Schoper, Yvonne; Böhle Fritz; Heidling, Eckhard (2016): Coping Better with the Project's Unknown Unknowns: New Competences for Overcoming Uncertainty in Projects. In: Bodea, Constanta-Nicoleta; Purnus, Augustin; Huemann, Martina; Hajdu, Miklós (Hrsg.): Managing Project Risks for Competitive Advantage in Changing Business Environments. Hershey: IGI Global, S. 1-22.

Managing Project Risks for Competitive Advantage in Changing Business Environments

Constanta-Nicoleta Bodea
Bucharest University of Economic Studies, Centre for Industrial and Services Economics, Romania

Augustin Purnus
Technical University of Civil Engineering Bucharest, Romania

Martina Huemann
WU-Vienna University of Economics & Business, Austria

Miklós Hajdu
Budapest University of Technology and Economics, Hungary

A volume in the Advances in IT Personnel and Project Management (AITPPM) Book Series

BUSINESS SCIENCE Reference
An Imprint of IGI Global

Published in the United States of America by
Business Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA, USA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: http://www.igi-global.com

Library of Congress Cataloging-in-Publication Data

Names: Bodea, Constanta-Nicoleta, 1959- editor. | Purnus, Augustin, 1958- editor. | Huemann, Martina, 1969- editor.
Title: Managing project risks for competitive advantage in changing business environments / Constanta-Nicoleta Bodea, Augustin Purnus, Martina Huemann, and Miklos Hajdu, editors.
Description: Hershey : Business Science Reference, 2016. | Includes bibliographical references and index.
Identifiers: LCCN 2016006118| ISBN 9781522503354 (hardcover) | ISBN 9781522503361 (ebook)
Subjects: LCSH: Project management. | Risk management. | Organizational change.
Classification: LCC HD69.P75 M3633 2016 | DDC 658.4/04--dc23 LC record available at https://lccn.loc.gov/2016006118

This book is published in the IGI Global book series Advances in IT Personnel and Project Management (AITPPM) (ISSN: 2331-768X; eISSN: 2331-7698)

British Cataloguing in Publication Data
A Cataloguing in Publication record for this book is available from the British Library.

Chapter 1
Coping Better with the Project´s Unknown Unknowns:
New Competences for Overcoming Uncertainty in Projects

Yvonne-Gabriele Schoper
HTW Berlin, Germany

Fritz Böhle
ISF München, Germany

Eckhard Heidling
ISF München, Germany

ABSTRACT

It is the goal of management to overcome and delete uncertainty. Uncertainty is seen as an obstacle and threat for successful management. However projects are full of uncertainty. Successful project management therefore aims to overcome and ideally delete uncertainty as far as possible. In project management, uncertainty and risk are often used synonymously. Current project management methodology contains only technics how to manage risk in projects. The assessment of risks is based on the precondition of stable conditions and the idea that the influencing parameters are known, assessable and calculable. Since more than 2,000 years it is the aim of the Western cultures to master the nature by natural sciences and mathematics. In the last three centuries of Modern Philosophy the perspective developed that analytical scientific know how (episteme) and technical skills (techne) can master any kind of complexity and risk. The third traditional Aristotelian competence, the practical wisdom (phronesis) however was perceived as not acknowledgeable.

DOI: 10.4018/978-1-5225-0335-4.ch001

INTRODUCTION

Management is defined as the organization, co-ordination, planning and control of activities in order to achieve defined objectives. It is the aim of the management of organizations to build and keep continuity and stability. This is done by objectives, and with the standardization of stable processes, with fixed procedures and pre-defined resources. Herewith the management aims to avoid uncertainty, as uncertainty is perceived as a threat for management as it could endanger the planning and steering of stability. This conceptual approach is also valid for the management of projects. Project management practice however shows that projects are full of uncertainty and that overcoming this uncertainty is nearly impossible.

A project is a temporary endeavor undertaken to create a unique product, service or result. However this uniqueness - in contrast to routine processes - leads to the fact that projects are full of uncertainty (e.g. developing a new product that is to be launched far in the future, a new constellation of team members or a lack experience in a new business segment). As a consequence uncertainty is an inevitable, typical characteristic of projects. The management of project aims to overcome and delete this uncertainty as far as possible. With the help of pre-defined project phases, standardized tools and good-practice methods the project processes shall be made predictable, plannable and calculable. This strategy of elimination of uncertainty is also applied when it comes to tasks that are not completely plannable as it is the case in projects.

Since the global increase of volatility, uncertainty, complexity and ambiguity (described with the acronym VUCA in the 1990s) of the general conditions, uncertainties in projects and their impact on the project results get increasingly in the light of the awareness of the senior management. These uncertainties demand for a new type of project manager who not only minimizes the upcoming uncertainties in the project but who also foresees and realizes the opportunities that derive out of the project uncertainties (Lechler, 2013; Dalcher, 2014). This new connotation of uncertainty containing both the chance for opportunity as well as for risk demands for a new attitude towards uncertainty.

The following chapter first examines the concept of uncertainty and of risk. It lays down the current risk management approach in project management and explores the potential for professional uncertainty management in projects. The analysis of Aristotle´s classification of knowledge and evolution of his concept in the West in the last 2,000 years shows that one of the three competences, namely phronesis was abolished in the last 300 years. In addition the concept of dealing with uncertainty in the Eastern societies as well as in current business management is analysed concening their management of uncertainty. The comparison shows the need for a new competence of opportunity management in addition to risk management in projects.

It is the aim of this chapter to raise the awareness for a new, so far disregarded competence of project managers, namely the capability to differentiate between uncertainty and risk. This is the basis to develop a further competence, namely to turn uncertainty into a potential opportunity. The significance of these new competences is that they lead to a redefinition of the project managers´ role from the one of passive execution of the corporate strategy to the active formation of the future of the organisation. This has consequences in the education, qualification and long-term career development of project managers in organisations as well as of those responsible for the governance of projects.

UNCERTAINTY MANAGEMENT IN PROJECTS

Differentiation between Uncertainty and Risk

Generally, uncertainty and risk are often used synonymously in project management as both terms are often used interchangeably. However, both concepts have a different meaning.

In a news briefing in 2002 the US Secretary of Defense Donald Rumsfeld said about the lack of evidence by supplying weapons for the mass destruction to terrorist groups in Iraque: "Reports that say that something hasn't happened are always interesting to me, because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know. And if one looks throughout the history of our country and other free countries, it is the latter category that tend to be the difficult ones. (US Defense Government, 2002)

From this speech in 2002 the terms "known knowns", "known unknowns", "unknown knowns" and "unknown unknowns" arised in the management theory (De Meyer., Loch, & Pich, 2002; Cleden, 2009; Winch & Maytorena, 2012; Sanderson, 2012). However this theoretical differentiation between the four different qualities of risk does not have an impact on project risk management in practice.

In the 1920s and 1930s the management theorists Frank Knight ("Risk, Uncertainty and Profit" 1921) and the economist John Maynard Keynes ("General Theory of Employment, Interest and Money" 1936 and "General Theory of Employment" 1937) differenciated between the two concepts of uncertainty and risk.

"The essential fact is that 'risk' means in some cases a quantity susceptible of measurement" (Knight, 1921). This quantifyable measurement can be expressed by mathematical statistical probabilities "[...] risks [...] were supposed to be capable of an exact actuarial computation" (Keynes 1937). In comparison to uncertainty that has no scientific basis to calculate a probability. "We simply do not know" (Keynes, 1937). Knight recommends to restrict the term 'uncertainty' to cases of the non-quantitative type (Knight, 1921). Further on Knight forecasted the dispute on the forms and consequences of uncertainty as an important task of economic scientific development. He warned that it is the *true uncertainty* that prevents the theoretically perfect outworking of economic success (Knight, 1921). The authors indicated already in the 1920s the great meaning of uncertainty on economic decisions.

