

EXPLORATION OF BLACK SWANS AND THEIR IMPACTS ON
CONSTRUCTION COMPANIES: THE CASE OF ARAB SPRING

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
CIVIL ENGINEERING

SEPTEMBER 2018

Approval of the thesis

**EXPLORATION OF BLACK SWANS AND THEIR IMPACTS ON THE
CONSTRUCTION COMPANIES WITH A CASE STUDY**

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ABSTRACT

EXPLORATION OF BLACK SWANS AND THEIR IMPACTS ON CONSTRUCTION COMPANIES: THE CASE OF ARAB SPRING

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September 2018, 137 Pages

Surprising extreme events which are described as “Black Swans” originate from unknowns and may cause extensive damages. This thesis explores the Black Swan events and how they may affect the construction companies based on the findings of a case study. This work also examines how the current strategies in the literature, which have been already offered for various industries, can be applied to the construction industry to improve management of the Black Swan events. Arab Spring, which can be denoted as an example of the Black Swan events in the recent history, was identified as a case study and its impacts on the construction market were investigated. As a result, this work offers some strategies to the construction companies under two main headings such as external recipes such as expert consultancy, inclusive insurance systems, government support and internal recipes including strategies and perspectives such as pessimistic viewpoint and avoidance behaviors. Findings of this study can be used by the construction professionals to develop effective strategies against Black Swans and have a potential to fill the gap in the construction management literature on black swan events.

Keywords: Black Swan, Extreme events, Uncertainty management, Arab Spring

ÖZ

SİYAH KUĞULARIN İNŞAAT FİRMALARI ÜZERİNDEKİ ETKİLERİNİN İNCELENMESİ: ARAP BAHARI ÖRNEĞİ

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Eylül 2018, 137 Sayfa

Sürpriz bir şekilde gerçekleşen yıkıcı olaylar “Siyah Kuğu” olarak tabir edilir. Bu olayların önceden tahmini neredeyse imkânsız ve etkileri genelde çok yıkıcı olur. Bu tez, bir vaka çalışması bulgularına üzerinden, Siyah Kuğu olaylarını ve inşaat firmaları üzerindeki etkilerini araştırmaktadır. Ayrıca bu çalışma, Siyah Kuğu olaylarının yönetimini geliştirmek amacıyla çeşitli endüstriler için hali hazırda sunulan konu ile ilgili mevcut stratejilerin inşaat endüstrisine nasıl uygulanabileceğini incelemektedir. Bu amaçla, Siyah Kuğunun yakın zamandaki örneği olarak ifade edilebilen Arap Baharı olayı ele alınmış ve inşaat firmaları üzerindeki etkileri araştırılmıştır. Sonuç olarak, inşaat şirketlerine harici (uzman bir danışma, kapsayıcı bir sigortalama sistemi ve devlet teşviki) ve dâhili (uygun stratejiler, kötümser bakış açısı, kaçınma davranışı gibi perspektifler) olmak üzere iki ana başlık altında bazı stratejiler sunmaktadır. Elde edilen bulgular, sektör uzmanları tarafından Siyah Kuğulara karşı etkili stratejiler geliştirmek için kullanılabilir. Ayrıca bu bulgular, Siyah Kuğular ile ilgili inşaat yönetimindeki literatür boşluğunu doldurabilecek potansiyel taşımaktadır.

Anahtar Kelimeler: Siyah Kuğu, Ekstrem olaylar, Belirsizlik yönetimi, Arap Baharı

ACKNOWLEDGMENTS

The author wishes to express his gratitude to his co-supervisor Prof. Dr. Irem Dikmen Toker and supervisor Prof. Dr. Talat Birgönül for their guidance, advice, criticism, encouragements and insight throughout the research.

The author would also like to thank all interviewees and sparing time out of their busy schedule and providing valuable information and insights for this thesis.

The author especially would like to thank Mr. Devrim Kolođlu for his special attention on this study.

Mehmet Hakan Karaaliođlu is also gratefully acknowledged.

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LIST OF ABBREVIATIONS

BLS	Bureau of Labor Statistics
C + C + NGL	Crude oil + Condensate + Natural Gas Liquid
COST	Construction Sector Transparency
DAST	Disrupter Analysis Stress Test
EIA	Independent Statistics & Analysis
ENR	Engineering News Record
EPU	Economic Policy Uncertainty
ERM	Enterprise Risk Management
GDP	Gross Domestic Product
ISO	International Organization for Standardization
MENA	Middle East and North Africa
OECD	Organization for Economic Co-operation and Development
ONS	Office for National Statistics
RIDM	Risk-Informed Decision-Making
SRA	Society for Risk Analysis
TCA	Turkish Contractors Association
TCIC	Timetric's Construction Intelligence Center
TICSS	Tradesmen International Construction Staffing Service
UK	United Kingdom
WSJ	Wall Street Journal

CHAPTER 1

INTRODUCTION

1.1. What is Black Swan?

Black Swan is an idiom that expresses the unpredictable or improbable events having extreme consequences. Until the discovery of Australia at 17th century, people convinced that the color of all swans was white unequivocally. A swan with black feathers was used to be considered something impossible. After the first Black Swans rose to the surface, they slapped the conventional thinking with their black wings. With a tiny feather, societies discovered the inadequacy of their observations and experiences on which the foundations of the society had been built. They also realized how the fragile their knowledge had been. After that, the black swan became a symbol of the idea which asserts that people live in such a world where even impossible things can become possible, and the knowledge about such world will always be very little.

This concept was firstly brought forward by Nicole Nassib Taleb in his best-selling book (*The Black Swan: The Impact of the Highly Improbable*) at 2007. Within his book, Nassib enlarges Black Swan concept by moving to the different dimension and presents it to the field of risk analysis (Aven, 2014; Lindley, 2008). In his book, Taleb argues that The Black Swan events have catastrophic ramifications and are impossible to predict under any circumstances. The concept which is called here as “Black Swan” has the following three attributes which distinguish it from other force majeure events.

First, the Black Swan is an outlier. It means that The Black Swan events are the exceptional events which are behind the regular expectations. In other saying, there is convincingly no (or no strong) link coming from the past to point a Black Swan’s

possibility. This is a main reason why the classic risk prediction methods are insufficient to detect the Black Swan events. The terrorist attack on Oslo in 2011 is a good match for aforementioned attributes. Until that unexpected and unimagined attack, Norwegians had never experienced such violence in their country before.

Second, the Black Swan events have always an extreme impact. The great examples of the Black Swan concept in history such as 9/11 attacks, financial crisis in USA in 2008, Internet bubble at 2000 etc. had extreme consequences locally or globally. Even after passing years, the negative impacts of some events are still being detected around the world. For example Hurricane Katrina which was one of the deadliest tropical cyclone in history happened in New Orleans in 2005. The hurricane affected more than 1800 lives in Louisiana, Mississippi and Alabama and caused more than \$100 billion in damage (Kunreuther et al. 2010; Swiss Re, 2011). By the way, it is worth highlighting that some Black Swans in history have also rarely positive extreme impacts and would be much easier and faster methods to destroy the old one and build the new one such as political changes and collapse of dictatorship etc. (Taleb, 2011; Higgins, 2013).

The third attribute is psychological. Despite its outlier status, in order to make the events explainable and predictable after such events, people try to make concoct ex-post explanations of its occurrence rather than accepting their inabilities. For example, after the occurrence, there has been remarkable increase in the number of people who believe that the blockade of Qatar, oil rig failure of BP at 2010 or calamity of Chernobyl were predictable and expectable.

Black Swans are extreme and unexpected events as mentioned before. Put differently, the Black Swan events are mostly the events that occur in wrong places and wrong time. Being investigated Black Swans at the history, it is seen that the perfect combinations push Black Swans to come to surface drastically. For example, in 2004, tsunami in Indian Ocean transformed into a Black Swan event with unexpected extreme impact resulted by people who stayed in wrong place at wrong time unexpectedly. In the Hurricane Katrina case in 2005, it was not expected that

the storm might have caused the cracks on the retaining walls and hence, people had not prepared against the flood which covered the city with water as deep as 15 feet. Furthermore, the US/Canada Blackout in 2003 caused the infrastructure failure which affected 50 million people by cutting their power supplies. The rare combinations in this case were not expected because the failure stemmed from many dependencies such as technical, political, managerial, and regulatory interventions (Johnson, 2008).

Additionally, according to Boulwood (2016), the results of the Black Swan events which have many interconnections at global, financial and politic networks also actuate the extreme failure of other markets. For example, the Great Kanto Earthquake in 1923 affected the typhoon and then the typhoon sparked a widespread fire, finally affected many systems consequently. Another appropriate example of this issue is the Arab Spring event. The Arab spring triggered the construction failure locally and brought a chaos on oil market and finally caused financial crises globally. Figure 1 shows the impacts of the Arab Spring on the oil market globally. After the initial impact of the event, the production coming from those countries fell from 3 million to 0.995 million bpd in September 2013.

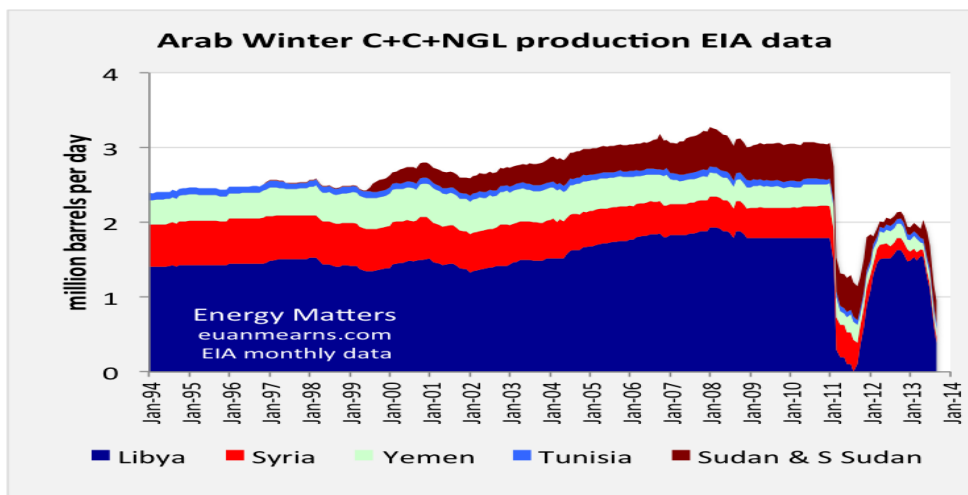


Figure 1: Production stacks for 5 oil producing countries affected by the Arab Spring (EIA, 2013)

Different perspectives result different definitions and categorizations. In the literature, unpredictable and unexpected extreme events have been clustered in many different ways based on different definitions and under different labeled such as “Perfect Storm”, “Near Black Swan”, and “Grey Swan” (Pate’- Cornell, 2012; Aven, 2014; Masys, 2012). The Black Swan events, in Paté-Cornell’s study (2012), are discussed into the concept of the definition of Taleb (2007) and linked to the “Perfect Storm” metaphor. Pate-Cornell (2012) states in her study that the Perfect Storm events have aleatory uncertainties in concurrence of rare but are known events; on the other hand, Black Swans have ultimate epistemic uncertainties or lack of fundamental knowledge. For example, she elaborates the earthquake at Japan in March 2011 and she concludes that the rareness of combination events which triggered the earthquake makes it an example of Perfect Storm events. In other respects, Aven (2014) generates some of the events as “Near Black Swan” concept. After categorizing the black swan events based on one's knowledge/beliefs, he defines the near black swan events as the events which have no extreme consequences due to the barriers preventing the extreme outcomes in somehow. In addition to that, Masys (2012) brings a new concept forward as “Grey Swan”. Grey Swan concept describes the unexpected extreme events for whose risk strategies can be formulated after certain phases. According to Masys, after integrating some approaches, the Black Swans will be illuminated to a certain degree and transformed to the Grey Swans (Masys, 2012).

1.2.Characteristics of Black Swans

In an attempt to alleviate some of the confusion, some characteristics should be briefly explained.

1.2.1. Characteristics of a system

The Black Swan events generally come to exist in the complex, uncertain and fragile systems. According to Komljenovic et al. (2016), complex systems are the dynamic systems able to adapt in and evolve within a changing environment. The term of "uncertainty" here is the lack of perfect information about future consequences of an event. The risk management literature defines the fragility as negative exposure to loss domain (Taleb 2007). In other words, fragility is a characteristic where little causes give more harmful effects. For example, when driving a car, even a little increase of your speed causes nonlinear harm and each kilometer creates higher risk status than the previous one. Antifragility, on the other side, is not the opposite of fragility, contrary what is considered. Antifragility is defined as the resistance of a system against the shock and, improvement under the related conditions. For example, running in everyday provides not merely a resist against obesity, but also improves your muscle systems as a positive outcome. Robust approach includes some characteristics to make the organizations more resilient against the disruptions and surprises. For example, this approach includes designing of the flexibility, and attempting in order to perform and improve the safety barriers by using redundancy, maintenance, testing etc. Also robust approach tries to measure the warning dimensions, to adopt the variations, and to apply control and assurance. (Aven, 2017, Hollnagel et al., 2006)

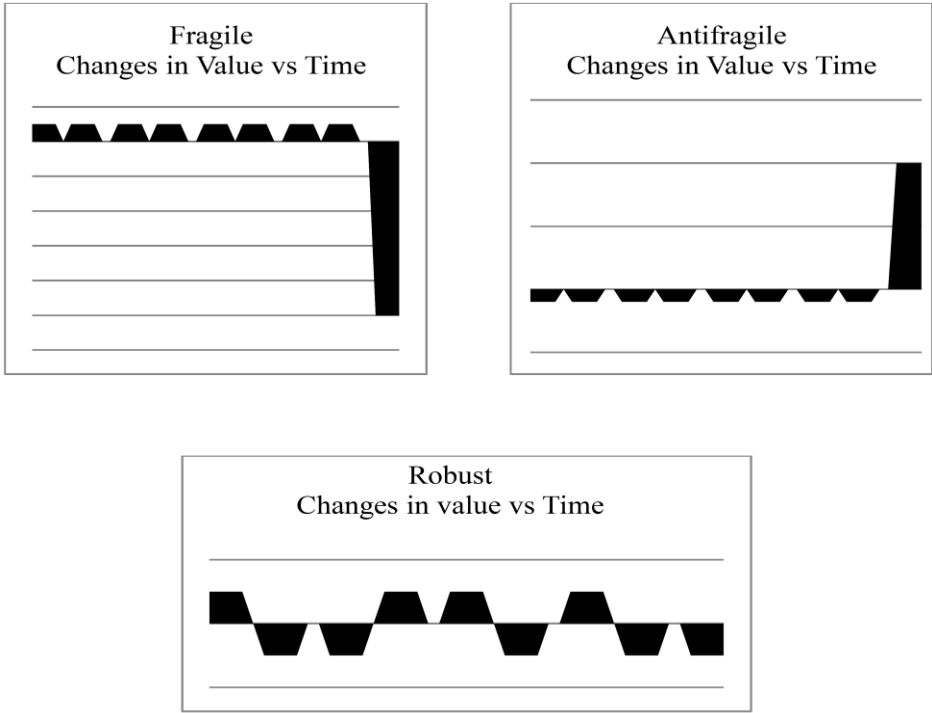


Figure 2-3-4: Changes at fragile, anti-fragile and robust systems

The figures above clearly show the differences among the characteristics. The first figure on the left illustrates the fragile variation with low gains through time and consequently the system has much higher negative domains than cumulative benefits. The case which is shown on the right figure has opposite variation of the fragile one with higher positive domains than cumulative loss. The figure below illustrates the outcome of variation in the robust case through time.

1.2.2. Characteristic of an event

“Severe events” term represents the events that cause the major deprivation in certain measures such as the number of money, people or quality. Risks of the severity are measured by three elements: the hazard, the exposure to the hazard and the vulnerability. For example, the expected long term losses of the tsunami event in Japan depend on the probability and the exposure to the tsunami. In other words, the number of people who are exposed to the tsunami is a necessary function to measure

the severity. Also, vulnerability of the hazards (i.e., how much loss will come to exist when one is exposed to the hazard) is another factor that effects of the severity of an event. For example, the severity of the Arab Spring was high, because in the region, there were considerable number of people and organizations which were exposed to the event.

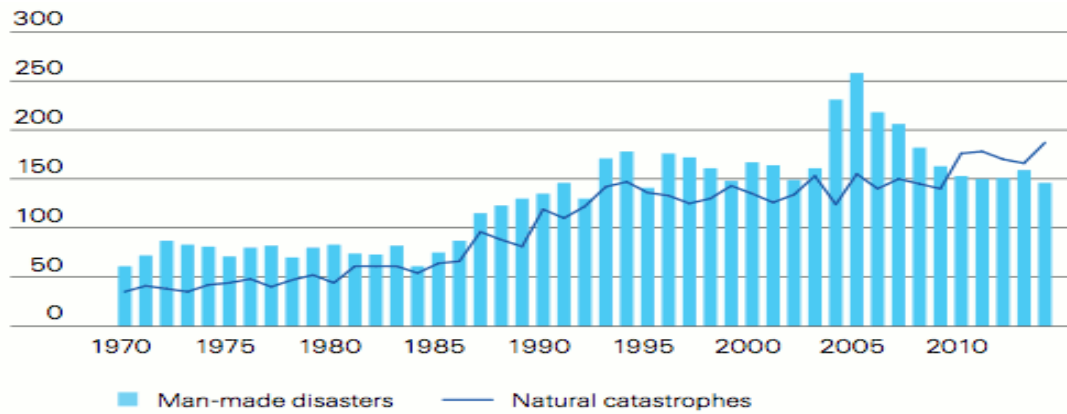
“Rare events” term describes a type of severe events that due to their rarity (i.e. their low probability) very few managers and related authorities expect them. Rare events, when they occur, generally creates large amount of the damage on systems and people, because of the unprepared environments due to their low probabilities of occurrences. Their rarity also increases the vulnerability of the hazard and results larger losses in the systems.

