Decision making in dynamic contexts: A dual perspective approach

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ABSTRACT

In this paper decision-making methodologies will be described with the help of two books; D. Kahneman – Thinking: Fast & Slow and J. Jaworski – Source, the inner path of knowledge creation. The biases will be extracted from these books to deal with decision-making in uncertain environments in which organization have an inherent need to adapt and be agile. The adaptive cycle of resilience will be used to linked with the two books, which will show where the two books can be applied within the adaptive cycle. Also the two book will be matched within the collaborative networks and virtual organizations.

1. INTRODUCTION

Decision making is something everyone engages in everyday of his life. From trivial decisions as what to have for breakfast, to decisions that influence the fate of an entire organization. It is therefore no surprise that decision making has been studied extensively in the past, ranging from general decision making theory (Edwards, 1954), ethical decision making theory (Trevino, 1986) and more recently towards decision making in more uncertain environments (Busemeyer & Townsend, 1993). What becomes clear after delving into the decision making research field is making the right decisions is far from a flawless process . In a managerial context decision making is just as flawed, as emotions and overdependence on tacit knowledge are influencing the process. Intuitive decision making has been an accepted managerial practice although it is increasingly being disputed (Sayegh, Anthony & Perrewe, 2004; Miller & Ireland, 2005). A subfield of this research field has been given to the biases and flaws in the decision making process and raises awareness of those flaws (Hammond, Keeny & Raiffa, 1998; Kahneman, 2011; De Martino, Kumaran, Seymour & Doylan, 2006). Especially in times of crisis and uncertainty intuitive decision making takes the forefront. We consider an environment uncertain when (1) there is a lack of information regarding the environmental factors associated with a given decision making situation, (2) when it is not possible to know the outcome of a specific decision in terms of how much the organization would lose if the decision were incorrect, and finally (3) inability to assign probabilities with any degree of confidence with regard to how environmental factors are going to affect the success or failure of an organization (Duncan, 1972).

Given the difficulty of decision making in uncertain environments this research aims to answer the following question:

How do decision making biases and heuristics affect organizational strategic decisions in dynamic environments?

To answer the research question we utilize the following approach. First we will look at two important works on the topic of problem solving and decision making biases, namely Kahneman's *Thinking, fast and slow* (2011) and Jaworski's *Source* (2012). From these works we will extract biases concerning decision making and possible methodologies to deal with decision making in uncertain environments in which organizations have an inherent need to adapt and be agile. Both works approach decision making from a slightly different perspective. Then we will look at the *adaptive cycle of resilience,* which is an analytic model used to analyze organizations that go through different stages, including uncertainty. Then we will look at another common concept in uncertain environments, collaborative networks and virtual organizations, and we will project the lessons learned from Kahneman and Jaworski on the topic. The paper will conclude with a discussion and with a conclusion.

2. LITERATURE REVIEW

2.1 Thinking, fast and slow

One of the cornerstones of this research and main motivations is the book *Thinking, fast and slow* by Daniel Kahneman (2011). In this book he reflects on his academic career and through personal anecdotes he elaborates on our cognitive biases. Kahneman not only creates his own framework of what according to him are the two systems at play when humans make decisions, but also gives numerous examples of biases and heuristics at work. The message that Kahneman wishes to convey is that we as humans are too confident in the quality of our own decisions and that we should pay attention to try and avoid the pitfalls that are caused by the way of thinking that is embedded in our brains.

Kahneman's framework is based on the notion of two different systems of thought people use when thinking. On every occasion the brain shifts between fast thinking (from now on System 1) and slow thinking (from now on System 2). System 1 is an intuitive response to the surroundings and sensory input based on mental conventions both learned and natural, and cannot be turned off. System 2 however is a deliberate effortful thought process that normally runs in low priority mode, is able to make limited computations, and monitors the person's behavior. These two systems work together as System 1 triggers System 2, while System 2 is able to program System 1 with a task set of overriding instructions. Conflicts may arise when System 2 programs System 1 but the tasks of both systems are contradicting, for example in a winter driving course you are trained to steer into a skid, while your intuition tells you to do the opposite. Kahneman warns us that we should compromise in our vigilance of the two systems' shortcomings and be wary when stakes are high.

While System 1 can only do simple relations and not statistics, System 2 is able to follow rules, make comparisons and choices, but at a price and to a limited capacity. When your System 2 activates this takes a lot of effort. You will experience 'blindness' or lack of attention during mental sprints as will your pupils dilate. Your brain works very economical and subscribes to the law of least effort, which biases your mental processes toward the easiest or most obvious decisions. Skill and talent may release mental effort, but investing in skill development is also selective. Mental efforts may be compounded by switching between tasks or time pressure, so our brain prefers to take its time and utilize its long term memory to avoid mental effort. Avoiding mental effort opens us op to biases. System 1 jumps to a conclusion if it saves time and effort, is likely to be right, and mistakes are not too harmful, which is risky with uncertainty, high stakes and little time.

