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Emerging Risk Knowledge System: An Interdisciplinary Approach of Emerging Risk in Supply Chain Management

Athanasios Batsakidis, Alexander Tsigkas

Department of Production and Management Engineering, Democritus University of Thrace, Xanthi, Greece

Email address:

a.batsakidis@re-think.gr (Athanasios Batsakidis)

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Abstract: This paper present and describe the Emerging Risk Knowledge System (ERKS) which offers solutions to manage effectively complex and unstable situations like emerging risks. Current knowledge is a base for developing new knowledge. However, developing a new Knowledge System (using an interdisciplinary approach) will help the managers to re-evaluate their risk environment. The world's volatility proves that an interdisciplinary understanding of the role of knowledge in the management of supply chain risk is needed. What makes wise-decisions so challenging is that they have to be trapped in the fog of doubt and uncertainty, clouding our ability to make-clear assessments. It is agreed that each situation regarding the supply chain risk is unique and the challenge is to develop an interdisciplinary approach that is meaningful in the practical context. The objective of ERKS is to "train-our-minds" to be more efficient-about-optimizing our decision-making ability. Building on three components (perception, tools, and experiences) that influence one another it develops a system that makes a manager capable of designing new ways of handling disruptions in supply chain management. It aims to provide him with the knowledge he need for his strategy.

Keywords: Wisdom, Emerging Risk Knowledge System, Supply Chain Risk, Perception, Emerging Risk

1. Introduction

The business environment's demands and the growth of emerging markets lead to the development of diverse and complex Supply Chain Global networks [20, 34]. As a result, these effects lead to higher risk exposure [14]. Fueled by a variety of well-documented incidents, including natural disasters and conflicts. Managers today recognize that these effects present a true and serious threat. However, the challenge for them is to develop an understanding of these disruptions. What causes them? What factors affect the disruptions, or reduce them? When we want to gain a deeper understanding of disruptions in the supply chain, what techniques can be used to tackle them, then an alternate approach is needed.

In such environments (continuous changes and ever-increasing speed), an interdisciplinary approach for handling those risks is necessary. Current knowledge is a base for developing new knowledge. However, developing a new Knowledge System (using an interdisciplinary approach) will help the managers to re-evaluate their risk environment. It aims to provide them with the knowledge they need for their strategy.

This paper commences described the nature of Emerging Risks and the need for a new Knowledge System for handling them. The paper then goes on and presents the Emerging Risk Knowledge System (ERKS) and its three components. It describes each component (*Perception, Tools and Thinking-Models and, Experiences (Practical Wisdom)*) and how to influence one another for creating a knowledge system for handling Supply Chain Risks. The paper concludes-by-emphasizing the paper's importance to academics and practitioners alike.

2. The Nature of Emerging Risks

The dynamic, interconnected global environment today has created a borderless risk that can spread rapidly across

geographical, societal, and organizational boundaries. This paper will concentrate on emerging risk, which can involve extreme events (low probability, high impact).

The first step, before we discuss and focus on emerging risk is to understand the environment within the risk is generated. Edgar Morin [22] describes this environment as "*Emerging Reality*". Emerging Reality has its characteristics and properties and is formed by the organization of elements that do not possess the properties and characteristics of that reality. This means that the organizational complexity of a supply chain provides features that are unknown to the components that make up it.

Emerging risk finds its source in the globalized, competitive, complex, and interconnected conditions of the modern world [13]. With the complexity and interconnectedness in supply chain networks is it increasingly difficult to isolate and establish the factors that generate risks. The rising difficulty in determining the relationships between causal factors makes rising risk more opaque and complicates events.

For this paper, the emerging risk is defined as a new form of risk, a kind never before encountered. Like Morin's emerging reality, emerging risk has characteristics and properties that do not have the elements that created them. Given the particularity of the appearance and form of emerging reality, considering the elements that constitute and create risks is not the best solution for dealing with it.

Our scientific and technological thinking is highly effective. But this is a very special sort of thinking involving defined objectives achieved by experiment, mathematics, and measurement [11]. Using only this form of thinking organizations can't handling supply chain disruptions. We need to look at something basic to all emerging risks, and that is our Knowledge System. This paper presents a knowledge system that has three mutually reinforcing components. We propose that this system offers solutions to manage effectively complex and unstable situations like emerging risks.

