 3, Systematic literature review, are combined. Dresch et al. (2015) present all steps in linear order except for these two, and also shows them to be iterative. Secondly the conclusions (Step 10, Conclusions) are presented in Chapter 5 and the discussion (Step 9, Clarifications of the learning achieved) in Chapter 6.

Character of the study

This study has an exploratory character: it regards the testing of an idea. The focus therefore is on the qualitative aspect: collecting knowledge is central. A few numbers are collected but these are a mean and not a goal.

Identification of the problem

This is the first step in the Design Science Research approach, see Table 1.

Research problem

Risk management is a component of all main project management methods, see Table 3. Also in research, risk management has the highest ranking regarding the number of published articles per knowledge area (Padalkar & Gopinath, 2016, p. 1311). Moreover risk management is a constant theme in the last 15 years (Padalkar & Gopinath, 2016, p. 1314).
There are many definitions of risks. A general and common description is Risk = (A, C, P), where A represents the events (initiating events, scenarios), C the consequences of A, and P the associated probabilities (Aven, 2010). Risk management is a tool for the project manager to cope with risks, or, put differently, to maintain the resilience of their project, where resilience is defined as 'the ability of a system to absorb disturbances, and particular unexpected disorder, and still retain basic function and structure' (Schroeder & Hatton, 2012). It should be noted that risk management is not the only way to deal with risks. Experience based action, which focuses on experience to cope with critical situations where rational planning is not possible, is such an example (Böhle, Heidling, & Schoper, 2016).
Management implies the assumption that something can be managed. Risk management thus starts from the presupposition that it is possible to manage risks. The underlying assumption under management is that there is an unbroken chain of cause and effect: a certain cause always results in the same effect and a certain effect always can be traced back to the same cause. This notion of causality, which is central to the philosophical doctrine of Determinism (Hoefer, 2016), is fundamental to managing. For a simple project in a simple environment, Determinism applies without problems. Nowadays however projects are becoming increasingly complex. In this world the perspective of Chaotic thinking (Van Eijnatten, 2002) prevails: causality does not exist. As a consequence, classic risk management, being based on the Deterministic assumption, no longer is sufficient to preserve project resilience. This being the case, what could be used instead?

Relevance

Out in the field, project managers are faced with an increasing level of complexity. 'While it holds true that complexity is traditionally high during the early phases of the project, complexity does not seem to disappear or fade over time' (Hertogh & Westerveld, 2010, p. 68). 'There is a paradox here, however. At the same time as many more and much larger infrastructure

projects are being proposed and built around the world, it is becoming clear that many such projects have strikingly poor performance records in terms of economy, environment and public support' (Flyvbjerg, Bruzelius, & Rothengatter, 2003, p. 3). Projects are about impressing amounts of money and have as impressive cost overruns. The same authors list 15 large transport projects, like the Channel Tunnel, the Great Belt Link and Boston's artery/tunnel project, where construction cost overrun percentages range from 26 to 196%. The Channel Tunnel for instance was estimated at £ 2.600 million and ended up at £ 4.650 million (1985 prices); an overrun percentage of 80%. In a more recent overview, Flyvbjerg (2014) even showed numbers up to 1.900%. In the introduction of a special issue of the Journal of Project Management on uncertainty, risk & opportunity, resilience and anti-fragility, Bredillet and Tywoniak (2016) show another, global perspective: the world's gross domestic product (GDP) amounts to $73,5 trillion (73,5E+12); the percentage of gross capital formation of the GDP, which is almost entirely project based, is 22%; and of all project budgets, 13% is estimated to be at risk. A simple calculation shows that this means that globally and annually, $2,2 trillion of project budget is under threat. To get a feeling for the size of this amount of money risk management is associated with, this is nearly three times the 2015 Dutch GDP of $0,8 trillion (Worldbank, 2016). So, there is quite some money at stake.

From a scientific point of view, risk management in these ever increasingly complex projects is under discussion. the relevance is that at this moment it is not clear how to preserve project resilience in a chaordic project. New knowledge on this topic will further the theory of Chaotic thinking. It also will enrich the approach for the management of complex projects. Last but not least it will give the project manager an answer on the question, how to preserve project resilience of a chaotic project, when risk management no longer is sufficient.

Research question

As the research problem shows, in nowadays increasingly dynamic project environments, Deterministic methods like classic risk management are no longer sufficient: something extra is needed. In software development, the reaction to the increase of chaos are Agile methods (Beck, et al., 2001). Not everything is planned ('just enough design upfront') and change is not excluded but accepted, even embraced (Dybå & Dingsøyr, 2008). Agile methods are adapted to change. This is in line with the concept of Chaos thinking (Van Eijnatten, 2002): a paradigm built on the Chaos theory, a theory on the behaviour of complex, dynamic, non-linear systems. Looking through this chaotic lens it can be seen that the basic assumption of risk management have changed, e.g. cause and effect are not directly related anymore. In this perspective, chaos is embraced: it can lead to unforeseen problems but as well to unforeseen opportunities. In management the chaotic lens also has been applied. The modern, complex world can be described as a 'chaordic' world (Hock, 1999), i.e. a world in which *cha*os and *or*der exist next to each other on a permanent base. Chaos is not something negative, but a fact of life and something that creates opportunities. Value-based Project Management (Mulder, 2012) has

transferred this concept to project management: it describes an approach to manage chaordic projects.

In biology, more specific in ecology, there is the premise that a higher diversity increases the stability of the ecosystem (MacArthur, 1955). Diversity is defined as the number of species present in the ecosystem. The driving factor is the number of food relationships, dinner and death; the more complex this food web, the more stable the ecosystem.

Ecosystems are chaordic systems: order and chaos exists next to each other. Transferring MacArthur's premise to project management and taking the chaotic perspective, this leads to the research question: How can relationships address resilience in chaordic project?

This study focuses both on theory and practice. Therefore the research question is split into two sub-questions, one science oriented and the other focused on design:

1. From a theoretical perspective, how can relationships address resilience in a chaordic project?
2. How would an artefact that is based on relationsips and is designed to address resilience in a chaordic project look like?

In Design Science Research, the artefact created should have a satisfactory performance level. Therefore, two other sub-questions are added:

3. How can the performance level of the artefact be defined?
4. Is the performance level of the artefact satisfactory?

2. Literature Review

The scientific knowledge base is examined looking to better understand what is mean by complex projects, why risk management in complex projects is an issue and what uncertainty means. Next the window of project management research is opened to biology, to understand stability of food-webs in ecosystems, and to translate this to project resilience. Relationships are key, so the project management literature is examined on this topic. The examination is closed by discussing a few related concepts and a description of the context of the research problem. The results of the literature discussion are summarised in the conceptual model. Turning attention to practice, requirements for the artefact and the level at which the artefact performance is regarded to be satisfactory are defined.
From a Design Science Research perspective this chapter is the combination of the second and third step, Awareness of the problem and Systematic literature review, see Table 1.

Project complexity

Complicated, complex, chaotic and chaordic

In software development, the reaction to the increase of chaos are Agile methods. Not everything is planned (‘just enough design upfront’) and change is not excluded but accepted, even embraced (Dybå & Dingsøyr, 2008). Agile methods are adapted to change. This is in line with the concept of Chaos thinking (Van Eijnatten, 2002): a paradigm built on the Chaos theory, a theory on the behaviour of complex, dynamic, non-linear systems. Looking through this lens it can be seen that the basic assumption of risk management no longer holds: cause and effect are not related anymore.
To make clear the differences between chaotic and related terms, the Cynefin model is used. This model originally was developed for knowledge management (Snowden, 2000), and later on transferred to the discipline of management (Snowden & Boone, 2007). The model and the context characterisations below following the newer publication, whereas the key-words and culture of acquiring new knowledge and the kind of sense making follow from the older one. The model is shown in Figure 1. It has five contexts. The first one is the Simple context. Cause and event are clearly related, there is only one good answer. This is the context where best practices flourish. Key-words are bureaucratic, structured and common language; the culture to acquire new knowledge is by training and sense making is open. The next context is Complicated: cause and effect are clearly connected but are more difficult to see, needing expertise and experience, and there are multiple right answers. In this context best practices are insufficient; what is needed are good practices. Key words are professional, logical and expert language; new knowledge is gained by training and sense making is restricted. The third context is Complex. The relation between cause and effect no longer can be seen. To illustrate the difference between complex and complicated, the authors use the example of a Ferrari (complicated) and rain forest (complex). ‘The car is static, and the whole is the sum of the parts.

The rainforest, on the other hand, is in constant flux - a species becomes extinct, weather patterns change, an agricultural project reroutes a water source - and the whole is far more

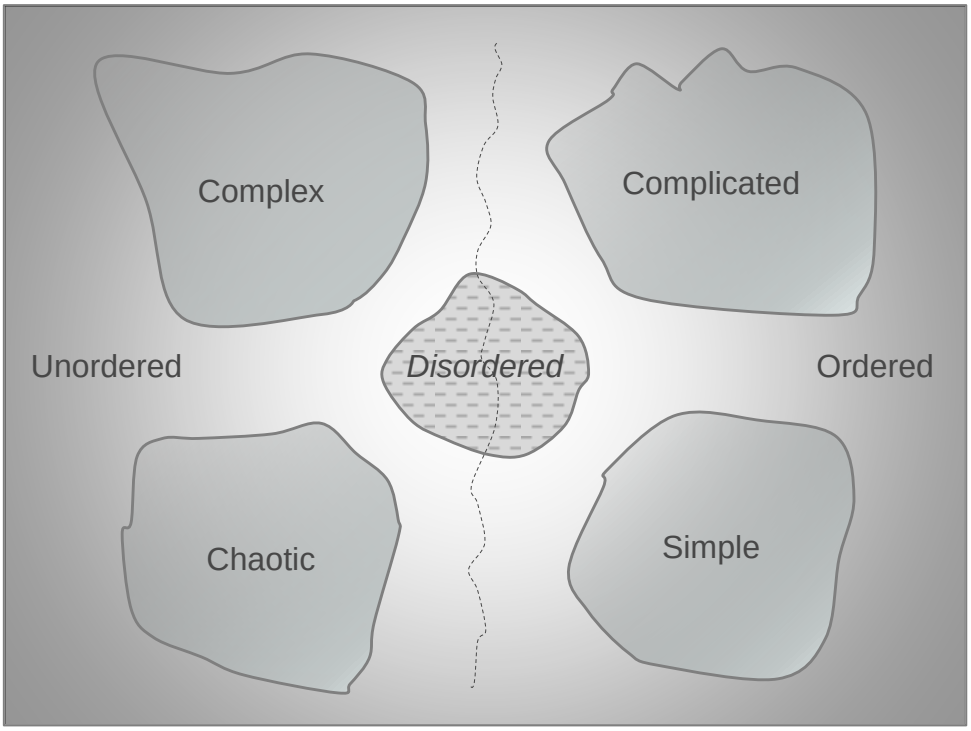

Figure 1:The Cynefin model

than the sum of its parts . . . in this domain, we can understand why things happen only in retrospect.'. Key-words in the complex context are informal, inter-dependent and symbolic language; getting new knowledge is done by learning and sense making is restricted. In the fourth context, Chaotic, 'searching for right answers would be pointless: The relationships between cause and effect are impossible to determine because they shift constantly and no manageable patterns exist - only turbulence.'. Key-words to characterise this context are uncharted, innovative and emergent language; learning is the way to get new knowledge and sense making is open. Simple and Complicated together are the Ordered world, the world where cause and effect are related; Complex and Chaotic make up the Unordered world, where the relationship between cause and effect no longer can be found or even does not exist. The fifth and last context is called Disordered. 'The very nature of this context . . . makes it particularly difficult to recognize when one is in it. Here, multiple perspectives jostle for prominence, factional leaders argue with one another, and cacophony rules.'

In management the chaotic lens also has been discovered. The modern world can be described as a 'chaordic' world, i.e. a world in which *cha*os and *or*der exist next to each other on a permanent base (Hock, 1999). Chaos is not something negative, but a fact of life and something that creates opportunities. In Value-based Project Management (Mulder, 2012), the chaordic perspective has been transferred to project management. Referring back to the Cynefin model, the qualification 'multiple perspectives' for the Disordered context hints at the chaordic perspective, where the Ordered and Unordered world exist side by side. The arguments and cacophony Snowden and Boone (2007) refer to, suggest that a choice has to be made between

the contexts. In the chaordic perspective this is unnecessary: chaos and order can and do exist peacefully together. The presence of chaos next to order is accepted, as a part of life.

Risk and uncertainty

As explained above, a risk can be defined as Risk = (A, C, P), with A being an event that triggers materialisation of the risk, C being the consequences or impact if the risk materialises, and P being the probability or change that the risk will materialise (Aven, 2010). In words: the change that A happens is P; when A happens then the consequence is C. Uncertainty in this study is defined as 'a context for risks as events having a negative impact on the project's outcomes, or opportunities as events that have beneficial impact on project performance' (Perminova, Gustafsson, & Wikström, 2008).

Two types of risk can be distinguished (Sanderson, 2012). Risks in Risk category 1 have an a priori probability: the chance of throwing a 6 with a perfect dice can be calculated mathematically. A risk in Risk category 2 has a statistical probability. There are also two uncertainty categories. Uncertainty category 1 covers uncertainties where there is a known range of future events but there are no data to assign objective, i.e. a priori or statistical, probabilities. Instead subjective probabilities are used. And lastly, an uncertainty in Uncertainty category 2 'regards a situation in which the nature and range of future events is unknown'. The probabilities assigned are created by group discussions; 'socialised probabilities'.

As suggested by Bredillet and Tywoniak (2016), these risks and uncertainty categories can be mapped to the Cynefin contexts, see Figure 1: Risk categories 1 and 2 are placed in the Ordered world, Uncertainty category 1 in the Complex context and Uncertainty category 2 in the Chaotic context.

Projects and ecosystems

The diversity-stability debate in ecology

In biology, more specific in one of its specialisations, ecology, there is a long standing diversity-stability debate (Sarkar, 2007). Following Odum (1975, p. 4), in ecology a population is a group of individuals of any kind of organism. A community is includes all of the populations of a given area. The community and its non-living environment function together as an ecological system or ecosystem. A system is described as 'a regularly interacting or interdependent group of items forming a unified whole'. In ecosystem theory the populations are called entities and they interact via relationship. These relationships can be modelled from a certain perspective. For instance if the perspective is food, all relationships are selected that regard dinner or die. This selection is called a food web. Examples of other perspectives are space to attach to, e.g. mussels on a stone, and nesting holes, for different species of birds and squirrels.

Entities can be populations but also other groupings of individuals, like species. One of the founding fathers of ecology, MacArthur, already in the fifties of the previous century postulated the premise that the higher the diversity, defined as the number of species in the system, the

more stable the ecosystem, in a way that after a sudden change it will return to equilibrium (MacArthur, 1955). For instance take an ecosystem X with a species A, eating a species B, whereas B eats grass. This is called a food chain, with species A being the predator and animal B the prey. When because of global warming the rainfall in the area decreases dramatically, the grass will dry. Species B will have less food and so the number of animals will drop, which will result in species A having issues to find enough food. Under extreme conditions the ecosystem can collapse. Now take an ecosystem Y with again species A and B and grass, but now also with species C that eats bushes and species D that eats trees, and species A predating on all of them. When in this case the grass disappears, the number of animals of species B will go down. To the predator this is not a big issue: species A can change to eat more of C and D. So despite the drought, ecosystem Y probably will change but not collapse. Of course this is a simple example and there are all kind of assumptions in it; however it illustrates MacArthur's premise.

In the seventies this diversity-stability relationship was seriously challenged (May, 1974). As a result the idea was abandoned. After several decades the debate has flared up again: in recent literature there are examples of positive and negative support for the relationship. Earlier work is reassessed: Harvey (2011) for instance had fundamental critic on May's approach. So, the over 60 years old debate still is open. 'Stalemate', according to Sarkar: a conclusion is not yet foreseen.

Ecosystems can be classified as chaordic systems: order as well as chaos exist. An ecosystem of a population of moss on a sand dune is simple, but as soon as ants dig holes under the moss, birds visit the place to eat and pine seedlings start growing, complexity increases. Most systems are more complex, up till the example already mentioned before, the rain forest.

The Project ecosystem

Despite the open status of the debate, the line of thought can be translated to the project management domain. A project can be seen as an entity in a Project ecosystem and the perspective to model relationships can be uncertainty. The resulting set of relationships are called the Uncertainty web. Following MacArthur (1955) it can be argued that the higher the number of relationships in the Project ecosystem, i.e. the more complex the Uncertainty web, the more stable the Project ecosystem is. And a stable Project ecosystem will support the resilience of the projects it contains.

Relationships in project management

Several examples of attention to relationships in the project management literature can be found. A number are on relationships on the organisational level (Söderlund, 2011), whereas this study looks at the level of the individual. On the personal level, risk management has a social dimension, where participants interact with each other (De Bakker, 2011). This results in personal relations between the project manager and stakeholders, which has a positive effect on project success (De Bakker, Boonstra, & Wortmann, 2012). The other way round, it has

been demonstrated that a strategy with very limited collaboration resulted in problems for the project (Newell, Goussevskaia, Swan, Bresnen, & Obembe, 2008). In another study it was concluded that intensifying contacts, e.g. by integrating line managers in projects creates a better chance on successful project implementation (Dupont & Eskerod, 2015). Other authors argue that discussing risks between team members and stakeholders in open forums could support risk mitigation (Zwikael & Ahn, 2011). Collaboration, with implies relationships between individuals, is mentioned as a direct way to improve project resilience (Schroeder & Hatton, 2012).