2.1.1 Heuristics and Biases

Kahneman goes further by exposing the biases and heuristics (rules of thumb of the mind) that system 1 and 2 are subject to. He begins with the law of small numbers. System 1 tends to automatically assign causal relations and neglects statistics; it tends to see patterns in randomness.

He then continues with the *the anchoring effect*, which constitutes that when we are presented with a particular value (anchor) for an unknown value we stay closer to that first value when actually estimating the unknown value. Anchoring evolves from an adjustment process by System 2 and a priming effect in System 1. The adjustment process is the premature conclusion of an iterative estimation of a value, whereas the priming effect is System 1's tendency to find compatible evidence for a suggestion. This is related to *framing effects* which are the unjustified influence of formulation on beliefs and preferences (De Martino et al, 2006).

Risk perceptions are also subject to bias. Perceptions of risk are affected by availability, for example after disasters people increase insurance and always prepare for the worst scenario to witness but no worse. This is also an example of an affect heuristic of making decisions informed by emotions. Contrary to emotions, the brain also has trouble dealing with statistics. An automatic activity of System 1 is to activate any association with a stereotype, even in the face of contradictory odds.This representativeness heuristic tends to neglect common statistics and the quality of any evidence provided. Enhanced System 2 activity aids to increase predictive accuracy to overcome the automatic process of System 1

2.1.2 Illusions & Fallacies

The final relevant part of the book is about illusions and fallacies. Kahneman refers to the book of Taleb (2010), *The Black Swan*, to describe how flawed stories of the past shape our views of the world and our expectations for the future by using the notion of narrative fallacy. Narrative fallacies arise from people's continuous attempt to make sense of the world. Explanatory stories that people find compelling are simple and concrete stories that assign a larger role to intentions, talent and a few events that happened. This leads to the illusion of understanding that we understand the past, which would also imply that the future should be knowable, but in fact we understand the past less than we believe we do.

Another illusion is the *illusion of validity*. The illusion of validity is a cognitive illusion where we think we are measuring phenomenon A, thinking it holds valid predictive power for phenomenon B, while this is not the case. Someone can have high confidence in the validity, but this subjective judgment does not positively influence the probability that this judgment is correct. Yet another illusion is the *Illusion of Skill*. The stock market industry is one that seems to be built on the illusion of skill. An interesting conclusion of a study was that the most active traders yielded the poorest results while the least active trader had the best. Kahneman reasons that cognitive illusions can be more stubborn than visual illusions and that the illusions of validity and skill are supported by a powerful professional culture.

As mentioned before, people need to be careful when it comes to statistics. People tend to overestimate their own insights even when the statistics are pointing in the other direction. Statistical algorithms are better predictors than experts. Experts are generally inferior to algorithms because experts try to think outside the box, try to be clever and consider complex combinations of features in making predictions. While this may work from time to time, but in general this reduces validity. While algorithms and formulas can be very helpful, there is still a certain hostility towards them because humans have a natural tendency to prefer the judgments of human experts, especially when the decisions or diagnoses come with consequences, such as surgery or not being accepted into an institution.

However, there are also occasions on which expert intuition is a trustworthy skill. As said before, the confidence people have in their intuitions is not representative for the validity. So when can expert intuitions be trustworthy? It can be trustworthy when there is an environment that is sufficiently regular to be predictable. The second is when it is possible to learn these regularities of the environment through prolonged practice. In a less regular (low validity environment), the heuristics of judgment (see part 2) are invoked once again, meaning that system 1 is often able to produce quick answers to difficult questions by substitution and in turn creates coherence where none can be found. The answer that is generated by system 1 is however not the answer to the original question but the answer to a simpler one. Another important fallacy that is important for management is about forecasting and planning.

Forecasts about the outcome of projects are mostly too optimistic. The Planning Fallacy: plans and forecasts that are unrealistically close to best-case scenarios, and/or could be improved by consulting the statistics of similar cases. The planning fallacy is only one of the manifestations of a pervasive optimistic bias. Some people are naturally more optimistic than others. Ultimately, an important bias is the endowment effect: people ascribe more value to things merely because they own them. This is illustrated by the fact that people will pay more to retain something they own than to obtain something owned by someone else—even when there is no cause for attachment, or even if the item was only obtained minutes ago. This is also related to the infamous sunk-cost fallacy, where companies are unable to let go of past investments while it is the rational choice, because they have already invested in them.

2.2 Jaworski – Source, the inner path to knowledge creation

The second main work about decision making of this research is Joseph Jaworski's *Source the inner path to knowledge creation*

(2012). This book exhibits parallels to the system 1 of Kahneman. Jaworksi described how he experienced the Source and also uses the U theory, which will be used to connect with the adaptive cycle.

The 'Source' is the story of Joseph Jaworski's fifty-year journey through the wilder sides of science and metaphysics, drawn by the promise of the illusive 'Source', once he experienced as a very young man and never forgotten.