Surprise events, on the other hand, are considered a surprise when it occurs unexpectedly (Gross, 2010). According to this concept, surprising of an event directly relates to the perspectives of the relative ones. Hence many studies classify the surprise events in different titles according to this perspective concept.

Extreme events are the rare events which have the extreme outputs, and get the extreme harms on people, companies and environment etc. Unfortunately, there is no unique definition of the “extreme” due to relativeness (i.e. it depends on conditions), and the ambiguity in the terms of "severe," "rare," "extreme," and "high-impact” (i.e. those words are often used interchangeably). Hence, there are several different definitions in common use. For example, Weber defines the term of "extreme” as either taking maximum values or exceedance above pre-existing high thresholds (Weber, 2012). Also, the extreme events are briefly defined as a combination of unusual circumstances which result the extremeness. Recently, another unusual circumstance shows itself by emerging from underground and this circumstance, which is called terrorism, is specially investigated under the extreme events. As time progresses, it seems that this new form will domain the construction industry much more.

1.3.Examples of the Black Swan events in history

The number of Black Swans around the world has dramatically increased in the last ten years (Boulton, 2016). Figure 5 and Figure 6 show the catastrophic events in history between 1970 and 2010. The data on the figures have been recorded by the global insurance industry and include seismic activity, health disasters, and political eruptions etc. for the last four decades. The number of recorded events, whether of man-made disasters or of natural catastrophes, have remarkable increase since 1985 and spread across global systems (Swiss Re, 2011; OECD, 2011)



Source: Swiss Re Economic Research & Consulting and Cat Perils.

Figure 5: Catastrophic events in history between 1970 and 2010

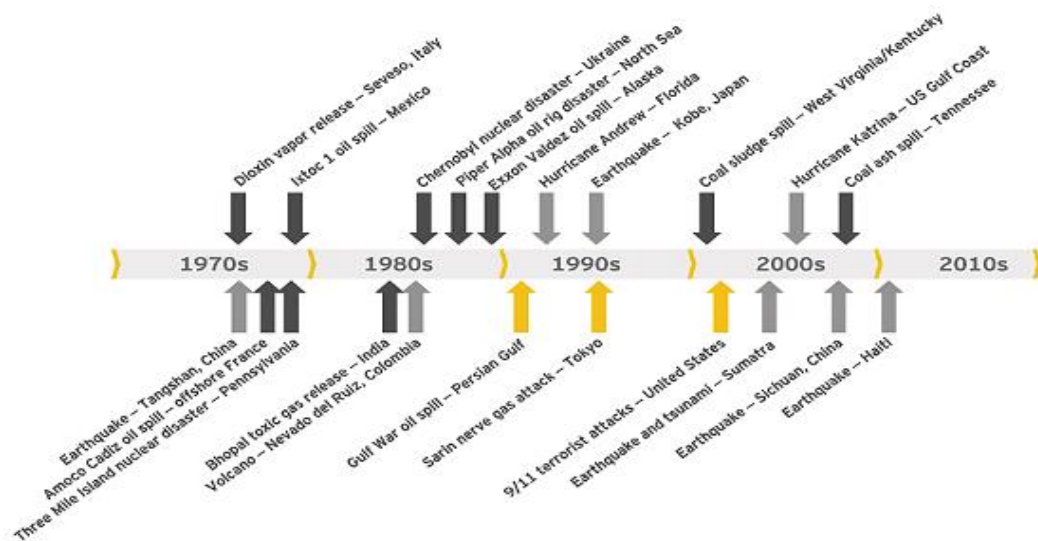


Figure 6: Main Black Swan Events last 40 years: (Ernst&Youngst, 2011)

Moreover, the literature includes different taxonomies for classifying Black Swans. The Black Swan events can be classified under different headings according to the individual interpretations. Table 1 illustrates some typical classes and the groups of some Black Swans which caused huge severe in economy, society and environment. Their negative effects played a prominent role in human history and have ensued in different systems on a continuous basis. The classification of Black Swans can be made based on the sources as environmental (such as volcanic activity in Iceland 2010, Hurricane Katrina in New Orleans) man-made (such as Sudan, and Ethiopia Famine and Arab spring) and financial (such as Mortgaged Backed Securities in USA at 2008, Cyber Attack in Estonia). The impacts of the Black Swans whose sources are environment were different based on their locations. Man-made events generally provoked huge and international impacts on the interconnected systems for a remarkable time. (OECD, 2011; Posner, 2010; Zurich, 2008) The classification can also be made based on the impact as local, (such as Oil Rig Failure of BP at 2010) natural (such as Chernobyl) and global (such as AIDS and Internet Bubble at 2000).

Table 1: Classification of Black Swans in recent history (Higgins, 2013)

Type	Examples	Location	Year	Impact	Category of Risk
Volcanic Activity	Iceland 2010	Iceland	2010	Local-Global	Environmental
Earthquake	Christchurch	NZ	2011	Local	Physical
Earthquake	Tsunami	Japan	2011	Local	Physical
Hurricane	Katrina, N. Orleans	USA	2005	Local	Physical
Pandemic	Bird Flu	Asia	2008	National-Global	Human
Pandemic	SARS	Hong Kong	2002	National-Global	Human
Pandemic	AIDS	World	1981	Global	Human
Investment	Mortgaged Backed Sec.	USA	2008	Global	Financial
Technology	Internet Bubble	World	2000	Global	Financial
Investment	Long Term Capital Management	World	1998	Global	Financial
Political	Arab Spring Uprising	MENA	2010	National	Human
Technical	Nuclear Disaster	Chernobyl	1986	Local & National	Environmental
Computer	Cyber Attack	Estonia	2007	National-Global	Financial
Political	Blockade	Qatar	2017	Local & National	Financial
Social	Terrorist Attack	Norway	2011	Local & National	Human
Political	Terrorist Attack	New York	2001	Global	Human
Religious	Wars/ Terrorism	Afghanistan	2002	National-Global	Human
Technical	Oil Rig Failure BP	Gulf of Mexico	2010	Local	Environmental
Famine	Sudan Famine	Sudan	1998	Local-National	Human
Floods	Floods	Pakistan	2010	Local-National	Human
Pandemic	Cholera Outbreak	Haiti	2010	Local	Human

1.4. Categories of Black Swans

Black Swans can be categorized under different headings according to the individual interpretations. After categorization of the Black Swan events, the strategies and approaches can be elucidated for each group separately and respectively. There are several popular and alternative classifications which have been suggested different from above. For example, Black Swans may be pieced and gathered together under three famous titles based on knowledge levels of respective team. Owing to this common definition which is recommended by Aven and Krohn (2014), Black Swans can be categorized based on the relative's knowledge, belief, and respective time. Also, whether the event is a Black Swan depends on the eyes of the relatives (Paté-Cornell, 2012). All the definitions and examples about the titles will be investigated by looking with the eyes of the risk managers.

-unknown unknowns (completely unknowns; nearly same image of Black Swan described by Paté-Cornell, 2012),

-unknown knowns (some authorities excluding related ones foreknow them, such as 9/11 event; similar to the concept of Grey Swan which is identified by Masys, 2012)

-known knowns (decision makers know the events, nevertheless ignore due to very low probabilities; relevant the figure of Perfect Storm drawn by Paté-Cornell, 2012, and Aven, 2014)

The events under the first title (which is unknown unknowns) are the events which are unforeseen for observed data and are unknown to all communities. A good and extraordinary example of this category is a glacial lake in Chile. In 2007, supposedly due to shakes on the ground, big fissures showed up on the foundation and then the lake which was behind a large dam suddenly vanished. This surprise event was completely unpredictable and unforeseen event. Another example can be the bubonic plague (a bacterial disease) in history. The bubonic plague appeared in 1350 in Europe and killed 200 million people roughly (one third of the human population at

that time). According to the researchers, this bacterial disease was born in China, carried by Asian rats with Silk Road, then spread to Anatolia by fleas, travelled to Italy along the sea and finally reached to shore of the Caspian Sea at southern Russia. Such event and its unimaginable journey were completely unknown and unpredictable to the scientific community at that time.

The second title of the classification (unknown knowns) is mostly about the perspective of the relevant risk assessments. In other words, the spot in which they stand is the key point to better understand this type. Simply, the known unknown events are the events that are already known by some authorities, but not foreseen by the risk assessments due to lack of knowledge or insufficient interest. A prime example of this category can be September 11 attack in New York in 2001. There is a common insight that such attack was expected by the authorities before happened. If the risk managers of the construction companies had assessed the risk with intensive work, this event would have been identified.

The third title (known, but rare) can be identified as low-probability, high-consequence events. The probability of such events is known but they are considered as unlikely. The chances of occurrence are neglected by the risk assessments due to low probability and high cost of preparation. Considering its consequences, the sinking of Titanic will be a good example of this type at history. Titanic was considered as unsinkable due to very low probability of sinking. As a result no one believed the necessity of life boats. The failure came as a surprise and hence its impacts were high.

There will be beneficial here to mention the Perfect Storm metaphor which is mainly discussed by Paté-Cornell in 2002. The concept of Perfect Storm, similar with the third title of the classification above, identifies the events that include rare combinations of sub conditions. In Perfect Storm events, uncertainties are small, the knowledge base is strong and hence accurate predictions can be made. But, in the type 3 Black Swans, managers cannot make the accurate predictions unlike in Perfect Storms. Put differently, if an event is a rare event and its low probability is

known with certainty; the event will be an example of a Perfect Storm rather than of a Black Swan.

In addition to these categories, there are also other different titles in the literature. For example, some authors such as Aven (2017) divide the Black Swan events into two parts as known surprises and unknown surprises, (or anticipated and unanticipated events) while Kay (1984) gathers them under three categories as unintended, imaginable and anticipated events. Figure 7 shows a schematic illustration which describes some categories of the catastrophic surprise events and their links. All Black Swans come as a surprise, but there are differentiations of their surprising when considering the categories separately. "Imaginable surprise events" are known surprises that are known but considered as very rare. "Unanticipated surprising events" are unforeseen events which are unknown for the organization. If an event which was judged as very unlikely (i.e. known knowns) occurs, it may be regarded as an unanticipated event, because it was not considered likely. Anticipated events, however, refer the events that are known to occur but not known their type and time (Aven, 2017; Gross, 2010).

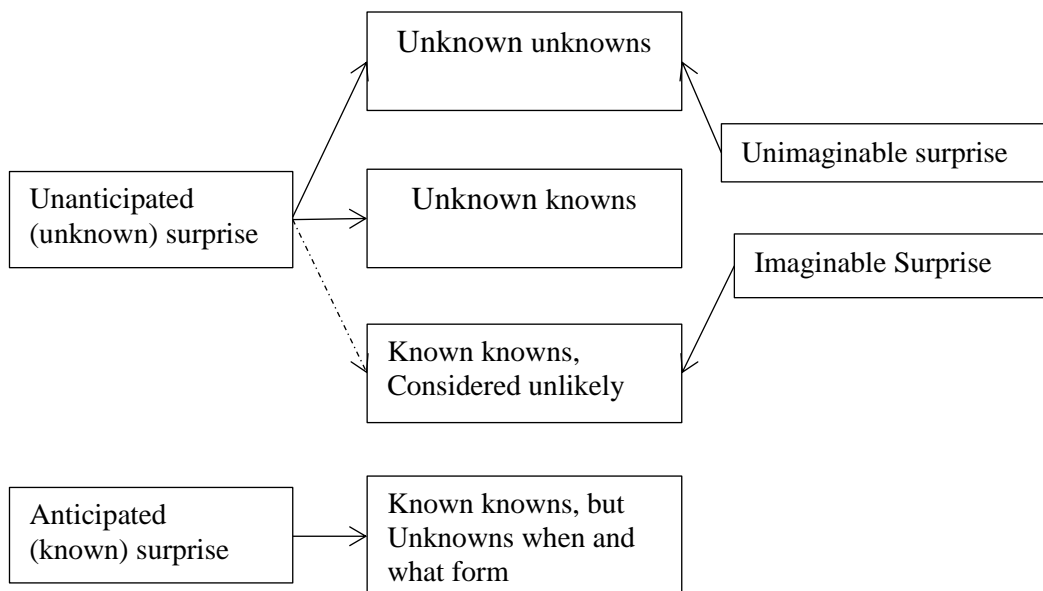


Figure 7 : A schematic illustration of some categories of Black Swans (Aven, 2017)

1.5.Literature survey on impact on Black Swans in various industries

Many articles and theses in the literature examine the Black Swan events and their impacts on the environment. According those authors in the literature such as Aven, Paté-Cornell and Cox, Black Swan concept must be seriously considered in the risk analyses (Aven, 2014; Paté-Cornell, 2012; Cox, 2012; Rzevski and Skobelev, 2014; Garret, 2015; Miller, 2010; National Academy of Sciences, 2014; NERC, 2010; OECD, 2011).

Most of these authors agree and focus on the negative effects of the Black Swan events which cause the catastrophic results in large-scale markets such as traffics, financial crisis, military impacts, etc. Taleb (2011) mostly elaborates the finance and security areas, and investigates the key examples such as the global financial crisis. The analyses of the other authors (Maslen and Hayes, 2016; Hayes and Hopkins 2014; Murphy and Conner 2012) try to prevent the hazards in the industry and infrastructure. Likewise, the Organization for Economic Co-operation and Development (OECD) believes that Black Swans spread across health, climate, social and financial systems around the world (OECD, 2011). Paté-Cornell (2012) approaches the earthquake in Japan at 2011 and tsunami which occurred as a result of the earthquake. Moreover, she extends her case examples in the large-scale markets by adding the nuclear disasters, failure risk of a U.S. Space Shuttle, and even by referring a medical case and insurance industry.

The works of Lindaas and Pettersen (2016) is another example for the literature survey. In their article, the terrorist attacks at Norway in 2011 are mentioned as a study of Black swan events. Similarly, Aven, who is an expert in safety engineering, tackles the examples in different markets such as the swine flu event in 2009 and the Fukushima Daiichi nuclear disaster in Japan (Aven, 2014). Furthermore, the 2010 BP Deepwater Horizon oil spill in the Gulf of Mexico is studied by Masys in 2012. Komljenovic et al. (2016) analyze the risks of extreme and rare events over two

different cases of Hydro-Quebec Company in North America. First case is the interruptions in the power grids installed in large urban areas, which is an example of the cases where the historical data is available. Second is the failure of the Nuclear Power Plant Gentilly-2, where no data is available is discussed separately. However, hardly any of them do not explicitly make an extensive analysis about the Black Swan events related with the construction market directly. Nearly related, Higgins (2013) scrutinizes Black Swans by researching Australian Financial forecasting in short and long terms. Additionally, Boulwood (2016) puts Black Swans into risk management in the construction practice both on a large and smaller scale.

In the next chapter, the effects of Black Swans on the construction companies will be further explored and applicability of suggested strategies will be discussed from the perspective of the construction industry.

CHAPTER II

BLACK SWANS IN THE CONSTRUCTION INDUSTRY

In order to propose effective strategies to manage Black Swans in the construction industry, the strategies proposed in the literature should be further elaborated. In this chapter, the Black Swan concept in risk management and appropriate strategies are presented and discussed from the perspective of construction industry.

2.1.Risk analyses and Black Swans

According to the Council of the Society for Risk Analysis (SRA), risk is briefly defined as “the possibility of an unfortunate occurrence and the potential for realization of the negative consequences” (SRA, 2015). It is also possible to define the risk in different ways. For example, the ISO 31000 on risk management terminology defines risk as the effect of uncertainty on objectives (ISO, 2009). Uncertainty here is the lack of perfect information about future consequences of an event.

Risk analysis is a systematic process to comprehend the nature of the risk and to express the risk with the available knowledge (Cox, 2012). Looking in details, the field of risk analysis consists of three areas namely risk assessment, risk management and politics (Figure 8). Risk assessment area focuses on the risk identification, quantification and characterization. Risk management, on the other hand, is the cumulative of the activities which handle the risk (Cox, 2012). Risk management area includes processes of communication, mitigation, and decision making. In the field of risk analysis, there is another area having equal importance

which is called politics and this field consists of criticizing the risk perception, values, power, and trust in the risk analysis (Slovic, 1999; Weber, 2001).