Relationships are between people. A relationship is created and maintained by communication. There are several types of communication. A main difference is between sending messages and a dialogue. Quite often communication is regarded as a 'transmission approach', where the goal is seen as 'to send clear, unambiguous and complete information' (Ziek & Anderson, 2015). A dialogue however is 'a way of conversation in which shared meaning is created among many. Learning is accomplished through inquiry into assumptions. Dialogue stresses the whole among the parts and focuses on connections between them' (Mulder, 2012, p. 155). Or, more practical, as expressed by Ziek and Anderson, 'a way that project managers generate the grounds for a project'. In this study when relationship is mentioned, it is based on dialogue. Because a relationship is between people, a dialogue with a group, department, organisation, government, et cetera is not possible. So a dialogue between the project manager and for instance a department always is between the project manager and a named individual, representing the department. If such a contact is not present, either the department should be removed from the Project ecosystem or a personal contact has to be established.

Deliniation

Context of the problem

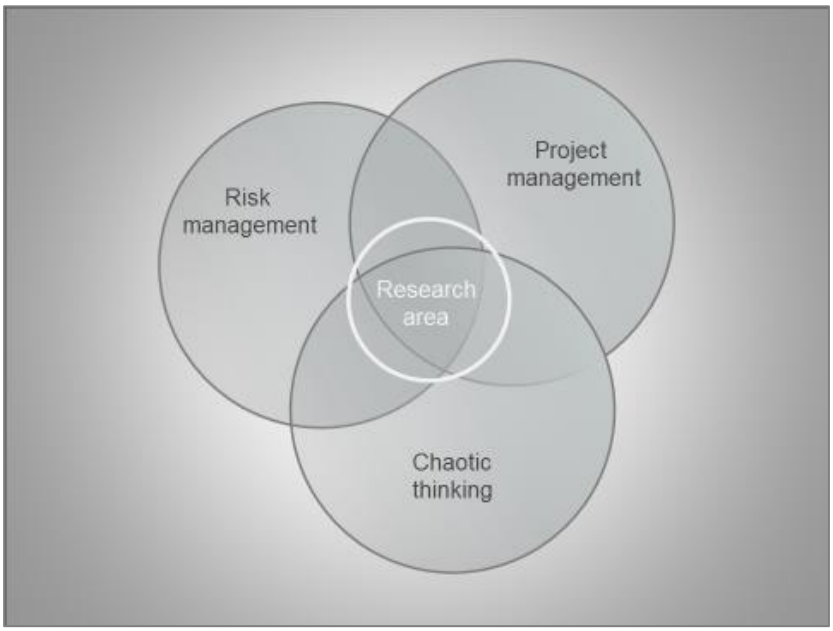

Figure 2: The research area in its context

From the above, the context of the problem can be defined from three points of view: project management, risk management and the chaotic lens; see Figure 2**Fout! Verwijzingsbron iet gevonden.**. The overlap between the three perspectives defines the research area. This area regards all projects, big or small, simple or complex; by adding the chaotic lens to look at a project it per definition is a chaordic project. The chaotic lens provides an alternative and effective perspective to deal with the aspects of the Unordered world, like complexity, uncertainty, time pressure, novelty and vagueness (Mulder, 2013).

Related concepts

From an organisational point of view, relationships can be classified as interorganisational (project to project/function/unit in another organisation); intraorganisational (project to function/unit within the same organisation); interproject (project to project within the same organisation); and intraproject (within the project) (Lampel, Scarbrough, & Macmillan, 2008). In this study relationships are between people, so the classification mentioned above is not applicable.

A term coined by Söderlund that is quite close to Project ecosystem is 'project ecologies', (Söderlund, 2004). Project ecologies also takes interest in the study of the interrelationships between projects and their environments. However, environment here is defined on a more abstract level: 'the research's interest in the links between projects and actors (e.g., firms), the sociology of projects, in the economics of projects and in the links between project participation and company development'. It is meant to 'better integrate project management with the general developments in management and organization'. Essentially, the concept of project ecologies is intended to stimulate project management related research to open windows to other areas of research. The concept of the Project ecosystem can be seen as an outcome of project ecologies: it is the result of opening the window to biology.

Conceptual model

Built on the scientific knowledge and the body of knowledge from practice as discussed above, and the chosen approach of Design Science Research, a conceptual model is outlined as shown in Figure 3. This model is adapted from Andriessen (2011). Two streams are recognised, a Knowledge stream and a Practice stream. In the Knowledge stream, the classical field of science, knowledge is mobilised: there is a search for knowledge from theory and practice that could help to analyse a problem from practice and design a solution. This solution then is developed and validated in the Practice stream. The knowledge that is produced by development and validation is fed back into the Knowledge stream. Dresch et al. (2015) add that the Knowledge stream also is the source for scientific rigor, i.e. provides the certainty that the research is conducted according to scientific standards. Next, the Practice stream is the

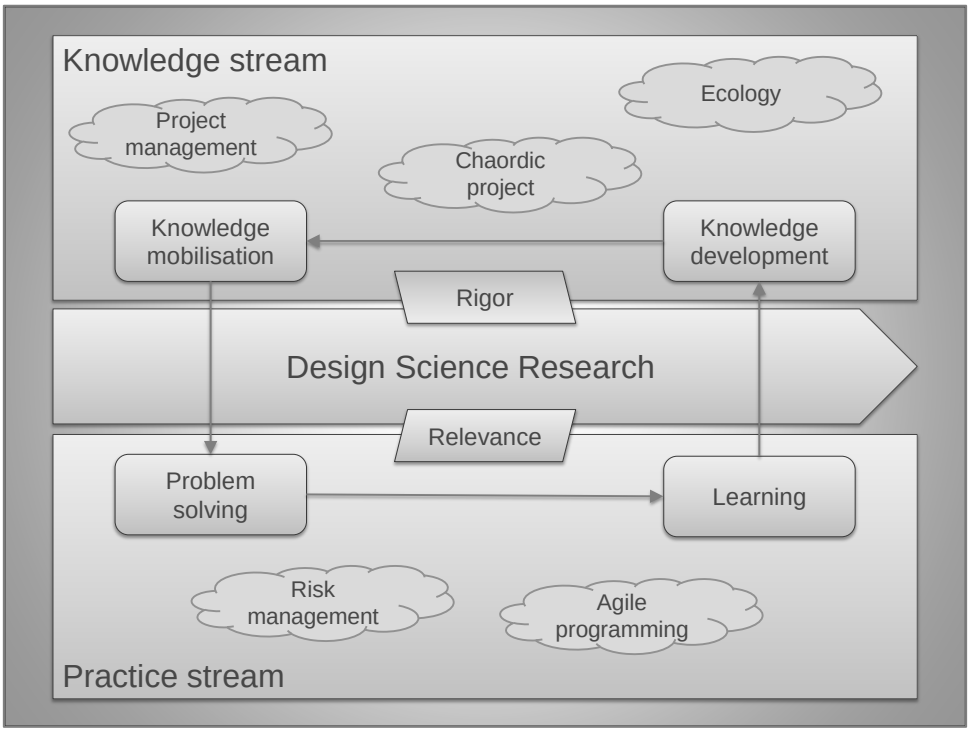

Figure 3: Conceptual model

source for relevance, which means that the work conducted in the Knowledge stream is connected to a real problem in practice.

Two out of the three contexts of this study, project management and Chaotic thinking, are situated in the Knowledge stream. The third one, risk management, is placed in the Practice stream, as this study started from a problem from practice. To solve the problem, theoretic knowledge from chaordic project management and ecology has been applied. From practice, concepts of Agile programming has been used.

Certainly discussion is possible about the position of some of the topics mentioned. Risk management also exists in the Knowledge stream, as many publications exist on this topic, and for project management an impressive body of knowledge is available in the Practice stream. The goal of the model however is to show what has led this study.

Artefact preparations

In Design Science Research a profound awareness of the problem is regarded essential. Thus, before jumping into solving the problem, high-level requirements and the performance level that is regarded as satisfactory are set. In this section these are described.

High-level artefact requirements

To be sure the problem is well understood, in Design Science Research specifications of the artefact are required. In design oriented research, four categories of requirements can be distinguished: Prerequisites, Functional requirements, User requirements and Design restrictions. In these groups in total 26 requirements can be distinguished (Mulder, 2012), see Table 2. The first column is a code added for referenceability. The second column contains the

translated requirement. The third column shows the way the original requirement is operationalised or that it is unused.

No	Original requirement	Operationalised requirement
	Prerequisites	
P1	Has explicit values	The values of the artefact are explicitly articulated
P2	Aligns to the strategy of the organisation	<Not used>
P3	Fits into the organisation culture	<Not used>
	Functional requirements	
F1	Supports project operations	The artefact is applicable in a project context
F2	Solves the scientific problem	The creation of the artefact solves the scientific problem of how to deal with uncertainties in a project ecosystem from a chaotic perspective.
F3	Has a positive balance	<Not used>
F4	Competences for usage have been developed	The competences for usage of the artefact have been specified
F5	Has been tested in practice	<Not used>
F6	Fit for a certain kind of problems	The artefact is fit for dealing with uncertainties from a chaotic perspective
F7	Solves a practical problem	The artefact supports from a chaotic perspective project stabilisation
	User requirements	
U1	Flexible	The artefact is easy to adapt to the circumstances
U2	Simple and transparent	The artefact is easy to understand.
U3	Interest-oriented	The artefact supports the project in reaching its objectives
U4	Motivating	Usage of the artefact motivates to deal with uncertainties
U5	Supports the personal development of the user	Usage of the artefact supports the personal development of the user
U6	Provides overview	The results of the artefact provide overview
U7	Supported by graphics	<Not used>
U8	Shortly described	The instructions to use the artefact are short
U9	Supports the development of a project vision	The results produced by the artefact support the development and maintenance of a project vision
U10	Supported by software	<Not used>
U11	User friendly	The artefact is easy to use

No	Original requirement	Operationalised requirement
U12	Well documented	<Not used>
U13	Structured	The structure of the artefact is clear
	Design constraints	
D1	Solves a problem from practice	<Not used>
D2	Extends the body of knowledge of the field of expertise	The knowledge produced by the research to design the artefact extends the body of knowledge
D3	Developed from the player's perspective	The artefact is developed from the perspective of the intended users, the project managers

Table 2: High-level artefact requirements

Requirements P2 (strategy) and P3 (culture) and F3 (balance) have not been validated because in this test the artefact is validated independent of the organisation. Requirement U12 (documentation) has not been part of the validation because context and instructions have been presented orally to the test persons. Requirements U7 (graphics) and U10 (software) have been excluded because they were not needed in this test. Finally, requirement D1 (practice) has been discarded because it is the same as F7.

Definition of satisfactory

One of the specific concepts of Design Science Research is that artefacts should be useful in practice but that the performance level should be satisfactory and not optimal or maximal. Dresch et al. define satisfactory as 'Solutions sufficiently appropriate for the context in question; the solutions should be feasible to the reality and does not necessarily need to be optimal solutions' (2015, p. 59). 'The decision maker can choose between optimal decisions in a simplified world or (good enough) decisions that are satisfactory in a world closer to the reality' (p. 57). It therefore is important, before developing the artefact, to define when the artefact is to be regarded as satisfactory'. In the Oxford Dictionaries satisfactory is defined as 'Fulfilling expectations or needs; acceptable, though not outstanding or perfect' (Oxford Dictionaries, 2016).

To validate if the performance level of the created artefact is satisfactory, it is validated against the User requirements, see Table 2 and the comments thereafter. In The Netherlands, on a 10-point scale a 6 equals the satisfactory level. The artefact is regarded to be of a satisfactory level if in more than 80% of the tests the respondent agrees that the requirement tested is met.

3. Research design and method

This chapter describes the design of the research and its implementation.

Research design

The research design follows Design Science Research, as explained in Table 1, with one exceptions. In Step 5, Proposition of artefacts to solve a specific problem, just one artefact has been proposed. The reason is the exploratory character of this study.

Method

First, Steps 1 till 6 have been conducted. A proto version of the resulting design has been shared with experts for review. Their input has been used to update the description of the first 6 Steps and to develop the artefact (Step 7). In Step 8, Evaluation of the artefact, the artefact has been validated by practitioners. The focus in this thesis is on building knowledge, therefore on qualitative analysis. Quantitative data have been collected only to get an indication if the performance level of the artefact is satisfactory.

Review of the design of the artefact

Because of the dual nature of this study, theory as well as practice, a prototype of the artefact has been reviewed by experts. The prototype was an earlier version of the artefact design. The experts have been selected as representatives for each the three contexts of the research area, as illustrated in**Fout! Verwijzingsbron niet gevonden.**; one representative for each context. he selection criterion was that the representative either has a PhD or has an MSc, has over 10 years of experience in project management and has written one or more books in the area represented. The representatives who satisfied the criterion and gave their support are:

- Mrs M. Bosch-Rekveldt - PhD, Assistant Professor of Project management, Delft University of Technology, The Netherlands - Chaotic lens
- Mr J.I.M. Halman - PhD, Professor of Innovation and Risk Management, Twente University of Technology, The Netherlands - Risk management
- Mr B. Hedeman - MSc Civil Engineering, MA Business Administration, Delft University of Technology, The Netherlands - over 20 years of experience and having written several books on the topic - Project management

The representatives have been asked to comment on the text and to answer the following questions, each from her/his own context:

- Is the problem indeed a problem?
- Is the line of thought correct?
- Is the conceptual model an answer to the question?
- Is the artefact a plausible implementation of the conceptual model?

The representatives were invited by telephone. In this call the background and goal of the research was explained and the representative was invited to join. The prototype and the questions were send by e-mail. The replies were received in the same way. The comments of the review were used to improve the description of the Steps 1 till 6 and to develop the artefact (Step 7). They are not mentioned as findings.

Evaluation of the proposed artefact

The proposed artefact has been validated via peer consultation: potential users have been asked for their feedback (Mulder, 2012). This validation is to be regarded as an α-test, i.e. a test where the researcher is present and so influences the test group (Dolan & Matthews, 1993). This set-up was chosen because it is the most effective way to learn from the test group.

The Prerequisites, the Functional requirements and the Design constraints - together called the Non-user requirements, see Table 2 - were part of the design and development of the artefact; these are built-in. The way they were taken into account in the design and the development of the artefact is described.

Data to validate the user requirements of the artefact have been collected by means of structured interviews (Shepherd, 2015), via workshops with groups of participants. The selection criterion for the participants was that they were project manager. Other parameters, like age, experience, education, kind of project or project size have not been considered. All participants had the Dutch nationality. The official language in the workshops was Dutch. In this way there was no language barrier for the participants to express the nuances of their opinion. The results of the questionnaire were translated to English by the researcher.

People were invited for the workshops per e-mail. The invitation can be found in Appendix A (in Dutch). Each workshop was led by the researcher and had a time slot of 1 hour. To start off, the participants were welcomed and a short introduction was given on the background of the research. Then the goal of the meeting was explained and the agenda was walked through. Next the research problem was elaborated and the artefact was explained, including an overview of the interventions. Following, the requirements on which the artefact was to be validated were discussed and the way to fill in the questionnaire was shown. Finally the way the data would be used was shared and after saying thanks to the participants the workshop was closed. The workshop protocol can be found in Appendix B (in Dutch).

The focus was on verbal feedback, to be able to learn and so improve the artefact for the next test round. So the participants were asked to write a short comment at each requirement. This could be on paper in the workshop, via a Word-document that was distributed after the workshop or via filling in the same document via Google Form. In terms of Shepherd (2015), the analytical focus was on Meaning and the mode of analysis was Condensation. Coding and Interpretation, the other two modes described for this analytical focus, were applied as part of the Condensation process. Language, the second group of analytical focus, was ignored, as this was not the focus of this study. Theoretical reading and Bricolage, together the General

group of analytical focus, were not applicable: the first because the focus was learning for practice and the second because not a mix but just one mode of analysis was used.

Condensation was conducted according to Systematic Text Condensation (Malterud, 2012). In the first step, 'Total impression - from chaos to themes', the researcher red the comments per requirement and defines up to three themes. This is an abductive process. In the next step, 'Identifying and sorting meaning units - from themes to codes', the comments were split in meaning units and these were coded. The meaning unit always has a relation to the goal of the analysis, creating knowledge regarding the artefact; text that did not meet criterion has been ignored. The codes were elaborated from the themes. It was allowed that a code in one requirement was related to a theme in another requirement. In the third step, 'Condensation - from code to meaning', per requirement the meaning units were compiled in an artificial quote, the condensate. The condensate was written in the first person singular and reflected as close as possible the terminology used by the participants. To every condensate an 'authentic illustrative quotation' of one of the participants was attached. In the fourth and final step, 'Synthesing - from condensation to descriptions and concepts', from the condensates and quotes the researcher developed 'a story about the phenomenon grounded in the empirical data as an analytic text presenting the most salient content and meaning. The researcher takes the role of a re-narrator, writing in the third-person format. This analytic distance reminds us that we as researchers are responsible for our interpretations'. This is called recontextualisation. First, all condensates were put together into what is called here the Compilation. Then the researcher, overseeing the text, created Category headings: 'brief and expressive statements of your most significant interpretations, not neutral labels that just announce the domains of your findings.' Next each sentence of the Compilation was moved to one of the Category headings. Subsequently the researcher created for each Category a Category description that connects the sentences in the Category with the Category heading. Finally all Category descriptions were combined into what is called here the Synthesis and all Category headings were combined into what is called here the Essence. Condensates, Compilation, Category headings and Category descriptions all are intermediate products. The Synthesis and the Essence are end products: both reflect the knowledge collected in the workshops, each in its own way. Decisions taken during the analysis were logged in a Decision trail, see Appendix C.