Jaworski describes his personal odyssey to find the source of human creativity and self-organization. The journey takes him and the reader through the realms of physics and philosophy, by way of Eastern religion and Native American shamanism, via metaphysics to a new way of knowing.

The Source like the eternal Tao, by its very nature, cannot be defined. But 'While it cannot be defined, Source can be experienced.

To achieve the next stage of personal, organizational and human experience we must access our intuition as a valid alternative way of knowing, distinct from and just as good as, scientific reasoning.

Jaworski takes us back to the aftermath of a tornado experienced as a very young man. The search and rescue team of which he was a part was, he says, 'self-organized from the very beginning'. This, for Jaworski, was an expression of Source or what D. Bohn calls 'implicate order'. That experience triggers his realization that we have a 'deep hunger for the experience of oneness' coming from working in harmony with the Source, and that 'Being used in this way is what it means to be human.'

The wellspring of the entrepreneurial impulse lies in our ability to 'access the knowledge for action we need at the moment', which comes from 'the Source'.

There is a process by which Individuals and teams can learn to 'sense the way the future wants to unfold, and to enable that unfolding.' Jaworski quotes Brian Arthur: 'for the day to day work of running a business scientific decision theory works pretty well'. But for "the big decisions in life, you need to reach a deeper region of consciousness" where you can "let an inner wisdom emerge". "It take courage to listen to your inner wisdom. But once you hear that wisdom, making a decision becomes fairly easy". Arthur describes a 'knowing' as coming from the heart where a different set of rules applies. 'You don 't act out of deduction, you act out of an inner feeling; you're not even thinking.' The process resembles the Taoist approach: first 'observe, observe, observe', then 'reflect and retreat' allowing inner knowledge to emerge, then finally, 'act swiftly, with a natural flow'.

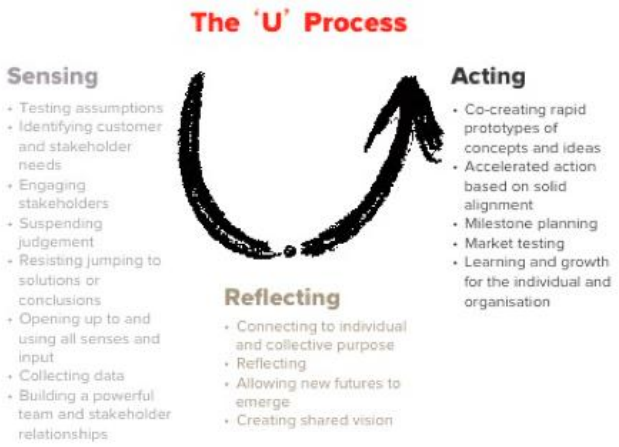


Figure 1: The U theory
(source: http://futureconsiderations.com/2011/12/theoryu/)

Jaworski applies this concept of what he calls the 'U-Theory' model 'a process by which transformational breakthroughs in any field occur, the creation of knowledge that changes the world as we know it'. Jaworski applies U-Theory to set up a 'Lab' to model the concept of leader as teacher. In the Lab, leaders are taught the new capability to sense and actualize emerging futures. The laboratory provides an environment where these lessons can be applied within U-Theory to enable entrepreneurial leaders to move through all three stages of observing, going to that place of deeper knowledge, and enacting.

2.3 The Adaptive Cycle

In this section the adaptive cycle will be introduced and described. The adaptive cycle of Holling (2011) will be described and then the adaptive cycle of resilience, which is derived from Holling(2011) by Abcouwer & Parson (2011).

Every organization goes through a cycle of development, this can be mapped with the adaptive cycle. The adaptive cycle is a heuristic model, a fundamental unit that contributes to the understanding of the dynamics of complex systems from cells, to ecosystems, to societies, to cultures (Holling, 2001). The first trajectory consists the transition from exploitation of an innovation to conservation of that innovation and the second trajectory consists the transition from release to reorganization (see figure 2. According to Holling (2001) the transitions from exploitation of an innovation to conservations of that innovation is due to the accumulation of resources. In times of crisis the transition from conservation to release occurs. The phase from release to reorganization is a period of rapid reorganization during which novel recombination's can unexpectedly seed experiments that lead to innovations in the next cycle (Holling, 2001), this phase is also called "creative destruction" by Schumpeter (1950).

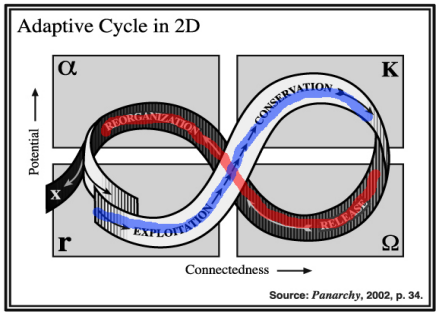


Figure 2: The adaptive cycle

The adaptive cycle consists of a front loop and a back loop. The front loop (see blue line in figure 2) is the exploitation quadrant to the conservation quadrant. The back loop (see red line in figure 2) is the release quadrant to the reorganization quadrant. The front loop is becoming more foreseeable during its development. But the back loop, in contrary, is unpredictable and uncertain.