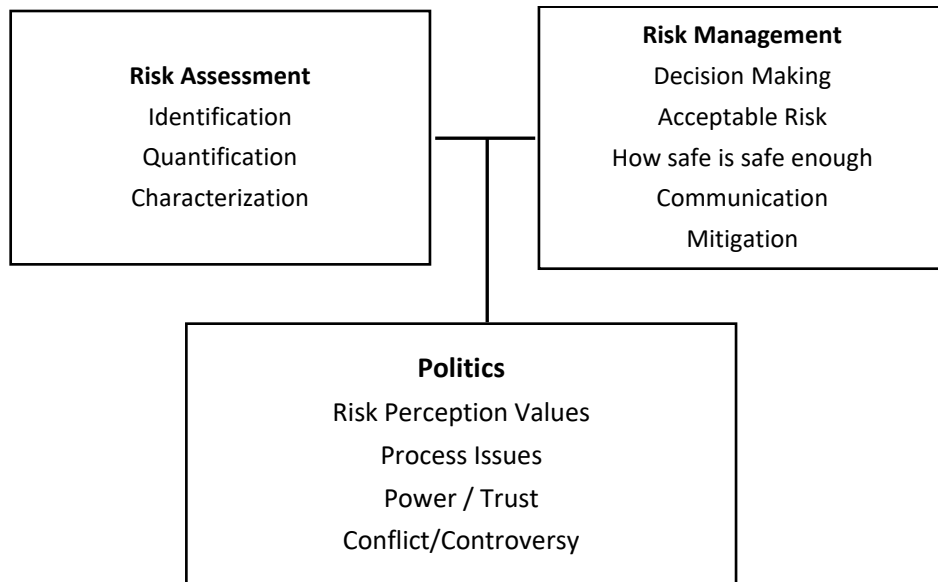


Figure 8: Components of the risk analysis (Slovic and Weber, 2002).

By virtue of risk analyses, risk strategies attempt to protect the organizations and large companies against the risks coming from different places, identify potential disruptions, and determine a road map. Despite becoming indispensable tool at the hand of risk managers, those strategies are not enough for Black Swans. The failures of the last decade show that traditional methods are not efficient ways to manage the extreme and rare events at the complex business. Lack of knowledge, inadequately management, and the nature of the Black Swan events force the decision makers to search alternative methods and tools. When looking at the current risk-informed strategies which attempt to prevent the extreme events, it will be understandable why they are not enough to confront Black Swans.

First reason of the inadequacy of the traditional risk strategies against Black Swans is uncertainty of environment. Several reasons increase the uncertainty. Firstly, the

perception in the risk analysis is the main part to identify and quantify the risks. This part plays a major role for the managers to make decision alternatives, to approach those decisions or to avoid options (Weber & Milliman, 1997; Weber, 2001). However, perception is a type of relative evaluation and related with natural and psychological aspects of the groups who make the decisions. For example, many authors accept that many variations exist among the risk perceptions of men and women (Finucane et al., 2000; Flynn et al., 1994; Slovic and Weber, 2002). Slovic (1999) also mention the variation of risk perceptions among the experts, members of general public and people from different cultures. These variations state that the human decision-making is not rational due to existence of cognitive and motivational biases. Also this circumstance makes the accurate predictions difficult or almost impossible especially for the extreme rare events (Kahneman, 2011; Mosey, 2014; Montibeller and Winterfeldt, 2015; Taleb, 2011). Secondly, Black Swans have many unexpected rare combinations coming from many dependencies. The risk-informed approach can only be used in cases where the knowledge is very strong and the uncertainties are low. However, information about the Black Swan events is very little. As mentioned above, the relativeness and variability of the risk assessment and weak knowledge about unexpected rare combinations increase the uncertainty of the rare events. In case of high uncertainties, robust and resilient solutions are needed to prepare the extreme unforeseen events.

Second reason of the inadequacy of the traditional risk strategies is complexity and fragility of the systems. In the risk management, commonly risk is calculated and combined with probability, loss and consequences. However, due to casual chains and many intervening variables in the systems, it is not possible to establish an accurate prediction for Black Swans. In other words, there are many interconnections of global, financial and politic networks prevented to see Black Swans, and hence, the resources of the information which are used to solve the complexity are limited for those unexpected extreme events. Major historical events, (such as Tsunami and nuclear hazard in Japan, civil war and political eruptions in Middle East, September 11 terrorist attack in New York, blockade of Qatar and even the financial crash of the U.S. housing market in 2008) had not adequate information to be anticipated. Also

the Black Swan events generally have lots of spots of origin, and have potential to spread to all the common risk areas. Due to this breadth and complexity, the current risk strategies cannot cover the whole area and identify the risks fully and they do not have enough capacity to detect the potential Black Swans continuously (LeMerle, 2011).

Additionally, interdependencies of the global markets bring fragility to the environment. A change at the details of remote markets may create some results for global market. Even smaller events or movements in the global markets such as innovations or failures may affect the whole market extremely. For example, Brenda Boulwood (2016) believes that the new technological developments create new weak and vulnerable points for the companies much as give them new opportunities. Therefore, in order to minimize the potential losses, companies are forced to follow the rigid, tight policies, procedures and regulatory obligations. The market is always fragile for most of the companies which do not follow these procedures. In addition to that, in order to gain relevant information and general knowledge about the effects of the complexity, mixing of the strategies, (i.e. finding and adapting the adequate balance between the approaches and strategies) is also required. All of these conditions make the anticipation of the Black Swan events more complicated and difficult. They are forcing the decision makers to analyze deeper to find more comprehensive strategies and to confront the risk of unpredictable scenarios.

2.2.Current strategies and approaches suggested in the literature

In the literature, many authors states that Black Swan concept must be seriously considered in the risk management. There are many strategies and approaches which are offered in order to withstand Black Swans by those authors, such as Aven (2015), Hand (2014), Miller (2010), Orrell and McSharry (2009), Paté-Cornell (2012), and Taleb (2011). This part will briefly collect the major and relatively pertinent strategies from various researchers and scholars. The purposes of such strategies and

approaches are making the fragile markets be more resilient, robust and agile against Black Swans.

For instance, LeMerle (2011) in his article “How to prepare for a Black Swan” points out the inadequacy of enterprise risk management (ERM), which is currently used by large companies to identify the risks. He believes ERM is not enough anymore after multiple disruptions of the past decade for several reasons. As first reason, he claims that ERM focuses on the traditional risks rather than the risks coming from Black Swans. Second, he says that the nature of Black Swans is too complex for ERM. Third, he mentions the insufficient capacity of the ERM teams. Hence he presents a disrupter analysis stress test (DAST) as subsidiary to ERM for the solution of the Black Swans’ risks. DAST consists of three major steps namely, mapping the enterprise, creating the disrupter lists, and asking “what if” (LeMerle, 2011).

On the other hand, Higgins, (2013) draws attention to the failure of the experts’ forecasts about the Global Financial Crisis at Austria in 1998 and inconsistencies of the traditional forecast models on the Black Swan events. He examines the accuracy of short term survey and six month bi-annual survey forecasting by leading economists and property analysts. Finally he suggests that the experts firstly should understand the risks associated with Black Swan Events and then examine the selected property determinants independently.

Additionally, Masys (2012) proposes a new approach called “red teaming” strategy, similar to “what if” step of DAST. In order to prepare against Black Swan risks, this approach firstly offers a scenario planning (i.e. a set of tools and methodology) which describes conceivable conditions and possible future coming from different point of views in order to explore uncertainties, and interdependencies. Figure 9 depicts an example of a scenario planning below (Masys, 2012). Then, he offers the different interpretations by drawing the imaginary wrong conclusions in order to support the idea “thinking the unthinkable”. Within the red teaming, the strategy

establishes various models, and detects the weak points of the systems and in this way helps to avert Black Swan's effects.

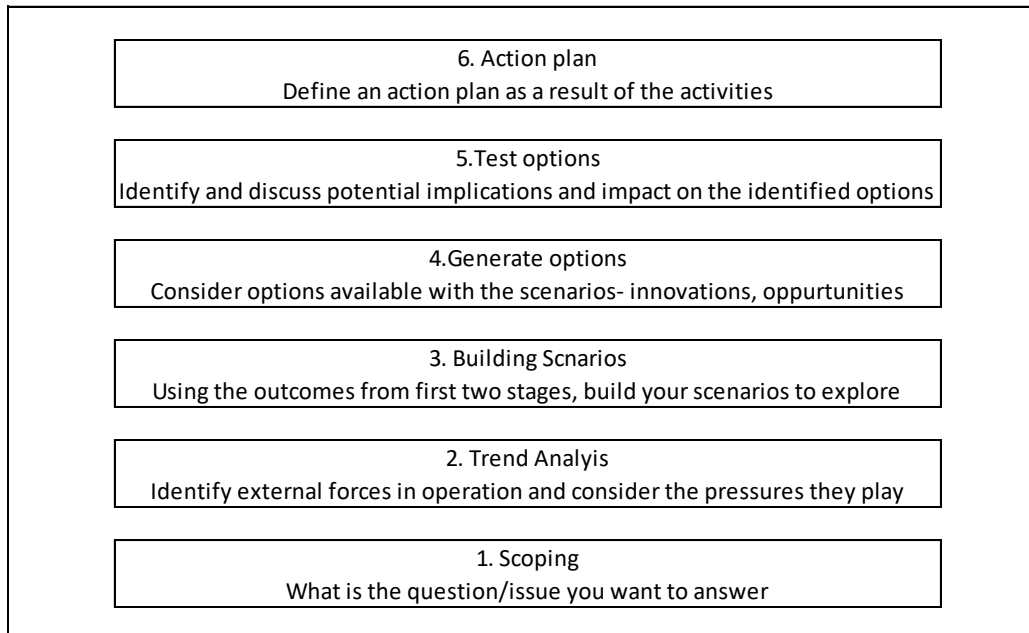


Figure 9: Steps of a scenario planning (Masys, 2012)

Aven (2014) and Paté-Cornell (2012), similar to other scholar (Miller, 2010; OECD, 2011), support that Perfect Storm events are distinctly different from Black Swans and can be handled by systematic risk analysis scenarios. Paté-Cornell (2012) agrees that Black Swans which are truly unexpected events cannot be seen before, but also argues that their unusual signals and the precursors can be detected, observed, and anticipated after emerge (called as reasoned imagination). Both (Aven (2014) and Paté-Cornell (2012)) state that the only way to anticipate such signals and prevent Perfect Storms and Black Swans are long-term observation of the historical records, careful evaluations, thinking of the rare combinations, and fast reaction.

Komljenovic et al. (2016) carry this idea one step further and they utilize the complexity theory which is currently used in different branches of the complexity science in order to understand and predict the rare combination of unusual

circumstances. Komljenovic et al. (2016) firstly describe the complex systems and they mention the several methods and tools such as Multi-Agent Based Models. Then they scrutinize a holistic model called Risk-Informed Decision-Making (RIDM).

Construction companies may need a specific comprehensive guide including all relevant solutions and offers which are mentioned dispersedly in the literature. In the following headings, Black Swan risks in the construction companies will be approached and then effective strategies will be developed to manage their impacts.

2.3.Understanding Black Swans in the construction industry

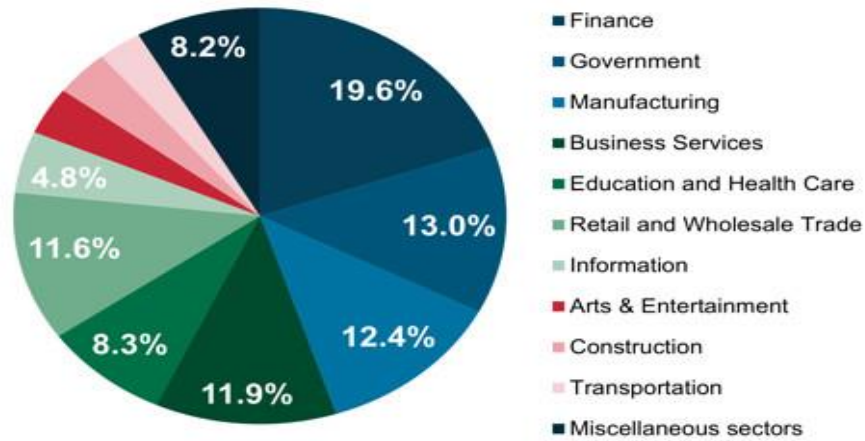
The main political (Arab Spring), technical (nuclear disasters), social (terrorist attack in New York), and environmental (earthquakes, tsunamis) Black Swan examples in history directly affected the construction world. In order to elaborate the reasons, the following sections will discuss the relations between construction industry and Black Swan dynamics.

2.3.1. General survey on the construction industry

Construction industry is one of the main industries which have great positive impacts on national economies and important roles in the economy directly and indirectly particularly for developing countries. The market as a driving force connects and contributes to other sectors such as energy, defense and transportation. Also, according Tradesmen International Construction Staffing Service (TICSS), the construction industry will have a higher employment rate than the overall economy (TICSS, 2018). When looking to the global GDP, construction industry has had about 4% contribution to GDP in recent years (Figure 10). Considering its fundamental role for other sectors and direct and indirect contributions to the other industries, construction industry has major value on the global GDP.

GDP by Industry

Finance remained the nation's top industry in 2013, while government was no. 2 despite efforts to roll back spending.



Source: Commerce Department | WSJ.com

Figure 10: GDP by industry

Source: Commerce Department | WSJ.com

According to the Bureau of Labor Statistics (BLS) and Timetric's Construction Intelligence Center (TCIC), the construction industry will be one of the fastest growing industries into 2020. According to the Global Construction 2020 report, construction industry will spend a total of \$97.7 trillion globally over the next ten years. Also the annual growth rate will be about 4.5% over the next several years. This rapid growth above GDP will continue and the market's budget will grow from \$7.2 trillion today to \$12 trillion by 2020.

2.3.2. Environment of the construction industry

Construction companies generally care about physical constructions, provide consultancy services on planning and design, and export goods and services abroad. Foreign construction markets are attractive for the contractors because they find the chance to growth in international areas. Also the foreign construction markets

provide to the multinational contractors the opportunities to be specialized and to gain experts in complex projects. However, construction projects are complex and are conducted in dynamic environments. Especially the multinational construction firms have to operate their projects with an environmental instability. Therefore, they have large uncertainty and many risks (Ashley and Bonner, 1987). According to Euler Hermes Economic Research, the risk rating of construction industry is sensitive (i.e. 3 of 4). Delays and cost overruns are evidently frequent problems of the construction industry for many developed and developing countries (Figure 11). It has been observed that construction projects are rarely completed within the estimated budget and schedule. According to Statista, the main reasons for cost overrun in construction projects worldwide are material price escalation (60%), poorly defined scope (55%), contractual disputes (%40), and design creep (% 32). According to Jayasudha et al. (2016) environmental, financial, physical, and design risks have the maximum risk rating.

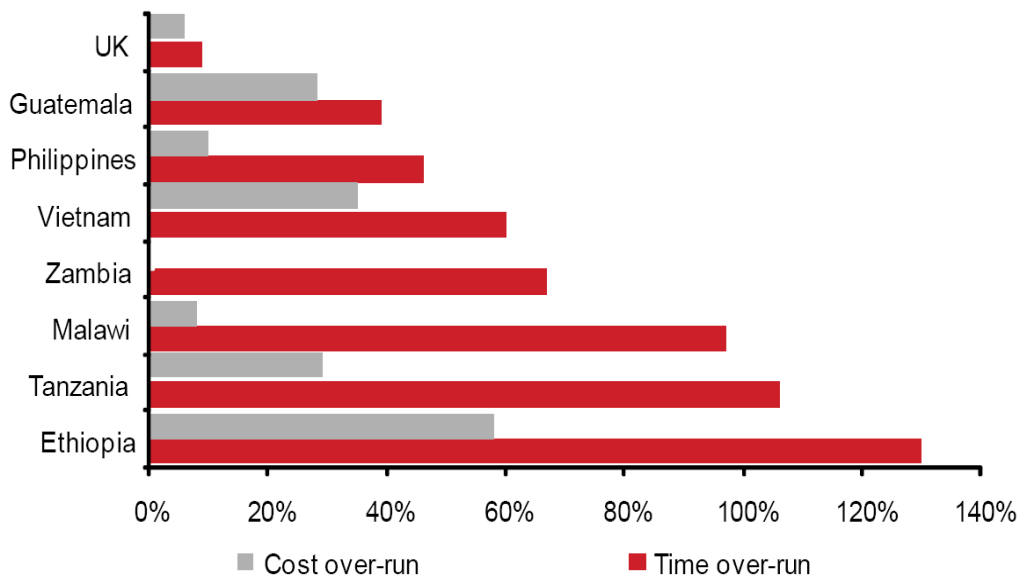


Figure 11: Cost and time over-run ratios by country Source: COST, 2011

Surprising extreme events which are described as Black Swans such as the Arab Spring, September 11, terrorist attack in Norway and blockade of Qatar and related complexities directly and badly affect the construction firms and their projects. The mixture of poor clarity and grand impact create uncertain and fragile environment for construction world and pull them down into dangerous contingencies and conflicts. As a result of the uncertainty and complexity, the sector has experienced many fluctuations providing numerous surprise events and crashes over the past years. As an example, the figure 12 shows the surprise changes on the level of the construction works growth in UK over past years. Now, the probable reasons of the complexity and uncertainty in the construction environment will be briefly explained.