To validate if the artefact in the opinion of the attendees had a satisfactory performance level, the attendants were asked to quantify the level to which the user requirements were met. So each participant gave a mark for each user requirement. The marking scheme was based on the one used with planning poker (Mahnič & Hovelja, 2012). These numbers are derived from the Fibonacci sequence. In this case the sequence started with 1, 2 and ended with 144: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89 and 144. 1 was set to mean that the artefact fully met the requirement, 144 that it did not meet at all. The marks given by the participants were collected. Then they were grouped into three categories: Agree (1 till 13), Neutral (21 till 55) and Disagree (89 and 144). The percentage of Agree marks denoted the performance level of the artefact.

4. Findings

This chapter covers Steps 4 till 8 of Design Science Research. In this approach the creation of the artefact, Steps 4 till 7, is method but also result: besides the artefact the approach also produces design knowledge. As mentioned by Dresch et al. (2015, p. 122), it 'is important to remember that construction heuristics derived from the development of artifacts constitute one of design science's contributions to advancing knowledge'.

Identification of the artefacts and configuration of the classes of problems

This is Step 4 of Design Science Research, see Table 1.

Identification of the artefacts

For risk management many well-developed and widely used artefacts exist. Examples from the most widely used project management method families are presented in Table 3, in alphabetical order of family name. These methods can be regarded existing artefacts for risk management.

Project management method family	Artefact	Category	Reference
AXELOS	Management of Risks (M_o_R)	Process	(AXELOS, 2010)
International Project Management Association (IPMA)	Risk & Opportunities	Practice competence	(IPMA, 2015)
International Standardisation Organisation (ISO)	Risk	Subject Group in Standard 21500	(NEN, 2012)
Project Management Body of Knowledge (PMBok)	Risk Management	Process	(PMI, 2013)

Table 3: Main risk management artefacts

All artefacts listed are created in the Ordered world: they all are based on the assumption that cause and effect are related.

Configuration of the classes of problems

In design oriented science, like Design Science Research, the external validity of the artefact is an important quality parameter. The transferability of the results to other contexts than the one the artefact was created for is highly valued. Dresch et al. (2015, p. 59) define these contexts as Classes of problems.

The artefact in this study has been developed for risk management in projects in the Unordered world. Most of the project managers involved in this study worked in a technology oriented environment. The Research class of problems then can be described as technical projects in the Unordered world.

In Design Science Research The other contexts are called Related classes of problems. The first one selected is technical projects in the Ordered world. The results of the study could give suggestions to enhance comparable artefacts, risk management methods, in this world. Another interesting Related class of problems are megaprojects (e.g. Flyvbjerg (2003)). These projects operate in the midst of society, have a high chaotic level and many related parties to keep good relationships with. The third Related class of problems mentioned here are projects in the area of organisational change (Caluwé & Vermaak, 2003)). These projects are characterised by many relationships. Compared to megaprojects these are on a more personal level and not so much focused on a tangible product. An approach that is applicable in both classes of problems is Projectmatig creëren (Project-driven creation) (Bos & Harting, 2015). In Figure 4, Research and Related classes of problems are shown.

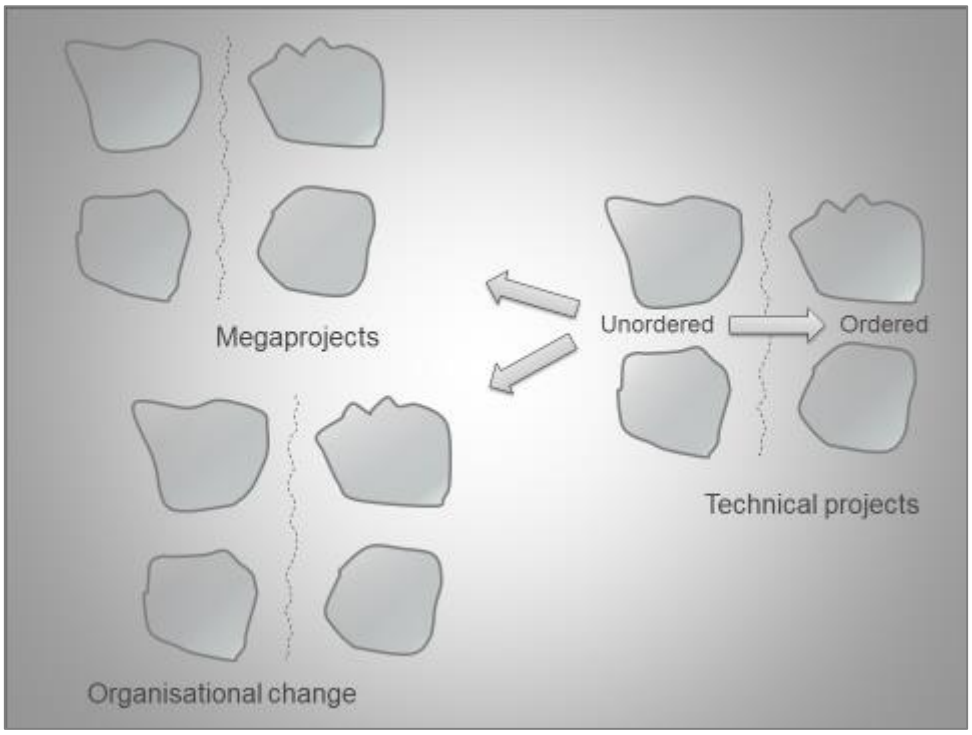

Figure 4: Configuration of the classes of problems

Proposition of artefacts to solve a specific problem

This is Step 5 of Design Science Research, see Table 1.
In this study only one artefact is proposed. The goal of this artefact is to support the project manager in dealing with uncertainties to preserve the resilience of a chaordic project. This artefact can be regarded as an alternative of risk management for the Unordered world: both are meant to act on uncertainties.

Design of the selected artefact

This is Step 6 of Design Science Research, see Table 1.

Step 6 is a creative step or abductive. The creativity is reflected in the fact that there is not a closed chains of logic. It regards creating the big picture from a number of sources of inspiration. One of the sources was the diversity-stability debate. More diversity, more stability. Another - negative - source was the statement ‘trust is good, control is better’; a phrase often heard in project management practice. When working with people, one of the main aspects of project management, this is a worrying phrase. A third source of inspiration was the increased dynamics and complexity in projects as experienced in practice. Will risk management be capable to stay on top of it? A next piece of the puzzle was the difference between risk and uncertainty: an intriguing question for someone who at several moments in his career worked in risk management.. Getting involved with the principles of chaordic project management delivered was the last source of inspiration: it delivered the last pieces of the puzzle, the chaotic lens and interventions.

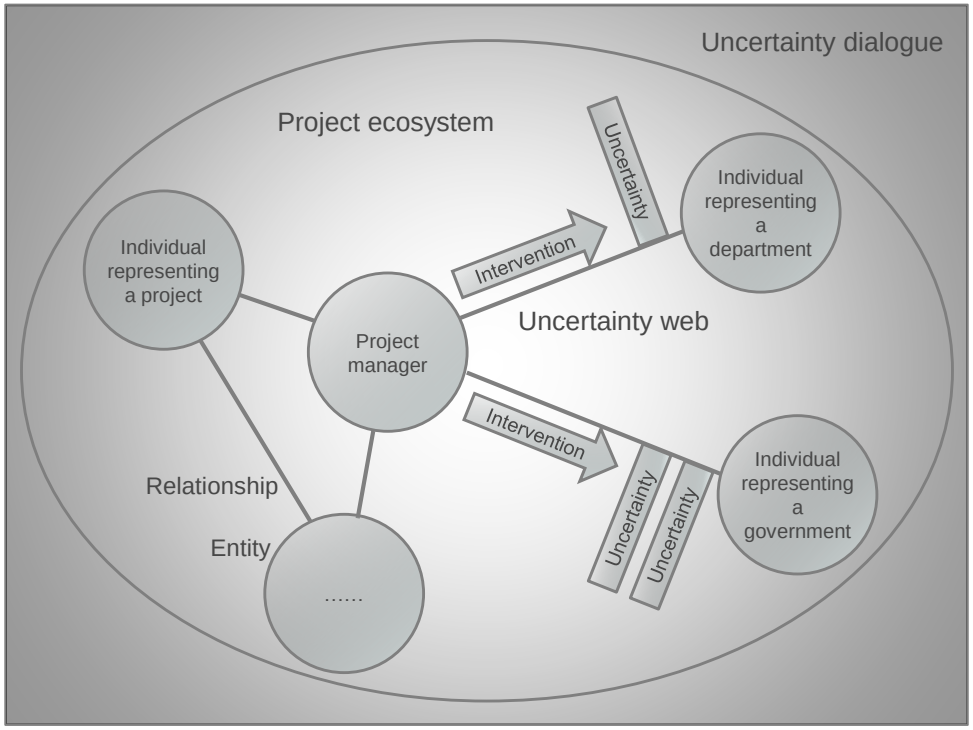

Figure 5: Uncertainty dialogue design

The artefact is shown in Figure 5**Fout! Verwijzingsbron niet gevonden.**. The context of the rtefact is called the Project ecosystem. This ecosystem is a chaordic system.**Fout! Verwijzingsbron niet gevonden.** The ecosystem contains entities: meaningful units. An entity in the Project ecosystem always is an individual, representing other entities; the project manager or individuals representing another project, a department, a supplier, et cetera. The group the individuals represent are meaningful to the project. Entities are connected via relationships - or not. Relationships can be of different types; in the artefact their subject is uncertainty. Relationships have a dynamic character: they come and go. All relationships on uncertainty in the Project ecosystem together constitute what is called the Uncertainty web. The project manager continuously develops the Uncertainty web, depending on the conditions and

needs. In this web the project manager actively moves around, communicating with other entities via dialogue and based on trust, eager to detect uncertainties and continuously deliberating which intervention(s) to use. The continuous development of the relationships, the search for uncertainties via dialogues and the application of interventions in the Uncertainty web is called the Uncertainty dialogue.

Development of the artefact

This is Step 7 of Design Science Research, see Table 1.

The project manager deals with uncertainties by developing the Uncertainty web of the project. The web is maintained by the active participation of the project manager in the web, by in a continuously having dialogues with representing individuals of all groups, departments, companies, governments, et cetera, the project is related to.

The development of a healthy Uncertainty web is based on the project goals: they provide arguments selecting entities to be added to the Project ecosystem, and for creating, maintaining and closing relationships. First the entities are selected. This regards all groups and the people in those groups that are important to the project. Next, the relationships in the Uncertainty web are defined. It is not necessary to have relationships to all entities in the Project ecosystem; with some entities, uncertainties from the perspective of the project are just marginal or negligible. The web is not static: in a chaordic environment it continuously will change. Therefore it is essential that the project manager actively participates in the web. Only in this way the web is kept up-to-date and so effective.

In a dialogue each relationship then is checked for uncertainties. Known uncertainties are examined and still unknown uncertainties are looked for. Assumptions most times are a rich source of uncertainties: sometimes the assumption can be proven, sometimes it can be rejected, sometimes it cannot yet be decided if it is true or not. An assumption of the last category results in a new uncertainty.

Depending on the uncertainties that are present in a relationship, on the quality of the relationship, on what is going on elsewhere in the Project ecosystem and on the experience, knowledge and intuition of the project manager, the project manager acts by using one or more of the interventions applicable to a chaordic environment (Mulder, 2012, pp. 124-159), see Table 4. Numbers have been added for the sake of referenceability.

Number	Intervention
1	Ground the project approach on shared values
2	Continuously focus on the higher project goal
3	Develop a project vision and keep it alive
4	Use a development approach which tolerates fuzziness
5	Act based on trust
6	Use transformational leadership

Number	Intervention
7	Create the conditions for self-organisation
8	Facilitate creativity
9	Let users participate right from the start
10	Keep the dialogue with stakeholders ongoing
11	Work result-oriented where it fits

Table 4: Interventions for a chaordic environment
NB:. Translated from Dutch by the author from Mulder (2012, p. 124)

No hierarchical order is present in these interventions. In the Uncertainty dialogue the fifth and tenth intervention, regarding trust respectively dialogue, are relative important: they are required to keep the Uncertainty web vivid. The second and third interventions are especially useful to develop the Uncertainty web: selecting the right entities, deciding which relationships should get special attention and deploying the appropriate intervention(s).

To work with the artefact, the project manager should be able to rely on good project management competences (IPMA, 2015). Three groups of competence elements are distinguished: Perspective competences, needed to be capable to work in a context; People, about personal and interpersonal capabilities; and Practice, regarding project management methods, techniques and tools. To get most from the Uncertainty Dialogue, some of these are more relevant than others. In the group of the Perspective competence elements, element Culture and values is of interest. The artefact is built from the perspective of ‘Value’ based project management and culture is a critical factor in the relationships between people. In the group of People competence elements, especially Self-reflection and self-management and Relationships and engagement. From the chaotic perspective the project manager has no processes, procedures, et cetera to build on. So the thinking of the person of the project manager is a major fundament. Self-reflection and self-management help the project manager to understand themselves and to act. Relationships and engagement is coupled tightly to the dialogue in the Uncertainty web. Lastly, in the group of Practice competence elements, Risk and opportunity .The first one because it regards one of the contexts of the artefact; the second the entities in the Project ecosystem that have a relationship with the project are stakeholders..

Evaluation of the artefact

This is Step 8 of Design Science Research, see Table 1.

The evaluation is split into three parts: the validation of the Non-user requirements, the validation of the User requirements, via the workshops, and the validation if the artefact has a satisfactory performance level.

Non-User requirements

In Table 5 the Non-user requirements are evaluated.

No	Requirement	Validation result
	Prerequisites	
P1	The values of the artefact are explicitly articulated	Value based project management has five central concepts: social, motivate, create, value and trust. 'Values may be defined as a set of concepts on which the individuals base their actions on' (IPMA, 2015, p. 58). The artefact is built from the perspective of Value based project management, so these concepts can be regarded as the values of the artefact.
	Functional requirements	
F1	The artefact is applicable in a project context	The artefact is created in the Project ecosystem.
F2	The creation of the artefact solves the scientific problem of how to deal with uncertainties in a project ecosystem from a chaotic perspective.	By creating a Dialogue web in which uncertainties are dealt with by interventions, it is clear how to deal with uncertainties from a chaotic perspective
F4	The competences for usage of the artefact have been specified	As described above, the competences that a user of the artefact need most are Culture and value (Perspective 5), self-reflection and self-management (People 1), relationships and engagement (People 4), Risk and opportunity (Practice 10) and Stakeholders (Practice 11).
F6	The artefact is fit for dealing with uncertainties from a chaotic perspective	The artefact is created from the chaotic perspective and gives an action perspective on dealing with uncertainties in practice, by applying the interventions from Value based project management.
F7	The artefact supports from a chaotic perspective project stabilisation	By creating a Dialogue web and applying the interventions on the uncertainties found in the web, the project manager is able to maintain the resilience of the project.
	Design constraints	
D2	The knowledge produced by the research to design the artefact extends the body of knowledge	The injection of the concepts of ecosystem, ecosystem stability and food-web from biology in project management, combined with Value-based Project Management, provides a new area of research.
D3	The artefact is developed from the perspective of the intended users, the project managers	The researcher is one of the intended users, a project manager.

Table 5: Evaluation results of the Non-user requirements

User requirements

Two User requirement validation workshops were held at NS, the main Dutch railway operator, at 28 June and 4 July 2016. A third one was hosted by RIDDS, the Professional Association of Masters in Project Management, an association of alumni who finished their Master of Project Management at the Utrecht University of applied Sciences, at 29 June 2016. Members of this association work at different companies. In total 19 persons attended the workshops, more or less equally distributed over the different workshops. Of these, 12 delivered feedback, which means a response rate of 63%.
The results of the first three steps of processing as prescribed by Systematic Text Condensation - themes, meaning units, condensates and quotes - can be found in Appendix D. Appendix E shows the Compilation; the combination of all condensates. The distribution of the sentences from the Compilation to the Category headings is shown in Appendix F. The re-narration of the Category heading and Category sentences into Category descriptions is to be found in Appendix G. All Category descriptions are combined into the Synthesis and all Category headings into the Essence. The products in the appendices are intermediate products, part of the analysis. The results of the analysis, the Synthesis and the Essence, are presented below. Both describe the results of the workshop. The text however was derived in different ways.

Synthesis

The Uncertainty Dialogue is a guideline. It comprises a way to look at the world and from that point of view a couple of activities. Both are important: without the right position, the activities become meaningless. It is not a tool in the sense of a fixed set of rules: from a chaotic perspective, rules don't hold. It is more like a music instrument: it only produces its beautiful sound when it is played by the skilled musician.

Applying the Uncertainty Dialogue results in an increased network. In this network the project manager explicitly looks for uncertainties related to the project objectives. Because of the targeted search, more uncertainties are likely to be detected and earlier. Where applicable, interventions are applied. The active relationships in the network, the insight in where uncertainties are and the application of interventions support the project manager in the stabilisation of the project: the emphasis of activities shifts from reactive to proactive. In this way using the Uncertainty Dialogue supports the project manager to give direction despite the experienced complexity.