Abcouwer and Parson (2011) used the adaptive cycle to develop their own adaptive cycle of resilience (ACoR) (see figure 3). They defined the adaptive cycle within the want and can context model.

It is important to keep in mind that the transition to the next phase does not mean a true change of the systems circumstances; the transitions can be viewed as Gestalt switch (Abcouwer & Parson, 2011). This means it involves suddenly giving an entirely different meaning to the situation at hand.

To describe the ACoR we start with quadrant 1. This is the equilibrium stage, here it's clear which and how the goals are realized. According to Abcouwer & Parson (2011) the overall statement of equilibrium is "*Business as usual: we know what we want and we are properly organized, structured and in equilibrium with the environment. Our world is safe*". This means that the market position consists of the pursuit for efficiency, preservation and improvement. Also, when a threat from outside is present the organization is able to handle it in a proper way. But when the threat becomes unmanageable and the organization

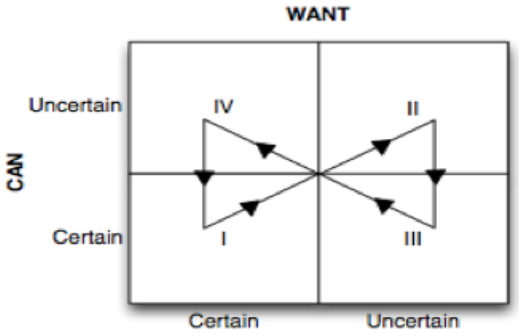


figure 3: The adaptive cycle of resilience

becomes aware of this, its confidence will change to insecurity/uncertainty. A 'Gestalt switch' occurs, from confidence to insecurity, which cannot be explained by the actual events (Abcouwer & Parson, 2011). This will move the organization from quadrant 1 to quadrant 2. Also, the organization can move to quadrant 2 due to a Black Swan (Taleb, 2010), this is an event that comes as a surprise, has a major effect and is often rationalized after the fact with the benefit of hindsight. In quadrant 2, also known as the crisis quadrant, the uncertainties about the want and the can do rises within the organization. Another point that Abcouwer & Parson (2011) states that the crisis situation consist of a double identity; 1) the crisis may arise from fear of the unknown, 2) it may also result in a desire for a new future. Holling (2001) describes the move from quadrant 1to quadrant 2 with the term Release. In the crisis situation the organization is aware that they cannot deal no more with the disruptions. Abcouwer & Parson (2011) describes three characteristics for the concept of crisis;

- The crisis arrives unexpectedly and was only foreseeable with hindsight.
- The crisis has a major impact on the organization/the system: everything changes.
- The crisis can only be predicted with hindsight; there were possible signs of imminent crisis but these not recognized from the prevailing logic. It was not taken into account.

According to Abcouwer & Parson (2011) the disruptions were developed by variables that were not assessed correctly. This happened because these variables caused durable changes to the context of the organization and existing working methods and insights did no longer suffice within the new changed context. When this situations occurs the organization has to find for options to come out of the crisis. During the crisis the organization's management attitude is uncertain, they will have to look further in the future for creation of new alternative options, this marks the move from quadrant 2 to quadrant 3. This move cannot be clearly identified, also here involves the Gestalt switch that creates new insights into the current situation (Abcouwer & Parson, 2011). Also, according to Abcouwer & Parson (2011), the potential for coping with the new is developed but there is no solidarity because one has not chosen which option will be utilized. Holling (2011) describes this phase with the term Reorganization (Abcouwer & Parson, 2011).

Quadrant 3 is called the new combinations quadrant. In this stage the organization is in a situation where it's still unknown what they want and is searching for possible options/new combinations. According to Abcouwer & Parson (2011) the organization does see the possible options and there is a feeling of innovation being appreciated, but when there are many possible options the choosing does not get easier. Also these possible options take a lot of time and resources to test them. Therefor they have to put a limitation on the possible options. When the organization's confidence in the future is reestablished the making of the definitive choice is done. According to Abcouwer & Parson (2011) intuition and emotions play an important role in the decision making process. Also this involves a Gestalt switch; the moment the decision is made, it is a choice for a certain option, for better or worse (Abcouwer & Parson, 2011). Holling (2011) described this by using the term Exploitation. This is also the move from quadrant 3 to quadrant 4. Quadrant 4 is the entrepreneurship quadrant, here is the final option decided and will be implemented. For a desired improvement or new development one should strives with much energy and focus. Abcouwer & Parson (2011, p.20) describes the quadrant as it "*involves growth and improvements also continuous dynamics and the initiation of changes outside the chosen focus is an enemy of this development. This concerns building up of a stable vision*

and the advancement of skills that facilitate the accumulation of knowledge, power and capital, which enables the exploitation phase of the new business as usual".