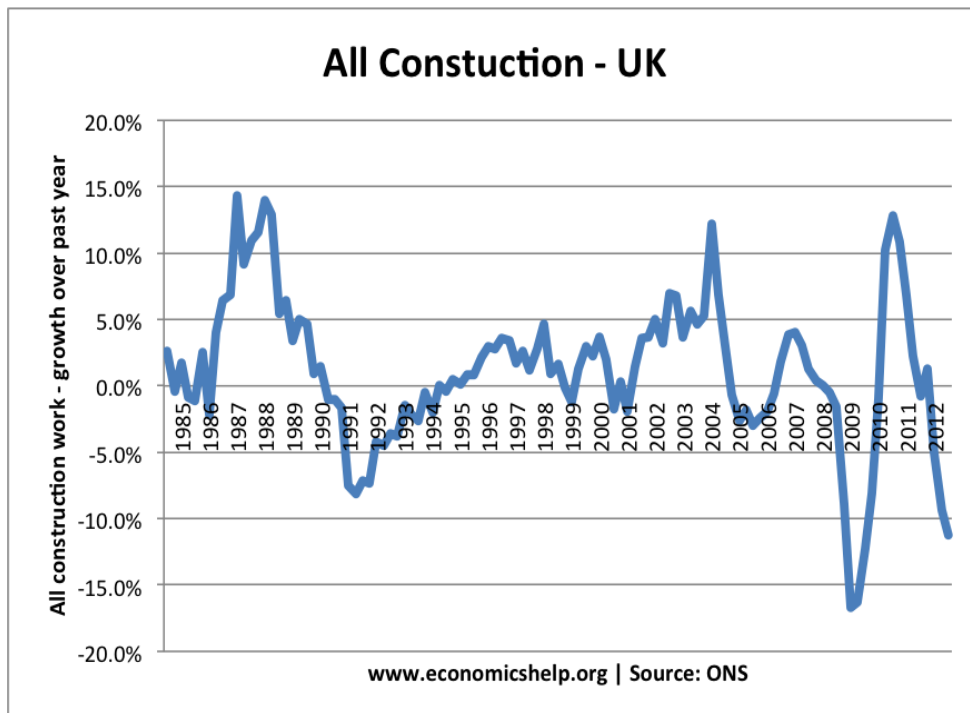


Figure 12: Surprise changes on the level of the construction works in UK

Source: ONS

a. Complexity and fragility

Construction projects connect with many disciplines, touch people from different markets and industries, and have lots of contractual relationships. Those factors create complex chains for the projects especially international and high volume ones. As a result, the contractors, especially multinational ones encounter the difficulties because of the private interest groups, local authorities and governments. Also this circumstance makes control measures difficult to implement for the risk managers. In addition to that, the volume and the scale of the investments are other factors that provide fragility. High volume and long-termed projects such as dams, airports and railways which have also high cost budgets bring along fragile environment, and then result the surprise catastrophes, the cost and time overruns and other high level events. Complex procurement procedures are also other factors which make the environment a very fragile and subtle area. Making even a little inadvertent confirmation on the procurement procedures can result widespread collusions, and inevitable disputes that create surprise failures as a result. Additionally, the lowest price biddings attract the contractors and force them to accept impractical bids. As a result, companies cannot provide the standards, or make profits. Then, time and cost overruns bring failure for those companies.

b. Economic uncertainty

The multinational construction companies are very sensitive to economic fluctuations. As mentioned above, the big reasons of the cost and time overrun are the uncertainty of the materials, and prices of the materials, and works. The risks of this area are directly related with the economic uncertainty in the related countries or global economy. Policy-related uncertainty arises as a consequence of major economic shocks and disruptions. Bernanke analysis and shows the effects of the economic policy uncertainty on the investment, hiring, consumption, financing costs, asset prices, output growth and other economic outcomes (Bernanke, 1983). For example, the fluctuant currency exchange in the host country can easily spoil the

construction companies' expectation. Even a little changes of cash flow between the host government and the construction company due to unbalanced policies can also severe all projects. Additionally, the failure of the insurance programs creates a tension for the construction companies. Moreover, the policies of the host government generally force the foreign construction companies to work with local firms in accordance with the host country's goals. These policies also pull the construction firms down and create uncertain environment. Figure 13 shows the economic uncertainty of the World for years. There is a remarkable and surprise increases on the levels of the uncertainty in the past five years (Davis, 2016).

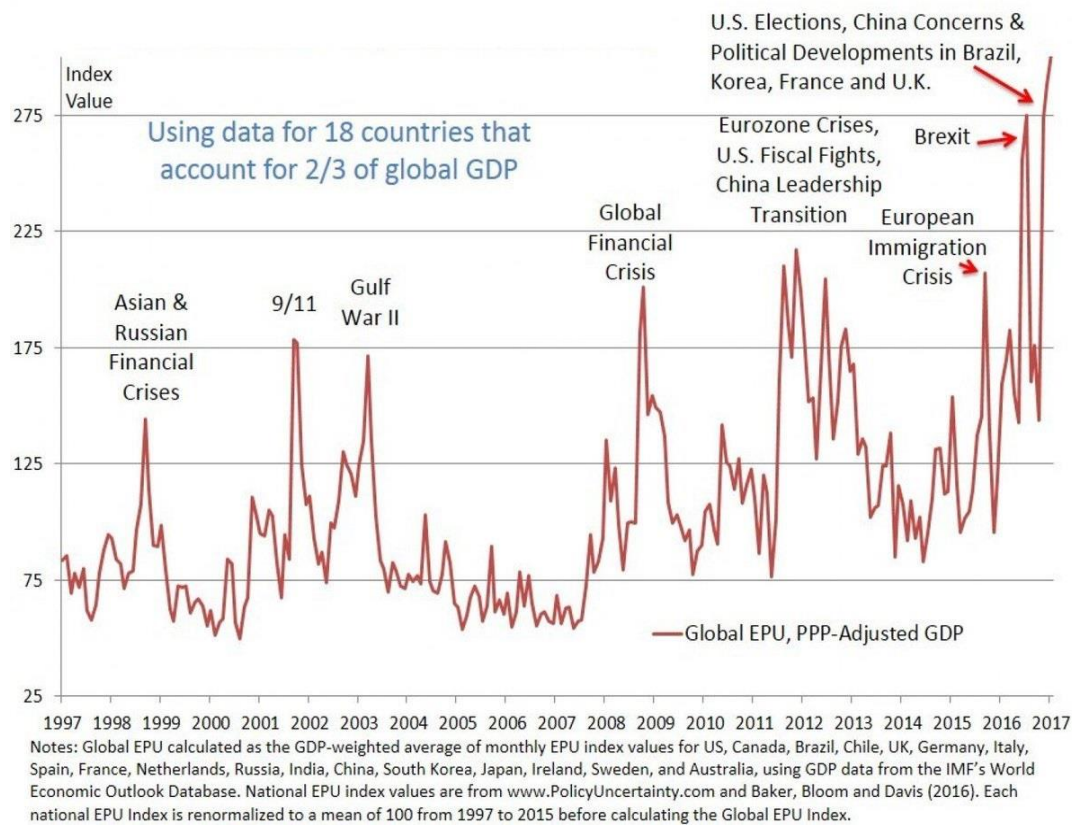


Figure 13: Global economic policy uncertainty

Source: EPU

c. Political uncertainty

Political risks mean the risks which shape with the occurrence of politically motivated events (Haendel 1979). Political problems, changes and corruptions are the main reasons which affect the multinational construction companies, and provide the uncertainty and the surprise crashes. For example, The Arab Spring event is an appropriate example of political changes which cause economic crises and the construction failure. Arab spring created the construction failures in the region, chaos on other markets and finally caused financial crises globally. Over 140 out of 180 construction companies could not receive their payment from governments, owners and local authorities. Addition to that, bureaucratic burdens and red tape are other factors providing uncertainty for the construction companies. Construction companies have to follow numerous approvals, the rigid, tight policies, procedures and regulatory obligations which make control measures difficult to implement. As a result, they fall into the risk of comfort with the status quo and eventually the risk of unpredictable scenarios.

When consideration of the uncertainty and fragile environment, some approaches and strategies are needed to focus on the threat of Black Swan types of events in construction industry.

2.4.Strategies about how Black Swan risks can be managed

According to Brenda Boulwood (2016), too few companies try to confront Black Swans and even consider them effectively today. In this work, the current strategies in the literature which have already offered for various markets or general purposes will be attempted to be adapted into the construction world to improve the uncertainty management. Now, the following sections will collect the comprehensive suggestions, which are acquired from the literature, under some major roofs and the drivers of the construction market.

2.4.1. Enriching the decision board

According to John Beck at Aecon Group, very few managers or board members have real experience about once-in-a-lifetime events, and therefore, they are not aware of all the risks (Galt, 2016). In the view of Lindaas and Pettersen, the real problem is not the predictability, but lack of understanding the unique risks (Lindaas and Pettersen, 2016). As described by Makridakis and Taleb (2011), in order to strengthen the forecast accuracy, managers should combine the predictions from different experts. Higgins (2013) states in his study in which he examines Black Swan effects of Global Financial Crisis that experts should, as the first step, understand the frame of the risks related with the Black Swan events. Johnson (2008) states that the technical, managerial issues and human failures are the main causes the failure stemmed from Black swan events.

It seems that there exists a common understanding that having experience and knowledge is an indispensable way to confront Black Swans. Companies can identify and manage the risks better if they have the experienced people or even if they keep in touch with them. In order to be on the alert and more resilient, construction companies should build up and enrich their board members with more experienced directors who have already proved themselves at the similar crises. Experienced and practiced decision boards may catch the signals or warnings and establish adequate solutions in different cases. This board will give to the companies the potential to increase the level of preparedness against the catastrophic events.

Sometimes, the events are on the list of hazards, however managers, due to lack of experiences or consistencies, may fail to notice the start point of a crisis that result local or global the Black Swan events for the companies. A prime example of this circumstance is "Australian property market failure" in 2008. At the failure at the "Financial Global Crisis in December 2008" period, all forecasts were inconsistent and inadequate to catch the start point. Only the forecasts of particular managers which had real experience before were succeeding. However, the number of these

forecasts was inadequate to affect the consequences. As a result, the impacts of Global Financial crisis on the property market in Australia were spread to the market and periled many local companies.

Moreover sometimes, the events are known, similar to the third group of the Black Swan events, but the decision makers do not believe that it will happen, therefore they ignore them. The destruction of Fukushima Daiichi which was resulted a volcanic eruption under the ocean is a good example for this issue. As far as it was surprise to happen, experts had known the risks, yet they ignored it because of improvidence and inexperience (Aven, 2014). Another example to show the important of the experienced people is the BP Deepwater Horizon oil spill. According to National Academy of Engineering and National Research Council (2010), the main reason of the various failures at the event of the BP Deepwater Horizon oil spill at 2010 were unsuitable approaches for the risks, and inadequate studies from previous near misses about drilling failures.

The power of knowledge and experience may change the color of the Black Swan event or shift them to a Perfect Storm. The Perfect Storm metaphor should be taken into account here. It must be accepted that the Perfect Storms and the Black Swan events are different concepts in principle. Perfect Storm events, no matter how they are rare, have a potential to exist and for managers, they should come as no surprise. In fact, the notion of "imaginable surprise", which is mentioned in Chapter 2, will be more accurate here to describe the unexpectation of the Perfect Storm. On paper, the proportion of the certain extreme events can be known statistically by looking at the past records. For example, when a very rare traffic accident having a strange combination happens, people will shock. In principle, this accident seems the concept of a Black Swan apparently. However, if annual proportion of this certain rare accident in traffic can be calculated or simply acquired, accurate prediction can be made by considering the statistical data and accordingly the occurring of the accident now will not be seen as a surprise. In this manner, the experienced and awake decision boards can kill the unpredictability of the Black Swan events with precise probabilities, accurate predictions and associated statistics.

2.4.2. Pessimistic view

Taleb (2007) claims a relation between human behavior and the Black Swan events and discusses some reasons why the Black Swan events are underestimated until they occur. Firstly, human nature is not designed to estimate the events which include the contradictions, complexity, and negativity. Addition to that, human behavior generally opts for the positive results. This is the basic instinct of human being which makes understandable the reason of why people buying a million-to-one chance lottery ticket. In other respects, no one can expect a meteorite, which will come to the earth from sky one day, strikes a nuclear power plant and hence causes a catastrophe. All the Perfect Storm and the Black Swan events in history such as earthquake in Japan in March 2011, Sanriku Earthquake in 1611, and Fukushima Daiichi nuclear failure can be considered as the example cases proving the fact that, no matter how rare the conjunction are, the existence of risk will always be there and has the potential to thwart or vitiate the whole project.

In principle, pessimistic view, as devil's advocate, is an approach that continually interprets the pessimistic results and draws the imaginary wrong conclusions. Thus, this approach can tackle the weakest points and the vulnerabilities of the systems in order to avoid the common faults (Janis, 1972). Also this approach helps to shed light on Black Swans in other various disciplines, such as government organizations, security of information, and competition of businesses (Rieger, 2008). Additionally, this approach plays a prominent rule in military and is currently applied in some military purposes tacitly or explicitly. Israel Military Forces apply another version of this approach which is called "tenth man rule". In this approach, a special board which consist of 10 advisors look into wide picture of the risks. In case that 9 advisors in this decision board believe that a plan or a strategy is perfectly correct and stable, the last advisor should play the role of the objector deliberately to find the weaknesses and pitfalls of the companies. According to Yosef Kuperwasser, head the Research Division of the Israel Defense Forces, Israel's Security Council have

been more prepared against many Arab attacks, and had many successful results thanks to this approach (Masys, 2012).

2.4.3. Enlarging perspective

As mentioned before, the lack of knowledge constitutes the weakest point against Black Swans. Most of the Black Swan events in history (especially in unknown knowns type), could have been mitigated, if the relevant managers had foreknown the real impacts of them before or during the events. However, it is theoretically possible to foresee Black Swans in a certain extent (not accurately, but approximately). According to Woods, “every event, no matter how dissimilar on the surface, contains information about underlying general patterns that help create foresight about potential risks before failure or harm occurs” (Woods, 2003). Additionally, recent works have suggested that computational analyses of the large text archives can predict future severe events. For example, Arab spring case had been predicted by a super computer which scrutinized geographic analyses to a 30-year worldwide news archive (Leetaru, 2011). Even gamble has many statistical and mathematical consequences, and accordingly many accurate predictions can be calculated behind the field of paradox (Epstein, 2010). So, lack of knowledge, in principle, can be satisfied actually. Paté-Cornell (2012) states that the important reason of missing the extreme rare events are the failure to detect precursors and warning signals. Also, Aven (2014) offers improved communication and transfer knowledge as a solution to confront the Black Swan events.

Perspective of viewpoints is one of the weakest parts of this complication. Risk analysts, generally, gaze inside of the frameworks. For example, in the Arab Spring case, some authorities and specialists from outside the construction market have already known, at least they were aware that something would happen in Middle East. At the case of Fukushima Daiichi Reactor failure, by taking the historical record into account, the risks of excessive load combination could have been forecasted (Paté-Cornell, 2012). If they change their perspectives and view the

coming or current events from wider standpoints, they will obtain more information about the signals and raise their awareness of the Black Swan events.

Perfect Storm metaphors should be reconsidered here. According to micro perspective of an event, the decision makers can ignore Black Swans. However, if they have a wider perspective, Black Swans may be disappeared and leave the place to the Perfect Storms. Perfect Storms, despite negligible probability, can be predicted with accurate proportion. Managers can now expect the Perfect Storms although still their time and type can be unpredictable. In case of having adequate wide perspective, the managers can also predict their time and type, thus they can withstand Black Swans properly.

On the other hand, human nature generally ignores other's knowledge and does not tend to consult with unknown sources. Humans concentrate on the known sources and ignore the complexity of reality (Taleb, 2011). Therefore, the complexity and uncertainties of Black Swans make the assumptions and predictions almost impossible to managers in some aspects. However, considering the butterfly effects in chaos theory, even tiny factor might trigger the catastrophes irreversibly. For offering effective and adequate solutions it is highly necessary to scrutinize Black Swans with wider perspectives.

Further research is needed about which strategies can be effective or how they can mix and adapt for the construction industry. Supportively, a research methodology based on case study will be used, which will be explained in the next section.

CHAPTER III

RESEARCH METHODOLOGY: A CASE STUDY ON THE ARAB SPRING

The aim of this thesis is to explore the impacts of Black Swans on the construction companies and propose the strategies to mitigate the adverse impacts. A case study approach has been selected for this research. In this chapter, why a case study research is selected, and how the research is conducted will be explained.

3.1. Case study research

Yin (1984) in his book “Case Study Research, Design and Methods” tackles the research methodologies and emphasizes the validity, reliability and credibility of a case study research. He explains the case study research as “linear, but iterative process”. Also, he defines a case study research as a useful, relevant, practical, and readable method for social complexities. The case studies, fundamentally, develop the theoretical ideas that put forward as a starting point throughout the research. Hence, the main purpose is to evaluate the validity, and reliability of the theories, approaches, and strategies that come up with. In order to explore Black Swan phenomenon and investigate the approaches, which are mentioned at Chapter 2, an appropriate and specific case study is needed. Therefore, this thesis will work on a case study from the construction world for investigating usability and reliability of the approaches offered and developing a visual environment to make them more apparent.

There are several methods of the case research in the literature mainly survey, experiment, archive, and historical methods. Yin (1984) shows in his book that the

case study is a unique method and a more inclusive way when compared to the others, because the case study researches encompass most of the methods by including collection techniques, data analysis, and specific designs. The other important point of the case study is that a case study is able to tackle the complexity and the contextual conditions of a case process including temporal changes in real life events. Accordingly, a case study research tries to answer basic questions such as why, how, when and where as an empirical inquiry. Most simply, a case study investigates a contemporary phenomenon in detail and within its real-world context and makes suitable evaluations (Yin, 1984; Yin 2009). For this purpose, the method follows some functional, analytical and legitimate ways to make a conclusion in the organizational and managerial processes.