In today's project management literature risk is defined as an "uncertain event or condition that, if it occurs, causes a significant positive or negative effect on the project objective" (Project Management Institute, 2008). Risks are events, circumstances, situations or conditions that might occur with a specific probability and have a potential negative impact on meeting predefined project objectives. Risks are the so-called "known unknowns" and can be separated from uncertainty if they are measurable, calculable and predictable for the course of the project (Cleden, 2012; Lechler, 2013).

In comparison to uncertainty in project management: Uncertainty can be defined as all unknown or unexpected project situations with a potential significant impact on the project. Uncertainties are unknown, not foreseeable and not predictable with the set of tools and instruments for the course of the project, with other words the so-called "unknown unknowns" or "black swans".

As project reality shows unexpected events often occur during a project (Pinto, 2007). Risk management limits the impact of the unexpected events and prevents these events from happening. Accordingly, it is generally assumed that risk management contributes to the success of the project (Olsson, 2007).

The standardized project management processes contain the aspect of risk management: Project risk management holds a strong position in the project management theory and methodology (APM, 2006; ICB 3.0 of IPMA; PMBok by PMI, 2008). Also the academic studies on project management concentrate on managing and avoiding risks. None of the project management standards copes with the aspect of uncertainty.

The analytical methods applied provide the backbone for the risk management approaches, and have the benefit of producing an assessment of a known risk situation relatively quickly, including economic measures of gains or losses (Thamhain, 2013).

In a survey of 171 articles in project management published between 2000 and 2010 Zhang summarizes that "risk is epistemologically probabilistic (...). A basic epistemological model in the analysis of project risk is the risk events-consequence link. Risk events stand forall possible events, situations, or circumstances whose occurrence can logically lead to the materialization of a certain consequences. This logic is universal and recognized, and objective and leads to the design of quantitative or semi-quantitative techniques to improve the efficiency and effectiveness of risk analysis" (Zhang, 2011). He states that "identifying and analyzing risks ... could negatively influence the process of the actualization" (Zhang, 2011, p. 9).

New information technology systems support project managers in becoming more effective in identying and describing risks analytically (like critical path analysis, earned value analysis, risk-impact matrices, online databases for categorizing and sorting risks, Monte Carlo analysis) all designed to make project-based results more predictable (Thamhain, 2013). Concluding it can be stated that the paradigm of systematic RM is predominantly focused on anticipated risks (Lehtiranta, 2014).

The objective of project risk management is to transfer the uncertainties into project risks in order to make them plannable and controllable (Korhonen et al., 2014; Howell et al., 2010; Yang et al., 2014; Creasy, Anatatmula 2013; Zwikael et al., 2014; Ghapanchi et al., 2012; Krane et al., 2010). To incorporate the uncertainties in project modeling this is done by stochastic networks where activity costs and durations are not deterministic but follow certain probability distributions (Acebes et al., 2014; Jani, 2011).

García-Fernández and Garijo highlight the limits of this approach in dealing with uncertainty. The traditional capital budgeting tools such as NPV or ROI have proven to be suitable enough to value the profitability of projects without uncertainty. The strategy for implementing such projects is completely defined before the start up. "However, these methods fail when they are used to evaluate projects that are subject to significant uncertainties, such as demand, costs and prices, or unexpected events, which can change the course of the project" (García-Fernández, Garijo 2010, p. 464).

Thamhain and Zhang demand a more professional approach in dealing with the hidden, less-obvious aspects of uncertainty, and in proactively coping with risks in the early stages. Uncertainties, ambiguities and risk factors that are often connected. They are non-linear and can develop into issues that ultimately affect the project performance (Thamhain 2013; Zhang, 2014; Fan 2014).

This chapter shows that in the economic theory there is a differentiation between uncertainty and risk, but that there is no differentiation between risk and uncertainty in project management theory. Today´s project management standards offer tools and techniques for risk management. But these methods fail when a project manager is confronted with uncertainty in projects. Therefore today´s risk management in projects is critized as the next chapter shows.

Risk Management in Today´s Project Management Practice

Critique on today´s application of project risk management is formulated as follows: "We suggest that the inappropriate use of project risk management techniques may be part of the problem rather than part of the solution here, and that we need to rethink project risk management from first principles" (Winch & Maytorena 2012, p. 355; Lenfle 2011; Cleden 2009). They critize the strong focus on risks in projects and the neglect of uncertainties. It can be stated that there is no differentation between uncertainty and risk in projects. "There is a tendency to conflate these terms and to use them interchangeably, which in effect means that uncertainty is either treated in the same way as risk or ignored" (Sanderson, 2012, p. 434; Hartono et al., 2014). In addition it is not clear how to manage these unknown-unknowns (Lechler et al., 2012, p. 60).

The main critique is that the positive potentials lying in the uncertainties are not seen with the currently existing approach. Situations of uncertainty are not negative per se. They definitely lead to project changes, but could even to improve the initial value proposition of a project. The potential possibility to improve the value of a project is called 'opportunity'. However the management of opportunities differs from the management of risks. The exploitation of an opportunity requires significant changes that go beyond modifications of a baseline" (Lechler et al., 2013, p. 18; Lehtiranta, 2014; Sanderson, 2012; Perminova, 2008; De Meyer et al., 2002).

The sources of uncertainty can be issues as contextual dynamics, the business or geographic context of the company or its subsidiaries, technical innovations, new norms, laws or regulations, cooperation and contracts with suppliers or third parties, market turbulence, all these are examples of uncertainty sources arising from the broader business and societal environment in which the organization operates (Martinsuo, 2014; Petit 2012). The management of theses contextual uncertainties has an important meaning for the success of a project, which is even more true for the management of megaprojects (Sanderson, 2012).

In reality projects are often separated from the remaining organisation. They are seen as a "lonely phenomenon, with neither history nor future [...].The perspective is from the inside [...]. In this perspective, the players and actions of the environment do not appear in their own right, rather through their relationship with the project in question. The historical and organizational contexts of the project are taken for granted, or simply not included in the analysis" (Engwall, 2003, p. 793).

Today´s paradigma in Western project management is: the more detailed a project plan the better the control of the project. However, the intense preoccupation with planning is linked to the project failure as detailed, rigid plans are limiting the freedom to make important decisions in projects. In addition it encouraging an attitude "where low level products become ends in themselves, instead of contributing to a greater goal" (Pollack, 2007, p. 271; Eschenbruch, 2013; Grösser, 2011).

This leads to "future outcomes as statistical shadows of the past" (Sanderson, 2012, p. 435; Scheurer & Ribeiro, 2012). Future developments are seen in the light of the past. Uncertainty arises often during the course of the project and not at its beginning. In addition to the traditional approach of project management to put emphasis on assuring conformance to time, budget and scope constraints. Continuous improvement, customer-oriented thinking or reflective learning are often left behind. "This leads to the fact that project companies become less flexible, unable to accumulate knowledge and experience necessary for coping with uncertainty" (Perminova et al., 2008, p.74).

Futher complexity is caused by the contingencies occurring in a project. "Unchecked contingencies tend to cascade and penetrate wider project areas. Contingencies occurring anywhere in a project have the tendency to penetrate into multiple subsystems (domino effect) and eventually affect over-all project performance" (Thamhain, 2013, p. 31; Scheurer & Ribeiro, 2012).

Concluding it can be stated that the straight application of the risk management techniques is not sufficient for adaquately dealing with today´s uncertain project environments.

Exploring the Potential of Uncertainty Management in Project Practice

A stronger focus on the management of uncertainties by the project managers might function as a lens through which one can gain new and important insights (Munthe et al., 2014; p. 214).

However, there is only few research that focuses on the analysis of the potential that lies in uncertainty in projects. Lechler at al. analysed 42 qualitative case studies concerning the potentials of uncertainty in projects.

They show that:

- The opportunities to create additional value for the projects by uncertainty become obvious in the project execution phase;
- Project managers who are able to differentiate between uncertainty and risk in projects will be able to identify new potentials in their projects with a higher probability;
- Project managers with a business perspective are more capable to classify uncertainty appropriately and the potential for increasing the value for a project (Lechler et al., 2013).