To go to the new equilibrium phase the organization has to find a balance between the want and can do within the organization. In this phase everyone works on the success of the organization, solidarity is high and they stick to the rules and norms of the organization (Abcouwer & Parson, 2011). It is important, according to Abcouwer & Parson (2011), to know that the business-as-usual situation thus achieved is not the same as the old one. The old business-as-usual situation should not be created again, but the new business-as-usual should be strived for.

Also it can be said that the equilibrium within the organization once again is in line with the changing environment (Abcouwer & Parson, 2011). Holling (2011) describe this by using the term Conservation for this phase (Abcouwer & Parson, 2011).

2.4 Dynamic Contexts and Virtual Organizations

When an organization finds itself in a dynamic context some of the key factors that can aid it to achieve persistent survival are agility and flexibility. It is important for an organization to be able to rapidly adapt to the environment. *Dynamic collaborative networks* provide these abilities and provide an approach to face challenges in dynamic environments (CamarinhaMatos & Afsarmanesh, 2007). Collaborative networks are networks of organizations that cooperate towards a common or compatible goal (Afsarmanesh, CamarinhaMatos & Msanjila, 2009). A virtual organization is a type of collaborative network. A virtual organization (VO) is an association of independent organization that come together and share skills and resources to achieve common goals (CamarinhaMatos & Afsarmanesh, 2007). In other words, VOs are generally triggered by opportunities or disasters and may only be short-term agreements.

While the concept of VOs is a very promising one and the potential gains in the form of great agility are sought after, setting up a VO is not without its difficulties. Starting a collaboration process, establishing the necessary conditions and finding the right partners has proven to be a costly process, both in terms of time and resources (CamarinhaMatos & Afsarmanesh, 2007). Some of the obstacles that exist that make it challenging are lack of information, lack of a common collaboration structure and lack of preparedness of organization to join the collaborative process. When it comes to partner selection mismatches often result from the inherent heterogeneity of potential partner firms (CamarinhaMatos & Afsarmanesh, 2007; .Afsarmanesh et al., 2009). Examples of heterogeneity in firms that make successful partnering difficult are corporate culture, work methodology and ICT infrastructures. Overcoming mismatches requires considerable investments not only expressed in resources, but building trust is also an important issue (CamarinhaMatos & Afsarmanesh, 2007). IT is an important vehicle that can potentially alleviate some of the difficulties of partner selection.

Another complication concerning setting up a VO successfully is that it partner selection is not just an optimization issue based on competencies and capacities. There are also factors of a more subjective nature at play, such as personal preferences and trust that is based on previous experiences (CamarinhaMatos & Afsarmanesh, 2007). Therefore it is unlikely that the partner selection process will be taken over entirely by a computerized selection system, and thus it is deemed preferable to have computer-assisted decision framework that helps a human decision maker to select the right partners (CamarinhaMatos & Afsarmanesh, 2007).

2.4.1 Virtual Breeding Environments

Another concept that can alleviate partner selection problems are *Virtual Breeding Environments* (VBEs). VBEs can be defined as an association of organizations and their related supporting institutions, adhering to a base long-term cooperation agreement, and adoption of common operating principles and infrastructures, with the main goal of increasing both their chances and their preparedness towards collaboration in potential Virtual Organizations (CamarinhaMatos & Afsarmanesh, 2007; Afsarmanesh, 2009). Where a Virtual Organization is a short-term agreement in most case, VBEs are generally based on a long-term agreement. VBEs drastically increase the readiness of organizations to rapidly join a VO by coordinating the operating principles and infrastructures of its members so they can organize and start a VO faster. IT plays a major role in VBEs by supporting frameworks that make the functioning of VBEs possible. Typically an IT based VO creation framework contains tools such as a Collaboration Opportunity (CO) finder, planning tools, partner search & suggestion tools and a agreement negotiation wizard.

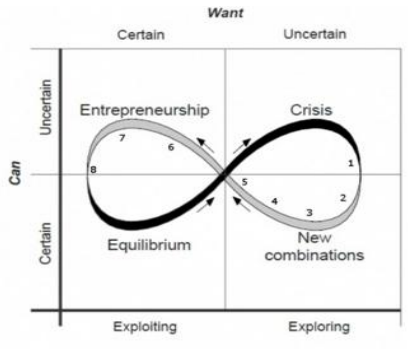
3. Analysis

In this section we will describe the link between the adaptive cycle and the two books about decision-making. First the link between the book of Kahneman, Thinking Fast and Slow, and the adaptive cycle will be discussed. Then the book of Jaworski, Source the inner path to knowledge creation, will be linked with the adaptive cycle.

3.1 Linking Kahneman and the adaptive cycle

This section will transpose the knowledge gained by examining the work of Kahneman (2011) on the adaptive cycle of change as proposed by Abcouwer and Parson (2011).

As mentioned before the adaptive cycle can be seen as a model that represents that an organization over time goes through a succession of phases, in which each phase includes a different assessment of reality, culture, management style and actions connected with these (Abcouwer & Parson, 2011). The model consists of 4 quadrants, with each one representing a certain phase.