Yin (1984) points out 5 components of a case study after the determination of the purpose; plan, design, preparation, collection, analyzes, and sharing. Put in other way, the research questions, the propositions, the collecting data, the logic plan and the criteria for analysis constitute the main frame of a case study preparation. In this work, the Arab Spring which is a prime example of the Black Swan at recent years will be discussed as a case study in this framework and the lessons learned from this event will be investigated.

3.2.The Arab Spring as a case study

Most cases that are scrutinized in the literature for exploring Black Swans are examples of the large projects in various markets. For example, while Aven (2014) studies in his article on different Black Swan cases at various perspectives from health to geology, Higgins (2013) examines the case of Austrian property market. On the other hand, Yin (1984) develops the insights into Black Swans by investigating BP Deepwater Horizon oil spill and nuclear accident in Japan. Komljenovic et al. (2016) analyze the risks of extreme and rare events over the case of Hydro-Quebec Company in North America. In history, there are many other Black Swan examples taken place and affected to the construction world badly, such as Tsunami and

nuclear hazard in Japan, terrorist attacks in New York and Norway, the financial crash of Turkey 2002, etc. The Arab spring is one of Black Swan examples related with the construction market directly.

Yin (1984) states some determinant factors which are the reasons of the choice of type of the case studies. The Arab Spring event is extreme, and long-term. Additionally, this event is unique and revolutionary in many aspects. Considering the characteristics of the region and the event, the Arab Spring is one of the best events to examine Black Swan phenomenon.

3.2.1. Extremeness of the Arab Spring

The Arab spring uprising began in December 2010 after security forces in Tunisia opened fire on a protest. Then it rapidly spread in a wide region, similar to a house in a fire. Figure 14 illustrates how the public consequences of the Arab Spring at the Arab countries separately spread. The catastrophe of the Arab spring event was one of the greatest disasters in the quarter of this century. Arab spring was a critical and extreme event for the world in almost every aspect such as economic, society, politic and security. The politic instability, the social problems in the region among people, and the security anxieties of the markets caused the short and the long term impacts with the local or global ramifications.



Figure 14: The Arab Spring consequences in Arab World Source: The Economist

Firstly, the Arab Spring had negative consequences for global economic performance tragically. For example, the global economy heavily depends on the oil industry and the Arab Spring region is on the most important oil and gas reservoirs in the world. Inherently, the oil and gas industry is the prime sector in that region. According to BP Annual Statistical Review in 2011, the region heavily encountered along with Saudi Arabia the world's oil needs by holding the 816 billion barrels of proven oil reserves in 2010. Even now, the area meets the great global demand by holding 29.1% of world's natural gas and 49.6% of proved oil reserves. This means that the global economy is directly related with that region and its stability. In other words, the shake on this area create great impacts on the oil and the gas industry with the strong local and global consequences on the world's economy. The impact of the Arab Spring is obviously seen in associated period. Before the event, the production oil from these countries was 3 million barrels per day. But after beginning of the spring, the total production felt under half million barrels per day (Figure 15).

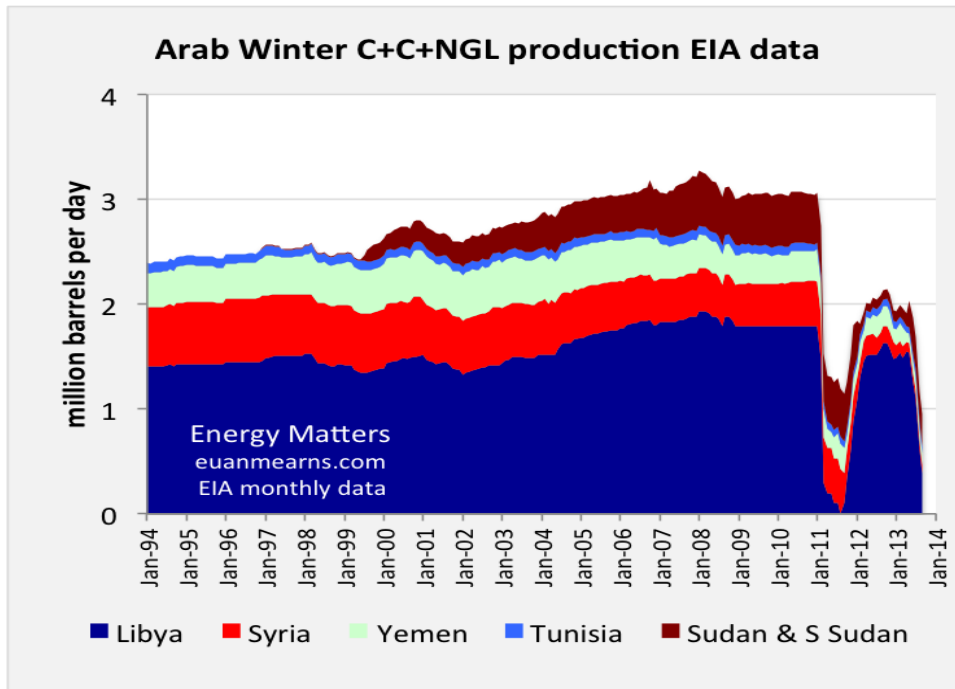


Figure 15: Crude oil and natural gas liquids production stocks affected by the Arab Spring
 Source: EIA (US Energy Information Administration)

Secondly, the region is very important for the international construction market. According to BMI research, the region is the fastest growing area in the world for the construction industry. Annually expanding of the construction sector in the short and long term in 5 years is averagely 6.5%. Only in 2018, the construction sector expanded by almost 6% and reached the 225 billion dollars. Moreover, according to the Timetric's Construction Intelligence Center (TCIC), the estimated expanding of the region in the next two years is 6.9% annually. For the Turkish contractors, Middle East and North Africa (MENA) region, especially Libya and Iraq are the key markets and this region has increased its weight steadily in recent years. However, with the civil war in the area, the activities have fallen behind temporarily. In a nutshell, over 140 construction companies from Turkey could not receive their payment from governments, owners and local authorities. Many large and small companies were bankrupted, or met with great difficulties which compelled them to run away from the region. Very few of them succeed to get their payment on time, and most of them still try to fight to bring what they lost back.

In addition to these, the increase of the inflation, the falloff in tourism, the fiscal deficits, and the unemployment were other extreme results of the event. The growth of real GDP between 2010 and 2011 dropped sharply in Libya, Egypt and Tunisia (Figure 16, 17 and 18). In Egypt, annually growth dropped to under 2 percent in 2011 from 5 percent in 2010. In Tunisia, this rate fell badly below to 0 from over 3. For Libya, the picture was worse than the others. After falling steadily until 2009, in 2010 the rate took a little step and reached over 0. However, during the event, the rate rapidly fell below to 0 and reached the deepest point as a result of civil war. As a result, it reduced the oil production, which was its main product, and its revenue source (Khan, 2014).

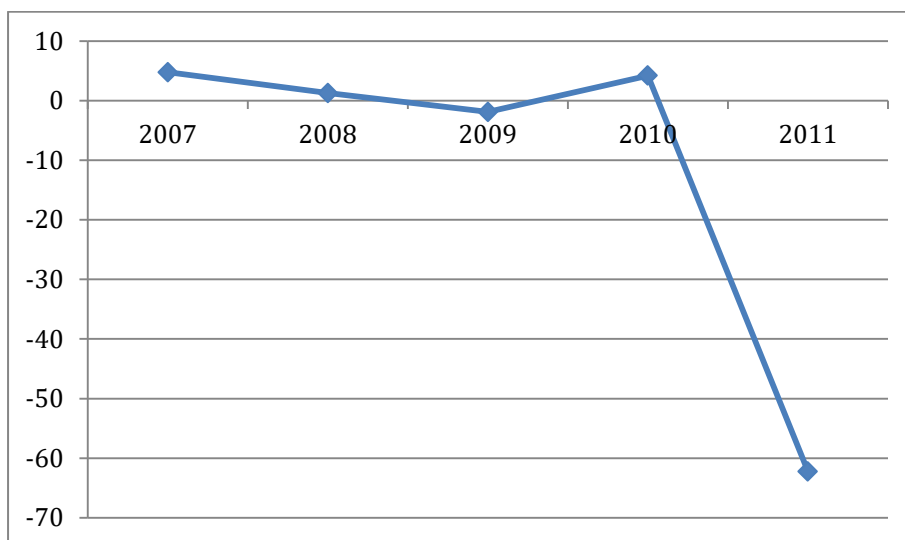


Figure 16: GDP per capita growth (annual %) for Libya Source: World Bank

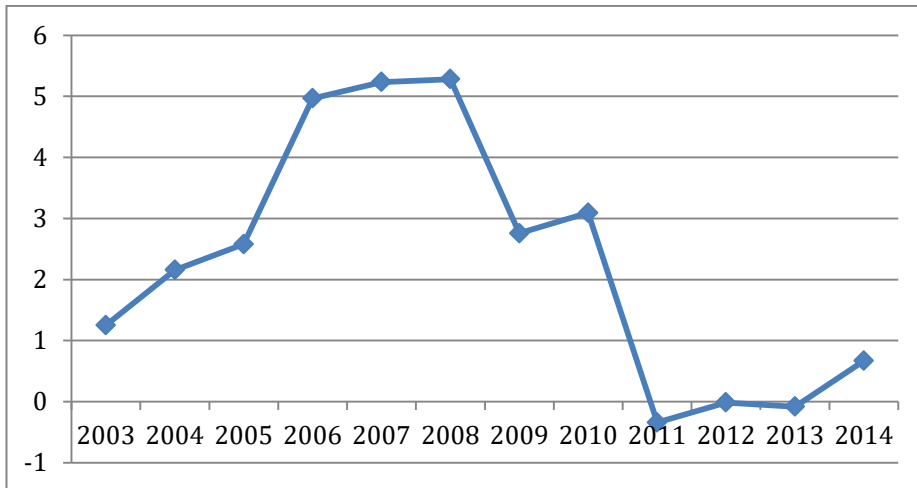


Figure 17: GDP growth (annual %) for Egypt Source: World Bank

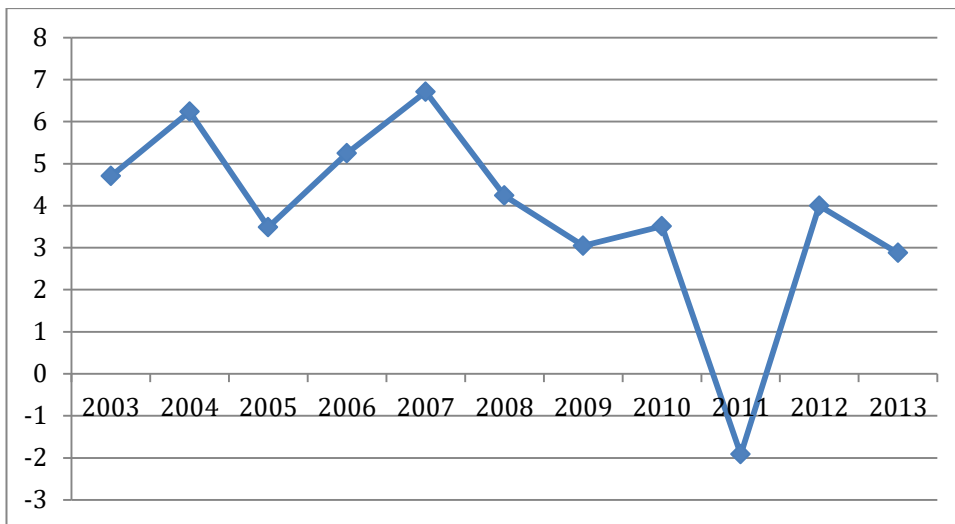


Figure 18: Tunisia GDP growth (annual %) Source: World Bank

Unemployment was another major problem which emerged as a result of the event. Unemployment rates in the aforementioned countries hit maximum numbers after the civil war. In 2010, the Arab spring sparked from Tunisia where the unemployment rate was already high. Then in the next station, Egypt, the rate rose until 14 percent when coming to 2012. After reaching to Libya, the unemployment rate jumped to over 26 percent in 2012 (Figure 19).

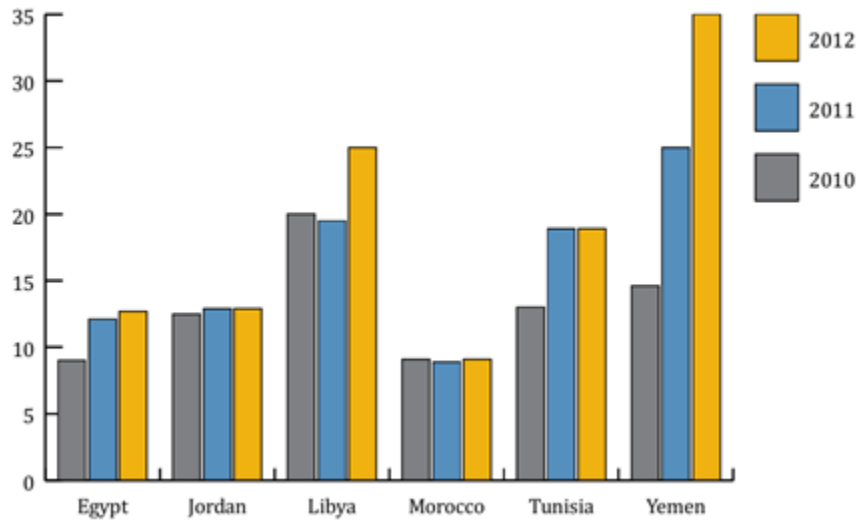


Figure 19: Official unemployment rates in years at some Arab countries affected the Arab Spring (Khan, 2014)

3.2.2. Surprise factors related with the Arab Spring

Arab spring is a typical example of unexpected and extreme events. As mentioned above, the Black Swan events have three characteristics as distinguished from other extreme events: a) outlier, b) widespread and c) with very low probability of occurrence. Put differently, the Black Swan events are very surprise events which have extreme impacts. The Arab spring seemingly have all three attributes under the study or the observation. Arab spring stemmed from a small spark, then cascaded and burned the vicinity surprisingly. The world shocked due to its rapid spread. This so-called spring first was perturbed, and then thwarted many companies in the various markets employed in the Arab world.

Arab Spring also fits to other attribute of Black Swans. Despite its outlier status, after Black Swans, in order to make the events explainable and predictable, people try to make concoct ex-post explanations of its occurrence rather than accepting their inabilities. Aftermath of the Arab Spring, some experts tried to make the Arab Spring a predictable event with ex-post explanations. These experts believe that the

Arab Spring was predictable and expectable event. For example, after the occurrence, in order to prove that the Arab Spring was predictable event, some old problems in the region, such as the politic corruptions, the high economic inequality, and the lack of the inclusion, have been asserted as the reasons of the event (World Bank, 2016).

However, the Arab Spring was as a surprise and unpredictable event. Because, contrary to popular opinion, MENA region when compared the other developing countries, has been thought by the experts as a more stable region in its league. According to the World Bank research, the situation of MENA region had stable on a continuous basis throughout 10 years (Figure 20).

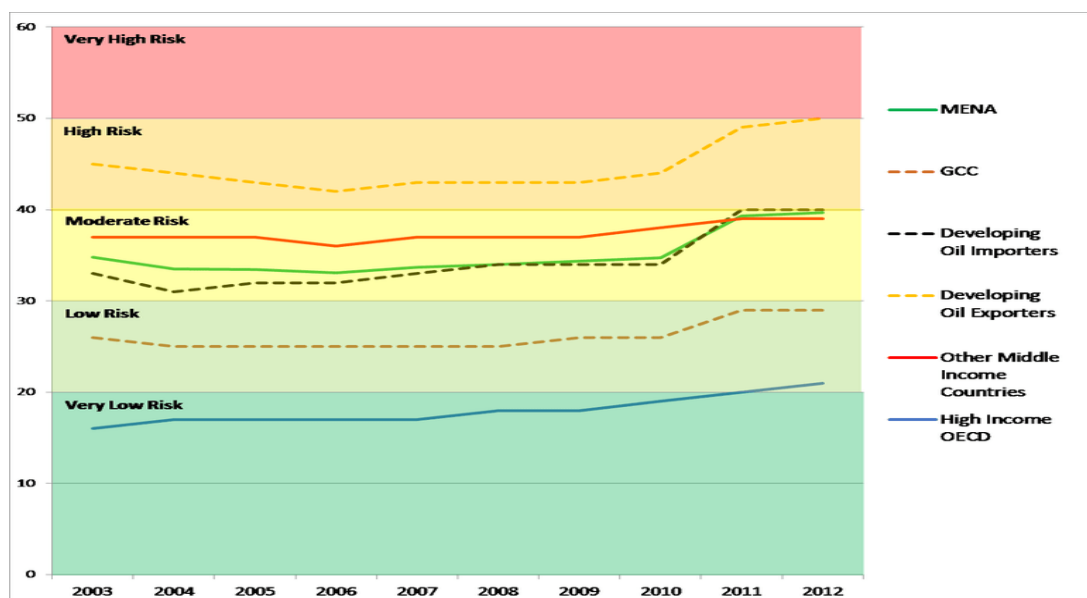


Figure 20: Political instability index, 2000-2012 (Ianchovichina, 2018)

Normally, the standard indicators try to capture the economic performance of the current countries and illustrate their development rate by employing the data of the poverty, education and health. Hence, for most managers who relied on the indicators, the Arab Spring event was a veiled event. Because, most standard data which capture the stability of the region prove that the Arab Spring was surprise.