3. Handling Disruptions in Supply Chain Networks

According to Berg, Knudsen & Norrman [5], disruptions in Supply Chain Networks are events that can cause adverse effects on the results and objectives of a supply chain. There are two categories for handling these events: "*Pre-Disruption*" and "*Post-Disruption*" [37]. In the first category (Pre-Disruption) managers take precautionary measures to mitigate the likelihood of a disruption whereas in the second (Post-Disruption) the risk management responds materializes after an accident.

The literature focuses primarily on the method of pre-disruption [2, 9, 12, 17, 16, 19, 20, 24, 25, 32, 38-40], while a few are provided on post-disruption [1, 6]. Few research-attention is also given to the value of both views and structures consisting of both pre- and post-disruption measures [5, 26].

Each disruption has a lifecycle comprising of two distinct phases (Figure 1). There is a time when disruption is latent and just a probability (*Potential Disruption*), as a possible disruption, and when an instance of disruption finally happens, it is a real disruption (*Actual Disruption*).

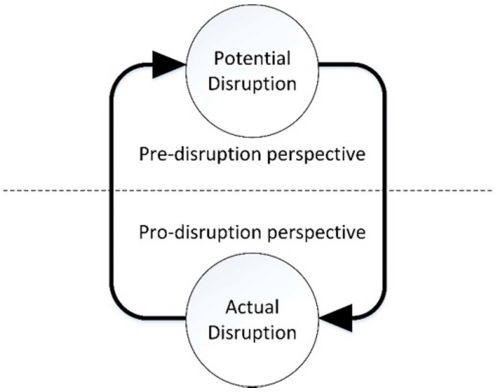

Figure 1. *The two distinct phases of Disruption lifecycle.*

Different decisions and actions must be taken in all stages of the lifecycles to better accommodate a disruption. However, it is impossible for an organization to avoid or have plans for every disruption. First, certain disruptions aren't identified in advance. Furthermore, the reliance on static-plans to deal with disruptions that are necessarily dynamic-events has also often been questioned [18]. For disruptions that cannot be avoided, more attention should be paid to the response side of the disturbance management cycle.

The ability to collect reliable information about the system state and the accident is crucial when a disruption occurs. For this reason, a risk management knowledge system - *Emerging Risk Knowledge System (ERKS)* - capable of adapting to the volatile event is presented in this paper.

4. Perception in Risk

Perception is described as the First-Stage of Thinking in De Bono's book *Po: Beyond Yes and No* [11]. It comes before processing in thinking. Managers have been concerned only with the thinking that comes after perception. They have not paid too much attention to perception because they have believed that there could be only one way to look at things. But this is not correct, we see the world not as it is but through a veil of conceptions [29]. Perception is a way of acting, and not something that happens to us passively [23]. All the world's knowledge, including scientific knowledge, is derived from our particular point of view, or from some real experience without which science's symbols will be meaningless [21].

The potential rather than the actual presence of the details is also evident from the changes that can happen to the outside world in front of our eyes and we do not perceive them (change blindness). Finally, perception is not thought, but it is completed by some cognitive processes of the mind.

The first step for handling a disruption in Supply Chains Networks is *Risk Identification*. This is an essential phase because a disruption must first be identified before it is handled. For this step in the literature is presented a range of methods like *Literature review* [41, 40, 7], *Personnel brainstorming* [24], *Ishikawa Diagrams* [39], *HAZard and Operability* [2], *Expert view* [41, 35], *Action Research method and AHP* [31], and *Expert interviews* [41, 7, 40, 36].

In this paper, we propose that Perception, which defines how we see the world around us takes for granted that the world can change. Perception is a dynamic process, the world is there before any analysis could be done about it. So we do not ask if we perceive a world, but rather say: the world is what we perceive [21].

Essentially, we resorted to perception, since management of the supply chain requires taking decisions under uncertainty. This complexity is a fundamental reality of the business world. It is widely perceived as increasingly affecting our capacity to manage relations within and between organizations. Challenges range from the dynamic complexity of business-relationships [28] to cognitive-limitations [27].

Our human mind deals with multiple tasks and decisions by mobilizing multiple systems of thought [15]. One is essentially automatic and conforms to the world as we've always known it. This is widely known as "*model-based learning*". In this way of thinking, we compare a possible future action or choice with similar situations we've confronted in the past. The other way is "*model-free learning*", this occurs when we are confronted with something novel or unexpected, something that doesn't align with our prior experience. Model-free learning is much less automatic, and consequently. It is the process of going back and forth between hypothesis and reality, which is the process of "*framing*" or perspective-taking. The way we frame a problem predicts the success with which we work our way toward a solution and in this way perception is the key-for-success.