The results of using the artefact are not a complete overview of uncertainties, like the risk log. From the chaotic perspective this is useless, as the world continuously changes in an unpredictive way. Trying to fence off will nip chances that arise from the chaos in the bud.

The results from applying the Uncertainty Dialogue could help to build the project vision. However the vision covers a much broader area. Moreover it is not the intention of the artefact. The uncertainties collected even can blur the vision.

A clear added value of using the Uncertainty Dialogue is that the project manager, developing the Uncertainty web, is stimulated to leave their ivory tower. Leaving their comfort zone could open up a whole new world. Next to that, when the interventions are regarded as a kind of competences, reflection on their use could stimulate the personal development of the project manager.

The Uncertainty Dialogue can easily be adjusted to the conditions. One or more of the interventions can be applied and the amount of effort put into each intervention can be tuned, resulting in a targeted mix. When the conditions change, the mix can be adapted accordingly. From the chaotic perspective there is no connection between cause (action) and effect (result); the outcome of applying the mix should be monitored carefully.

The descriptions of the interventions are open to different interpretation. This is a risk, as people could have different expectations. From the chaotic perspective this risk is small; it is known and accepted that things are not aligned.

The Uncertainty Dialogue is an artefact which use should be deliberately considered. Applying the artefact consumes resources. When the world is ordered it probably better should stay on the shelf. On the other hand, changing to the chaotic perspective, it even then can be useful, maybe in a light version; to be prepared for when chaos emerges.

The relationship between the Uncertainty Dialogue and risk management and shareholder management needs further elaboration. The same applies to the attitude and context competences that are used when applying the artefact.

Applying the Uncertainty Dialogue means that a chaordic perspective is chosen: it is accepted that there is no relation between cause and effect. People working closely with the project manager who uses the Uncertainty dialogue, like the members of the project team and the Steering Committee, should understand and accept this position.

The Uncertainty Dialogue is an artefact that originates from the chaotic perspective. Knowledge of this perspective, and even better of the chaordic perspective that considers both the ordered and unordered perspective, is a prerequisite for effectively using the artefact. Another special to most people is that the dialogues are based on trust instead of on control. It can be argued that these all are part of standard project management required competences.

Developing and maintaining the Uncertainty Web, and applying the Uncertainty Dialogue, requires effort. The relationships need to be monitored continuously.

Essence

The artefact is like a music instrument: it only produces its beautiful sound when it is played by the skilled musician. It helps to prepare for unexpected events. Using the artefact stimulates to interact with the environment. The mix of interventions used combined with selecting the effort put into each intervention enables the project manager to fine-tune activities. The artefact can be used next to risk management and stakeholder management - to extend coverage into the

unordered domain. The project manager and their inner circle, like team members and Steering Group members, need to understand the background of the artefact, chaordic project management. Effort is needed to use the Uncertainty dialogue.

Satisfactory performance level

In total 19 persons attended one of the workshops. Of these, 11 delivered their scores, which means a response rate of 58%. Of the scores collected, 76% implied that the participant agreed with the statement that the artefact satisfactorily met the requirement tested, in 17% of the cases the qualification was neutral and in 7% of the cases the respondent disagreed.

User requirement	A	B	C	D	E	F	G	H	I	J	K	L	M
1. The artefact is easy to adapt to the circumstances	89		2	3	55	5	3	8	3	13		5	1
2. The artefact is easy to understand.	5		13	13	5	3	3	5	3	8		3	144
3. The artefact supports the project in reaching its objectives	2		5	2	5	1	2	1	13	21		34	8
4. Usage of the artefact motivates to deal with uncertainties	21		3	5	13	5	2	13	2	5		34	5
5. Usage of the artefact supports the personal development of the user	2		21	5	1	21	2	21	2	8		5	8
6. The results of the artefact provide overview	144		34	8	8	8	5	8		21		13	144
7. The instructions to use the artefact are short	21		34	3	5	13	89	3	2	13		3	144
8. The results produced by the artefact support the development and maintenance of a project vision	2		13	3	1	144	5	8	3	13		5	55
9. The artefact is easy to use	21		2	13	21	8	5	1	34	13		3	55
10. The structure of the artefact is clear	89		13	8	13	8	3	3	3	13		3	55

Score	1	2	3	5	8	13	21	34	55	89	144	
Qualification	Agree						Neutral			Disagree		Not scored
Result (%)	76						17			7		

Table 6: User requirement scores

Limitations

The one-hour time slot for the workshop appeared to be far too short. The invitation did not contain much information on the background and the process. This was by choice, to keep it short so it would be read. The consequence was that expectations were only partially managed, which resulted in many questions on the background of the study and on the process during the workshop; which took more time than planned.

To be able to evaluate the artefact correctly, it is important to understand the chaordic point of view. This required more explanation than expected, especially to people who never were in touch with concepts of the Unordered world. Also the explanation of the requirements and the interventions needed more time than foreseen. Quickly walking through the lists definitely was insufficient to get a good understanding.

The Agree score of 76% is below the threshold level set for a satisfactory performance level of the artefact, 80%. This result is very dependent on the qualification of the scores: if for instance 21 also is regarded as Agree, then the Agree score is 84%. It can also be argued that the limit was set too high: in the 10 points scale that is used most of the times in The Netherlands, satisfactory is equal to 6. From this, 60% would have been a reasonable threshold level to determine if the performance level of the artefact was satisfactory. This also would have been more in line with the way Dresch et al. (2015) explain what satisfactory means. On the other hand, in this α-test, the focus was on the qualitative response. The estimated performance level is regarded as an indication, not as a proof.

The participants were not informed on the grouping of the scores to Agree, Neutral and Disagree. This was intentionally because these scores were meant as an intermediate product, to stimulate group thinking. Because the time slot appeared insufficient, they became the end product. The grouping therefore can be questioned. Would there have been enough time, after group discussion the participants could have been asked to give there marks on the 10 points scale that is used most of the time in The Netherlands and with which they were familiar.

There were several comments on the requirements. Especially requirement 2 and 10, the artefact is easy to understand respectively the structure of the artefact is clear resulted in several questions. It is suggested that the requirements are reassessed, to make them more easy to understand and more consistent.

Looking in hindsight the literature search in this study was extensive but not systematic. More attention to this subject would improve the quality of the search results.

5. Conclusions

This is Step 10 of Design Science Research, see Table 1.

Based on the findings, the sub-questions of the research question can be answered as below.

1. From a theoretical perspective, how can relationships address resilience in a chaordic project?
    - Ecosystems are chaordic systems. A project environment can be regarded as such an ecosystem. In ecosystems, the more diversity, the more complex the food web, the more stable the system. Translated to a Project ecosystem, this means that the more relationships, the more complex the relationship web, the more resilient the projects in the system. The focus is on relationships that regard uncertainties; the whole of these kind of relationships is the Uncertainty web. Relationships in the Uncertainty web are built from dialogue and trust.
2. How would an artefact that is based on relationships and is helpful to address resilience in a chaordic project look like?
    - The artefact, the Uncertainty dialogue, is based on the Uncertainty web. To 'activate' the web, the project manager actively looks for uncertainties. Interventions are used to prepare the project for dealing with uncertainties and for handling unexpected events.
    - The Uncertainty Dialogue is an artefact that originates from the chaotic perspective. Knowledge of this perspective, and even better of the chaordic perspective that considers both the ordered and unordered perspective, is a prerequisite for effectively using the artefact. Another special to most people is that the dialogues are based on trust instead of on control.
3. How can the performance level of the artefact be defined?
    - Project managers marked the performance of the artefact against 10 requirements. The marks were grouped in Agree, Neutral and Disagree. The percentage of Agree marks has been defined as the performance level.
4. Is the performance level of the artefact satisfactory?
    - In an α-test the performance of the artefact was not satisfactory: the level was 76%, whereas the level of satisfactory performance was set at 80%.

To summarise, and so to answer the main research question, relationships can address resilience in chaordic projects. This can be realised by using the Uncertainty dialogue, an instrument based on the Uncertainty web. A continuous development of the Uncertainty web, an active search for uncertainties in the web and the application of interventions from the chaordic domain help the project manager to prepare for unexpected events and so to preserve project resilience. The artefact still needs improvement: the performance level of the artefact proved to be below the satisfactory level.

6. Discussion

This chapter contains Step 9, 11 and 12 of Design Science Research, see Table 1.
First the findings and conclusions are discussed. Also the research design and method are examined. Then suggestions are given for use of the results in related classes of problems. Lastly it is described how the results of this study are planned to be communicated.

Clarification of the learning achieved

This is Step 9 of Design Science Research, see Table 1.
Firstly some comments will be made on the theory used. Then the research design and method will be discussed. Next the findings and conclusions will be examined. A short personal reflection on performing this study will close this chapter.

Theory

An additional type of position for Klakegg's list

A fifth type of position could be added to Klakegg's list, indicating the position in the Deterministic - Chaotic thinking range. This shows where the author stands regarding the inevitability of the chain between cause and effect. In the Deterministic position, chaos is impossible so for everything that happens it is assumed there is a cause; in the position of Chaotic thinking this chain is not seen as a necessity. The chaordic position is in the midst: the chaotic position is the starting point but for parts of the project temporarily the rules of the Ordered world can be applied. In project management literature this type of position is reflected in three eras: Deterministic (starting early '60s), Explanatory (starting mid-'80s) respectively non-Deterministic (starting mid '90s) (Padalkar & Gopinath, 2016). Nowadays all three positions are present. So this is a relevant type of position.

The opposite of Determinism above is simply called non-Determinism. In the more philosophical oriented literature inDeterminism often is found. This is the zone where the discussion on free will rages. Another term that is put opposite of Determinism is Probabilism. Whereas Determinism means 'if X then Y', unconditionally, probabilism means 'if X then Y with a probability between 0 and 1'. In social sciences it sometimes reflects the assumption that there are laws however they are not discovered yet (Duus-Otterström, 2009). Both options are not related to chaordic projects so it is suggested to keep Chaotic thinking as the opposite of Determinism. The author's position is somewhere in the midst: order exists but chaos too; the chaordic position.

A formal definition of uncertainty

In the scientific literature as well as in the body of knowledge used by practitioners, several definitions of risk and uncertainty can be found. The risk definition used in this study, as proposed by Aven (2010), covers the core of these definitions: Risk = (A, C, P), where A

represents the events (initiating events, scenarios), C the consequences of A, and P the associated probabilities. This is risk as defined in the Ordered world.

For uncertainty however an ambiguity can be seen. It is being used as a collective term to cover risk as well as opportunity, e.g. Ward and Chapman (2003). Another way to look at these two is that a risk originates from an uncertainty, e.g. Halman (2008) and Böhle et al. (2016). Bayesian Belief Networks (Cárdenas, Al-Jibouri, Halman, & Van Tol, 2014) are dealing with risks. Following Sanderson (2012), these are not risks but Category 1 uncertainties: these tools help to estimate the relationship between two variables. In this study it is used as a concept from the Unordered world, defined as a context for risks and opportunities.

The difference between risk and uncertainty can be defined clearly combining Aven's (2010) formula and Sanderson's (2012) classification. The Aven formula means that for a given A, both C and P are known (or knowable). This matches with the two Risk categories Sanderson distinguishes. The relationship between cause and effect is clear; the point of view is Deterministic, it is the Ordered world. In Uncertainty category 1, for a given A, C is known and P is unknown. The relationship between A and C in not defined anymore: although consequences stil are known, it is not possible anymore to describe the relation. In Uncertainty category 2, also C is unknown; here even the consequences are cannot be defined anymore. This means that Uncertainties are part of the Unordered world. A Category 1 uncertainty then can be defined as Uncertainty = (A, C, ?P), where '?P' means that P is unknown. A Category 2 uncertainty can be defined as Uncertainty = (A, ?C); P is undetermined and therefore skipped from the equation. Ward and Chapman (2003) define uncertainty as a lack of certainty; following the above this can be regarded as a general term covering both Uncertainty categories. In this way Risk and Uncertainty are unambiguous defined, showing their similarities and differences.

Definition of a chaordic project

A chaordic project is defined as a project with a lot of complexity, (technological) uncertainty, vagueness, time pressure and novelty; characteristics are defined as consciousness, connectivity, indeterminacy, dissipation and emergence (Mulder, 2012). The problem with this definition is that based on these it is not always possible to qualify a project as chaordic or not chaordic. Moreover in an Unordered world these properties can and do change all the time. Consciousness means that the fundament of the chaordic system is the way of thinking. Generalising, this could mean that thinking, the lens, is the qualifying parameter to decide if a project is chaordic or not. If the project manager approaches the project as a chaordic system, the project is a chaordic project. Independent of the level of complexity, et cetera. It is a way of managing projects (Value-based project management (Mulder, 2012), which is developed for complex projects, but in principle also can be applied to simple ones.

Research *design and method*

Research design

In Design Science Research according to Dresch et al. (2015), Systematic literature review has been described separately from Awareness of the problem: Step 3 respectively 2. These steps however are tightly intertwined. This also appears from the descriptions. It therefore is suggested to merge both steps, by adding the activities of Systematic Literature Review to Awareness of the problem.

The order of Step 9 Clarification of the learning achieved and Step 10 Conclusions has been changed in this study. Conclusions have to follow objectively from the findings. Learning is subjective: here the opinion of the researcher is involved. Therefore it is more logic to keep the Evaluation step and the Conclusion step closely together. This leads to the suggestion to reverse the order of these steps in Design Science Research.

For future research it is suggested to enrich Step 11, Generalisation for a class of problems, with an expert review of the suggestions proposed for the related class(es) of problems (Van Burg, 2011). This would substantiate the advices.

Findings and conclusions

In the workshops it became clear that many of the attendants expected a tool. Several people asked for processes and products. The artefact has some processes: create and maintain relationships, built on dialogue and trust; look for uncertainties; and apply interventions. Interventions are used when the project manager thinks they are useful; this is not related to finding or not finding of uncertainties. As one of the attendants said, ‘It helps to prepare for unexpected events’.

Some participants were confused about the relation between the artefact and risk management. What to use when? The Uncertainty dialogue is a chaordic tool. All projects can be managed from a chaordic perspective. This suggests that the Uncertainty dialogue, created for the Unordered world, also could have value in the Ordered world. Risk management, being the management of risks - and not uncertainties, see above - only fits to the Ordered world. Using the Uncertainty dialogue asks for effort. In simple projects the economics of the artefact therefore probably are negative: the effort does not outweigh the benefits. However for projects in the Complex contexts it would be interesting to have a closer look.

Several attendants asked for the difference between the Uncertainty dialogue and stakeholder management. The creation of relationships is common ground. Comparing to an extreme of classical stakeholder management, a main difference is that the relationships are built on one-way communication and control, instead on dialogue and trust. A different way to look at the way stakeholder participation is approached is the stakeholder dialogue. In policy making this is a well-known way of working. A few examples are Ferri et al. (In press) and Cuppen (2012). In this way there is much overlap: the difference is that the Uncertainty dialogue focuses on uncertainties. The knowledge about and the experience with the stakeholder dialogue could be fed back to improve the Uncertainty dialogue.

In the findings the Uncertainty dialogue has been compared to a music instrument. The word tool is intentionally not used, because it suggests processes and rules based on a firm

connection between cause and event. Although the association with a music instrument explains a certain aspect of the artefact, it also has a risk. What would be the first impression of a project manager well trained in the Ordered world of such an artefact? No tool, no rules … what should I do? Because words are important to set expectations and because this project manager represents a potential user group, it is suggested to look for word that better characterises the artefact.

Generalisation for a class of problems

This is Step 11 of Design Science Research, see Table 1.

The Uncertainty dialogue is created for the chaordic project. These project operate in the Ordered and Unordered world. The Uncertainty dialogue therefore can also be applied to enhance risk management, which is based in the Ordered world. A more intensive two-way communication build on trust could help to earlier detect risks and to better be able to deal with them.

Megaprojects are much involved in policy making. The stakeholder dialogue will probably be used in most of them. Adding the lens of Chaotic thinking, focusing on uncertainties and applying the interventions thus could be applied as an extension of the stakeholder dialogue. The preservation of project resilience then will become an extra effect.

In organisational change projects the dialogue with the stakeholders has a central place in projects. The extension to the Uncertainty dialogue therefore could be worthwhile to study.

Communication of the results

This is Step 12 of Design Science Research, see Table 1.

The results of this study are communicated by this thesis and its defence. Furthermore a presentation at the NS Competence Center Projectmanagement is being discussed. Moreover it is likely that the results will be presented at RIDDS and Ordina.