As a consequence Lechler demands a new set of business competences for project managers. These competences contain a fundamental understanding of the specific industry branch and the company´s competitive situation to be able to realize new opportunities that emerge in the course of the project. As a consequence the senior management has to give to the project managers more power, to enlarge the capabilities and competences of their project managers and to strengthen the interactions between corporate strategy and project management (Lechler, 2013, p. 102).

Several researchers see the capability to successfully cope with unexpected events as the ability to cope with changes. These project managers seem to exercise the art of 'managing the unexpected' parallel to executing the plan (Söderholm, 2008, p. 81; Thamhain, 2013, p. 29). This corresponds to a set of personality traits of project managers that are able to act both formal and intuitive. These managers are able to lead projects with less data and to rely more on their intuition. (Cohen et al., 2013, p. 83).

Judging the relevance of information is an intuitive process rather than a rational one (Perminova et al., 2008, p. 77) and confirms the need for 'gut-feeling' approaches that can capture weak signals without having a specific focus in mind (Williams et al., 2012, p. 47).

The results demand for a higher appretiation of practical knowledge in dealing with uncertainty in projects. Professional experience is defined as the familiarity with circumstances and procedures. Experience cannot prevent the upcoming of an unexpected event, but can support the appropriate reaction" (Syben, 2014, p. 83).

This capability of identifying new opportunities in uncertainty demands for a different personality of project managers, different competences, organizational flexibility and freedom. Risk managers in projects are typically risk avoidant, conservative, precise and careful. These characteristics are not required

when it comes to the management of opportunities. An opportunity manager should typically be open-minded, visionary, innovative, flexible and fast. By comparing these personality types it can be stated that the roles of the risk and the opportunity manager should be carried out by two different individuals in a project. Particularly the opportunity manager should have strong links into the organisation and a deep understand of the corporate strategy and its competitive situation.

This chapter showed that the role of the opportunity manager who identifies the potential lying in project´s uncertainty was so far neglected in project management. The capability to successfully cope with the unexpected corresponds to project managers that are able to act both formal and intuitive and shows the need for 'gut-feeling' approaches.

HISTORICAL EVOLUTION OF KNOWLEDGE

The following chapter shall analyse how the classic concept of knowledge developed and changed its meaning in the course of the last 2,500 years in the Western culture.

Aristotle´s Classification to Knowledge

In ancient Greece it was the aim of the researchers to understand the fundamental laws of nature by mathematics, natural sciences and philosophy.

The ancient Greek formular *panta rhei* ("everything flows") describes the mental attitude of the mindset, first defined by the Greek Heraclitus (535 – 475 BC). The following sentence demonstrates the idea of continuous change: "Everything changes and nothing remains still ... and ... you cannot step twice into the same stream."

This sentence expresses the attitude that everything is always changing following the course of nature. The ideal is to create a mental attitude to cope with the changes. This attitude is very similar to the concept of the Chinese *I Ging* and the Japanese *Hōjōki* which will be explained in a later chapter. However it can be stated that in ancient Greece the people were aware of the continuous change and the resulting uncertainties in life as the logical consequence of the change.

The Greek philosopher and scientist Aristotle (384 – 322 BC) researched in nearly all fields of science as physics, biology, zoology, metaphysics, logic, ethics, aesthetics, poetry, theater, music, rhetoric, linguistics, politics and government and constituted the first comprehensive system of Western philosophy. One of the questions Aristotle tried to answer is the classification in general and of knowledge. In the Nicomachean Ethics Aristotle differentiates between three fundamental approaches to knowledge: *episteme, techné and phrónēsis*.

Episteme means "to know" in Greek. It is related to the scientific knowledge and is universal, invariable, context-independent and based on general analytical rationality.

Techné is the Greek word for craftsmanship, craft, or art. It is the set of principles, or rational methods involved in the production of an object or the accomplishment of an end. Techné resembles episteme in implying knowledge of principles, but differs in that its aim is making or doing, not disinterested understanding. Its characteristic is pragmatic, variable, context-dependent and production oriented. For the ancient Greeks techné was looked at negative when it appeared in art, whereas when used as craftmanship it was regarded positive. Aristotle regarded techné as an imperfect human representation of

nature. According to Eikeland, in human relations techné is the mastery of influencing, manipulating, and using other human beings (Eikeland, 2008, p. 98).

Phrónēsis means prudence, practical wisdom or judgement in English. It´s quality is pragmatic, context dependent, action-oriented and assigned to praxis, or doing. Phrónēsis deals with particulars. According to Eikeland phrónēsis can be defined as an intellectual virtue, being prescriptive, and deliberate (Eikeland, 2008, pp. 97-101). Eikeland sees in phrónēsis aspects of deliberate excellence, critical and situational understanding, quicknesss of mind and cleverness (Eikeland, 2008, p. 103).

Phrónēsis goes beyond both analytical, scientific acknowledge (episteme) and technical knowledge or know-how (techne) as it involves the capability of judgments and decisions made in the manner of a virtuous social and political actor (Flyvbjerg, 2001). He argues that Phrónēsis is an important part of social practice and that the attempts to reduce social sciences to episteme or techne, or to comprehend them in those terms, are misguiding.

Phrónēsis is an intellectual virtue that concerns values and is commonly involved in practices of planning. Therefore, that any attempts to reduce planning research to episteme or techne or to comprehend planning practices in those terms are misguided (Flyvbjerg, 2004).

For the reason of completeness it must be added that Aristotle defined two more competences: sophia (philosophical wisdom) and nous (intuitive mind; rationality). He distinguished sophia and phrónēsis in the way that sophia involves the reasoning concerning universal truths, while phrónēsis includes rational thinking.

In summary it can be stated Aristotle differenciated three fundamental forms of knowledge: episteme (the theoretical know why), techné (the technical know how) and phrónēsis (the practical knowledge).

Evolution of Aristotle´s Concept of Knowledge in the Western Societies

Already since Plato the Western philosophers and scientists are unified by the aspiration to detect the universal truth, where the concept of Absolutism derived from. The emphasis on universality of the modern science and the philosophers' "quest for certainty" however ignored the practical issues in preference for theoretical issues. The pursuit of absolutism and theoretical arguments that lack practicality is one of the main defects of modern philosophy (Toulmin, 1990).

The guiding principle in the West is the mastery of nature, accompanied by the conviction that one can, in principle "master all things by calculation" (Weber, 1919/1988). Thus, the "maturity of mankind" advocated in the enlightenment era, the "disenchantment" of the world (Weber, 1919/1988) was mainly directed to the disenchantment of nature by calculation. Therefore the natural sciences became the model for all sciences.

This development led to the fact that Aristotle´s third principle of practical knowledge *phrónēsis* was neglected and forgotten after more than 2,000 years. The concept of phrónēsis plays no role in today´s social sciences. The core of phrónēsis is the reflexive analysis and discussion of values and interests, which is the prerequisite for an enlightened political, economical and cultural development in any society (Flybjerg, 2012). The concept of episteme is found in the words 'epistemology' and techne in 'technology' and ´technical'. However the concept phrónēsis was neglected as the lack of the word already shows. It can be stated that the modern Western societies do not show sufficient appreciation for practical knowledge. Since the raise of the industrialisation in Europe the third Aristotle competence practical knowledge was delegated to the low appreciated profession of craftsmen. Today practical knowledge is not part of academic education or training.

Summarized it can be stated that Aristotle´s concept of phrónēsis as practical knowledge was neglected by the Western cultures in the last 300 years. This leads to an imbalance between the three classic intellectual virtues in favour of the two knowledge concepts episteme and techne.

COMPARISON OF THE WESTERN AND EASTERN APPROACH TO UNCERTAINTY

The following chapter analyses the differences between the Western and the Eastern cultures in their approaches towards dealing with uncertainty.