It is clear in Israel Rosenfield's book *The Invention of Memory – A New View of the Brain* [30] why perception is so important in our daily decisions. He is wondering why our brain should have an enormous number of mnemonic centers when all it needs is just the ability to fit the pieces together rather than isolate them. We don't read letters. We read words and sentences. But to be able to make sense of words and sentences, we must be able to recognize the infinite variety of ways in which letters can be organized, which means we must be ready for letter and word layouts we have never met before. Our intelligence is not only the accumulation of knowledge but also the reprocessing, the creation of new categories and, consequently, the generalization of information in new and unexpected ways.

There is no question that in almost every area of our lives, or at least our perception of risk, the risk is becoming more prevalent. Today technology and science have so speeded up the rate of change in the world which means that organizations and managers need to change their ideas (their perception) to keep up with the world. Unfortunately, today's tools and thinking-models for managing disruptions are not developed with this approach, for changing ideas in this way. As mentioned above, perception is the key to Risk Identification, it guides the development of tools or frameworks for thinking-models against emerging risk.

5. Emerging Risk Knowledge System

The Emerging Risk Knowledge System (ERKS) (Figure 2) has three components. The broadest and most abstract element of that system is the perception, the knowledge domain in which you define how to see the world around you. We all have a perception, and that perception deeply influences our actions.

One step down in ERKS are the tools and thinking-models we use to organize our thinking and to understand and handle the emerging risks. As mentioned above in this paper, there are many tools and frameworks to handle disruptions in supply chain risk management.

The final component of ERKS is Experience, most practical, and tangible knowledge. As we accumulate experiences over time, they enable us to hone our sensitivities and skill. Sensitivity is the capacity to make distinctions between conditions that are similar but not mot the same. One of our most common mistakes is to believe that one thing is like another [33].

We are looking for patterns that will help us understand and predict what we are experiencing. When we use the extent that something seems like another thing to decide if we can let the first object concept or event stand in our thinking as a representation of the second object concept or event, we can end up with incorrect comparisons. This is the *representativeness heuristic* [37] and it can have important implications for the estimation of probabilities associated with risk assessment. Skill is the capacity to carry out the activity to consistently produce the desired result.

The Emerging Risk Knowledge System develops a system because its three elements influence one another. Perception guides tool acquisition, which in turn guides the accumulation of experience. The flow, however, is not one-way. Experiences inform the acquisition of more tools. As experience leads us to acquire new tools, we add depth and clarity to our perception.

A narrow and defensive perception will lead to the acquisition of extremely limited tools and extremely limiting experiences. Those experiences then feedback into the acquisition of more powerful tools and challenging learning experiences, which will promote more tool acquisition and more powerful perception.

Neither a downward nor upward spiral is foreordained. We have wide latitude as to how to develop ERKS. As long as we can change our perception, we can change the tools and experiences we use to develop our risk-thinking capacity. ERKS is distinctive along all three dimensions – perception, tools, and experiences. It generates a self-reinforcing spiral that values validity and exploration. Also, it develops the

perception, tools, and experiences that make a manager capable of designing new ways of handling disruptions in supply chain management. Rather than perpetuating the past, it creates the future.