7. Recommendations

This chapter summarises the recommendations made in the Discussion

1. Especially in an ever increasingly complex world, it is suggested to create a fifth position type (Klakegg, 2015) that describes the position of the researcher in the continuum between a Deterministic position, where cause and event are tightly connected, and a chaotic position, where a relationship between cause and event not exists.
2. Awareness of the problem (Step 2) and Systematic literature review (Step 3) are tightly intertwined. Therefore it is suggested to combine both steps.
3. Conclusions (Step 10) can only regard the results (Step 8). It then is not logical to put the discussion (Step 9) in between. Therefore it is advised to flip the order of both Steps 9 and 10.
4. It is suggested to enrich Design Science Research as described by Dresch et al. (2015) in Step 11, Generalisation for a class of problems, with an expert review of the suggestions proposed for the related class(es) of problems (Van Burg, 2011). This would substantiate the advices.
5. Following Aven (2010), an uncertainty in the Complex context can be defined as Uncertainty (Complex) = (A, C, ?P), where '?P' means that P is unknown: for an event A, consequences are know but the probabilities are not. An uncertainty in the Chaotic context can be defined as Uncertainty (Chaos) = (A, ?C): for an event A the consequences are unknown. Probabilities then are irrelevant.
6. A more systematic literature search is proposed.
7. The design of the workshop need some improvements. One hour is too short; two hours is suggested. The invitation should give more background information. It is crucial to well explain what chaotic and chaordic means; only in this way are the attendants able to validate an artefact created from that perspective.
8. The definition of a satisfactory performance level was incorrect; the treshold level was set to good.
9. The planning poker discussion, between the person with the lowest score and the person with the highest score, is a valuable part of the workshop design and in future research should be present. It is suggested that after this discussion the attendants should rate the performance level in a scale that is familiar to them; in The Netherlands a 10 point scale would meet this requirement.
10. The user requirements used in this study appeared not always to be clear and concise. For future research it is suggested to reassess the list. The list of Mulder (2012, p. 120) could be an alternative.
11. The word 'tool' for the artefact should be avoided. It stimulates associations from the Ordered world. The word music instrument also appeared to generat adversory associations. It is suggested to look for a better word.

12. The chaordic Uncertainty dialogue probably also has value in the Ordered world. To apply the artefact extra effort is needed. In a Simple context this probably does not outweigh the benefits from risk management. In a Complicated context it could be interesting to have a closer look.
13. The dialogue with stakeholders which is part of the Uncertainty dialogue also is known in projects where politics are dominant, as the stakeholder dialogue. It could be interesting to further look into this overlap, from both sides.

Personal reflection

Being trained in biology, one of the in natural sciences, it was a special opportunity to conduct research in the social counterparts. It was my intention was to create maximal exposure, to experience and feel in the full breadth and depth - within the limitations of time set - what this kind of research means. Therefore the qualitative focus, direct contact with participants, and text analysis, for me the most striking aspects of social studies, were intentionally included.

Well, I got where I was looking for. And it wasn't too bad. Especially text analysis, something I was pretty sceptical about, to me turned out to be a logic process. Of course there are subjective steps, but this is made clear upfront and the results can be followed. In this way my main issue with social science, subjectivity, was solved.

The contacts with the participants was a pleasure. Quite different from the contact with mussles or starfishes I had in biology. During the workshops a lot was happening. The goal was to get answers on the questions from the questionnaire, but the questions from and the discussions in the workshops also provided a wealth of knowledge. Totally different from an experiment in natural sciences.

Of course when I started I had much more in mind then was possible to realise in the given amount of time. My ultimate goal was to have a publication in one of the high-rating project managament journals. More research, more literature study. What was accomplished is a first step. A nice first step, but only a first step. But who knows? After this thesis study there is new time …

All in all, conducting the research and writing the thesis has been an intereasting and pleasant temporary endeavour.

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Glossary

The definitions of the main concepts applied in this study are presented in **Fout! erwijzingsbron niet gevonden.**.

Concept	Definition
Chaordic project	A project with a lot of complexity, (technological) uncertainty, vagueness, time pressure and novelty (Mulder, 2012)
Chaotic context	This is the context where the relationship between cause and effect is impossible to determine (Snowden & Boone, 2007). For a given event, the consequences are unknown (Aven, 2010).
Chaos theory	The Chaos theory is the theory of complex, dynamic, non-linear systems (Gleick, 1987)
Chaotic thinking	Looking from a perspective based on Chaos theory (Van Eijnatten, 2002) Synonym for Chaotic lens.
Complex context	This is the context where the relationship between cause and effect cannot be seen. For a certain event, the relation to consequences can only be understood in retrospect (Snowden & Boone, 2007)
Complicated context	This is the context where cause and effect are clearly connected but are more difficult to see, needing expertise and experience, and where there are multiple right answers (Snowden & Boone, 2007)
Project	A project is a temporary endeavour undertaken to create a unique product, service or result (PMI, 2013)
Project management	Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (PMI, 2013)
Resilience	Resilience is the ability of a system to absorb disturbances, and particular unexpected disorder, and still retain basic function and structure (Schroeder & Hatton, 2012)
Risk	Risk = (A, C, P), with A being an event that triggers materialisation of the risk, C being the consequences or impact if the risk materialises, and P being the probability or change that the risk will materialise (after Aven (2010))
Simple context	This is the context where cause and event are clearly related and where there is only one good answer (Snowden & Boone, 2007)
Ordered world	A world in which cause and effect are related (Snowden & Boone, 2007)
Uncertainty	An uncertainty is a context for risks as events having a negative impact on the project's outcomes, or opportunities as events that have beneficial impact on project performance (Perminova, Gustafsson, & Wikström, 2008)
Unordered world	A world in which the relation between cause and effect cannot be seen (Snowden & Boone, 2007)

Table 7: Definitions of the main concepts

List of figures

List of tables

Appendices

Appendix A: Invitation to the workshop

Beste mensen,
Ik ben bezig met de afronding van een masterstudie Projectmanagement aan de Hogeschool Utrecht. Een van de laatste onderdelen is de thesis: een wetenschappelijk onderzoek, het verslag ervan en de verdediging daarvan.
Mijn thesis gaat over risicomanagement in chaordisch perspectief. Voor sommige van jullie is dit perspectief misschien al bekend: Nicoline Mulder, die het chaordisch perspectief heeft toegepast op projectmanagement, is te gast geweest bij BAS CoE PM. Chaordisch wil zeggen dat chaos en orde steeds aanwezig zijn – en ook mogen zijn. Chaos wordt dus niet bestreden maar gebruikt; net als orde. Het probleem dat ik onderzoek komt voort uit het feit dat de kern van chaos is dat er geen verband is tussen oorzaak en gevolg, terwijl dat verband voor risicomanagement een dwingende voorwaarde is. Standaard risicomanagement is dus per definitie niet mogelijk onder chaordische omstandigheden. Maar wat dan? Hoe kan een projectmanager dan het project op koers houden?
Op basis van een hypothese uit de biologie – mijn oude studierichting – heb ik hiervoor een aanpak ontwikkeld: de Onzekerheidsdialoog. Mijn onderzoek gaat namelijk niet alleen over wetenschap, maar heeft ook expliciet als doel iets te ontwerpen voor de praktijk. Die aanpak nu wil ik toetsen. Voor die toets zoek ik praktijkmensen. Zoals jullie.
In een uur tijd presenteer ik jullie de aanpak en laat jullie die vervolgens toetsen op een aantal criteria. Voor elk criterion vraag ik jullie om een waarderingscijfer. De cijfers zijn een middel: de discussie naar aanleiding van verschillen in waardering vormt het belangrijkste resultaat. Hetzelfde idee als planningspoker bij Scrum. Op deze manier wil ik de waarde van de aanpak voor de praktijk beter doorgronden. Jullie terugkoppeling gaat gebruikt worden om de methode te valideren en verbeteren. Waarschijnlijk zullen ook quotes van jullie opgenomen worden in de thesis. Dit gebeurt anoniem.
Ik vraag een uur van jullie tijd. Voorbereiding is niet nodig. Wat je ervoor terugkrijgt is een uitwisseling van gedachten rondom het stabiliseren van een project in een chaordische wereld èn mijn thesis – zodra die af is.

Heb je vragen, stel ze gerust.
Ik hoop jullie te zien op de achtentwintigste!

Met vriendelijke groet,

Meinte Wildschut
Projectleider

Appendix B: Workshop protocol

Workshop Toetsing gebruikerscriteria Onzekerheidsdialoog

Welkom

Leuk dat jullie een bijdrage willen leveren aan wetenschappelijk onderzoek. Ik hoop dat het jullie ook wat brengt.

Achtergrond

Master Project Management HU

Bijna klaar. Laatste module onderzoek en verslag/thesis

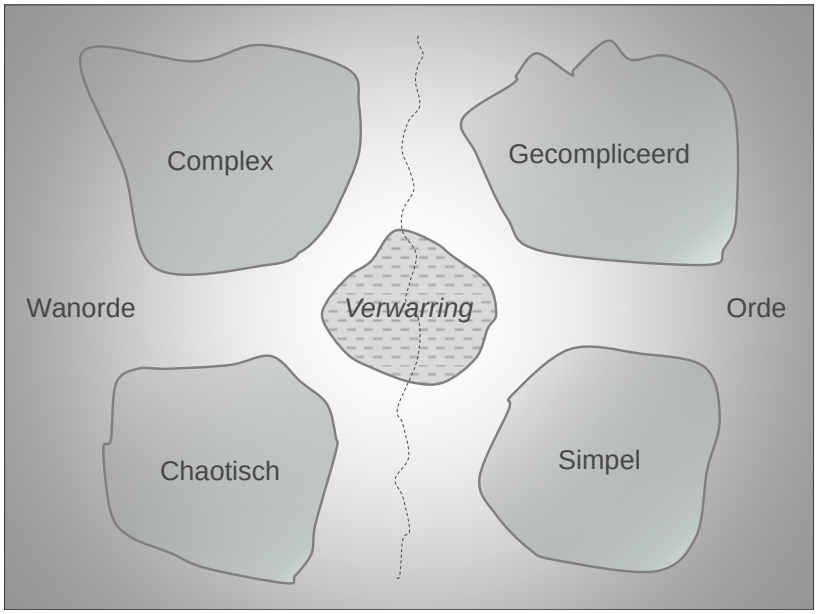
Agenda

Gestructureerde bijeenkomst, zodat het achteraf (wetenschappelijk) toetsbaar is hoe het gegaan is.

1 uur

Doel

Toetsing van een nieuwe methode door potentiële gebruikers



Aanpak

Probleemstelling

Oplossingsrichting

Voorgestelde oplossing

Criteria

Beoordeling criteria

Slotvraag: eerste indruk: ga je dit gebruiken?

Afsluiting

Probleemstelling

Praktijk: steeds meer complexiteit/chaos → steeds meer onzekerheid → de grenzen van risicomanagement worden bereikt of overschreden

Eerst de wereld een beetje structuren: het Cynefin model → Plaat 2

Vervolgens het chaordisch perspectief: manier van kijken waarin je om kunt gaan met chaos. Orde word niet voorondersteld, is geen voorwaarde. Chaos wordt niet veroordeeld: het biedt kansen op ongedachte mogelijkheden. Het chaordisch perspectief bestrijkt het hele Cynefin model.

Terug naar risicomanagement. Risicomanagement gaat uit van orde: als <aanleiding> dan <direct gevolg/impact> waardoor <gevolg voor bedrijfsdoelen> met <x> procent kans

Vanuit het chaordisch perspectief werkt risicomanagement dus soms - in de afgebakende gebieden waar orde heerst - en soms niet - waar wanorde de boventoon voert.

Hoe ga je nu met onzekerheid om in het Wanordedomein? Hoe hou je je project op koers, stabiel? Dat is de onderzoeksvraag.

Oplossingsrichting

Ecologie → ecosysteem → chaordische omgeving: orde en wanorde

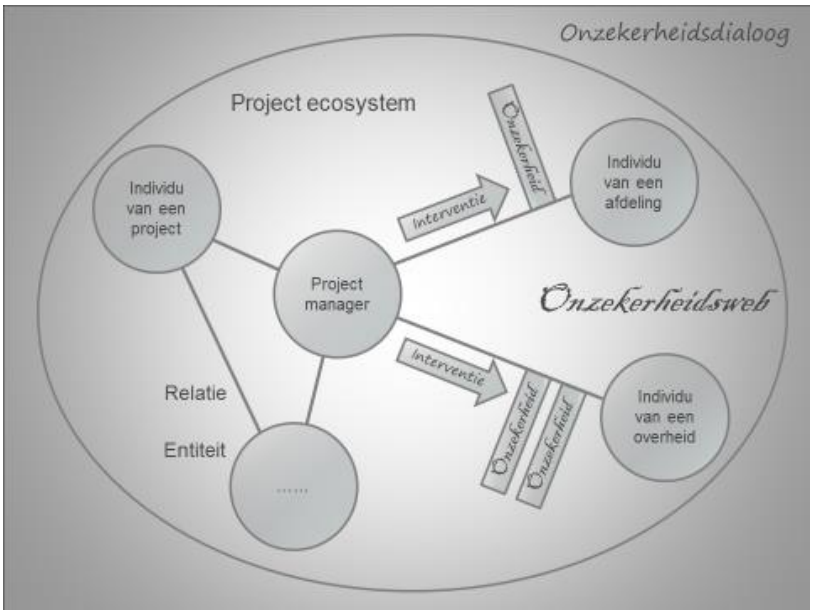
(Voedsel)relaties tussen entiteiten → voedselweb → hypothese: hoe meer relaties hoe stabieler.

Oud - onderuit gehaald - oppositie ook onderuit gehaald - hypothese

Voelt tegennatuurlijk: hoe meer relaties hoe meer onzekerheid. Maar voelt ook natuurlijk: meer relaties betekent beter vangnet tegen een lokale verstoring.

Oplossing

Ontwerpmodel



Onzekerheidsdialoog

Kruising tussenrisicoworkshop maar dan continu, en stakeholder engagement met nadruk op dialoog, maar dan breed en gericht op onzekerheden.

Verschil: onzekerheden mogen er zijn; gericht op zoek naar relaties; je wapenen tegen negatieve gevolgen van onzekerheden met interventies

Interventies: uit het chaordisch domein

Nr	Interventie uit het chaordisch domein
1	Baseer de aanpak van het project op de gedeelde waarden
2	Richt de aandacht voortdurend op het hogere projectdoel
3	Ontwikkel een projectvisie en houd hem levend
4	Hanteer een ontwikkelbenadering die vaagheid toelaat
5	Werk op basis van vertrouwen
6	Hanteer transformationeel leiderschap
7	Realiseer de voorwaarden voor zelforganisatie;
8	Faciliteer creativiteit
9	Laat gebruikers van begin af aan participeren
10	Houd de dialoog met belanghebbenden gaande
11	Werk resultaatgericht waar het past

Criteria

Nr	Criterium
1	De methode is eenvoudig aan te passen aan de omstandigheden
2	De methode is eenvoudig te begrijpen
3	De methode is gericht op het projectbelang
4	De methode motiveert om onzekerheden te onderzoeken
5	Het gebruiken van de methode stimuleert de persoonlijke ontwikkeling van de gebruiker
6	De resultaten van de methode geven overzicht
7	De instructies om de methode te gebruiken zijn kort
8	De resultaten van de methode helpen om een projectvisie te ontwikkelen en onderhouden
9	De methode is eenvoudig te gebruiken
10	De opzet van de methode is eenvoudig te begrijpen

Toetsing aan de criteria

Google form / Word via e-mail / Invullen op papier

Vraag: voldoet het instrument aan het criterion

kwalitatief: het gaat om de inhoud van het commentaar

kwantitatief: als snelle indicatie, opstarter van de discussie

Kwalificatie: geen waarde gevraagd (4 is 2 keer zo goed als 2); niet mogelijk

Daarom Fibonacci-achtige reeks en daaruit 11 opeenvolgende waarden:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144

1 = heel goed – 144 = heel slecht

Slotvraag

Ga je dit gebruiken: ja / denk van wel / weet het nog niet / denk van niet / nee

Afronding

Mijn dank.

Jullie antwoorden worden geanonimiseerd en vertaald naar het Engels. Jullie krijgen een exemplaar van de thesis, dit najaar.

Appendix C: Decision trail of the analysis

1. Input is in Dutch, article is in English; analysis will be in English. This means that texts will be translated by the author. The original Dutch texts will be available upon request.
2. Still unclear if the analysis will be on the level of seperate questions or that all questions are put together as one single case.
3. Step 1 is started on the single case level
4. Initial themes
    a. Not intuitively applicable - mental position - not a tool, with processes, formats, et cetera - guidelines too vague
    b. Methodic aspects
        i. Question 2 and 10 have overlap
        ii. Ad 6: An artefact gives insight, not overview; that's created by the project manager
        iii. Ad 4: Goals motivate, not a method
5. Quite global. Therefore now a try with themes per question
    a. The method can be adapted, the model should stay as it is
    b. Flexibility is in the combination of interventions used and the intensity of effort put into it
6. Research question guides the selection of meaning units
    a. Only those meaning units that provide information on the research question are analysed. Others, mostly on the 10 questions, are used to evaluate the research approach.
7. Way of working
    a. One to maximum three themes per question. Meaning units not too small. Coding preferably related to themes, but not necessarily. A quote is added. The synthesis is built from all condensates.
    b. Please keep in mind:
        i. The same theme can appear in more questions, in different words.
    c. Checks:
        i. Are most of the meaning units related to the themes?
        ii. Does the condensate cover all themes?
        iii. Does the synthesis cover all quotes?
    d. Language: Original data untranslated (in Dutch). All other items, meaning units included, are translated to English. Translation by the author.
8. A meaning unit can refer to a theme in another question
9. Validation
    a. Table with a list of the themes and per theme the connected meaning units. Check if the meaning units correctly are connected and if the theme well covers all meaning units.
    b. Check per question if the condensate covers all themes.

c. Check if the synthesis covers all condensates.
d. Indepentent check: does the synthesis cover all quotes?

10. Writing the synthesis
    a. All condensates are put together into a compilation.
    b. Based on reading through the compilation a structure has been set up, concretised in headings.
    c. Every sentence from the compilation is moved to the right heading.
    d. The sentences under each heading are rewritten, from the first to the third person
    e. The logic of the synthesis is checked and when needed improved.
    f. Sentences that got no place under one of the headings are left out. These are explicitely marked as such.
11. Change in validation c (see 10):
    a. Check if the synthesis covers all themes.