Table 2 shows the stability of some indicators until the Arab Spring Event in Egypt. In 2011, the indicators in Egypt fell down surprisingly.

Table 2: Changes of the indicators during years in Egypt Source: World Bank

Country Name	Indicator Name	2008	2009	2010	2011
Egypt, Arab Rep.	GDP per capita growth (annual %)	5.28	2.76	3.09	-0.34
	Natural gas rents (% of GDP)	2.36	1.78	0.97	1.66
	GDP growth (annual %)	7.16	4.67	5.15	1.78

Also, In Libya case, the picture is clearer than the others. Whilst almost every indicator in Libya has come steadily until 2011, they explicitly fell down during and after the civil war (Figure 21).

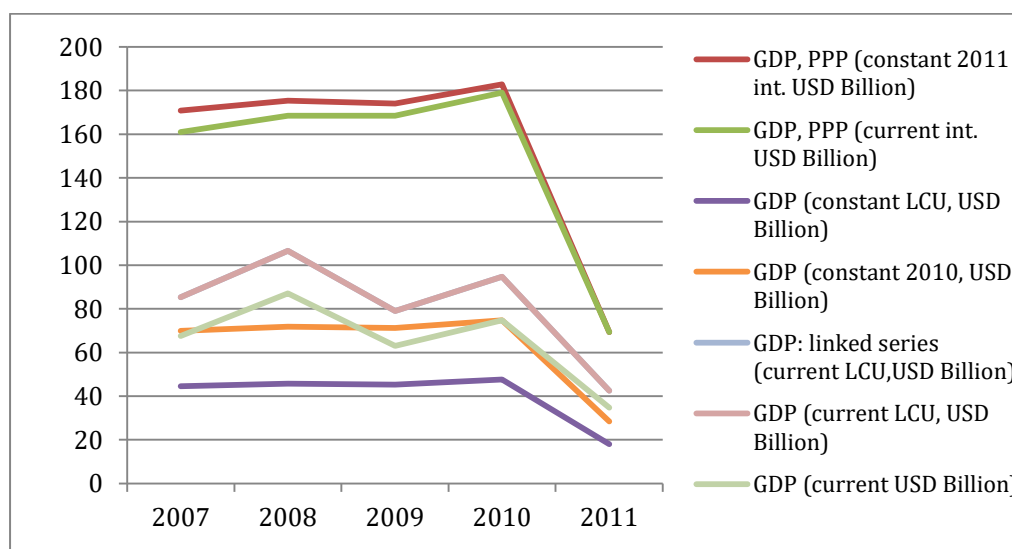


Figure 21: Changes of the indicators during years in Libya Source: World Bank

Forth, the Arab Spring Case may also be considered as a typical example of a Perfect Storm concept. Aftermath of an extreme event, merging local, regional and global impacts create a Perfect Storm. For Arab Spring event, the social uncertainty, the political changes, and raising the unemployment caused a regional spillover. Meanwhile, the global crisis especially in Europe decreased the volume of the products demanding from the region. When raising the oil prices due to the irrelevant reasons and reducing the tourism income combined and joined to the other problems, the event transformed a Perfect Storm (World Bank, 2016). As a result, Arab countries drastically affected from that Perfect storm.

3.3.The Arab Spring and the Turkish construction market

3.3.1. A survey of the Turkish construction market

Construction sector plays a prominent role for Turkey's economy. In fact, Turkey is one of the global leading producers for construction sector with 8755 projects in over 100 countries. According to the publish prepared by ENR magazine, Turkey is the second biggest country in the construction world and 43 Turkish companies take place in the list "The World's Top 250 International Contractors in 2014 (ENR-Engineering News Record, 2014).

Table 3: Grow rates of the Turkish construction sector in years

Year	GDP %	Construction Sector GDP %
1999	-3.4	-3.1
2000	6.8	4.9
2001	-5.7	-17.4
2002	6.2	13.9
2003	5.3	7.8
2004	9.4	14.1
2005	8.4	9.3
2006	6.9	18.5
2007	4.7	5.7
2008	0.7	8.1
2009	-4.8	16.1
2010	9.2	18.3
2011	8.8	11.5
2012	2.1	0.6
2013	4.2	7.4
2014	3	2.2
2015	4	1.7

(Source: Ministry of Economy of Turkey)

The major role of the success is undoubtedly geographical advantages of its location. Additionally, achievement of the Turkish companies in the previous projects, the extensive experience and the social connection with other countries give also great contributions in this success. Table 3 and Figure 22 show and compare the grow rates annually between 1999 and 2015. Turkey experienced two big economic crises in 1999 and 2001, and then the foreign contracting services rapidly recovered in the next years. After falling down slowly in 2007 due to the global crisis, the construction sector made a remarkable progress and started recovery at the end of that year. Between 2000 and 2009, Turkish contactors majorly carried out the

international projects of Russian Federation in ratio 16%, and of Libya in ratio 12.4% (Figure 23). Up until 2010, the sector grew up by 18.5 % in 2006, and 18.3% in 2010. After 2010, the growth trend ended up and started to fall down sharply due to the impact of the global crises such as the Arab Spring. At the end of 2012, Turkish construction sector reached the bottom by suffering under the global crises.



Figure 22: Annual changes in grow rates of GDP and construction sector in Turkey
Source: Ministry of Economy of Turkey

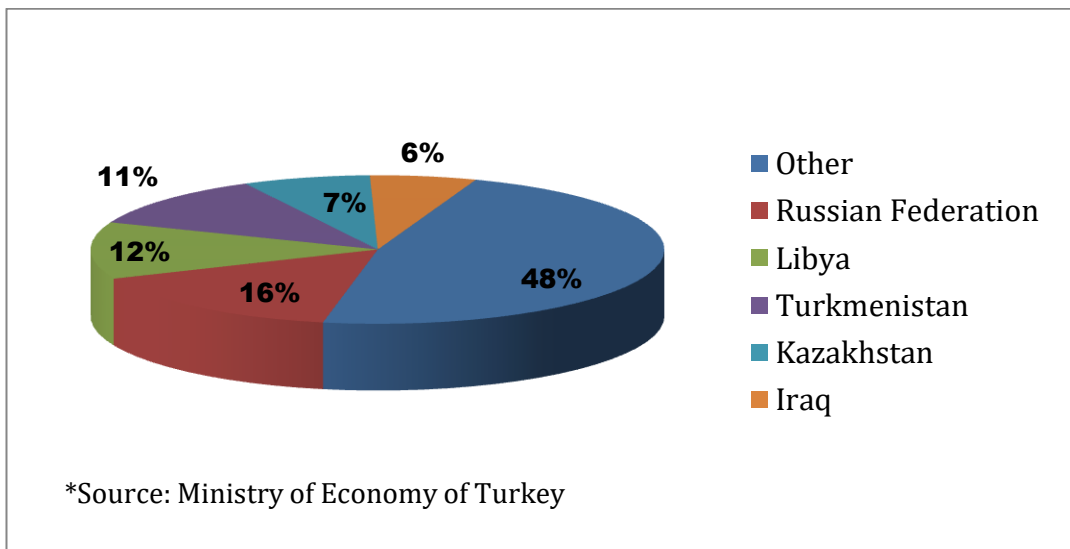


Figure 23: Distribution of international works of Turkey between 2000 and 2009

3.3.2. The impacts of the Arab Spring on the Turkish construction market

Before revolution, the economy of the Arab world developed rapidly and steady over 10 years especially until right before the events. Turkish contractors and consultancies have in only Libya conducted 124 projects valued at about 8 billion dollars between 2009-2010 years. After the revolution, everything dramatically changed and this event caused the major dilemma for Turkey and the Arab world in every aspect as well as in the construction market.

According to Ministry of Economy of Turkey, during 2010-2013 periods, the annual international contracting services was not shaken as expected and after holding its ground, the rate reached its peak in 2013 (30 billion USD) (Figure 24). On the other hand, the distribution of the international works undertaken by the Turkish contracting slightly changed during this period. While Russia has still been the leading market, Libya could not hold its position and fell down sharply at the bottom of the list with 3.5% (Figure 25). It can be said that the main reason of this sharp drop at the level of Libya was the civil war and the politic uncertainty in the region.

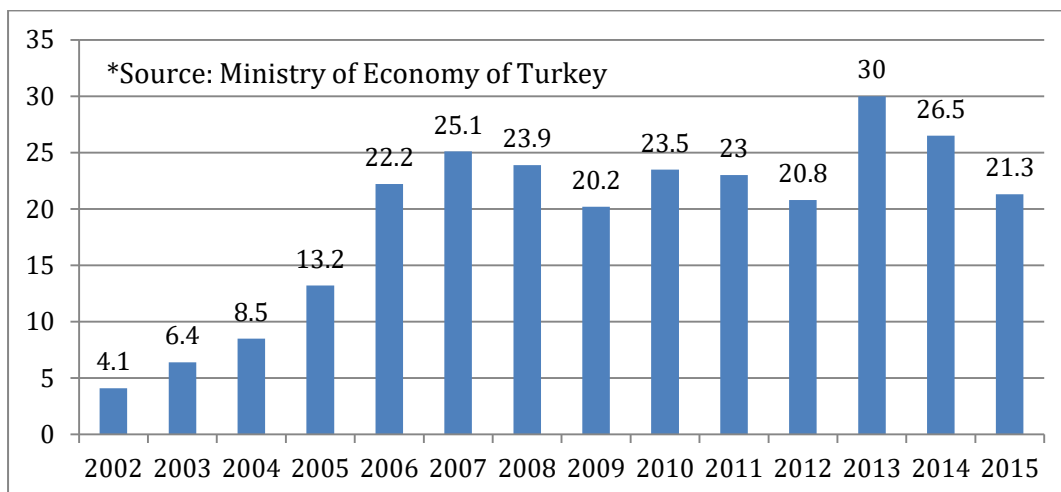


Figure 24: Annual international contracting services (USD Billion)

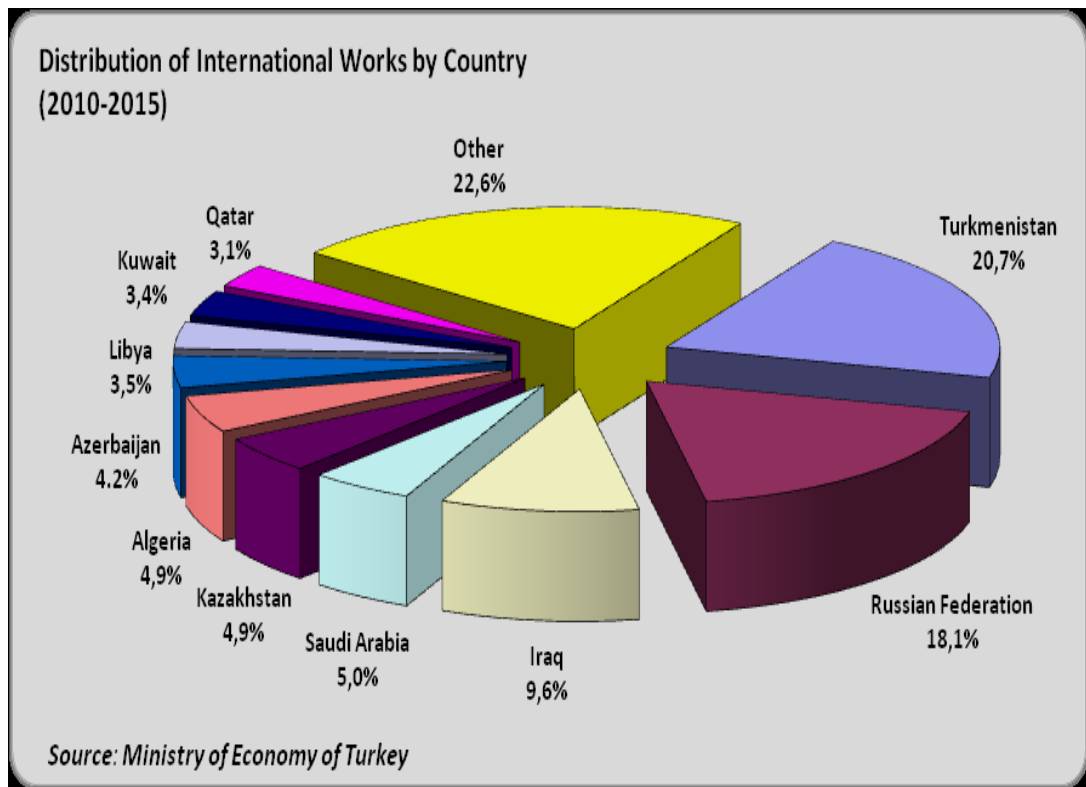


Figure 25: Distribution of international works by country between 2010 and 2015

Indeed, coming to 2015, the table went worse for Libya. In 2015, Turkey carried out over 180 new projects around the world, especially in Russia, Kuwait, and Turkmenistan which were the leading locations for the projects. According to the data from Ministry of Economy of Turkey, the Turkish contracting companies also undertook the projects in Saudi Arabia (4.9%), Azerbaijan (4.0%), Kazakhstan (3.8%), Ghana (2.7%), Congo (2.6%) and Iraq (1.8%). However, Libya, which was one of the top markets for Turkey until 2009, declined dramatically in almost every aspect due to the uncertainties (Table 4).

Table 4: Distribution of the Turkish Contracting Companies by Country in 2015

Country	Number of Projects	Total Project Value (USD)	Share (%)
Russia	24	5.331.328.572	25.1
Kuwait	3	4.518.076.782	21.2
Turkmenistan	20	3.235.323.089	15.2
Algeria	18	2.094.546.442	9.8
Saudi Arabia	7	1.039.408.890	4.9
Azerbaijan	10	847.610.491	4
Kazakhstan	13	808.449.211	3.8
Ghana	5	576.000.000	2.7
Congo	2	559.881.359	2.6
Iraq	19	391.813.548	1.8
Other	67	1.874.972.333	8.9
TOTAL	188	21.277.410.717	100

(Source: Ministry of Economy of Turkey)

3.3.3. Turkish contractors in Libya

According to office of the commercial counsellor in the Turkish Embassy in Tripoli, between 2009 and 2010, the Turkish contracting and consulting companies undertook 124 projects in the amount of 8 billion dollars in Libya. Among Turkish companies in Libya, there were outstanding construction companies of Turkey. During 2009-2010 periods, 1013 mass housing project at Tripoli El Falah location, Burj Al Baher commercial center, energy transmission line (with capacity of 400 Kw, and length of 275 km) at Sirte-Huon region were only some of the great examples of the main projects in Libya. Table 5 includes other example of the projects, and the companies in Libya just before starting of the civil war in Libya.

Table 5: Some Turkish construction companies worked at Libya at relevant time

COMPANIES	LOCATION	WORK TYPE
SEMBOL-ANAYURT	Bingazi	Building
DOGUS INS	Sirt	Infrastructure
KOLİN	Tripoli	Mass Housing/Infrastructure
ÇUKUROVA	Misurata	Infrastructure
GULSAN	Giryan-Jadu	Maintenance/Repair
ARTES	Humus	Hospital
SUMMA	Al baher	Hotel Building
USKON	Ghabat	Parking
UNAL AKPINAR	Zintan	Maintenance/Repair
KOLTEK	Bingazi	Railway
SEGA	Garyat	Infrastructure
NUROL	Al Fateh	University
NA-LIDCO	Sirte	Harbor
MİTAŞ	Sirt-Huon	Transmission Line
FERMAK	Sebha	Sewage System
CENGİZ	Ubari	Infrastructure
OZALTIN	Derne	Infrastructure
ENKA	Tripoli	Maintenance/Repair
TURKMALL	Al Andalus	Hotel Building
TEKSER	Tripoli	Railway
ANAYURT	Bingazi	Steel Construction
GURİŞ	Tripoli	Tunnel/Railway
REC LİBYA	Tripoli	Building/Mining
SYSTEM	Tripoli	Building
YUKSEL	Al Fateh	Infrastructure
TAŞYAPI	Tripoli	Mass Housing
ERKOÇ	Sirte	Watering/Decontamination
ENDEM	Al Khalij	Thermal Power Plant
FINAL YAPI	Al Moura	Infrastructure
ŞAHAN	Tarhuna	Transportation
METİŞ	Sirte	Reservoir
ÖZTAŞ	Nalut	Infrastructure
MESA	Tripoli	University
CEVAHİR	Bingazi	Shopping Mall Construction
ÇELTİKÇİOĞLU	Wadi El Mejaneen	Infrastructure

(Source: Ministry of Economy of Turkey)

3.4. The design of the case study

The case studies can be divided into two main categories as the single (holistic or embedded single cases) and the multiple (holistic or embedded multiple cases) case studies. Yin (1984) offers that the single case study should be chosen when the phenomenon is extreme, typical, revolutionary, and long-term. In this work, the Arab Spring event will be investigated as a single case study. Because the impacts of Black Swan dynamics on the construction market via the Arab Spring event are extreme, long-term, unique and revolutionary in many aspects.