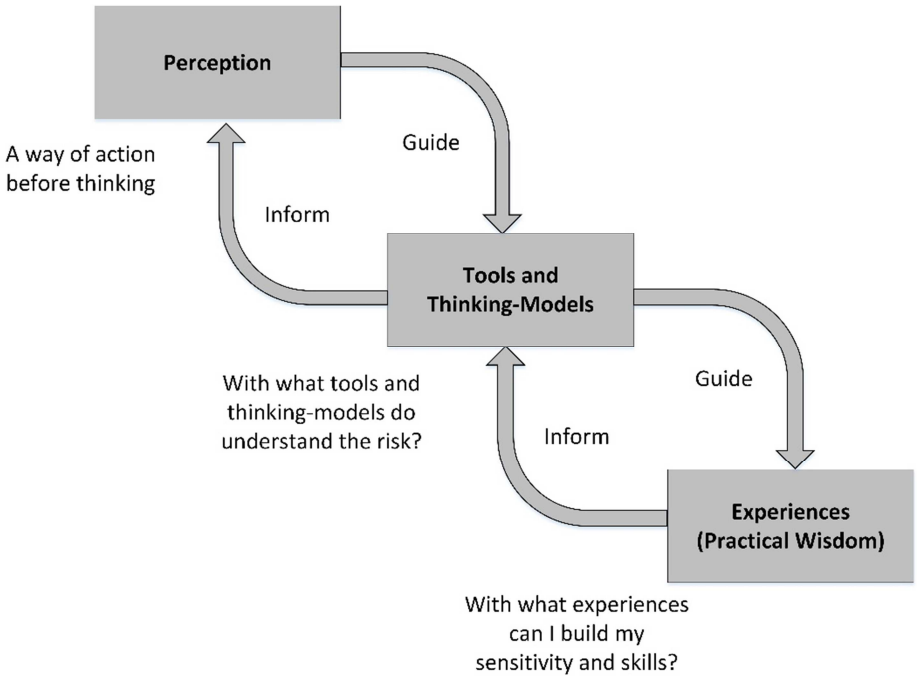

Figure 2. *The Emerging Risk Knowledge System (ERKS).*

Perception, as we have mentioned, comes before the component of *Tools and Thinking Models*. We can call this second component the second-stage of thinking or processing of a situation that been presented by perception. Perception is responsible for *incoming information* to this stage. De Bono [11] described two types of information systems and show how this affects our thinking and our choice of thinking tools and models. The first system is the *towel system* which is the sort of accurate memory system that one uses in a computer. Incoming information is stored exactly and without alteration. The essential point is that there are an accurate recording system and an outside processor who uses it. This is our traditional view of the brain.

The second system is the *jelly system* where the towel is replaced by a large shallow dish of ordinary jelly. In the towel system the ink remains exactly where it has been placed - that is, the '*experience'* of the surface. But with the jelly system, a spoonful placed at one spot can flow down a channel and end up at a completely different place, just as if it had been put there, to begin with. Thus an information input of one sort is moved by the surface to give a different sort of input. This changing of information is processing, or 'thinking'.

One will wonder if the jelly system is a bad information system because it alters the incoming information, but this is not true. The incoming information alters the surface of the jelly, in a way that causes it to react differently to future information. This creates patterns on its surface. The sequence of these actions is of enormous importance. With these patters, the second component of ERKS *informs* Perception which continually *guides* the creation or change of Thinking Models and Tools for handling Supply Chain disruptions.

6. The Need for Wisdom

It is clear that in our personal life things happen one after another, acquiring our experience piece by piece. The particular sequence in which experience is acquired makes a huge difference to the ideas and attitudes we hold. At each moment we have to make the best of whatever information or experience is available at that moment. We cannot tell what is coming next or when it is coming - a seemingly uncertain and volatile future [11]. Professionals in daily practice face a difficult bind: they have to decide on the action in a setting where the relevant knowledge is incomplete when working within the dominant paradigm of evidence-based practice that implies there is a certainty. We actively use our experiences to deepen our expertise and cultivate our originality to be a better manager and to make wise decisions.

The third element – *Experiences* – of the ERKS can create or change a thinking model tool based on experience. Aristotle was probably the first to develop a systematic understanding of what constitutes a practically wise person. Especially in book VI of his Nichomachean Ethics, he conceives *practical wisdom* as one of the five intellectual virtues. Also according to Socrates, "Wisdom is a human virtue, won like all virtues by hard work, in this case, the hard work of experience, error, intuition, detachment, and, above all, critical thinking". To Heraclitus, "Knowledge was fluid". Nothing was constant; everything changed. The

Heraclitean wisdom started with the idea that nature is dynamic; inevitably, the world as we thought-we-knew it in the past would be changed as we tickle into-the-future. It changes; we change.

While intelligence may be described as the ability to "think logically, conceptualize, and abstract from the truth," wisdom extended experience to the comprehension of human nature, both of itself and others, and yet worked on "the principles of inconsistency, paradox, and change." [10]. As Clayton wrote in her essay [10], "The function of intelligence is characterized as focusing on questions on *how* to do and accomplish necessary life-supporting tasks; the function of wisdom is characterized as provoking the individual to consider the consequences of his actions both to self and their effects on others. Wisdom, therefore, evokes questions of *should* one pursue a particular course of action."

From the above, it is clear that wisdom requires professional knowledge of reality and human nature as well as awareness of ambiguity, both at the level-of-thinking and action. Wisdom addresses complex behavioral and interpretative issues. The theoretical aspect of wisdom dealt with the capacity of a person to analyze an event from different points of view and take a different perspective [3]. Wisdom is closely linked with a sense of time in a person. As your time shortens, as it does as you get closer to the ends-of-things, you start concentrating on emotionally important targets. When the time is long you concentrate on gaining skills [8]. Because the future is expansive and open-ended, people have to adjust to the temporal sense through planning for the future.