Appendix D: Results from the practitioner's user requirements validation

The original table here is split into three, for publication reasons. Theme(s), Condensate and Quote for a certain requirement are applicable for all respondents; that's why they are the same in all three tables. Only those meaning units that are relevant to the development of the artefact have been translated. Respondent M has not answered the questions and therefore is not present in the data. The original table is available from the author upon request.

Question	Respondent			
	A	B	C	D
1. The artefact is easy to adapt to the circumstances	Ik denk dat het onwenselijk is de methode aan te passen of op zijn minst zou het model niet 'eenvoudig' aan te passen moeten zijn: 1	De 11 te onderscheiden interventies zijn op zichzelf helder. De complexiteit zit hem met name in de samenhang van de verschillende interventies. Een kleine wijziging in de omstandigheden kan daardoor leiden tot een sneeuwbal-effect en uiteindelijk tot een compleet andere uitkomst. Vraag is dan of je hier in voldoende mate op kunt sturen. Dus aanpassing is eenvoudig, maar de monitoring van de uitkomsten is een ander verhaal.	Afhankelijk van het vraagstuk of de fase waarin je verkeerd kun je kiezen om meer of minder aandacht te geven aan de interventies. Dat is dus eenvoudig aan te passen aan de omstandigheden. Of het alle invalshoeken concreet afdekt is de vraag?	Ja, denk wel -> mate van intensiteit van het toepassen van de interventie instrumenten kun je afstemmen op de mate van (verwachte) chaos.
Theme(s)	Th.01.01 Not a method but a mind-set.			
	Th.01.02 Flexibility is in the combination of interventions used and in the intensity of effort put into each seperate intervention.			
Meaning units		B.01.01 Managable? Th.01.01 The complexity is particularily in the combination of the different interventions. A small change in the conditions can therefore result in a snowball-effect and ultimately in a complete different outcome. The question then is if this can be managed sufficiently.	C.01.01. Selective use of interventions Th.01.02 Dependent of the issue or phase you are in, you can chose to give more or less attention to the interventions.	D.01.01 Selective use of interventions Th.01.02 You can tune the level of intensity of applying the interventions to the level of (expected) chaos.
Condensate	I can easily adapt the artefact. I can choose which intervention or combination of interventions to use, and the amount of effort I put into each of the selected interventions. When conditions change I can change the mix. I see the artefact as a mind set, as a guideline, not as a method in the sense of a fixed set of rules. It is not simple: a small change in the conditions can have a big impact on the mix and so a serious influence on the outcome.			
Quote	Guideline.			
2. The artefact is easy to understand.	ik denk dat het meer gaat om een manier van denken, dus het vertrekpunt is een methode te begrijpen alvorens een methode toe te passen 5	Ja, kunst is echter om er voor te zorgen dat ook iedereen het zelfde beeld heeft van de methode. De benoemde interventies kunnen snel individueel gekleurd worden en daardoor leiden tot onvergelijkbaarheid. Vervolgens kan blijken dat de methode opeens niet meer zo eenvoudig is en er veel tijd gaat zitten in het weer glad strijken van de verschillende beelden. Kortom aan de voorkomt veel energie stoppen in communicatie.	Als de methode is: breng zoveel mogelijk je relaties in kaart en benader deze vanuit de 11 interventies dan ja eenvoudig te begrijpen. Echter wil je de methode als vernieuwende methodiek echt begrijpen in relatie tot stakeholders management en de gedrags- en context competenties wordt het voor mij lastiger. Veel overlap, maar wel mooie bewustwording qua model van aandachtspunten. Daarnaast vind ik de interventies ook van toepassing op de interne (individu van een project/projectteam)	Nee, sterke behoefte aan goede (toepassings) voorbeelden / case beschrijvingen, handvatten voor de methodiek. Nadere verkaring van de instrumenten (interventies).

Question	Respondent			
	A	B	C	D
			leden. Komt in model niet tot uiting.	
Theme(s)	Th.02.01 The interventions should be described more sharply.			
	Th.02.02 The relationship with risk management and stakeholder management is not clear.			
Meaning units	A.02.01. Way of thinking Th.01.01 I think that it is more about a way of thinking.	B.02.01 Different interpretation of the interventions Th.02.01 The point is to have everybody have the same picture of the method. The interventions can easily be interpreted in different ways and so result in incomparibility.	C.02.01 Overlap with stakeholder management Th.02.02 However if you want to really understand the method in relation to stakeholders management […], then it becomes more difficult to me. A lot of overlap.	D.02.01 Better descriptions Th.02.01 Good example descriptions, case description, approaches for the method. Furter explanation on the interventions.
			C.02.02 Relationship with competences Th.02.03 However if you want to really understand the method in relation to […] the attitude and context competences, then it becomes more difficult to me. A lot of overlap.	
			C.02.03 Way of thinking Th.01.01 Beautiful way of becoming aware.	
Condensate	A better description of the interventions would help me. People can interpret interventions differently from what I mean. Actively interacting with the people in the project ecosystem and using the interventions I make myself and my team ready to deal with anything that pops up on our path proactively instead of reactively. I need to better understand the relationship of the artefact with risk management, stakeholder management and attitude and context competences.			
Quote	In my projects I manage primarily based on relationships.			
3. The artefact supports the project in reaching its objectives	JA, als het projectbelang is dat er een concretisering plaatsvindt van een hoger doel (onze discussie vanavond gaat onder andere over de definitie van een project; waarbij mijn lezing van uitkomst is dat een project een project is vanaf het moment dat er een structuur gegeven wordt aan een doel (dus scope, planning, budget en dergelijke)8	Dat hangt af van de definitie van projectbelang. Zijn het bv het behalen van afgesproken deliverables binnen tijd, geld en kwaliteit of zijn zaken zoals samenwerking, aandacht voor individuele ontwikkeling aan de orde. M.i. kan de methode voor beide richtingen ingezet worden.	Als projectbelang wordt omschreven als de mate waarin naast de opdrachtgever de overige stakeholders bepalend zijn voor het succes van het project dan ja. Het accent ligt in mijn beleving sterk op het 'meenemen en draagvlak en input krijgen' van de omgeving. Meer relatiegerincht dan product gericht.	Zeker, projectdoelen staan centraal, het relatienetwerk vanuit het project bezien staat centraal.
Theme(s)	Th.03.01 The focus of the artefact is on relationships.			
	Th.03.02 The artefact is also to be used by the team members.			
	Th.03.03 Actively working the network requires quite some effort.			
Meaning units		B03.01 Additional goals Th.03.01 What is meant by project objectives. Are these for instance achieving the deliverables agreed upon within time, budget and quality or do arpects like cooperation and personal development play a role. In my mind the artefact can be used for both.	C03.01 Creating commitment Th.03.01 The emphasis in my mind is strongly on 'to bring around and commitment and getting input' of the environment. More focus on relationship than on product.	
Condensate	I use the artefact to get a better relationship with others in the project ecosystem and so to better understand what is going on. These people, e.g. from my team and my Steering Committee, need to understand my way of working and accept it. I realise that more relationships means even more talking.			
Quote	I don't know if the organisation/project is ready for this.			
4. Usage of the artefact motivates to deal with uncertainties	ik denk eerder dat de methode motiveert om aannames te (willen) doen: 3	Motiveert vindt ik wat zwaar aangezet, het biedt de mogelijkheid om op een andere wijze naar zaken te kijken. Motivatie haal ik minder snel uit methoden en technieken maar uit uit de uitdaging om het	Absoluut, door het in gesprek gaan met belanghebbenden kom je snel tot inzicht wat er in de context speelt. En kun je daar op inspelen.	Dat vind ik wel, al kunnen de middelen die worden aangerijkt nog wel scherper. Ik mis de tools…..(zie ook vr 2)

Question	Respondent			
	A	B	C	D
		beoogde einddoel te realiseren.		
Theme(s)	Th.04.01 Looking for uncertainties gives more insight in the context.			
	Th.04.02 The artefact is additional to risk management tools.			
Meaning units			C.04.01 Better insight in the context Th.04.01 By getting in touch with stakeholders you will find out quickly what is going on in the context. And you are able to deal with it.	D.04.01 Better descriptions Th.02.03 Good example descriptions, case description, approaches for the method. Further explanation on the interventions.
Condensate	By applying the artefact I get a better insight in what is going on in the project environment and where uncertainties are. I see this as an addition to classical project management tools like risk management; I get a view on items that can become important for the success of the project but still are not a risk. I acknowledge that this is extra work but in the end it adds value. I realise that the interventions are quite loosely defined.			
Quote	Those you want to add to the risk log not yet.			
5. Usage of the artefact supports the personal development of the user	JA, met name ook dankzij de interactie (ik denk aan Dialogue on Risk van Karel de Bakker) 8	Ik ben de mening toegedaan dat het gebruiken van methoden en technieken een breder overzicht en een dieper inzicht kan verschaffen in je eigen competenties, immers je zoekt grenzen op, wilt weten wat je intellectueel/emotioneel aan uitdagingen aankan en methoden en technieken kunnen hierbij een positieve rol spelen.	Mee eens, bewust stil staan bij de de 11 interventies of mogelijk te lezen als competenties die je aanwendt, geeft focus hierop en daarmee voorbereiding, ervaren en mogelijkheid voor reflectie. Je moet de reflectie alleen dan nog wel doenJ	Vast, 'kom uit je ivoen toren en ga op zoek naar samenwerking' wordt hiermee wel gestimuleert en dat is altijd gunstig voor projectsucces. Als persoon leer je daar dan ook weer van, al is het natuurlijk van persoon tot persoon verschillend in welke mate dat nog bijdraagt aan je ontwikkeling.
Theme(s)	Th.05.01 To use the artefact the project manager needs to leave her/his comfort zone.			
	Th.05.02 Looking at the interventions as competences, reflection on them stimulates personal development.			
Meaning units	A.05.01 Interaction Th.05.01 Especially thanks to the interaction (I think at Dialogue on Risk of Karel de Bakker).		C.05.01 Reflection on interventions Th.02.03 Consciously giving a moment's thought to the 11 interventions or possibly also to read as competencies you are applying gives focus on it and with that preparation, know what it feels like and possibility for reflection.	D.05.01 Leaving the ivory tower Th.05.01 'Leave your ivory tower and look for cooperation' is stimulated.
Condensate	Using the artefact I am stimulated to leave my comfort zone, my ivory tower. Working based on trust is running counter to what I have learned. To use the artefact I need standard project management competencies. Regarding the interventions as a kind of competences, reflection on these stimulates my personal development.			
Quote	To work based on trust (and not on facts) is exciting.			
6. The results of the artefact provide overview	neen, ik zie nog niet hoe de uitkomsten vervolgens verwoord/verbeeld/geconcretiseerd worden 1	Ik ga meer voor inzicht. Overzicht moet je creëren door zaken in het juiste perspectief te plaatsen, door onderlinge verbanden/ afhankelijkheden te onderzoeken en op basis daarvan conclusies te trekken. Methode kan bijdragen aan het verkrijgen van de diverse puzzel stukken, ze draagt echter niet bij tot het samenstellen van de puzzle.	In mijn beleving meer thermometer en methodiek op vlak van haalbaarheid, maakbaarheid en procesricht om te komen tot je resultaat. Heb minder gevoel bij overzicht van je resultaat al kun je dit altijd wel ergens aan linken, bijv interventie 11? Overzicht op niveau waar zitten de onzekerheden/weerstand/andere inzichten wel.	Daar ben ik nog niet zo zeker van. Ze geven denk ik wel meer inzicht (of eerder inzicht), maar de chaos kan best ook chaos blijven, ook al 'manage'je de onzekerheden dmv onzekerheidsdialogen.
Theme(s)	Th.06.01 More insight in the actual situation than overview on the whole.			
	Th.06.02 What is overview from the chaotic perspective?			
Meaning units		B06.01 Insight, no overview Th.06.01 I am in favour of insight. The artefact can help to	C.06.01 Thermometer Th.06.01 In my mind more a thermometer and tool on feasability,	D.06.01 More/earlier insight Th.06.01 The results provide

Question	Respondent			
	A	B	C	D
		get the pieces of the jigsaw, it does not add to complete the jigsaw.	manufacturability and process orientation to get your results.	more insight (or earlier insight).
			C.06.02 Overview of uncertainties Th.06.01 Overview on the level where are the uncertainties/resistances/different views certainly.	D.06.02 Chaos stays Th.06.02 The chaos can well stay chaos, despite the fact that you 'manage' the uncertainties by means of the uncertainty dialogues.
Condensate	I get overview on where uncertainties are located. Not on the results of the project: this implies fencing off, a 'Blue' perspective, which contradicts with the chaotic perspective. What using the artefact certainly is obtained is improved insight: a thermometer. I get a better picture of what is going on, and I get it earlier.			
Quote	Fencing off is not on the top of your mind.			
7. The instructions to use the artefact are short	JA, wederom, het gaat over de manier van denken (ad1) 5	Ja, misschien wel te kort. Geeft nu ruimte voor interpretatie en daarmee ruimte voor discrepanties. Uiteindelijk wil je onzekerheid ombuigen in zekerheid, toch..... :)	Ja kan kort, maar er is wel uitleg nodig waarom je deze methode toepast, wanneer je het toepast, wat het vernieuwende is of bijdraagt aan aan je resultaten in het veld van modellen, methodieken, ,,,,,,. Stel dat het op het schap zou liggen, zou je het kopen? Of is het meer van hmm klinkt logisch, goed om aandacht aan te besteden in mijn aanpak. Was gisteren behoorlijk uitleg nodig om scherp te krijgen 'wat is het nu eigenlijk'.	Op zich is dit als stelling correct, maar dat is m.i niet direct ook een voordeel in dit geval, immers, de methode is niet zomaar voor idereen intuitief toepasbaar.
Theme(s)	Th.07.01 To understand when and why to use the artefact requires quite some explanation.			
Meaning units	A.07.01 Way of thinking Th.01.01 It is about a way of thinking.	B.07.01 Different interpretations possible Th.02.03 As it is now it gives room for interpretation and with that room for discrepancies. In the end you intend to change uncertainty in certainty, isn't it …. :)	C.07.01 Explanation needed Th.07.01 Explanation is needed why to apply the method, when to apply, what is innovative or adds to the results in the area of models, methods, ….	D.07.01 Not intuitively applicable Th.07.01 The method is not easily intuitively applicable for everybody.
			C.07.02 Concrete or idea? Th.04.02 Assume it is on the shelf, would you buy it? Or is it more something like hmm, sounds logic, good to give attention to in my approach.	
Condensate	I need quite some explanation to understand why I should use the artefact and when. To me it is not clear if the artefact is a tool or just an interesting thought to keep in the back of my mind. I have to think about if I would I buy it when it is on the shelf.			
Quote	The method is not easily intuitively applicable for everybody.			
8. The results produced by the artefact support the development and maintenance of a project vision	Absoluut, wederom afhankelijk van de interactie en manier van verbeelden 8	Kunnen helpen, hoeft niet, de resultaten kunnen ook leiden tot een gebrek aan samenhang, ondoorzichtigheid, onduidelijkheid, of moet ik dat chaos noemen. De methode is een hulpmiddel, het is de man/vrouw die de interpretaties doet en dus de projectvisie ontwikkelt en onderhoud.	Afhankelijk van het vraagtstuk denk ik. Als je op niveau van een doelstelling of het bereiken van een effect in een organisatie een vraagstuk of een 'dip' in je project hebt dan helpt het denk ik wel. Maar als je een concreet projectresultaat wilt bereiken dan wat minder. Dan ga je met een projectvisie naar de relaties toe. Stelt mogelijk wat bij. Met aantal relaties heb je daarnaast laag frequent contact waar je minder kunt werken aan relatieopbouw.	Ja, dat zal zeker helpen.