In this work, in order to formulate the theoretical framework, an interview form consisting of a set of questions has been constructed [Appendix D]. The interview method, which is also called as oral type, is the main instrument to gather the data for the research. There are two types of the interview offered by Yin (1984), namely structured interview and semi-structured interview. In this research semi-constructed interview method was attempted thanks to following advantages.

The aim of the semi-structured interviews is to comprehend the case via the real experienced people who live through the problem. Semi-constructed interviews also allow to the interviewers for approaching to the different respondents, and different aspects. Moreover, while the structured interviews include predetermined questions, (how many, when etc.) the semi-structured interviews have more flexible area to cover questions within the certain frameworks. Nonetheless, semi-constructed interviews have also some drawbacks. In this method, it is quite hard to analysis the case objectively due to the proportional and the open-ended questions. Also interviewers can easily lead and direct the respondents before or during the interviews. Additionally, providing the diversity among the respondents is another hard task for the interviewers. As a solution for this work, in order to reach an adequate diversity among the respondents, the interviewers must determine the respondents among the managers, decision makers or relative staff members of the

different organization based on their responsibilities, the volume of their works, and their strategic positions. Addition to that, the questions in the interview must be carefully designed to get the purpose adequately. In order to avoid the possible ambiguity and complication, the designed questions must encapsulate the main frame and meet all the need by themselves. The following section will be illustrated the selection and distribution of the interviewees.

3.4.1. Respondents for the semi-structured interview

In this study, two different organizations, which experienced the Arab Spring event, (company, and Turkish Embassy) were selected as depicted below. The construction companies were selected from the companies undertook the projects in Libya at the relevant period. These chosen companies are directly related with the case and the region economically and psychologically. In other words, they got their fingers burnt from the Arab spring. In order to get diversity, the construction companies have been chosen differently based on their volume, positions, and scope of activities as far as possible.

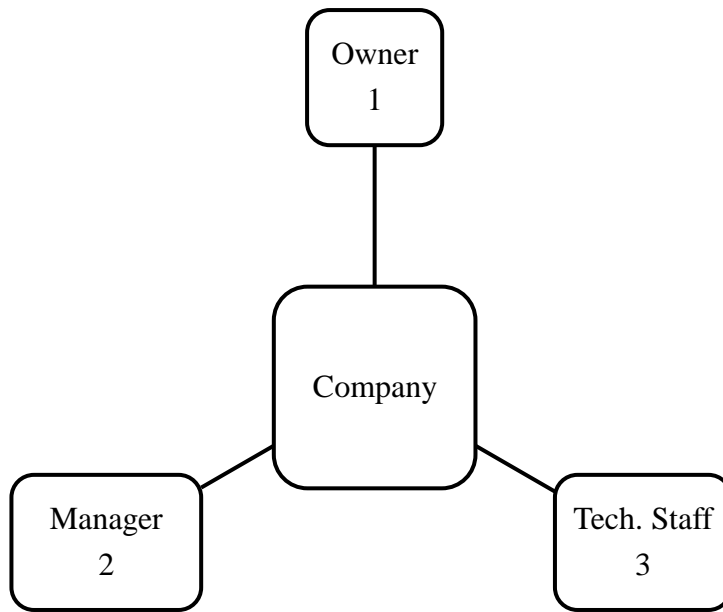


Figure 26: Interviewees at the companies

Relevant officers on the Turkish Embassy in Libya who have officiated at the relevant period were also selected in this study. The main purpose of this selection is to get information about the impacts of the Arab Spring on the construction environment in Libya. For this, the chosen officials are one “commercial attaché”, one “labor and social security attaché” and one “third secretary”.

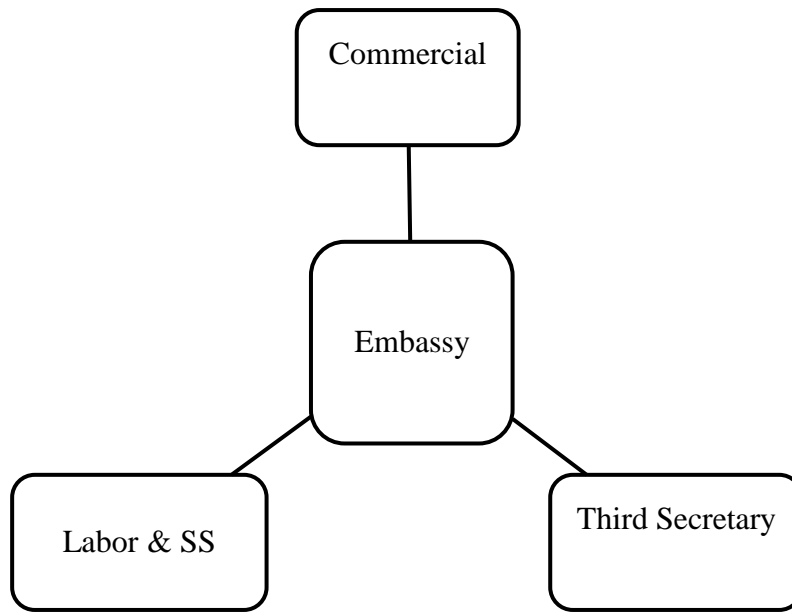


Figure 27: Interviewees at the Embassy

3.4.2. The contents of the semi-structured questionnaire

Following are the questions of the interview form as given in the Appendix D and some explanations:

Q1. Surprising extreme events are described as Black Swan and they come from unknowns and cause the extensive damages. These are the events that are terribly hard to predict and mitigate. According to its specific definition, Black Swan type of events saliently has three characteristics as distinguished from regular extreme events: a) outlier, b) widespread and c) with very low probability of occurrence.

Do you believe that the Arab Spring was one of Black Swan examples?

The first question is the foundation of the case study. The first reason of asking this question is to acquaint the respondent with the existence of the Black Swan concepts

tacitly. For, it is highly possible that the respondents can confuse this concept with the other extreme events or the force majors. Secondly, literally, it is impossible to find solid evidence which proves if an event is a Black Swan or not. All the relative explanations are subjective and depend on the perspectives. In fact, many articles and experts believe that the Arab Spring fits into the Black Swan concept. However, it is equally important that the respondents agree this insight for the sake of the progress of the study.

Q2. In the literature, the Black Swan events have been clustered under three titles based on knowledge levels of respective team.

-unknown unknowns (which means as completely unknowns)

-unknown knowns (some authorities excluding related ones know beforehand somehow)

-known knowns (decision makers know the events, nevertheless ignore due to very low probabilities)

Based on this classification, which title is the best place for the Arab Spring?

Possibly, at this part the respondents will be confused about the nature of the phenomenon. Due to the scattered of the issue, it will be hard for the respondents to opt for one title. However, the interview allows to the respondents to change their views into the next questions. Seemingly the explanation of the concept and the differentiation of the titles are difficult on the paper within a limited time. Fortunately, because of the interview type which facilitates the oral presentation, those concept and titles will able to clarify adequately during the interview.

Q3. The Arab spring began in Tunisia at 2010 and spread to Libya, Egypt and Syria quickly and changed every corner of the business world dramatically.

How Arab spring process was developed in Libya? And what were the impacts at the end of the day?

The purpose that is expected in this part is to gain the knowledge of the process from inside and the first hand. This question is also aimed to lead the respondents to realize the surprise sides of the event and make them go into particulars of those specific points. Explicitly, this part again allows the interviewer to make a conversation about the real and the private impacts of each company or the organization. Thus, the extremeness of the event will become more meaningful and acceptable.

Q4. Arab spring was an event which is notoriously difficult to predict before coming. Within the frame of the responses of the first question, could you have found any chance to predict the event before appearing in Tunisia or the impacts during the process? And did you foresee that spark would trigger the bigger events and spread to Libya?

This part is seemingly parallel to the previous one in accordance with their purposes. After accepting the surprising of the event, in this part, respondent is expected to agree strongly the insight that Arab Spring is a Black Swan example. However, during the conversation, it is also expected to change their opinions about the classification which is mentioned into the second part. Since, it is highly possible that some respondents may express that they partially predicted the spread of the event after the first spark at Tunisia. Hence, this possible expression will allow them to change their opinions about the classification. It will also be discussed these roll backs in Chapter 4 in details.

Q5. After the internal disturbance arriving to Libya, which part or parts of the management was the most challenge for you? And to what extent at the process of management did you success?

After the first attack, the managers and the embassy officers attempted undoubtedly to manage the crisis. Each decision maker struggled with different aspects of the disaster based on own position. The aim of this question is to learn as possible the main challenges of the Arab Spring in each aspect. Additionally, it is expected that the respondents (from both the companies and the embassy) had some achievement during the management process and this question provides the area to discuss about this process.

Q6. In the literature, many different and seemingly effective ways are mentioned by the authors. This work attempts to explore whether the current strategies in the literature which have already offered for various markets or general purposes can be applied to the construction world to strengthen the uncertainty management.

It is expected to know your general opinion (effective or not etc.) (If they would have been effective or not) about those strategies which will be mentioned briefly as follows:

Q6.1. According to some authors, if the historical data are focused on in detail, and the lessons are taken from failure, Black Swans can be described. Also, after mentioned the inadequate of the current classic risk management methods, they offer a new, complement and alternative risk managements which are special to Black Swans. Hence, the companies and the organizations will be able to create new scenarios with different probabilities, and they will be able to develop various risk strategies by solving the relevant chain of events. If Black Swans had been

considered before the Arab Spring, with the help of the historical analysis deeply, could it have been possible that the construction companies would provide the various scenarios including the Arab Spring threat.

Q6.2. In literature, many authors mention a new approach under different names. This approach offers to form a new team who always supposes the consequences without success, and additionally focuses on the scenarios in case of those failures. Finally, this team attempts to create the safe strategies against those negative scenarios. In other words, the purpose of this special team is to develop a new road map by thinking the former strategies as the worst case, no matter how low the probability has. Supposedly the Arab Spring was known before happened but ignored due to low proportion, do you believe that such approach can raise the awareness of Black Swans, and compelled the companies to develop new strategies?

Q.6.3. There is two popular offers that shed the light to Black Swans. One is to enrich the decision board by having the experienced managers who are experts against the unexpected extreme events. Other is to work collectively with the institutions that have macro perspectives and the expert members. What do you consider about the decision teams of the companies in Libya? Do you believe that they were experienced enough for the Arab Spring? In case of not enough, and in case that the companies had enriched their decision boards with quite experienced and practiced people against Black Swans, or with the collective works, in what extend were the results changed?

As mentioned at Chapter 2, there are many strategies and approaches in the literature against the negative effects of the Black Swan events. Because it is almost impossible to discuss all of them with the respondents, they are combined into three categories. The aim of this part is to prove roughly the possibilities of killing Black Swans or (at least) the utilities of the ways at the real life. This part and subparts are presented three titles, which are mentioned in details at Chapter 2. They give the

opportunity to the respondents (especially to the companies) in order to elaborate those approaches specifically and individually.

Q7. From now on, what do you recommend to the construction world? Do you have new thoughts or strategies to avert Black Swans or permit more rapid recovery after the impacts?

This part is the end of the interview and its aim is to summarize all the conversation tidily. It is also an open space to take new and (hopefully) remarkable thoughts for the future from the respondents. The content of this question varies across the respondents based on their positions. In other words, each respondent will try to respond differently with regard of own position.

The findings of the semi-structured interviews will be discussed in the next chapter.

CHAPTER IV

RESEARCH FINDINGS

In this chapter, the responses acquired from the semi-structure interview will be evaluated and the connections with their literature will be examined.

4.1. Interviewees

In this study, the interviews were conducted with 2 large and 1 small Turkish construction companies and 3 attachés. In total, 10 interviewees were involved in this study. Table 6 shows the information about the respondents such as their status, types and duration of the interviews. The names of the companies and respondents are withheld due to confidentiality reasons.

Table 6: General information about the interviewees

Organization	Interviewee	Status	Types	Duration
Company X	Respondent X1	Owner	Face to Face	70 min
	Respondent X2	Project Manager	Skype	45 min
Company Y	Respondent Y1	Owner	Face to Face	76 min
	Respondent Y2	Project Manager	Face to Face	60 min
	Respondent Y3	Technical Staff	Skype	35 min
Company Z	Respondent Z1	Owner	Face to Face	50 min
	Respondent Z2	Technical Staff	Telephone	45 min
The embassy	Respondent G1	Commercial Attaché	Face to Face	53 min
	Respondent G2	Labors& SS. Attaché	Face to Face	65 min
	Respondent G3	Third Secretary	Face to Face	35 min

4.2. Companies and background of interviewees

a. Company X

The company carries out the road, railway, metro, port, house, industrial facility, and irrigation and dam projects on all sides of Turkey for 40 years. Also, it undertakes its activities on a large region from Libya to Azerbaijan and Uganda through foreign offices located in Baku/Azerbaijan, Libya/Tripoli, Uganda/ Kampala, Algeria/Alger, Saudi Arabia/Al-Khobar and Kuwait/South Al Mutlaa. The company conducted 4 projects in Libya, 3 of them were a pump station and water conveyance pipelines, the other was infrastructure works for National Housing Project in Tajurah (near Tripoli) during 2008-2011. The total cost of those projects was roughly about 1 billion dollars with all items. Except one, none of the projects could be completed due to the Arab Spring. More information about the company is available in Appendix A.

Respondent X1 is an executive committee member and manager of international business development of Company X. He was also the manager of the works in Libya at related time. He was in Libya at the relevant time and took care of the projects personally until the mandatory return. Respondent X2 was also one of the members of Company X who came to Libya firstly. He was the manager of one of the infrastructure project in Tajurah. After that, he completed the mobilization works and set up the construction site in Tajurah. Also, he was one of the last staffs who left Libya as well after the civil war.

b. Company Y

The company, which has been operated in the sector since 1979, carries out constructing infrastructure, roads, tunnels, metros, industrial plants, steel buildings, shopping centers, residences, mass housings, and hotel and business centers. It has been specialized especially in metro construction, tunnels, oil and gas pipelines,

industrial facilities, road, and railways. In total, construction of 12,000 housing units, 4 hospitals and 9 hotels was completed by the company Y in previous years. Since 2004, the company has conducted 6 big projects in Libya, which were a water supply project, the construction of infrastructure network of Badr town in Libya, a hospital, a renovation, and a university. Except for the water supply project in Gharyan / Libya, none of them was completed successfully due to the Arab Spring. More information about the company is available in Appendix B.

Respondent Y1 is the general manager of Company Y. He has been in Libya for 2 years approximately and got involved the projects personally. He knows the region very well. Until the very last day, he stayed there and witnessed the riots himself. Respondent Y2 is structural engineer and was in Libya between 2006 and 2011 as general manager of Company Y. For now, he is self-employed. He stayed there for a long time so he also knows the region very well. Respondent Y3 was one of the structural engineers of Company Y. He worked at university project in Tripoli between 2010 and 2011. Two years after his return to Turkey, he also came back to Libya to undertake another job of Company Y. He also worked as a personnel manager during evacuation and he was one of the last members from Company Y who left there.

c. Company Z

The company is a relatively small construction company and carries on its business at Istanbul now. First, it conducted housing and infrastructure works in Libya before 2011 in a different trade name. During the revolution, it stopped its works and came back to Turkey. Then, between 2013 and 2015, it returned to Libya in order to resume on its works. Two projects were conducted in Tobruk/ Libya by Company Z. One of them was an infrastructure and transporting project with 27 million dollars budget, the other was water treatment project with 4 million dollars budget. Company Z had performed the second project as sub-contractor. However, both projects could not be finished due to security and payment problems. More

information about the company is available in Appendix C. Respondent Z1 is an engineer and he was one of two owners of the company and project manager of the two projects in Tobruk at 2010 and 2014. Respondent Z2 is a map engineer and he worked in Libya as a technical staff of Company Z for the infrastructure project during 2014-2015.

d. The Turkish Embassy Office in Libya

The Turkish Embassy opened on 1952 and since then, has performed his duty at different locations in Libya. It has been in service at Zavia Dahmani region since 1991. Respondent G1 began his duty in the ministry at 1991. Since then, he has worked in different countries within different positions. His last workplace before Libya was Kuwait. Then, he performed his duty as the labor and social security attaché in Libya at 2010-2012. During this period, protection of citizen's rights and remedies in Libya, control of legal labor relations, and organization of official transactions were main parts of his duty. Hence, he had a very good relation with Turkish citizens and local people there. He also stayed at Libya until the last day and organized the citizens' evacuation during the period. Respondent G2 was commercial attaché of the Turkish Embassy Office during the related period. He established the economic relations of the companies and provided economic information and analysis to Turkey. Development projects, communication and transportation were some parts of his duty during the period. Hence he had a strong relationship with Turkish companies which worked in Libya at that period. Respondent G3 was the third secretary of the Turkish Embassy Office during related period. He also performed his duty after 2014 in Misrata/Libya. He had a good experience on the technical sides of the official works at that time.

Now, in the following sections, the responses of the interviewees will be summarized according to each part of the interview.

4.3.Responses of the Q1

In this part, Black Swan is briefly defined to the respondents. Three characteristics of Black Swans are explained briefly. Each respondent is asked whether the Arab spring is an example of Black Swan or not. Now the responses taken from each will be summarized below.

Respondent X1: He definitely agrees that this event is an example of Black Swan event. His reply includes certainty. However, with the answers in the second part, Respondent X1 opens up the subject even more.