Western Approach to Uncertainty

The concept of the Western philosophy can be well described with Aristotle who noted: "But we only deliberate about things which seem to admit of issuing in two ways; as for those things which cannot in the past, present, or future be otherwise, no one deliberate about them, if he supposes that they are such; for nothing would be gained by it." (Aristotle, 1357). It is therefore the "issuing in two ways" or in other words: the uncertainty of the outcome, that challenges philosophers and scientists ever since.

The evolution from the traditional agrarian society to the modern industrial society can be described as the transition from stability and certainty into change and uncertainty. Hallmark of modern societies is the "destruction of the old certainties" (Bonß, 2010) by dissolving traditional communitization, experiences of agricultural and handcraft work (Giddens, 1995; Joas & Knöbl, 2004; Nassehi, 2006; Wehling, 1992).

In Europe, this perspective became the guideline for the behavioral demands of the individuals (Weber, 1919/1988). Economic action particularly relies on the calculation of future developments, thus requiring computability of opportunities and risks on the market. The postulatation of rationality in conduct has a long tradition in the modern social sciences, particularly with regard to dealing with uncertainty. In the economic sciences in particular the researchers focused this aspect with the decision theory under uncertainty. It can be stated that the established theories rally around the poles "mastering uncertainty" and "powerlessness against uncertainty" (Neumer, 2009). However it is the aim of mankind to reach the status of "coping with uncertainty in acting". Whereas the guiding principles of "mastery of nature" and "production of certainty" connected to it have been valued as the comprehensive signum for economically successful human action. Uncertainty received the signum of powerlessness and was interpreted as the consequence of individual resp. collective failure to control the environment.

The industrial societies have developed a great repertoire of strategies to overcome uncertainty. Among the most important are science, technology, and organization. Especially the natural sciences became the epitome of the ability to progressively master the nature's secrets. Technological progress was seen as proof that it is possible to systematically master the given conditions of nature. This is evident in technological developments geared to seal themselves off to a large extent from the potential "risk factor man" (e.g. the autonomous self-driving car). In organizations, companies still follow the guiding principles of Taylorism to largely eliminate the subjective side of the workforce. In this context, uncertainty appears as a deficiency and a disturbing factor that should be eliminated. This can best be effected if the technical and organizational processes are stable and if the internal and external influences are known and can be controlled.

Uncertainty as the lack of security causes a feeling of fear in human beings. Both uncertainty and fear are indefinite feelings without reference to an object or situation. In comparison to anxiety and risk, which both refer to a defined situation (e.g. to fly in an airplane) or a precise object (e.g. dogs) (Hofstede, 2001). Uncertainty is not linked to probability, but risk is linked to probablility. Uncertainty refers to situations where everything could happen. As soon as uncertainty turns into a risk by becoming more concrete and precise and calculable, people lose their fear. Now it is the risk that can become the source for a negative feeling, now called anxiety. Dealing with this anxiety can be trained in routines like driving a motorbike or sporty activities like climbing montains (Hofstede, 2001). Routines are the basis to build up established practices in normal situations (see the checklist procedure of pilotes in airplanes before taking-off). More important routines help people to familiarize with critical incidents (e.g. fire or earthquake alarm) and to react in an appropriate, good-practice standard procedure in critical situations (e.g. Man-Over-Board training in off-shore sailing). This training of routines gives people, and particularly the employees, customers and the senior management of the organisation the certainty to react in the appropriate way in critical situations.

Eastern Approach of Dealing with Uncertainty

One of the pioneers in examining the intercultural differences between societies, the Dutch Geert Hofstede, was the first who defined uncertainty avoidance as one so-called cultural standards. Although his approach is critized as being related to the company IBM, as old-fashioned in its wording and in stereotyping the national cultures, the cultural dimension "uncertainty avoidance" is used also within other cultural theories.

The GLOBE study from 2004 elaborated nine cultural dimensions, one of them named also "uncertainty avoidance". In this study uncertainty avoidance is defined as "the extent to which a society, organization, or group relies on social norms, rules, and procedures to alleviate the unpredictability of future events" (House, 2004).

The Globe study differentiates between societies that have a high uncertainty avoidance orientation as Germanic cultures, who tend to prevent all sorts of uncertainty in private and business life. In comparison to the Arabian, Chinese and Latin American cultures that tend to be more relaxed towards uncertainty in life as well as in business. This positive attitude towards uncertainty in the Eastern cultures encourages to analyse how the different approaches to uncertainty could develop in the different cultures in the past centuries.

The concept of uncertainty in China is directly linked to "I Ging - Book of Changes", a 3,000 year old ancient text and the oldest and most important book of the Chinese classics, also called the "Chinese Bible". Its fundamental principle is the law of Changes which says that everything is always changing. Influenced by the observation of the course of nature the unknown authors of the I Ging detected that change follows a specific structure. The I Ging is a collection of 64 oracle signs and describes the 64 stages of change between Yin and Yang. In the course of the times the I Ging turned from an oracle book into the book of wisdom as it contains all stages of human life. In detecting the own situation in one of the signs the reader of the I Ging could derive his action and therefore master the specific situation (I Gin, 2006, p. 12). Translated for first time into a foreign language in 1924 by the German missioner R. Wilhelm he stated "what makes the system of thought of this book so interesting is the fact that it takes the fundamental principal from a primitive concept – without being primitive - and developed them

further, that is what we Europeans seem to have lost in the course of development." The I Ging had influence on several European philosophers like C.G. Jung and H. Hesse who used it as a guidebook.

The I Ging had a great influence on the two main Chinese philosophies, the Confucianism and the Taoism, both created around 500 BC in China. These two philosophical concepts still represent the basis of Chinese thinking until today. On the basis of the I Ging the Chinese developed a contrary approach in comparison to the Western concept of strategy making: the attitude to take a long view on an opportunity, to carefully observe the environment and the situation, and then to use the appropriate moment (Sun Tzu, 2010; Jullien, 2006).

To better understand the nature of change the Chinese started to observe the changes in nature as shown e.g. in the seasons. On this basis they derived a concept of the patterns of change. This was further developed into a general applicable concept, the so-called Five Elements. The Five Elements is a conceptual scheme developed in the first century to explain the interactions between phenomena. The Five Elements represent a good example for the Chinese approach to dealing with uncertainty by trying to understand the concept that stands behind the changes and deriving a general model. It finds its application in various fields like architecture or medicine which underline the universal concept of the model. It can be stated that the two thousand years of experience give the Chinese people a feeling of security in dealing with uncertainty.

In his "speech in front of managers about the effectiveness and efficiency in China and the West" Jullien describes this approach as thousands of years of experience of dealing with uncertainty, ambiguity, and risk (Jullien, 2006). He states the difference between the East and the West in the way that the ancient Greeks first defined a model, on this basis they defined an objective and then planned to realize the plan. First the model, then the realization of the model, which corresponds to the Western concept of a strong mind to create a plan followed by a strong will to realize this ideal. Whereas the Chinese general approach is to judge and assess a situation particularly concerning its potentials and then to determine what to do next. This approach is by far more variable as the situation can steadily change as well as the environmental factors and the goal that can be reached in the situation. This circumstantial Chinese approach is often misunderstood and misinterpreted by Westerners as being passive and without a specific objective (Jullien, 1999; Jullien, 2006).

As a consequence Qi states in his "Anbang Qi's reflections on David Hillson's Risk Doctor briefing" that Chinese project managers pay more attention to risk management in projects as projects in their nature are uncertain. They put more focus on reviews and the re-planning of the project. It is perceived as the main task of the project manager to manage the changes that originate from uncertainty in order to prevent that they become risks. In Chinese thinking it is the main task of a manager to turn bad external events into good, positive things (and vice versa). According to this idea, all project objectives, project scope, time, quality and cost, are modifiable in the course of the project process. Therefore it is the main task of a project manager to concentrate on the change management to cope with these modifications. In fact Qi states that a project manager should mainly focus on managing the uncertainties, changes and risks. In comparison to the certainties as they do not need to be managed (Qi, 2011).