Question	Respondent			
	A	B	C	D
			Komt vraag wie was er eerder, de kip of het ei bij me op.	
Theme(s)	Th.08.01 The artefact can help to develop and maintain a project vision but it is not its intention.			
	Th.08.02 A project vision is not developed from the risk perspective.			
Meaning units		B08.01 Creating chaos Th.08.01 The results can also lead to a lack of consistency, non-transparancy, indistinctness, or should I call that chaos.	C.08.01 Chicken or egg Th.08.01 Who [of project vision or artefact] was first, chicken or egg?	
Condensate	Using the artefact can help me to develop a project vision but it is not required. A project vision can result in using the artefact. The uncertainties the artefact generates even can confuse me. On the other hand, using the artefact helps me to give direction despite the complexity I experience. I don't develop a project vision solely from the risk perspective.			
Quote	I think that [the artefact] adds to a nice vision, to stay able to indicate direction notwithstanding complexity.			
9. The artefact is easy to use	voor iemand die is ingevoerd JA, ik denk dat implementatie/acceptatie een grote uitdaging is, Wellicht helpt het om in het vervolgonderzoek ook de/een relatie met projectsucces te definieren is. 5	Neen, deze methode gebruiken vergt m.i. een goede kennis van het aandachtsgebied. Dit zul je dus moeten borgen. Iemand die niet van de hoed en de rand weet zal het beoogde doel voorbij schieten.	Zie ook vraag 2 In feite heb ik het beeld dat ik het al, zij het minder bewust vanuit dit model, toepas.	Hmm, daar wringt ém de schoen een beetje. Als je kijkt naar stakeholders en van daaruit relaties in kaart brengt en met al die relaties (en soms ook de relaties van die relaties) dialogen wilt aangaan kan dat behoorlijk arbeidsintensief worden. Tevens moet je dat ook nog allemaal in het vizier houden / administreren. M.i. niet direct eenvoudig. Ook is niet makkelijk te bepalen in welke mate je dit moet doen om het optimaal te laten functioneren. Hoe chaotisch is (of wordt) mijn project….dat blijft vaak koffiedik kijken.
Theme(s)	Th.09.01 Difficult to estimate the level of chaos, to determine it the artefact should be applied.			
Meaning units		B.09.01 Thorough knowledge required Th.01.01 To use this artefact requires thorough knowledge of the specific area.		D.09.01 Labour intensive Th.03.03 When you look to stakeholders and from there plot relationships and with all of them (and sometimes also the relationships from those relationships) want to start dialogues then this can become pretty labour intensive. Besides one also needs to keep an eye on it / registrate.
		B.09.02 Thorough knowledge required Th.01.01 Someone who does not have good thorough knowledge will easily go astray.		D.09.02 Determine the level of chaos Th.09.01 It is not easy to estimate in to which extent you have to do this to let the artefact perform optimally.
				D.09.03 Level of chaos of the project Th.09.01 How chaotic is (or will become) my project .... that is difficult to predict.
Condensate	To apply the artefact I need thorough knowledge of the chaotic perspective. One aspect is that I find it not easy to estimate the position of the project between order and chaos, right now and later on. Moreover, I need to spend a lot of effort to correctly describe all the relationships and keep the registration up-to-date.			
Quote	Most difficult issue is to plot the project between disorder and order.			
10. The structure of the artefact is clear	hoe verhoudt zich dit tot 2? Ik vraag me af of het begrijpen van opzet relevant(er) is dan het	Ja, misschien ook omdat ik de achterliggende filosofie van Nicoline Mulder	Zie ook vraag 2 Moet zoeken naar de verschillen in beantwoorden vraagstelling tussen de	Redelijk, ik vond het methodische aspect zoals gezegd nog te onderontwikkeld.

Question	Respondent			
	A	B	C	D
	begrijpen van de methode.	gelezen heb en denk te begrijpen :)	methode, de opzet van de methode, begrijpen, gebruiken. Ligt denk ik aan mij, zit dicht bij elkaar.	
Theme(s)	-			
Meaning units		B.10.10 Background from chaordic management Th.07.01 [The structure of the artefact is well to understand] maybe also because I have read the theory of Nicoline Mulder [on chaordic project management] and think I do understand.		
Condensate	Because of my knowledge of the theory of chaordic projectmanagement I understand the structure of the artefact well. The relationship with risk management is not clear to me.			
Quote	I have read the theory of Nicoline Mulder [on chaordic project management].			

Table 8: Data analysis for respondents A till D

Question	Respondent			
	E	F	G	H
1. The artefact is easy to adapt to the circumstances	Zeker	Lijkt me wel omdat ik de betrokken spelers (mensen) en relaties door de band al in kaart breng	ik verwacht dat per situatie de methode toe te passen is. En de richtlijnen die worden gegeven in de sheets zijn duidelijk. Echter zijn het wel veel richtlijnen.	Je moet altijd een methode volledig kunnen doorgronden (en mee kunnen werken) voor je hem kan en mag aanpassen (mijn mening) en daarvoor zijn de richtlijnen te vaag.
Theme(s)	Th.01.01 Not a method but a mind-set.			
	Th.01.02 Flexibility is in the combination of interventions used and in the intensity of effort put into each seperate intervention.			
Meaning units			G.01.01 Too much rules Th.01.01 There are certainly a lot of rules.	
Condensate	I can easily adapt the artefact. I can choose which intervention or combination of interventions to use, and the amount of effort I put into each of the selected interventions. When conditions change I can change the mix. I see the artefact as a mind set, as a guideline, not as a method in the sense of a fixed set of rules. It is not simple: a small change in the conditions can have a big impact on the mix and so a serious influence on the outcome.			
Quote	Guideline.			
2. The artefact is easy to understand.	Definities en verschil tussen risicomanagement en stakeholdermanagement dient nog verduidelijkd te worden.	Ik snap wel wat de bedoeling is omdat ik in mij projecten vooral stuur vanuti relaties	Het plegen van interventies wanneer er reactief in plaats van proactief geopereerd moet worden. Vind ik duidelijk mits ik daarmee de goede interpretatie te pakken heb.	Ja, maar ik verval steeds in projectmanagement, terwijl het om interventies gaat en dat zou dus duidelijker naar voren moeten komen m.i.
Theme(s)	Th.02.01 The interventions should be described more sharply.			
	Th.02.02 The relationship with risk management and stakeholder management is not clear.			
Meaning units	E.02.01 Overlap with stakeholder management Th.02.02 Definitions and difference between risk management and stakeholder management should be better explained.	F.02.01 Managing relations Th.01.01 In my projects I manage primarily based on relationships.	G.02.01 Pro-active instead of reactive Th.01.01 The interventions are to be used when proactive instead of reactive action is needed.	H.02.01 Fall-back into project management Th.01.01 Every time I fall back into project management, whereas this is about interventions.
Condensate	A better description of the interventions would help me. People can interpret interventions differently from what I mean. Actively interacting with the people in the project ecosystem and using the interventions I make myself and my team ready to deal with anything that pops up on our path proactively instead of reactively. I need to better understand the relationship of the artefact with risk management, stakeholder management and attitude and context competences.			
Quote	In my projects I manage primarily based on relationships.			
3. The artefact supports the project in reaching its objectives	Methode is gericht op risicobeheersing. Dit is natuurlijk in projectbelang, maar	Ja	Het doel draag bij en het resultaat en dus het projectbelang	Ja

Question	Respondent			
	E	F	G	H
	heeft wel effect in doorlooptijden, resourcesbenutting en focus, welke ook gericht kan zijn op het daadwerkelijk leveren van de gevraagde producten. Ik zie aandacht voor methode niet alleen van projectmanager, maar ook van projectteamleden en SG.			
Theme(s)	Th.03.01 The focus of the artefact is on relationships.			
	Th.03.02 The artefact is also to be used by the team members.			
	Th.03.03 Actively working the network requires quite some effort.			
Meaning units	E03.01 Artefact not only for the PM Th.03.02 I see attention for the artefact not only from the project manager but also from the project team members and the Steering Committee members.			
Condensate	I use the artefact to get a better relationship with others in the project ecosystem and so to better understand what is going on. These people, e.g. from my team and my Steering Committee, need to understand my way of working and accept it. I realise that more relationships means even more talking.			
Quote	I don't know if the organisation/project is ready for this.			
4. Usage of the artefact motivates to deal with uncertainties	Ik merk dat door de onzekerheden op relatie individueel niveau, merk ik dat dit moeilijk is te overzien aan begin van project en oog te houden gedurende het project. Zeker gezien dat de methode een middel is om ingezet te worden door het projectteam en niet alleen projectmanager	Ja	De interventie toepassen op onzekerheden is waar de winst te behalen is en waar men het verschil kan maken. Dus dit stimuleert dat zeker	Nee, daar vind ik het te globaal voor (maar dat komt omdat ik geen ervaring heb met chaordische projecten).
Theme(s)	Th.04.01 Looking for uncertainties gives more insight in the context.			
	Th.04.02 The artefact is additional to risk management tools.			
Meaning units	E.04.01 Uncertainties per relationship is quite laborious. Th.03.03 I notice that by uncertainties on relationship individual level, I notice that this is difficult to keep overview at the start of the project and keeping an eye on during the project.		G.04.01 The artefact adds value Th.04.02 To apply the artefact on uncertainties is where added value can be obtained and where a difference can be made.	
	E.04.02 Artefact also to be used by team members Th.03.02 The artefact is a tool to be used by the project team and not only by the project manager.			
Condensate	By applying the artefact I get a better insight in what is going on in the project environment and where uncertainties are. I see this as an addition to classical project management tools like risk management; I get a view on items that can become important for the success of the project but still are not a risk. I acknowledge that this is extra work but in the end it adds value. I realise that the interventions are quite loosely defined.			
Quote	Those you want to add to the risk log not yet.			
5. Usage of the artefact supports the personal development of the user	Zie ik niet. Ik vind het qal standaard vaardigheden van een projectmanager. (Voor een projectmedewerker zou dit wel het geval kunnen zijn.)	Tja, dat hangt er van af of je er voor open staat.	Het transformationeel leiderschap en het ondzoeken van onzekereheden zorgen ervoor dat men zich begeeft buiten de comfort zone en daardoor wordt ontwikkeling gestimuleert.	Wie is de gebruiker?
Theme(s)	Th.05.01 To use the artefact the project manager needs to leave her/his comfort zone.			

Question	Respondent			
	E	F	G	H
	Th.05.02 Looking at the interventions as competences, reflection on them stimulates personal development.			
Meaning units	E.05.01 Standard project manager competencies Th.02.03 I think it are standard competencies of a project manager.		G.05.01 Outside the comfort zone Th.05.01 The transformational leadership and search for uncertainties result in the fact that one leaves her/his comfort zone.	
Condensate	Using the artefact I am stimulated to leave my comfort zone, my ivory tower. Working based on trust is running counter to what I have learned. To use the artefact I need standard project management competencies. Regarding the interventions as a kind of competences, reflection on these stimulates my personal development.			
Quote	To work based on trust (and not on facts) is exciting.			
6. The results of the artefact provide overview	Geven inzicht in analyse wijze, hetgeen maar is wat mij betreft echt een moment-opname is. Geven inzicht in welke interventie je kunt inzetten, maar geen inzicht in welke situatie de interventies het meest passend is Het biedt voor mij niet veel toegevoegde waarde.	Dan moet ik het actief gaan toepassen, ik vermoed dat het wel meer inzicht geeft.	Dat geven ze, maar daarentegen zijn 11 stappen erg veel een compactere uitwerking zou bijdragen aan het onthouden/bijblijven van deze stappen.	Geen idee
Theme(s)	Th.06.01 More insight in the actual situation than overview on the whole.			
	Th.06.02 What is overview from the chaotic perspective?			
Meaning units	E.06.01 Snapshot Th.06.01 Give insight in way of analysing, but is in my mind really a snapshot.	F.06.01 Insight, no overview Th.06.01 I expect that it will give more insight.	G.06.01 More compact elaboration Th.01.01 11 steps are quite a number a more compact elaboration would add to remember/keep in mind the steps.	
Condensate	I get overview on where uncertainties are located. Not on the results of the project: this implies fencing off, a 'Blue' perspective, which contradicts with the chaotic perspective. What using the artefact certainly is obtained is improved insight: a thermometer. I get a better picture of what is going on, and I get it earlier.			
Quote	Fencing off is not on the top of your mind.			
7. The instructions to use the artefact are short	Nee, op dit moment nog veel onduidelijk. Zie antwoord vraag 2.	Voor mij kort genoeg	Ze zijn kort en bondig echter zijn het er veel.	Ja (wat is de achterliggende gedachte van deze vraag? Ze zijn kort, maar niet duidelijk t.a.v. onzekerheden\interventies en soms vaag (zie bovenstaande).
Theme(s)	Th.07.01 To understand when and why to use the artefact requires quite some explanation.			
Meaning units				
Condensate	I need quite some explanation to understand why I should use the artefact and when. To me it is not clear if the artefact is a tool or just an interesting thought to keep in the back of my mind. I have to think about if I would I buy it when it is on the shelf.			
Quote	The method is not easily intuitively applicable for everybody.			
8. The results produced by the artefact support the development and maintenance of a project vision	Nee, zie dit meer als risicomanagement-methode	Ik ontwikkel mijn visie niet vanuit het perpectief risico's	Het zit in de stappen en kan er zeker aan bijdragen	Maar dat is toch helemaal niet de bedoeling van deze methode. Waarom niet de vraag: kan je onzekerheden zo met deze interventie vragen aanpakken?
Theme(s)	Th.08.01 The artefact can help to develop and maintain a project vision but it is not its intention.			
	Th.08.02 A project vision is not developed from the risk perspective.			
Meaning units	E.08.01 Risk management method Th.08.02 This is more a risk management method [than a tool to develop a project vision].	F.08.01 Risks don't add to a vision Th.08.02 I develop my vision not from the perspective risks.		
Condensate	Using the artefact can help me to develop a project vision but it is not required. A project vision can result in using the artefact. The uncertainties the artefact generates even can confuse me. On the other hand, using the artefact helps me to give direction despite the complexity I experience. I don't develop a project vision solely from the risk perspective.			
Quote	I think that [the artefact] adds to a nice vision, to stay able to indicate direction notwithstanding complexity.			

Question	Respondent			
	E	F	G	H
9. The artefact is easy to use	Nadat definities duidelijk zijn, wel. Moeilijkste punt is het plotten van project in mate van wanorde en orde. (uit de respons was een inzicht dat een project geplot was in orde en dat door een situatie er toch sprake was van wanorde-moment. Hier werden toen interventies op toegepast.)	Ik moet er nog wel een keer induiken maar vind de gedachte zeker interessant.	Het is duidelijk verwoord en de overzichtelijk gepresenteerd/ toegelicht.	Dat denk ik wel
Theme(s)	Th.09.01 Difficult to estimate the level of chaos, to determine it the artefact should be applied.			
Meaning units	E.01.01 Plotting between order and chaos Th.09.01 Most difficult issue is to plot the project between disorder and order			
Condensate	To apply the artefact I need thorough knowledge of the chaotic perspective. One aspect is that I find it not easy to estimate the position of the project between order and chaos, right now and later on. Moreover, I need to spend a lot of effort to correctly describe all the relationships and keep the registration up-to-date.			
Quote	Most difficult issue is to plot the project between disorder and order.			
10. The structure of the artefact is clear	Kan duidelijker.	Dat ervaar ik wel.	De opzet is duidelijk	In het algemeen ja, maar in verband met risicomanagement (onzekerheid) niet.
Theme(s)	-			
Meaning units				I.10.01 Relationship with risk management not clear Th.02.02 [The structure of the artefact is] clear in general sense, but not in relation to risk management (uncertainty).
Condensate	Because of my knowledge of the theory of chaordic projectmanagement I understand the structure of the artefact well. The relationship with risk management is not clear to me.			
Quote	I have read the theory of Nicoline Mulder [on chaordic project management].			

Table 9: Data analysis for respondents E till H

Question	Respondent			
	I	J	K	L
1. The artefact is easy to adapt to the circumstances	De interventies zijn zelf te bepalen en in te zetten. Wanneer een situatie vraagt om een creativiteitsimpuls dan kun je die interventie toepassen. Ik denk dat er meer/andere interventies te bedenken zijn dan die in het lijstje staan. Als relaties zo belangrijk en essentieel zijn, dan verbaasd het me dat er niet MEER interventies zijn die dit kunnen bewerkstelligen	Volgens mij bruikbaar in veel omstandigheden, en eenvoudig toe te passen	Ja, leidraad. Doel van de methode helder. Deze …. componenten … toepasbaar. Dus ook in verschillende omstandigheden.	Onduidelijk
Theme(s)	Th.01.01 Not a method but a mind-set.			
	Th.01.02 Flexibility is in the combination of interventions used and in the intensity of effort put into each seperate intervention.			
Meaning units	J.01.01. Selective use of interventions Th.01.02 The interventions can be chosen and applied.		L.01.01 Guideline Th.01.01 Guideline.	
Condensate	I can easily adapt the artefact. I can choose which intervention or combination of interventions to use, and the amount of effort I put into each of the selected interventions. When conditions change I can change the mix. I see the artefact as a mind set, as a guideline, not as a method in the sense of a fixed set of rules. It is not simple: a small change in the conditions can have a big impact on the mix and so a serious influence on the outcome.			

Question	Respondent			
	I	J	K	L
Quote	Guideline.			
2. The artefact is easy to understand.	De toets: ik denk dat de methode is: wanneer je project chaotisch is, dan heeft sturen op planning en risico geen zin; immers, alles in onzeker. Wat helpt is dit te accepteren en jouzelf en je team te wapenen tegen chaos. Dit kun je doen door de benoemde interventies. Doel is om je netwerk groter te maken, opdat je minder afhankelijk bent van 1 persoon. Samen = beter.	Het is een eenvoudige methodiek om te begrijpen en toe te passen	Ja, zie het als leidraad om tot interactie te komen	Nee, nog niet concreet genoeg.
Theme(s)	Th.02.01 The interventions should be described more sharply.			
	Th.02.02 The relationship with risk management and stakeholder management is not clear.			
Meaning units			J.02.01 Guideline Th.01.01 Indeed, it should be seen as a guideline to start interactions.	
Condensate	A better description of the interventions would help me. People can interpret interventions differently from what I mean. Actively interacting with the people in the project ecosystem and using the interventions I make myself and my team ready to deal with anything that pops up on our path proactively instead of reactively. I need to better understand the relationship of the artefact with risk management, stakeholder management and attitude and context competences.			
Quote	In my projects I manage primarily based on relationships.			
3. The artefact supports the project in reaching its objectives	Moeilijke stelling. Ik denk het wel, maar, ik weet niet of het bedrijf/project hier al klaar voor is. En daarmee bedoel ik dat het in de praktijk niet eenvoudig geaccepteerd en dus ook in uitvoering te brengen is. Het projectbelang wordt gemeten in feiten, en in chaos accepteer je dat die er niet zijn (als in: planning, risico's, etc). Lastig. Ik denk dat het helpt in het belang van relativeren.	Volgens mij is deze methode ook heel erg gericht op het aansluiten van de omgeving en het begrijpen daarvan	Jazeker. Echter door nog meer relaties aan te gaan nog meer praten.	Ja.
Theme(s)	Th.03.01 The focus of the artefact is on relationships.			
	Th.03.02 The artefact is also to be used by the team members.			
	Th.03.03 Actively working the network requires quite some effort.			
Meaning units	I.03.01 Organisation needs to be ready Th.03.04 I don't know if the company/project is ready for this. In every day's life it won't be easily accepted and so implemented. Project objectives are measured in facts, whereas in chaos one accepts that these are not there.	J.03.01 Creating commitment Th.03.01 This artefact is also very focused on committing and understanding the environment.	K.03.01 More talking Th.03.03 Increasing the number of relationships means still more talking.	
Condensate	I use the artefact to get a better relationship with others in the project ecosystem and so to better understand what is going on. These people, e.g. from my team and my Steering Committee, need to understand my way of working and accept it. I realise that more relationships means even more talking.			
Quote	I don't know if the organisation/project is ready for this.			
4. Usage of the artefact motivates to deal with uncertainties	Het stimuleert mij te zoeken naar wat we wel weten en datgene veilig stellen (deelproject bijvoorbeeld) en een proces in te richten om 'whatever' te kunnen ontvangen vanuit ons bedrijf en andere ketenpartners. Deze aanpak richt zich op onzekerheden en het is aan jou als projectleider	Absoluut, het is daartoe een goede trigger	Ja ook maar die je nog niet als risico op wil nemen	Ja.