Technological discovery and development seemed to be the key to progress toward a better world but in the last few decades, a darker side of all of this progress appears. Wisdom is an important element in gaining experience, it is about both achieving good ends and being good in achieving the ends. Aristotle wrote. "It is impossible to be practically wise without being good."

The ability to exercise good-judgment in the face of imperfect-knowledge which distinguishes it from mere intelligence is one of the hallmarks of wisdom. Wisdom as a method will act as a guide to help us make the best-possible choices at critically important junctures in our lives. This can help us frame-problems differently so that possible solutions can be seen [15].

At the root of wisdom lies decision-making, but it's not the whole story. Wisdom is founded on knowledge but confusion forms part of the nature of wisdom. Action is important but judgmental silence is also important. Emotion is fundamental to wisdom but it is important to have emotional detachment. In one context a wise act could be sheer folly in another.

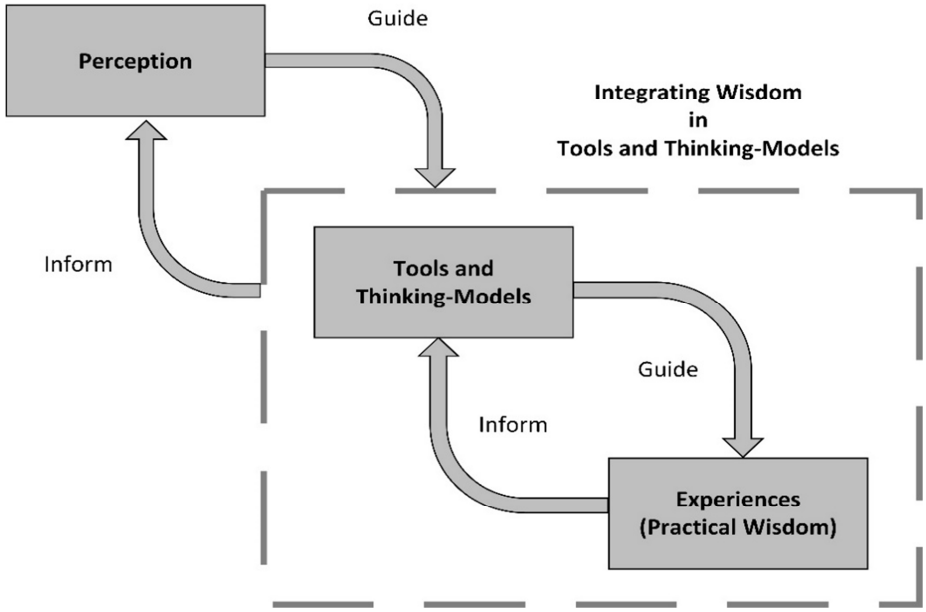

Figure 3. *Integrating Wisdom into tools and thinking-models.*

In the literature, tools and thinking models exist for managing disruptions in the supply chain in which wisdom has been integrated [4]. In these cases, the two components of ERKS (2nd and 3rd) are merged and interact directly with Perception - the first component of ERKS (Figure 3). This new component takes an interdisciplinary approach when dealing with complexity and unpredictability. Into this new component, there is an internal flow which *informs* (Tools and Thinking-Models) and *guide* (Experiences) just like before.

7. Conclusion

Risk management approaches have arguably been implicit in the management of supply chains over a long period. It is agreed that each situation regarding the supply chain risk is unique and the challenge is to develop an interdisciplinary approach that is meaningful in the practical context.

Given the emerging nature of supply chain risks an interdisciplinary Emerging Risk Knowledge System (ERKS)

was presented in this paper that is intended to guide managers in their efforts to handle supply chain disruptions. ERKS aims to develop a deeper understanding of the main constructs underpinning risk within the supply chain.

What makes wise-decisions so challenging is that they have to be trapped in the fog of doubt and uncertainty, clouding our ability to make-clear assessments. The objective of ERKS is to "train-our-minds" to be more efficient-about-optimizing our decision-making ability. Building on three components (perception, tools, and experiences) that influence one another it develops a system that makes a manager capable of designing new ways of handling disruptions in supply chain management.

Certainly, ERKS initiates new research aspects and questions in the academic world. The literature is beginning to reveal research on the integrating capabilities of interdisciplinary approaches in Supply Chain Risk Management. Addressing even these questions requires wide-ranging empirical management studies.

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