A further competence in dealing with uncertainty that is more developed in the Eastern cultures than in the Western societies is the capability to cope with ambiguity. The ambivalence of the contrary and the dialectic of the thinking led to the well-developed ambiguity tolerance of the people in China but also in India. Chauhan shows in a study between managers in India and Fiji that the Indian managers demonstrated a higher level of tolerance of ambiguity and greater adaptability to deal with ambiguity and had a greater managerial effectiveness (Chauhan, 2014). First research started in 1995 by analysing

the correlation between managerial effectiveness and their level of tolerance of ambiguity (Furnham 1995). These findings could have relevance for human resource managers, particularly in designing training programs for project managers.

The Japanese equivalent to the ancient Greek principle of panta rhei is Hōjōki, an important work by Kamo no Chōmei. Written in 1212, it displays the Buddhist concept of impermanence through the description of various disasters that befall the people of Kyoto. Considered as a Japanese literary classic, the work is part of the Japanese school curriculum. The opening sentence of Hōjōki is famous as an expression of mujō, the transience of things:

The current of the flowing river does not cease, and yet the water is not the same water as before. The foam that floats on stagnant pools, now vanishing, now forming, never stays the same for long. So, too, it is with the people and dwellings of the world.

The similarity to the Greek concept of *penta rhei* and the picture of the river as symbol for change are striving. However it is wrong to derive from the flow of nature the acceptance of uncertainty in the case of the Japanese culture. Japan displays in this concern an exception in the Eastern cultures. Measured in the cultural dimension uncertainty avoidance, the majority of Japanese people show a very high tendency to avoid uncertain situations.

Indicators of this tendency can be seen in the life-long employment policy at the professional level (so-called "shuushin koyou"), in the long-term relationship networks between customer and suppliers (so-called "keiretsu") or in the transfer of employees to the suppliers or to subsidiaries (Berger, 2009). The Japanese society consists of a wide set of complex rules, formal structures and defined rituals in language, behaviour and values, with great impact on business and private life. The reasons for the creation of these strictly ritualized behaviours can only be assumed. Hypotheses say that it could lie in the local hostile environmental conditions like earthquakes, tsunamis and volcano eruptions that created over the centuries the feeling of fear and uncertainty in the people. To survive in this natural environment the people had to co-operate and build up networks to support each other.

However the success of the Japanese motor company Toyota in the competitive global automotive industry shows that it is possible to build up managerial effectiveness and strengths despite a high level of uncertainty avoidance in the national culture. In the 1990s the global benchmark study by the MIT published in the book "the machine that changed the world" (Womack, Jones, Ross 1991) showed the differences in the key performance indicators between the US-American, European and Japanese car manufacturers.

The deeper analysis of Toyota´s production and management system shows that the company´s management puts a lot of effort in its knowledge assets, the so-called Toyota "kata" (translated with "pattern" or "way of doing things"). The kata consist of a set of routines that are daily practiced to improve the corporate quality and efficiency and routines in the dialogue between manager and employee. Toyota´s management stresses the importance of the improvement kata routines for the firm's corporate development as they enable the continuous improvement process and knowledge creation by preserving efficiency and fostering creativity (Rother, 2009; Ichijo et al., 2006). The second element is the so-called "Coaching-Kata". As in sports or music practicing should be done under periodic observation and correction by an experienced coach, who spots old behavior and helps the learner to practice the desired behaviors. Without coaching the learner would not practice the right pattern, or practice ineffectively.

Without coaching, a change of mindset is unlikely to occur. Toyota developed the Coaching Kata is a practice routine for teaching the scientific working patterns like its Improvement Kata (Rother, 2009).

The two katas of Toyota are symbols of the high level of uncertainty avoidance in the Japanese culture. However in comparison to the standardization of the business processes of the Western companies who aim as well to manage the uncertainty in their operations, Toyota developed an approach of standardized routines in solving the daily problems in business operations and in coaching its employees. With these two routines Toyota established a strong organizational culture of improvement, adaptiveness and innovation. With that Toyota built an ongoing, sustainable process of developing scientific skills and mindsets in their people, through the work itself.

Referring to the model of routines to cope with uncertainty it seems that Toyota build a successful approach to turn its cultural weakness of uncertainty avoidance into corporate strengths. By continuously optimizing its two kata routines Toyota developed a unique strategy of leading the employees and solving problems. Since 2008 Toyota is the biggest car manufacturer worldwide in terms of volume and turnover.

This chapter showed that uncertainty is interpreted in Western societies as a lack of security which causes fear. Routines to teach people how to deal with calculable risks and give people the feeling of certainty. In comparison the eastern cultures perceive uncertainty as part of life and therefore developed an attitude and specific strategies to cope with it.

CURRENT TRENDS OF UNCERTAINTY MANAGEMENT IN BUSINESS

The last 15 years since the late 1990s are characterized by the sudden decline of large established companies like Kodak, Nokia or Sony. These multinational corporations failed although they managed their business with all up-to date management tools. Reason for their failure is the sudden success of the so-called "disruptive innovations" of new high-tech products like the digital camera, the smartphone or the MP3 player (Christensen, 2011). A disruptive innovation creates a new need and disrupts the existing market by displacing the earlier technology. These are products or services that the market does not expect. In many cases the disruptive innovations derive from new competitors like Apple or LG or start-up companies that inhabit different internal value networks.

This unexpected success of the disruptive innovations increases the level of uncertainty in the business world. The management style and techniques of the 20th century seem to have reached their limits. The new type of manager that is able to cope with these new uncertainties is the entrepreneur who intuitively applies a new of way of thinking.

Sarasvathy interviewed 27 entrepreneurs and let them solve cases. In this research he detected a new business approach that he called effectuation. Effectuation is a way of thinking that supports the process of opportunity identification and new venture creation. It includes decision-making principles that these entrepreneurs employ in situations of uncertainty, whereas causal reasoning is used when the future is predictable. He defined the following principles of effectuation that are:

- Entrepreneurs start with what they have. They look at who they are, what they know and who they know. They look at the 3F's friends, family and fools. From this point they look at their abilities. The entrepreneur does not start with a given goal, but with the tools he or she has.
- An entrepreneur does not focus on possible profits, but on the possible losses and how to minimize the loss.

- Entrepreneurs cooperate with parties they can trust. These parties can limit the affordable loss by giving pre-commitment.
- Entrepreneurs look at how to leverage contingencies. Surprises are not necessarily seen as something bad, but as opportunities to find new markets.
- Here all the previous principles are put together. The future cannot be predicted, but the entrepreneur tries to control some of the factors which determine the future (Savasvathy 2001).

It can be stated that the key competence of this new type of entrepreneur is the competence to cope with uncertainty in the way that they seek for the opportunities in situations and have a stepwise, flexible, resource-based, loss-reducing approach. These principles are similar to the attitude of Chinese management described above.

CALL FOR NEW COMPETENCES IN RISK MANAGEMENT

Since the 1980s, a change in dealing with uncertainty is taking shape in the Western societies. Uncertainty is emerging in a new form in those areas where the strategy of elimination of uncertainty had been eminently successful in the past.

Increasingly complex and interconnected technological systems give rise to new imponderabilities due to a great number of internal and external influence factors that are not completely predictable and controllable (Böhle & Rose, 1992; Pfeiffer, 2007; Weyer & Grote, 2012). New models of organization, particularly the decentralization of enterprises, not only lead to a heightened flexibility but also boost the internal dynamics and self-organization. Moreover, with the expansion of services the interface between organization and market becomes fluent, there is a blurring of boundaries and imponderabilities originating from market and customer relations are imported into the organization (Heidling, 2011). Particularly service work with direct contact to customers implies fundamental uncertainties, much more so than production and administration work (Böhle, 2011; Dunkel & Weihrich, 2012).