Question	Respondent			
	I	J	K	L
	en jou als project om je daar weerbaar tegen te maken			
Theme(s)	Th.04.01 Looking for uncertainties gives more insight in the context.			
	Th.04.02 The artefact is additional to risk management tools.			
Meaning units	I.04.01 Difference between known and unknown Th.04.02 To search for what we do know and secure that (subproject for instance) and to set up a proces to be able to deal with 'whatever' coming from our company and other chain partners.		K04.01 Not in the risk log yet Th.04.02 Those you want to add to the risk log not yet.	
Condensate	By applying the artefact I get a better insight in what is going on in the project environment and where uncertainties are. I see this as an addition to classical project management tools like risk management; I get a view on items that can become important for the success of the project but still are not a risk. I acknowledge that this is extra work but in the end it adds value. I realise that the interventions are quite loosely defined.			
Quote	Those you want to add to the risk log not yet.			
5. Usage of the artefact supports the personal development of the user	Ik denk dat je hier als persoon enorm door uitgedaagd wordt. Werken in onzekerheid is spannend, werken op basis van vertrouwen (en niet op feitelijkheden) is spannend, het druist in tegen vanalles wat aan ons geleerd wordt wat belangrijk is. Leuk! Ik zou het graag meemaken in de praktijk, al denk ik dat we dat ook aan het doen zijn.	Het helpt om op een andere manier naar de wereld te kijken, en meer geoefend te worden in systeemdenken	Ja	Nee, geeft, inzicht
Theme(s)	Th.05.01 To use the artefact the project manager needs to leave her/his comfort zone.			
	Th.05.02 Looking at the interventions as competences, reflection on them stimulates personal development.			
Meaning units	I.05.01 Uncertainty is exciting Th.05.01 To work in uncertainty is exciting, to work based on trust (and not on facts) is exciting, it runs counter to all what has been teached to us to be important. Great!	J.05.01 System thinking Th.05.02 It helps to look differently at the world, and to become more trained in system thinking.		
Condensate	Using the artefact I am stimulated to leave my comfort zone, my ivory tower. Working based on trust is running counter to what I have learned. To use the artefact I need standard project management competencies. Regarding the interventions as a kind of competences, reflection on these stimulates my personal development.			
Quote	To work based on trust (and not on facts) is exciting.			
6. The results of the artefact provide overview	Mij is even onbekend wat de resultaten van de methode zijn.	Dat vraag ik me af, misschien wel, misschien juist niet omdat je minder duidelijk in afbakeningen denkt	Ja. Valt nog wel 'Blauw' te categoriseren.	Ja, mits goed toegepast. Zie 2 voor randvoorwaarden
Theme(s)	Th.06.01 More insight in the actual situation than overview on the whole.			
	Th.06.02 What is overview from the chaotic perspective?			
Meaning units		J.06.01 Delineation Th 06.02 Overview maybe yes, maybe no, maybe especially no because fencing off is not on the top of your mind.	K.06.01 Category Blue Th.06.02 Overview can be categorised as 'Blue'.	
Condensate	I get overview on where uncertainties are located. Not on the results of the project: this implies fencing off, a 'Blue' perspective, which contradicts with the chaotic perspective. What using the artefact certainly is obtained is improved insight: a thermometer. I get a better picture of what is going on, and I get it earlier.			
Quote	Fencing off is not on the top of your mind.			
7. The instructions to use the artefact are short	Klopt: accepteer chaos en stel een nieuwe 'orde' vast	Klopt	Ja - te kort. Verhaal nodig om gevoel erbij te krijgen en toe te passen.	Relatie instructies en methode onduidelijk
Theme(s)	Th.07.01 To understand when and why to use the artefact requires quite some explanation.			

Question	Respondent			
	I	J	K	L
Meaning units			K.07.01 Story needed Th.07.01 Story needed to get a feeling and to be able to apply the artefact.	
Condensate	I need quite some explanation to understand why I should use the artefact and when. To me it is not clear if the artefact is a tool or just an interesting thought to keep in the back of my mind. I have to think about if I would I buy it when it is on the shelf.			
Quote	The method is not easily intuitively applicable for everybody.			
8. The results produced by the artefact support the development and maintenance of a project vision	Een volgend project zal ik beginnen met te odnerzoeken met het team wat wel bekend is, en wat niet. En samen gaan we dan vaststellen dat het niet erg is dat we niet alles weten, en dat we ons gaan voorbereiden om op elke manier informatie te kunnen ontvangen en te verwerken. Ook over hetgeen we al wel denken dat zeker is. Chaos accepteren en daar kracht uithalen; daar ga ik voor.	Ik geloof dat het bijdraagt aan een mooie visie om ondanks complexiteit richting te blijven geven	Nee, ik van het niet.	Nee. Projectvisie lijkt breder dan dit onderwerp. Lijkt mij geen ijmpact op de visie te hebben
Theme(s)	Th.08.01 The artefact can help to develop and maintain a project vision but it is not its intention.			
	Th.08.02 A project vision is not developed from the risk perspective.			
Meaning units		J.08.01 Direction despite complexity Th.08.01 I think that [the artefact] adds to a nice vision, to stay able to indicate direction notwithstanding complexity.		
Condensate	Using the artefact can help me to develop a project vision but it is not required. A project vision can result in using the artefact. The uncertainties the artefact generates even can confuse me. On the other hand, using the artefact helps me to give direction despite the complexity I experience. I don't develop a project vision solely from the risk perspective.			
Quote	I think that [the artefact] adds to a nice vision, to stay able to indicate direction notwithstanding complexity.			
9. The artefact is easy to use	Geen ervaring. Het lijkt mij spannend om in te voeren, zie mijn voorgaande antwoorden bij o.a. vraag 5	Zeker	Ja, omdat voor methode geen andere gebruikers nodig zijn of zeer beperkt.	Toepassen van de interventies wel. Relatie met methode nog niet helemaal helder
Theme(s)	Th.09.01 Difficult to estimate the level of chaos, to determine it the artefact should be applied.			
Meaning units				
Condensate	To apply the artefact I need thorough knowledge of the chaotic perspective. One aspect is that I find it not easy to estimate the position of the project between order and chaos, right now and later on. Moreover, I need to spend a lot of effort to correctly describe all the relationships and keep the registration up-to-date.			
Quote	Most difficult issue is to plot the project between disorder and order.			
10. The structure of the artefact is clear	Zie vraag 2	Hij sluit goed aan bij zaken die in de praktijk naar voren komen. Daarom voelde het eenvoudig en verhelderend aan.	Ja. Zie ook de methodes van ex-Ordinees Jean Bollen - Lean met	Nee
Theme(s)	-			
Meaning units				
Condensate	Because of my knowledge of the theory of chaordic projectmanagement I understand the structure of the artefact well. The relationship with risk management is not clear to me.			
Quote	I have read the theory of Nicoline Mulder [on chaordic project management].			

Table 10: Data analysis for respondents I till L

Appendix E: Compilation of the condensates

I can easily adapt the artefact. I can choose which intervention or combination of interventions to use, and the amount of effort I put into each of the selected interventions. When conditions change I can change the mix. I see the artefact as a mind-set, as a guideline, not as a method in the sense of a fixed set of rules. It is not simple: a small change in the conditions can have a big impact on the mix and so a serious influence on the outcome. A better description of the interventions would help me. People can interpret interventions differently from what I mean. Actively interacting with the people in the project ecosystem and using the interventions I make myself and my team ready to deal with anything that pops up on our path proactively instead of reactively. I need to better understand the relationship of the artefact with risk management, stakeholder management and attitude and context competences. I use the artefact to get a better relationship with others in the project ecosystem and so to better understand what is going on. These people, e.g. from my team and my Steering Committee, need to understand my way of working and accept it. I realise that more relationships means even more talking. By applying the artefact I get a better insight in what is going on in the project environment and where uncertainties are. I see this as an addition to classical project management tools like risk management; I get a view on items that can become important for the success of the project but still are not a risk. I acknowledge that this is extra work but in the end it adds value. I realise that the interventions are quite loosely defined. Using the artefact I am stimulated to leave my comfort zone, my ivory tower. Working based on trust is running counter to what I have learned. To use the artefact I need standard project management competencies. Regarding the interventions as a kind of competences, reflection on these stimulates my personal development. I get overview on where uncertainties are located. Not on the results of the project: this implies fencing off, a ‘Blue’ perspective, which contradicts with the chaotic perspective. What using the artefact certainly is obtained is improved insight: a thermometer. I get a better picture of what is going on, and I get it earlier. I need quite some explanation to understand why I should use the artefact and when. To me it is not clear if the artefact is a tool or just an interesting thought to keep in the back of my mind. I have to think about if I would I buy it when it is on the shelf. Using the artefact can help me to develop a project vision but it is not required. A project vision can result in using the artefact. The uncertainties the artefact generates even can confuse me. On the other hand, using the artefact helps me to give direction despite the complexity I experience. I don't develop a project vision solely from the risk perspective. To apply the artefact I need thorough knowledge of the chaotic perspective. One aspect is that I find it not easy to estimate the position of the project between order and chaos, right now and later on. Moreover, I need to spend a lot of effort to correctly describe all the relationships and keep the registration up-to-date. Because of my knowledge of the theory of chaordic project management I understand the structure of the artefact well. The relationship with risk management is not clear to me.

Appendix F: Categorisation of the Compilation statements

The artefact is like a music instrument: in the hands of a competent player it will produce its sound

- I see the artefact as a mind-set, as a guideline, not as a method in the sense of a fixed set of rules.
- To me it is not clear if the artefact is a tool or just an interesting thought to keep in the back of my mind.
- I can easily adapt the artefact.

The artefact helps to prepare for unexpected events

- Actively interacting with the people in the project ecosystem and using the interventions I make myself and my team ready to deal with anything that pops up on our path proactively instead of reactively.
- I use the artefact to get a better relationship with others in the project ecosystem and so to better understand what is going on.
- I get overview on where uncertainties are located. Not on the results of the project: this implies fencing off, a 'Blue' perspective, which contradicts with the chaotic perspective.
- What using the artefact certainly is obtained is improved insight: a thermometer.
- I get a better picture of what is going on, and I get it earlier.
- By applying the artefact I get a better insight in what is going on in the project environment and where uncertainties are.
- I don't develop a project vision solely from the risk perspective.
- On the other hand, using the artefact helps me to give direction despite the complexity I experience.
- Using the artefact can help me to develop a project vision but it is not required.
- The uncertainties the artefact generates even can confuse me.

Using the artefact stimulates to interact with the environment

- Regarding the interventions as a kind of competences, reflection on these stimulates my personal development.
- Using the artefact I am stimulated to leave my comfort zone, my ivory tower.

The mix of interventions used combined with selecting the effort put into each intervention enables the project manager to fine-tune activities

- I can choose which intervention or combination of interventions to use, and the amount of effort I put into each of the selected interventions. When conditions change I can change the mix.
- It is not simple: a small change in the conditions can have a big impact on the mix and so a serious influence on the outcome.
- I realise that the interventions are quite loosely defined.
- A better description of the interventions would help me.

- People can interpret interventions differently from what I mean.
- I need quite some explanation to understand why I should use the artefact and when.

The artefact can be used next to risk management and stakeholder management - to extend coverage into the unordered domain

- One aspect is that I find it not easy to estimate the position of the project between order and chaos, right now and later on.
- I have to think about if I would I buy it when it is on the shelf.
- The relationship with risk management is not clear to me.
- I see this as an addition to classical project management tools like risk management; I get a view on items that can become important for the success of the project but still are not a risk.
- I need to better understand the relationship of the artefact with risk management, stakeholder management and attitude and context competences.

The project manager and their inner circle, like team members and Steering Group members, need to understand the background of the artefact, chaordic project management

- These people, e.g. from my team and my Steering Committee, need to understand my way of working and accept it.
- Because of my knowledge of the theory of chaordic projectmanagement I understand the structure of the artefact well.
- To apply the artefact I need thorough knowledge of the chaotic perspective.
- To use the artefact I need standard project management competencies.
- Working based on trust is running counter to what I have learned.

Effort is needed to use the artefact

- I acknowledge that this is extra work but in the end it adds value.
- I realise that more relationships means even more talking.
- Moreover, I need to spend a lot of effort to correctly describe all the relationships and keep the registration up-to-date.

Appendix G: Re-narration of the categorised Compilation statements

The artefact is like a music instrument: it only produces its beautiful sound when it is played by the skilled mucisian

The Uncertainty Dialogue is a guideline. It comprises a way to look at the world and from that point of view a couple of activities. Both are important: without the right position, the activities become meaningless. It is not a tool in the sense of a fixed set of rules: from a chaotic perspective, rules don't hold. It is more like a music instrument: it only produces its beautiful sound when it is played by the skilled mucisian.

The artefact helps to prepare for unexpected events

Applying the Uncertainty Dialogue results in an increased network. In this network the project manager explicitely looks for uncertainties related to the project objectives. Because of the targeted search, more uncertainties are likely to be detected and earlier. Where applicable, interventions are applied. The active relationships in the network, the insight in where uncertainties are and the application of interventions support the project manager in the stabilisation of the project: the emphasis of activities shifts from reactive to proactive. In this way using the Uncertainty Dialogue supports the project manager to give direction despite the experienced complexity.

The results of using the artefact are not a complete overview of uncertainties, like the risk log. From the chaotic perspective this is useless, as the world continuously changes in an unpredictive way. Trying to fence off will nip chances that arise from the chaos in the bud.

The results from applying the Uncertainty Dialogue could help to build the project vision. However the vision covers a much broader area. Moreover it is not the intention of the artefact. The uncertainties collected even can blur the vision.

Using the artefact stimulates to interact with the environment

A clear added value of using the Uncertainty Dialogue is that the project manager, developing the Uncertainty web, is stimulated to leave their ivory tower. Leaving their comfort zone could open up a whole new world. Next to that, when the interventions are regarded as a kind of competences, reflection on their use could stimulate the personal development of the project manager.

The mix of interventions used combined with selecting the effort put into each intervention enables the project manager to fine-tune activities

The Uncertainty Dialogue can easily be adjusted to the conditions. One or more of the interventions can be applied and the amount of effort put into each intervention can be tuned, resulting in a targeted mix. When the conditions change, the mix can be adapted accordingly. From the chaotic perspective there is no connection between cause (action) and effect (result); the outcome of applying the mix should be monitored carefully.

The descriptions of the interventions are open to different interpretation. This is a risk, as people could have different expectations. From the chaotic perspective this risk is small; it is known and accepted that things are not aligned.

The artefact can be used next to risk management and stakeholder management - to extend coverage into the unordered domain

The Uncertainty Dialogue is an artefact which use should be deliberately considered. Applying the artefact consumes resources. When the world is ordered it probably better should stay on the shelf. On the other hand, changing to the chaotic perspective, it even then can be useful, maybe in a light version; to be prepared for when chaos emerges.

The relationship between the Uncertainty Dialogue and risk management and shareholder management needs further elaboration. The same applies to the attitude and context competences that are used when applying the artefact.

The project manager and their inner circle, like team members and Steering Group members, need to understand the background of the artefact, chaordic project management

Applying the Uncertainty Dialogue means that a chaordic perspective is chosen: it is accepted that there is not relation between cause and effect. People working closely with the project manager who uses the Uncertainty dialogue, like the members of the project team and the Steering Committee, should understand and accept this position.

The Uncertainty Dialogue is an artefact that originates from the chaotic perspective. Knowledge of this perspective, and even better of the chaordic perspective that considers both the ordered and unordered perspective, is a prerequisite for effectively using the artefact. Another special to most people is that the dialogues are based on trust instead of on control. It can be argued that these all are part of standard project management required competences.

Effort is needed to use the Uncertainty Dialogue

Developing and maintaining the Uncertainty Web, and applying the Uncertainty Dialogue, requires effort. The relationships need to be monitored continuously.