In the adaptive cycle to the right, the phases have been renamed to equilibrium (I), crisis (II), new combinations (III) and entrepreneurship (IV).

So to which quadrant do the insights gained from Kahneman belong? This question has multiple answers. To start off it can be argued that good and unbiased decision making in itself is of such importance to the success of an organization. It should therefore not only belong in a single or a few quadrants of the model, but it should be represented in every phase of the model, since avoiding the negative consequences that can be caused by decision making biases is of importance in all phases. Therefore we map biases to specific quadrants where we deem them to be most important, but with the notion that they do not belong exclusively to a single quadrant. In our opinion the insights are most valuable at the uncertainty side of the model.

This first quadrant, the equilibrium quadrant, is the business-as-usual quadrant in which there is a pursuit for efficiency and preservation and improvement of the market position (Abcouwer & Parson, 2011). This phase of the cycle can be seen as the most steady and comfortable phase to be in as a business. Organizations and managers must keep the what-you-see-is-all-there-is (WYSIATI) bias in the back of their head. This bias signifies the fact that it is impossible to see everything there is. Therefore an organization must not assume it knows everything there is going on and organizations must prepare for challenges that rise out of seemingly nowhere (black swans). One way to prepare for this is making efforts to become anti-fragile. Another relevant insight from Kahneman is that expert intuition is inferior to statistical algorithms most of the time. In this phase of certainty, picking safe divestments based on statistical algorithms is likely a better idea than to base the decisions on expert intuition.

In the corresponding crisis quadrant, the organization is in a phase in which it is unsure of what it is able to do and it recognizes this uncertainty. Furthermore, the old proven ways from the previous phase do not longer work and the organization will have to search for new tools to deal with the changed situation (Abcouwer & Parson, 2011). During this reorganization the organization needs to decide on favorable options in order to go to the new combination quadrant. Here, it needs to take into account some of the biases that are mentioned in Kahneman's work to avoid choosing a faulty solution to the problem. When looking back at the equilibrium situation and the gestalt switch that led to the current crisis situation, the first biased that one is receptive to is *hindsight bias*. This bias is caused by the illusion that past events were as predictable at the time they happened as they are now, which relates to the illusion of understanding (Kahneman, 2011). When failing to acknowledge this bias, the corresponding decisions are likely to suffer from other biases that are related to heuristics. The *anchoring heuristic* entails that we perceive recently required information as relevant for decision making even when it is not. After having analyzed what happened and after being influenced by the illusion of understanding, the new information that came to light in our view of what occurred in the past might not be relevant to decisions that need to be made for the future in the short term, but due to anchoring bias the new information will be weighed in the final decision. A decision that is likely to be influenced by confirmation bias, which biases intuitive thinking towards interpreting information so that it confirms preconceptions.

Another danger that must be taken into consideration during decision making in this crucial stage is the danger of substitution. When there is a difficult problem to solve or a difficult question to answer, system 1 has the tendency to quickly find an answer to a related, simpler question. It then in turn gives this answer to system 2 and poses it as the solution to the original question. Substitution occurred. For example, when a company finds itself in the crisis phase and faces the dilemma of which industry to join next in order to survive, substitution can occur. Instead of solving the question which industry would be best for your company to enter, system 1 will substitute the question and change it to a related yet simpler question such as "what do I think about the different industries?".

Even when a line-up of new combinations has been created managers need to be on their toes for biases. The first important relevant heuristic is the *commitment heuristic* which has to do with the sunk-cost fallacy (Kahneman, 2011). This fallacy is the decision to invest additional resources in a losing account, when better investments are available. Just because an investment has been made into a decision we intuitively think we should continue to do so, partly due to the endowment effect. In a business context this means that the rational decision to stop funding a project or to continue with it is biased. An organization in the crisis phase of the adaptive cycle might continue on a selected path which rationally speaking is not the best path just because it had already invested in it. This could lead to failure of the organization to survive the crisis phase.

When fallacies like the sunk-cost fallacy were avoided and the company is confident in their solution in the form of new combinations to the crisis problem, it must be still careful not to get caught in a *planning fallacy* due to an *optimism bias.* In this fallacy plans and forecasts that are unrealistically close to best-case scenarios, and/or could be improved by consulting the statistics of similar cases. Aside from projects that are forecasted too optimistically on purpose (to get them approved for example), it is due to people having a tendency to ignore data that does not coincide with their beliefs (*believe bias*). When the forecasts are made in the new combinations quadrants, companies must be careful to avoid this bias, or the company will have a higher chance of failing in the entrepreneurship quadrant due to their unrealistic set goals.

3.2 VOs, VBEs& Kahneman

As mentioned before, one of the major strengths of collaborative networks and thus virtual organizations is their ability to be rapidly formed when triggered by business opportunities or disasters (Camarinha-Matos & Afsarmanesh, 2007). In the context of the adaptive cycle this ability would be most useful in response to a crisis phase of the cycle, where organizations have to deal with a turbulent environment and this agility can be utilized as a survival mechanism to attract the needed resources and capabilities needed to survive.