These trends are apparent in project work as a whole: the more projects differ from a reproduction of the known, in terms of their contents and targets, their procedures, their personal and material resources, their participating partners and the preconditions of their environment and application, the more uncertainty becomes a substantial parameter of project work (Løwendahl, 1995; Shenhar & Dvir, 1996; De Meyer et al., 2002; Sommer & Loch, 2004; Söderlund, 2011). The methods of planning and measurement to evaluate the results seem to be successful if the targets, procedures and the end product can be defined exactly in advance, before the project starts. However, the projects are often very different from its planning because the projects turn out to be much more complex, unpredictable and multidimensional than its planning (Winter et al., 2006). The differences between planning and the realization are most apparent if the project targets are only roughly defined, if the project results are not material artifacts but rather concepts or models comprising different variations, if the measurement of project success has qualitative criteria, and if partners from different cultures participate in the project whose cooperation has to be established mainly by discursive procedures (Atkinson et al., 2006). In these projects, the project management is challenged to develop adequate management forms for dealing with the information gaps and the participants' different points of view and interpretations. Project management prefers the dimension of risk ("known unknowns") to the dimension of uncertainty ("unknown unknowns"). This

is often accompanied by an intermingling of the two dimensions, both in project management textbooks and in the project managers' practical action (Lechler, 2013). An important consequence is: since risks are mostly connected to negative outcomes, the positive potential of uncertainties is often neglected (Lechler, 2013). More critical objections to the formally oriented methods of risk management are linked to this observation.

- Because of its strong affinity to planning, project management tends to lean towards routines (risk identification and analysis, monitoring, control) (Geraldi et al., 2010).
- Standardized routines of planning are strongly tied to states known from the past in their scenario drafts, which reduces their prognostic value ("future outcomes as statistical shadows of the past" (Sanderson, 2012, p. 435)).
- Reflexive modes of action are insufficiently developed on the project participants, although these modes of action are especially able to improve the coping with uncertain situations in the course of the project (Perminova, 2007).

Empirical research has shown that purposeful utilization of uncertainty during the implementation of projects can contribute to an enhancement in value compared to the original planning. According to the results, project managers who are able to differentiate between risk and uncertainty will also be capable to identify such positive potentials in projects with a higher probability (Lechler, 2013). In order to make use of these potentials, especially context-related competencies and correspondent problem-oriented modes of action are of vital significance (Lechler et al., 2013; Perminova et al., 2008; Söderholm, 2008; Jaafari, 2003).

Analyses of project managers show that those being capable to integrate the diverse perspectives into their project conception, repeatedly establish shared viewpoints of all project participants in the different stages of the project, "read" situations occurring in the course of the project, deal with the respective preconditions of the political environment, and develop qualitative valuation standards are those to complement the conventional quantitative ones (Winter et al., 2006; Atkinson et al., 2006; Pollack, 2007). In this context a fundamental change of perspectives in project management is called for: from the common "triple constraint management" to a "business value optimization" (Lechler et al., 2013, p. 102).

Empirical findings come from several research projects about the work action of project leaders and project team members (Böhle, 2013; Heidling, 2012; Meil et al., 2004). The statements of the project members (mechanical engineers, electrical engineers) were gathered in two research projects conducted between 2008 and 2015. Among others, the research projects also covered two small and medium-size enterprises in Germany. These SMEs are producing technological goods and services in joint projects with big companies from plant engineering, iron and steel industry, automotive industry and aerospace industry. The empirical results were gained with methods of qualitative social research, with the concept of experience-based action as heuristic instrument. 35 guideline-based qualitative interviews were conducted in addition to several feedback workshops and group discussions.

According to this research project actors are able to cope with uncertainties by means of an experience-based subjectifying mode of action (as opposed to a planned objectifying mode of action). Experience-based subjectifying work action includes the following four dimensions and is illustrated by citations of project managers participating in the reseach (Böhle, 2009; Böhle, 2013):

1. *Dialogical-exploratory proceeding* makes it possible to gradually feel one's way and make discoveries within the concrete work process. "In the best case you can just set project milestones [...]. In our case where specific physical conditions must be reached no other proceeding would be possible. There are so many little side conditions that nobody can foresee in advance, no chance".
2. This is accompanied by an *associative metaphorical thinking*: an event evokes associations, images and ideas that show the way to new solutions. "I see it as in a film" or "I not only go through it in my thought, but I put myself in the situation and see things from this perspective"
3. A kind of *sensual perception* related to feeling and sensation permits to integrate sensory impressions as noise, vibrations, atmospheres and moods into the processing of information. This perception comprises all senses and also includes physical sensations: "[...] you have your idea how the production should run. Basically all business processes are the same in all companies, but every company is a little different. This you mus see. You must smell the specific procedures in a company".
4. Finally, a specific *relation to environment* characterized by closeness, attachment and unity. The central feature is the ‚joint action' which includes co-operation with or referring to material objects: "there is a meeting every morning at 9 a.m. No tools. Just: what was finished yesterday? What new problems appeared? There is technical discussion. [...] No specific scheme. The discussion is defined by the previous day – what was good, what was bad, what needs improvement? [...] This works well for me as I can handle the situation. This is in my head. There is nothing to cross in a paper, no list to check. Just on the basis of the situation which we try to handle".

As a complement to planned rational action which is suitable for successful use in foreseeable tasks, experience-based subjectifying action is particularly suited to deal with unforeseeable situations. This does not mean that the model of instrumental planned rational action is invalidated, but should be complemented by the experience-based subjectifying action.

The authors' empirical findings show that an important competency of successful project leaders is to "see the picture" of the course and results of the project and to "foresee the developments". They typically remark that they "see it like a movie running" or that they "not only play it through in thought but really get immersed in the situation". If customers' requests change during the project, they don't see this as a disturbing factor; they rather say that this is the "nature of things". They have the attitude that what is really needed or suited is often not known beforehand but will transpire in the course of the practical execution of the project. They do not classify deviations from the original project target *per se* as a lack of reliability or deficiency of planning, rather they will check whether there are also positive effects of it. This may refer to the contents but also to the temporal and the financial aspects. Of course, this is never a carte blanche for desultoriness or arbitrariness. Project success can be met by means of conventional planned action, but they may require other procedures and competencies, as shown above (Meil et al., 2004; Heidling, 2012; Pander, 2010; Pommeranz, 2011).

SUMMARY

The aim of management is to build and keep stability in the organisation and herewith to overcome uncertainty. This is done by objectives, standarized procedures and control, which is also applied in project management. The concept of planning and standardization is based on past experience however

it reaches its limits by coping with uncertainties in projects. The focus on planning and controlling prevents flexibility to handle the changing circumstances in the course projects which lead to uncertainty. These uncertainties demand for a new type of project manager who not only sees the risks but also the opportunities that derive from uncertainty which demands for a new attitude towards uncertainty.

Project managers are not educated in differentiating uncertainty from risk, neither in using uncertainty and turning it into a project benefit and herewith to increase the project value.

A retrospective view to Aristotle knowledge areas shows that he distiguished between the three main knowledge areas: *episteme* (know why), *techné* (know how) and *phrónesis* (practical knowledge). Where the first two built the basis for today´s education in social, technical and natural sciences, the third competence was neglected in the Western societies. The destruction of the old certainties through the modern industrial societies led to the focus on rationality in mastering the nature and therefore recreating the feeling of certainty.

In comparison to the Eastern cultures that remained in their tradition of coping with uncertainty by accepting the principle of continuous change, observing it and creating a general applicable model of change. Both the Chinese and the Indian societies developed cultural strategies that lead to an uncertainty accepting attitude. Whereas the Japanese society shows high uncertainty avoidance tendency which in the case of the motor company Toyota led to a management routine-based corporate culture of problem solution and continuous improvement.

The rapid technological change of the last 20 years caused by the fast success of disruptive innovations lead to the search for a new entrepreneurial management style that is able to cope with change. This new competence called effectuation enables to deal with uncertainties by seeing the opportunities and approaching them step-wise. This proceeding is similar to the Chinese management tradition.

According to the findings of the authors experience-based subjectifying work proves to be an important strategy for dealing with uncertainty in projects. The four aspects are: dialogical-exploratory proceeding, associative metaphorical thinking, sensual perception and relation to environment. This experience-based subjectifying work competence can be compared with the third traditional Aristotelian competence *phrónesis* (practical knowledge), which was neglected in the Western societies in last centuries.