While forming a virtual organization can be a means to an end for multiple organizations in a crisis situation, selecting the right partners is still a difficult task. Here some of the biases could arise that are described in Kahneman's (2011) work that could potentially bias the selection of the right partners.

Most second generation VBEs are aided by ICT systems providing them with information about potential partners, however this information can be incomplete or insufficient. The occurrence of the biases will be more profound in situations where information about partners' knowledge, competencies or performance is not readily available. Adding to the chance of the occurrence of decision making biases is that the final decisions are made by a human planner. Here the risk of people trusting their

own instincts and intuitions more than algorithms due to a hunch is increased.

Imagine a situation in which there is insufficient information available to a human planner and he needs to choose between potential partners, one from Japan and one from China. System 1 processes will then see *stereotypes* as a valid value for judgment. The decision might be biased towards Japan, because of the perceived stereotypical trustworthiness of the country compared to China.

The illusion of skill can also be at play not unlike at the stock market, where successful partner selection is more a game of luck instead of successfully making educated guesses. In a time when the environment becomes more certain and sufficiently predictable, expert intuition can be trusted in partner selection.

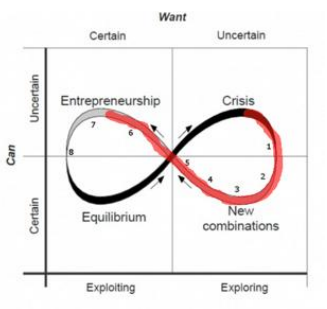
3.3 Linking Jaworski and the adaptive cycle

In this section the book Source (Jaworski, 2012) will be linked with the adaptive cycle of resilience. The use of the U theory will be linked to the important decision moments of the adaptive cycle.

The U theory, as Jaworski described, can be used on the important moments of the organization. These moments can be described as where crucial decisions have a big influence on the organization. The U theory is not suitable for situations in day-to-day working decisions.

The U theory can be applied in times of crisis. When the organization is in the crisis quadrant of the adaptive cycle a threat from outside has disturbed the equilibrium of the organization. This crisis can have two appearances; as a crisis in the negative sense of the word and as a crisis that is an opportunity for innovation (Abcouwer & Parson, 2011). The organization's future is will be in an uncertain situation, and herein the organization is unsure what it wants and can do. The U theory can help the organization to think about the possible solutions to come out of this crisis. The organization must observe first on what is going wrong, what can be better, how can it be better, etc. After the observation, the organization must retreat & reflect on the situation and also on the observations. After the reflection the organization has to move forward with the possible solutions to come out of the crisis. These solutions will be formed in the new combinations quadrant of the adaptive cycle. In this quadrant the search for possible solutions will be realized. The U theory can also be applied when the organization has to make the final choice for the option to be implemented. Making the final choice also stands for the move from the new combinations quadrant to the entrepreneurship quadrant, also the back loop. To be able to make the final choice the alternative options have to be considered as a final choice, otherwise the options needs to be eliminated.

Overall the U theory can be applied on the right side of the adaptive cycle, but is also applicable for the transition from the right side of the adaptive cycle to the left side from the adaptive cycle.



The U theory can, also, be linked with organization in collaborative networks, in a virtual setting is it called a virtual organization (Camarinha-Matos & Afsamanesh, 2007). With organization in a virtual dynamic context the U Theory can be used in certain situations. For example, the search of partners can be time and resource consuming (Camarinha-Matos & Afsamanesh, 2007). When selecting partners, as a virtual organization, difficulties can arise such as trust building, sharing, cooperation, determining and responsibilities. The U theory can help an organization select the right partners for collaboration, because the U theory reflects on the possible partners and based on this the organization can decide whether they accept the VO as a partner.

First, an evaluation of the potential organizations (observe), then reflect (retreat & reflect) on them and finally decide which VO could be a partner (act). The evaluation of a potential organization can be based on the competency matching, building trust, etc. Also in the evaluation the organization can check the references of the potential partner to see how the collaboration went in their previous collaboration. After the evaluation the organization has to reflect on the potential partner by letting the information into their inner source, and then they must come with a decision for the collaboration with the potential partner. If the potential partner is selected the collaboration need to be contracted, this can be done by electronic contracts (e-contracts). E-contract describes the rights and duties of all virtual organization partners, as well as penalties to be applied to those that do not satisfy the agreement (Rocha et al., 2004). Also e-contracting is faster and cheaper than paper contracts, because otherwise a human needs to be hired to set up the contracts and to sign the contracts.

For long-term commitments, such as in the case of supply chains, is this very useful because you do want the assurance of a good collaboration.

4. Conclusion

Given the difficulty of decision making in uncertain environments the goal of this research was to answer the question as to how do decision making biases and heuristics affect organizational strategic decisions in dynamic environments? First of all dynamic environments are difficult territories for organizations to operate in. After having examined two books on decision making we have identified multiple biases and sources of decision making that are applicable not only to firms in dynamic environments, but also for regular use the extracted notions can come in handy. These identified notions projected onto the adaptive cycle show in which phases of a cycle these biases can influence strategic decision making.