The authors demand for a holistic approach to deal with uncertainty by referring to strengthening the practical capabilities of awareness, intuition, perception of weak signals and associated intuitive thinking. These capabilities could be interpreted as the third competence category *phrónesis* and should have high relevance for the selection of personnel in project management and designing training programs for project managers.

REFERENCES

Aristotle, . (2006). Fundamental uncertainties in projects and the scope of project management. *International Journal of Project Management*, *24*(8), 687–698. doi:10.1016/j.ijproman.2006.09.011

Böhle, F. (2009). Weder rationale Reflexion noch präreflexive Praktik. Erfahrungsgeleitet-subjektivierendes Handeln. In F. Böhle & M. Weihrich (Eds.), *Handeln unter Unsicherheit* (pp. 203–230). Wiesbaden: VS Verlag. doi:10.1007/978-3-531-91674-3_13

Böhle, F. (2011). Management der Ungewissheit – ein blinder Fleck bei der Förderung von Innovationen. In S. Jeschke (Ed.), *Enabling Innovation* (pp. 17–30). Berlin: Springer. doi:10.1007/978-3-642-24299-1_2

Böhle, F. (2013). Projektmanagement und Projektarbeit mit Ungewissheit. In A. Wald, T.-L. Mayer, R. Wagner, & C. Schneider (Eds.), Komplexität. Dynamik. Unsicherheit. Advanced Project Management (Vol. 3). GPM Deutsche Gesellschaft für Projektmanagement e.V., Nürnberg.

Böhle, F., & Busch, S. (2012). *Management von Ungewissheit – neue Ansätze jenseits von Kontrolle und Ohnmacht.* Transcript. doi:10.14361/transcript.9783839417232

Böhle, F., & Rose, H. (1992). *Technik und Erfahrung - Arbeit in hochautomatisierten Systemen.* Campus.

Bonß, W. (2010). (Un-)Sicherheit als Problem der Moderne. In H. Münkler, M. Bohlender, S. Meurer (Eds.), Handeln unter Risiko. Bielefeld: Transcript.

Cantarelli, C. C., Flyvbjerg, B., Molin, E. J. E., & van Wee, B. (2010). Cost Overruns in Large-Scale Transportation Infrastructure Projects: Explanations and Their Theoretical Embeddedness. *European Journal of Transport and Infrastructure Research*, *10*(1), 5–18.

Chauhan, V., Pathak, D., & van Gramberg. (2014). Managerial Effectiveness as a Function of Culture and Tolerance of Ambiguity: A Cross-Cultural Study of India and Fiji. *International Employment Relations Review, 15*(8), 73-92

Christensen, C. (2011). *The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business*. Harper Business. doi:10.15358/9783800642816

Cicmil, S., Williams, T., Thomas, J., & Hodgson, D. (2006). Rethinking Project Managment: Researching the actuality of projects. *International Journal of Project Management*, *24*(8), 675–686. doi:10.1016/j.ijproman.2006.08.006

Cleden, D. (2012). *Managing Project Uncertainty*. Gower Publishing.

Dalcher, D. (2014). Managing Project Uncertainty. In Advances in Project Management: Narrated Journeys in Unchartered Territory. Academic Press.

De Bakker, K., Boonstra, A., & Wortmann, H. (2011). Risk Management affecting IS/IT project success through communicative action. *Project Management Journal*, *42*(2), 60–67.

De Meyer, A., Loch, C.H. & Pich, M.T. (2002, Winter). Managing Project Uncertainty: From Variation to Chaos. *MIT Sloan Management Review*, 60-67.

Dunkel, W., & Weihrich, M. (Eds.). (2012). *Interaktive Arbeit. Theorie, Praxis und Gestaltung von Dienstleistungsbeziehungen*. Wiesbaden: Springer VS. doi:10.1007/978-3-531-19359-5

Dvir, D., Lipovetsky, S., Shenhar, A., & Tishler, A. (1998). In search of project classification: A non-universal approach to project success factors. *Research Policy*, *27*(9), 915–935. doi:10.1016/S0048-7333(98)00085-7

Eikeland, O. (2008). *The ways of Aristotle: Aristotelian phronesis, Aristotelian philosophy of dialogue, and action research.* Bern: Peter Lang.

Engwall, M. (2003). No project is an island: Linking projects to history and context. *Research Policy*, *32*(5), 789–808. doi:10.1016/S0048-7333(02)00088-4

Flyvbjerg, B. (2001). Making Social Science Matter: Why social inquiry fails and how it can succeed again. Cambridge.

Flyvbjerg, B. (2004). Phronetic Planning Research: Theoretical and Methodological Reflections. *Planning Theory & Practice*, *5*(3), 283–306. doi:10.1080/1464935042000250195

Furnham, A., & Ribchester, T. (1995). Tolerance of ambiguity: A review of the concept, its measurement and applications. *Current Psychology (New Brunswick, N.J.)*, *14*(3), 179–199. doi:10.1007/BF02686907

Geraldi, J. G., Lee-Kelly, L., & Kutsch, E. (2010). The Titanic sunk, so what? Project manager's response to unexpected events. *International Journal of Project Management*, *28*(6), 547–558. doi:10.1016/j.ijproman.2009.10.008

Giddens, A. (1995). Konsequenzen der Moderne. Frankfurt/Main: Suhrkamp.

Heidling, E. (2011). Strategische Netzwerke. In J. Weyer (Ed.), *Soziale Netzwerke* (pp. 135–165). München: Oldenbourg.

Heidling, E. (2012). Management des Informellen durch situatives Projektmanagement. In F. Böhle, M. Bürgermeister, & S. Porschen (Eds.), *Innovation durch Management des Informellen* (pp. 69–114). Berlin: Springer. doi:10.1007/978-3-642-24341-7_5

Hofstede, G., & Hofstede, G. J. (2005). *Cultures and Organizations: Software of the Mind*. McGraw-Hill.

House, R., Hanges, P., Javidan, M., Dorfman, P., & Gupta, V. (2004). *Culture, Leadership and Organization*. Thousand Oaks, CA: Sage Publications.

Ichijo, K., & Nonaka, I. (2006). *Knowledge Creation and Management: New Challenges for Managers*. Oxford University Press.

IHK. (2009). Restrukturierung in Japan: Ungeahnte Freiheiten für ausländische Unternehmen. Tokyo: IHK.

Jaafari, A. (2003). Project Management in the Age of Complexity and Change. *Project Management Journal*, *34*(4), 47–57.

Joas, H., & Knöbl, W. (2004). Sozialtheorie. Frankfurt/Main: Suhrkamp.

Jullien, F. (1999). *Über die Wirksamkeit*. Berlin: Merve Verlag.

Jullien, F. (2006). *Vortrag vor Managern über Wirksamkeit und Effizienz in China und im Westen*. Berlin: Merve Verlag.

Keynes, J. M. (1936/1973). *The General Theory of Empoyment, Interest and Money. Cam-bridge*. Macmillan Cambridge University Press.

Keynes, J. M. (1937). The General Theory of Empoyment. *The Quarterly Journal of Economics*, *51*(2), 209–223. doi:10.2307/1882087

Knight, F. H. (1921/1964). *Risk, Uncertainty and Profit*. New York: Sentry Press.

Lechler, T., Edington, B. H., & Gao, T. (2012). Challenging Classic Project Man-agement: Turning Project Uncertainties into Business Opportunities. *Special Issue: PMI Research and Education Conference*, *43*(6), 59–69.

Lechler, T., Gao, T., & Edington, B. (2013). *The Silver Lining of Project Uncertainties. Newton Square*. Project Management Institute.