5. Discussion & Future Research

First point of discussion is the link between the book of Jaworski and the adaptive cycle. As described earlier the book is linked with the right side of the adaptive cycle, but the book can also be linked with the left side of the adaptive cycle. An example of this is the following: the U theory can also be used in the entrepreneur quadrant when an organization has made the final choice on the option to be implemented. Also when the new goals of the organization are known, the U theory can be helpful to think of ways to achieve these new goals and implementation of the option. While Kahneman is more applicable to the uncertainty side of the adaptive cycle, as mentioned before decision making biases are important on every aspect.

Another point for discussion is the different perspective on decision-making between the two books. Jaworski's book is

mainly about the inner source of a human. This is a somewhat vague concept, which according to Jaworksi can only be experienced. By experiencing the inner source you can decisions without explicitly thinking about what to do, you just know the correct course to follow. The source will only be used in big decisions, because of the accessibility of the source it's not suited for the day-to-day work decisions. Also the use of the U theory is a tool, which can be useful to get access to the source. The U theory can be used in the important situations of an organization, for example the decision for reorganization. On the other hand, the book of Kahneman is about two systems, system 1 is thinking fast, emotional and subconscious and system 2 is thinking slow, logical and conscious. System 1 can be linked with the book of Jaworski, both views on decision-making are intuitively. When making a decision, using the inner of a person will do this, the feelings and emotions will be of an influence. But Kahneman advocates for slow and thoughtful decision making, while Jaworski focuses more on the intuitive. Both are therefore a different perspective about the source of where important strategic decisions should come from.

6. Further Research

For further research on decision-making, the theory can be tested in practice in dynamic environments. . As we described the link between the adaptive cycle, virtual organization and virtual breeding environment and the two books the theory should be tested to see if it the two perspectives can be applicable within decision-making. Another research proposal is the search for partner selection for virtual organizations. The partner selection for the virtual organizations is more a game of luck instead of successfully making educated guesses.

7. REFERENCES

[1] Abcouwer, AW, & Parson, B. (2011). Sustainable assertiveness - the adaptive cycle of resilience.

[2] Busemeyer, J. R., & Townsend, J. T. (1993). Decision field theory: a dynamic-cognitive approach to decision making in an uncertain environment.*Psychological review*, *100*(3), 432

[3] Camarinha-Matos, L. M., & Afsarmanesh, H. (2007). A framework for virtual organization creation in a breeding environment. *Annual Reviews in Control*,*31*(1), 119-135.

[4] Camarinha-Matos, L. M., Afsarmanesh, H., Galeano, N., & Molina, A. (2009). Collaborative networked organizations–Concepts and practice in manufacturing enterprises. *Computers & Industrial Engineering*, *57*(1), 46-60.

[5] De Martino, B., Kumaran, D., Seymour, B., & Dolan, R. J. (2006). Frames, biases, and rational decision-making in the human brain. *Science*, *313*(5787), 684-687.

[6] Duncan, R. B. (1972). Characteristics of organizational environments and perceived environmental uncertainty. *Administrative science quarterly*, 313-327.

[7] Edwards, W. (1954). The theory of decision making. *Psychological bulletin*,*51*(4), 380.

[8] Holling, C. S. (2001). Understanding the complexity of economic, ecological, and social systems. E*cosystems*, *4(5)*, *390-405.*

[9] Jaworski, J. (2012). Source The Inner Path of Knowledge Creation.. San Francisco: *Berrett-Koehler Publishers*.

[10] Kahneman, D. (2011). Thinking, fast and slow. *Macmillan.*

[11] Kasper-Fuehrer, E. C., & Ashkanasy, N. M. (2003). The interorganizational virtual organization: Defining a Weberian ideal. International Studies of Management & Organization, 33(4), 34-64.

[12] Miller, C. C., & Ireland, R. D. (2005). Intuition in strategic decision making: friend or foe in the fast-paced 21st century?. *The Academy of Management Executive*, *19*(1), 19-30.

[13] Rocha, A. P., Cardoso, H., & Oliveira, E. (2004). Contributions to an electronic institution supporting virtual enterprises' life cycle. Virtual enterprise integration: Technological and organizational perspectives, 229-246

[14] Sayegh, L., Anthony, W. P., & Perrewe, P. L. (2004). Managerial decision-making under crisis: The role of emotion in an intuitive decision process. *Human Resource Management Review*, *14*(2), 179-199.

[15] Schumpeter, J. A. (1962). Capitalism, socialism and democracy. *New York: Harper & Row.*

[16] Taleb, N. N. (2010). The Black Swan:: The Impact of the Highly Improbable Fragility. *Random House Digital, Inc.*

[17] Trevino, L. K. (1986). Ethical decision making in organizations: A person-situation interactionist model. *Academy of management Review*, 11(3), 601-617.