Lehtiranta, L. (2014). Risk perceptions and approaches in multi-organizations: A research review 2000–2012. *International Journal of Project Management*, *32*(4), 640–653. doi:10.1016/j.ijproman.2013.09.002

Longman, A., & Mullins, J. (2004). Project management: Key tool for implementing strategy. *The Journal of Business Strategy*, *25*(5), 54–60. doi:10.1108/02756660410558942

Løwendahl, B. (1995). Organizing the Lillehammer Olympic winter games. *Scandinavian Journal of Management*, *11*(4), 347–362. doi:10.1016/0956-5221(95)00034-S

Lupton, D. (1999). *The Risk*. London: Routledge.

Meil, P., Heidling, E., & Rose, H. (2004). Erfahrungsgeleitetes Arbeiten bei verteilter Arbeit. In F. Böhle, S. Pfeiffer, & N. Sevsay-Tegethoff (Eds.), *Die Bewältigung des Unplanbaren - Fachübergreifendes erfahrungsgeleitetes Arbeiten und Lernen* (pp. 180–198). Wiesbaden: VS Verlag. doi:10.1007/978-3-322-80597-3_8

Nassehi, A. (2006). Der soziologische Diskurs der Moderne. Frankfurt/Main: Suhrkamp.

Neumer, J. (2009). *Neue Forschungsansätze im Umgang mit Unsicherheit und Ungewissheit in Arbeit und Organisation - Zwischen Beherrschung und Ohnmacht. Expertise im Rahmen des Projekts "International Monitoring" im Aktionsfeld "Management der Ungewissheit"*. IMA/ZLW & IfU, RWTH Aachen University. Retrieved from http://www.internationalmonitoring.com/fileadmin/Downloads/Experten/Expertisen/Expertisen_neu/Expertise_Neumer.pdf

Pander, S. (2010). Der Netzwerkmanager – neue Anforderungen und Kompetenzen in produktionsnahen Dienstleistungsnetzwerken. In E. Heidling, F. Böhle, & T. Habler (Eds.), Produktion mit Dienstleistungen. München/Mering: Hampp.

Perminova, O., Gustafsson, M., & Wikström, K. (2008). Defining uncertainty in Projects – a new perspective. *International Journal of Project Management*, *26*(1), 73–79. doi:10.1016/j.ijproman.2007.08.005

Pfeiffer, S. (2007). *Montage und Erfahrung – Warum Ganzheitliche Produktionssysteme menschliches Arbeitsvermögen brauchen*. München/Mering: Hampp.

Pinto, J. K. (2007). *Project management: achieving competitive advantage*. Pearson/Prentice Hall.

Pollack, J. (2007). The changing paradigms of project management. *International Journal of Project Management*, *25*(3), 266–274. doi:10.1016/j.ijproman.2006.08.002

Pommeranz, I. (2011). *Komplexitätsbewältigung im Multiprojektmanagement. Die Handlungsperspektive der Multiprojektarbeiter*. Dissertation an der Universität Augsburg.

Qi, A. (2011). Anbang Qi's reflections on David Hillson's Risk Doctor briefing. *Journal of Project, Program & Portfolio Management*, *2*(1).

Rother, M. (2009). *Die Kata des Weltmarktführers: Toyotas Erfolgsmethoden*. Campus Verlag.

Sanderson, J. (2012). Risk, uncertainty and governance in megaprojects: A critical discussion of alternative explanations. *International Journal of Project Management*, *30*(4), 432–443. doi:10.1016/j.ijproman.2011.11.002

Sarasvathy, S. (2009). *Effectuation: Elements of Entrepreneurial Expertise*. Edward Elgar Publishing.

Scheurer, S. & Ribeiro, M. (2012). Projektmanagement unter Unsicherheit – Die tägliche Herausforderung im Projekt. *Projektmanagement aktuell*, *2012*(1), 27-31.

Shenhar, A., & Dvir, D. (1996). Toward a typological theory of project management. *Research Policy*, *25*(4), 607–632. doi:10.1016/0048-7333(95)00877-2

Söderholm, A. (2008). Project management of unexpected events. *International Journal of Project Management*, *26*(1), 80–86. doi:10.1016/j.ijproman.2007.08.016

Söderlund, J. (2011). Pluralism in Project Management: Navigating the Crossroads of Specialization and Fragmentation. *International Journal of Management Reviews*, *13*(2), 153–176. doi:10.1111/j.1468-2370.2010.00290.x

Sommer, S., & Loch, C. (2004). Selectionism and learning in projects with complexity and unforeseeable uncertainty. *Management Science*, *50*(10), 1334–1347. doi:10.1287/mnsc.1040.0274

Sun, T. (2010). *The Art of War*. Academic Press.

Sydow, J., & Müller-Seitz, G. (2009). Strategien, Projekte und Praktiken – Eine Praxisperspektive auf strategisches Projektmanagement. In R. Wagner (Eds.), Projekt als Strategie – Strategie als Projekt. Nürnberg: GPM Deutsche Gesellschaft für Projektmanagement e.V.

Thamhain, H. (2013). Managing Risks in Complex Projects. *Project Management Journal*, *44*(2), 20–35. doi:10.1002/pmj.21325

Toulmin, S. (1990). *Cosmopolis: The hidden agenda of Modernity*. Chicago Press.

Wang, A. (1954). *Cosmology and Political Culture in China*. Cambridge Studies.

Weber, M. (1988). Wissenschaft als Beruf. In M. Weber (Ed.), *Gesammelte Aufsätze zur Wissenschaftslehre* (pp. 582–613). Tübingen: Mohr-Siebeck. (Original work published 1919)

Wehling, P. (1992). Die Moderne als Sozialmythos. Zur Kritik sozialwissenschaftlicher Modernisierungstheorien. Frankfurt/Main u. a.: Campus Verlag.

Wehling, P. (2006). Der Umgang mit Nichtwissen. In H. Wichmann, H. Schlipköter, & G. Fülgraff (Eds.), Handbuch der Umweltmedizin. Landsberg: eco-med.

Weyer, J., & Grote, G. (2012). Grenzen technischer Sicherheit – Governance durch Technik, Organisation und Mensch. In F. Böhle & S. Busch (Eds.), Management von Ungewissheit. Bielefeld: transcript, pp. 189-2012.

Winter, M., Smith, C., Morris, P., & Cicmil, S. (2006). Directions for future research in project management: The main findings of a UK government-funded research network. *International Journal of Project Management*, *24*(8), 638–649. doi:10.1016/j.ijproman.2006.08.009

Zhang, H. (2011). Two Schools of Risk Analysis: A Review of Past Research on Pro-ject Risk. *Project Management Journal*, *42*(4), 5–18. doi:10.1002/pmj.20250

Zhang, Y., & Fan, Z.-P. (2014). An optimization method for selecting project risk response strategies. *International Journal of Project Management*, *32*(3), 412–422. doi:10.1016/j.ijproman.2013.06.006

KEY TERMS AND DEFINITIONS

Episteme: Means "to know" in ancient Greek. It is related to the scientific knowledge and is universal, invariable, context-independent and based on general analytical rationality.

Opportunity: Events, circumstances, situations or conditions that might occur in the course of a project and have a favorable or advantageous impact on a project.

Opportunity Management: The identification, analysis, assessment, planning, monitoring and controlling of opportunites related to a project.

Phrónēsis: Ancient Greek, can be translated with practical wisdom, judgement, or the virtue of practical thought.

Risk: Events, circumstances, situations or conditions that might occur with a specific probability and have a potential negative impact on meeting the predefined project objectives. Risks are to be separated from uncertainty if they are measurable, calculable and predictable.

Risk Management: The identification, analysis, assessment, planning, monitoring and controlling of risks related to a project. Risk management limits the impact of the unexpected events and prevents these events from happening. It is generally assumed that risk management contributes to the success of an undertaking.

Techne: The ancient Greek word for craftsmanship, or technical skills. It is the set of principles or rational methods involved in the production of an object or the accomplishment of an end.

Uncertainty: All unknown or unexpected situations with a potential significant impact on the project. Uncertainties are unknown, not foreseeable and not predictable with the existing set of tools and instruments. Uncertainty has no scientific basis to calculate its probability.

Unknown Unknowns: The not identified facts that a person is not aware of not knowing.