Respondent X2: He agrees that this definition is appropriate for the Arab Spring. To support this idea, he mentions the general conditions of Libya before the revolution.

Respondent Y1: He states that the size and schedule of this event were unpredictable. Even, he mentions that the local activities against the government just before a few days of the big crash were peaceful. In spite of some reasons such as strict bureaucracy, red tape and favoritism facilitated internal disturbance, neither the government members nor the local communities, (even people) were expecting that such big extreme consequences happen. Respondent Y1 also points out that the Arab Spring was examined by the bulk of managers as predictable after it occurred. This insight supports the psychological definition of Black Swan. Taleb defines that Black Swans are almost impossible to predict, however, after Black Swans happen, people believe the possibility of their predictability (Taleb, 2007).

Respondent Y3: He says “This event was definitely designed by foreign forces”. He gives some information of the situations of Libya before the revolution and concludes the initial impossibility of such a big civil war in Libya. Respondent Y3 also interestingly points out some signals and precursors. He tells that “a couple of weeks ago, I was warned by several American and European controllers against the impending disturbance and those controllers had abandoned Libya just before a few

days of the crash.” He also emphasizes that this event was surprise but for all Turkish contractors in Libya.

Respondent Z1 and Z2: They state that this definition is quite appropriate for the Arab Spring. Respondent Z1 also mentions the catastrophic impacts of the civil war in Libya and he adds that the impacts were much higher than what was expected.

Respondent G1: He, similar to the respondent G3, did not expect this civil war due to the same reasons and the situation of the country.

Respondent G2: He claims that the Arab Spring was a prime example of Black Swans especially for the business world in Libya.

Discussion of findings for Q1:

The first question is the fundamental for the research to facilitate the progress of the case study reliably. All respondents, both from companies (big and small ones) and from the embassy, agree that the Arab Spring was a surprise and unpredictable for themselves. However, they all consider that the Arab Spring was known somehow. Accordingly they believe that accepting this event as an example of Black Swans can be changed with regard to this perspective. This common insight supports the view of Paté-Cornell and Aven. As mentioned in Chapter 2, Paté-Cornell (2012) supports that the Black Swan events have many precursors. Aven claims that “Black Swans’ surprising aspect must always be understood in relation to by whom and when.” (Aven, 2104) Again, Paté-Cornell states whether the event is a Black Swan depends on the eyes of the relatives (Paté-Cornell, 2012).

Table 7: Results of the Q1

	COMPANY						EMBASSY			
	X1	X2	Y1	Y2	Y3	Z1	Z2	G1	G2	G3
The Arab Spring in Libya is a Black Swan example	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

4.4. Responses of the Q2

In this part, respondents are informed about the categories of Black Swan based on the relative's knowledge, belief, and respective time. Then, they are asked about their opinions. The categories of Black Swans that is mentioned here are briefly as follows:

- First Category: unknown unknowns (which means as completely unknowns)
- Second Category: unknown knowns (some authorities excluding related ones know beforehand somehow)
- Third Category: known knowns (decision makers know the events, nevertheless ignore due to very low probabilities)

Respondent X1: He opts for the second category for the Arab Spring case. He again claims that the main reasons were exogenous and the countries having secret agenda about the regions knew and even designed the civil war in Libya.

Respondent X2: He mentions that he was in Tunisia 2 months before the beginning of the disturbance. Hence, his responses are more inclusionary. He states that the first category is a more appropriate place for the case.

Respondent Y1: He does not accept the second and third category. He says that the important thing here is to predict the intensity of the event, rather than to foreknow the existence of a disturbance. Hence, the first category is fit for the Arab Spring in Libya with regard to its intensity and volume. He adds that a little movement in the dependent factors of the construction market in Libya created big dilemma in this uncertain environment. Actually his insight matches the definition of anticipated events. According to Gross (2010) and Aven (2017), anticipated events refer the events that are known to happen but not known their type and timing.

Respondent Y2: He opts for the third category. He asserts two big mistakes of Kaddafi which allowed to the external involvement in Libya. Then, he concludes that he foresaw the signals. This view supports the insights of Paté-Cornell about the existence of signals and precursors (Paté-Cornell, 2012). Also, similar to Respondent Y1, he claims that this circumstance has some catalytic factors which increased its intensity and volume. For example, ha says that even a small mistake of Kaddafi provided adverse consequences in every market of Libya.

Respondent Y3: He supports the idea that a deep historical analysis facilitates to predict Black Swan or kill Black Swan concept for the relative case.

Respondent Z1 and Z2: Respondent Z1 and Respondent Z2 do not have a certain answer for this part. As mentioned before at Chapter 2, it is highly difficult to distinguish and express the type of Black Swans under those three categories. However, after giving some thought, they point out the first category as an appropriate one for the civil war in Libya. Their responses to the case show that the Arab Spring was more surprise for the small companies.

Respondent G1: Respondent G1 chooses the second category. He asserts some reasons of the civil war in Libya. Then, similar to Respondent Y2, he mentions some precursors and signals of the event and he states that those signals were read even by the public. Supporting to this, he points out his good relation and non-stop communication with the public as a part of his job. Hence, he concludes that third

category may also be appropriate for some companies. His definition is also relevant of the definition “imaginable surprises”. As mentioned at Chapter 2, known surprise events are imaginable surprises that are known but considered very rare (Gross, 2010).

Respondent G2: Respondent G2 states that to put it in one category will not be appropriate with general viewpoint. He claims that this classification should be made by regarding to the perspectives. He adds that to foreknow the civil war in Libya specifically was impossible but with global study, it is highly predictable of a system change in the region.

Discussion of findings for Q2:

This part supports the insight of Aven and Paté-Cornell about the perspective. Paté-Cornell (2012) states that with regard of the uncertainties, to decide an event is a Black Swan or a Perfect Storm depends on the viewpoint. In other words, the classification changes depend on the parties and where they stand. This also explains the reason why the chosen categories by the respondents interestingly are different although their explanations are similar. Moreover, the responses and explanations are slightly different between the small and big companies’ members. While the big companies’ members consider about the concept and categories, the small company’s members keep away from certainty. This probably stems from the fact that the experience helps to reveal the mysterious parts of Black Swans and transform them to the grey swans (Masys, 2012).

Furthermore, the embassy officers highlight the signals, and precursors of the event which are among public and labors mostly. Similarly, some company members accept the existence of such signals which are among the business world. It is also worth to mention that it does not seem quite possible to express and analyze all the type of Black Swans under those three categories. Also, due to the unconformity of Black Swan’s categorizations as mentioned in Chapter 2, it seems hard to distinguish

the categories from each other, and from Perfect Storm metaphor. Moreover, the differentiation among the “unimaginable surprises” and “anticipated events” which are defined by Gross (2010) makes the categorization more difficult. Additionally, the psychological attribute of Black Swans, defined by Taleb in 2007, produces more contradictions at the interviewees’ expression. It is also worth highlighting that after the event happened, it is not very important for the sufferers which category is fit, or which definition is appropriate (Paté-Cornell, 2012).

Table 8: Results of the Q2

	COMPANY						EMBASSY			
	X1	X2	Y1	Y2	Y3	Z1	Z2	G1	G2	G3
Which Category is appropriate for Arab Spring	2	1	1	3	3	1	1	2	1-3	1

4.5. Responses of the Q3, Q4, Q5

Those parts include personal questions and allow understanding of the process of the civil war in Libya at first hand. Also, respondents will give some specific information individually about surprise sides of the event for their organizations. Additionally, those parts enable the respondents to discuss and reconsider the previous questions in their perspectives. It is also expected from the interviewees to mention the signals and the precursors of the event in the region before they happened.

4.5.1. Responses of Q3

Respondent X1: He explains the situations of other construction sites and compares them to his circumstance. He points out that the construction sites belonged to local people and then they were protected thanks to those local residents. However, the construction sites in Benghazi were plundered by the rioters. This circumstance shows that it might be possible to ward off the ruinous impacts of Black Swans with some precautions.

Respondent X2: He says that at the beginning of the riots, a serious fear showed up among the staffs. He also states that the event had a domino effect and got out of control in a short time in every corner. Also, according to Respondent X2, the situation was completely scandal in terms of safety of life and property in small companies.

Respondent Y1: He reports that they vigilantly came back to Libya after 2 years of the civil war to try to finish the rest of one project and receive the payment. However, the formal government structures still was not working properly and still, there were the security problems in the region. Therefore he states that they had to return again to Turkey with team and equipment. This circumstance proves the longitudinal effects of the Black Swan events.

Respondent Y2: He states that the riots started suddenly and unexpectedly. In February, the riots began and spread to every cities rapidly. Every personnel of all companies had to leave Libya necessarily and quickly.

Respondent Y3: He states that he stayed until the end of March of that year and had a chance to observe the progress more closely. He tells that all construction sites were plundered, and then the materials were captured and seized. The captured foreign labors, personnel, and workers by the rioters were brought to a big stadium and locked up there in a while. All interviewees of Company Y claim that they

waited until the very last moment, and then evacuated the country with a successful operation.

Respondent G1: He states that the revolt occurred harshly in Libya by contrast with other riots in Egypt and Tunisia. The reaction of the local government was so rigid and they killed thousands of people in a short time. He also considers that after some statements of the local authorities, local people took courage from them to plunder the foreign construction sites. This statement supports that the politic movements affect directly the consequences of the event.

Respondent G2: He claims that the riots were sudden and unprepared for both companies and the embassy. He also mentions the real experiences of Turkish companies associated with the region and asserts that the impacts of the event became softer for Turkish construction companies than for others. This statement supports that the experience is one of the key factors to avert the negativity of Black Swans.

Respondent G3: He states that the number of Turkish personnel in Libya was approximately 25000 and more than 200 companies were working in Libya just before the event. He adds that some big companies evacuated the region with their own efforts, and other companies especially small ones managed to run out the country with Turkey's efforts.

Discussion of findings for Q3:

All interviewees describe the surprise sides of the event and its general and individual impacts on their organizations. In addition to this, because of more thought on the phenomenon, the answers about the categorization of the Arab Spring differ from the answers of the second part as expected.

Secondly, they all express how the event started surprisingly and developed rapidly. After recovering from the first shock, they all began to evacuate the region as soon as possible. Their priority was life protection rather than the financial concerns. This shows the extremeness of the impacts and how the event had a potential of devastation. Gross states that surprise events are considered as a surprise when it occurs unexpectedly (Gross, 2010). Those statements provide another proof that the Arab Spring in Libya was a typical example of a Black Swan.

Thirdly, Yin (1984) offers that single case studies should be chosen when the phenomenon is extreme and longitudinal. After the civil war, the attempts of some countries for recovering their lost illustrate that the impacts of the Arab spring were longitudinal. Again, it supports that this event is an appropriate example as a case study for this work.

Third, Taleb states that for fragile events, shocks bring higher and higher harm as their intensity increases (Taleb, 2011). The members of the Turkish Embassy mention that how spontaneous statements of the local authorities changed the impacts of the disturbance immediately and drastically. Considering other relevant insights of the interviewees together, the Arab spring was a nonlinear, asymmetric and fragile event.

4.5.2. Responses of the Q4

In this part, interviewees are asked about their individual opinions about the predictability of the event. In other words, interviewees express if and to what extent they predict the impacts of the event before and during the process.

Respondent X1: His answers at the forth part are similar to the previous ones. He states that even after the beginning of the event in Tunisia, he had never expected that the crush jumped to Libya. Hence, he states that they took the action only after starting of the event in Libya. Moreover, as expected, Respondent X1 gives the

details about some signals and footprints of the event in his viewpoint such as economic injustice, political eruption, and big mistakes in international areas. On the other hand, he states that such signals were believed as “rumor” at that time because it was believed that the government had enough power, and invulnerable domination against such riots. This statement is another support of the view that correctly reading the signals facilitates to make the event more predictable. Also, it supports that surprise of the Arab Spring was fit the definition of “known surprises” defined by Gross (2010).

Respondent Y1: He mentions some signals of the event. He points out some American and European companies which have not left the region even after the civil war. He also considers that a special team which had entered the country from Egypt just before the event was used to start the riots. Additionally, he mentions some tribes which warned and advised the company against the approaching event.

Respondent Y2: He claims that no risk analysis could have seen this event even after beginning of the event in Tunisia and therefore there was no appropriate strategy which was supposed to follow. Also, he mentions that just 3 weeks before the beginning of the event in Libya, the company had entered a new agreement with the local government and had received the advance payment. Perhaps this statement is the strongest indicator that shows how surprise the event was for his company. Also, it proves that the event was highly unexpected for both places (companies and local government).

Respondent Y3: He states that even after the beginning of the riots, they, as company Y, did not expect that this disturbance transformed to a long-running civil war. However, similar to other respondents, he mentions some signals of the event. Respondent Y3 mentions that the foreign controllers and colleagues warned them loudly before 1 month. Even, they abandoned the region 2 weeks ago before the event. Also, 2 weeks ago before the beginning of the event in Libya, many formal government members were suddenly disappeared and the agencies did not work properly as if they had known before.

Respondent G1: He states that the relationship between the local people and the Turkish Embassy was strong. Additionally, Respondent G1, as a part of his position in the Embassy, was in contact with the local people as well. Accordingly, he implies that he had predicted the event from the unusual behavior that he observed among the people. Those signals, warnings, near misses prove that the event had been known by the foreigners and the local people.

Discussion of findings for Q4:

Firstly, it seems clear that the internal disturbance in Libya was unpredictable for Turkish companies and the Embassy members. Secondly, the statements about the new agreements signed between the government and companies just before the beginning of the event in Libya are remarkable. Because those statements support the idea that this event was also surprise for some local authorities.

Thirdly, based on the statements of the Respondent G1 and Respondent Y3, the event actually had been known by the local people and some formal government agencies. This fact describes the main targets of an appropriate perspective which facilitates to kill Black Swan for this case.

Fourthly, the respondents point out some signals and precursors of the civil war which were dispersed in time, and region. This supports the Paté-Cornell's view. Paté-Cornell (2012) mentions the existence of many precursors and signals of Black Swans. Addition to that, interviewees, although they noticed the signals, did not pay attention to them adequately. Paté-Cornell (2012) asserts that the main reasons of the failure may only be misdetection of precursors, and lack of observation of the near misses. Supporting to that, many authors believe that the best way to reduce risks is a mix of alertness, quick detection, and early response.

Despite all the signals they point out, expectedly the respondents believed that there seemed no rational reason in vicinity. Hence, they did not expect such chaos. Johnson claims that the rare combinations are not expected because the failure stems from many dependencies such as technical, political, managerial, and regulatory interventions (Johnson, 2008). This statement is also additional support to the idea that the Arab Spring is a surprising event, but had the signals and precursors which should have been read correctly with a special framework.

4.5.3. Responses of the Q5

In this part, respondents state their accomplishments during the crises, and their failures at part or parts of the management.

Respondent X1: He describes the positive and negative consequences of the crises management. He, similar to Respondent X2, believes that the operation of personnel evacuation from Libya was successful hopefully. Also, the protection of some construction sites was another managerial achievement in Libya. However, despite the protection of sites, 150 of medium and 4 of big equipment were plundered by the rioters. Those properties are now rusting out and cannot be brought back for the current condition. Moreover, he states that the losses of the project which they conducted as a subcontractor are slightly less than the other projects.

Respondent X2: He states that the financial damage of company X due to this event was approximately 20-30 million dollars. Similar to Respondent X1, he states that they could not have received their progress payment after returning to Turkey and warranty letters have become another problem since then.

Respondent Y1: He informs that before the event, there were totally 1500-1700 personnel of company Y in Libya. He believes that the Company Y was successful in life security and evacuation. On the other hand, the event hindered all the current projects and all construction sites with the equipment and the materials were

plundered by the rioters. The financial damage of Company Y was approximately 70-80 million dollars.

Respondent Y2: He complains about the insurance systems and similar to Respondent X1, he states that they could not have received their progress payment after returning to Turkey. He also believes that they could not succeed with respect to manage the crises because the event was completely out of the control.

Respondent Z1: He states that after 3 years of the event, they returned to Libya to receive a new project, however, the situation of Libya got worse than before. He describes the problems of control engineers and the lacking of the authorities. He explains that although they were taking the steps carefully, they never had what they expected and the company came to the edge of bankrupt. Respondent Z1 also points out that all risk analysis became useless during and after the crises.

Respondent Z2: He states that the company returned to Turkey immediately and dramatically felt down, finally at the end of the second years, it bankrupted. Then, they established a new company.

Respondent G1: Similar to all the Embassy members, he considers that the Embassy was succeeded at the evacuation and undertook a successful operation in terms of time and life protection.

Respondent G2: He claims that the Minister of Turkey helped the companies to receive their payment after the civil war. He adds that receiving all the payments was impossible so the government attempted to get the payments as much as possible.

Respondent G3: He points out the devastating effects of the event for the companies. He claims that many companies especially the small ones were bankrupted during the process.

Discussion of findings for Q5:

Until the first attack, neither companies nor the Embassy had expected the disaster. However, the organizations were fortunately well prepared for such an emergency case. They took a quick reaction and carried out the successful operations in terms of evacuation and life protection just after first attack.

Secondly, to make a mention of an achievement of the companies about property protection is seemingly difficult. The war caught the companies unpreparedly and hence the quick progress caused a huge material loss for them. Additionally, the financial losses due to incomplete projects, and non-performing payments of the completed parts were other extreme impacts of the Arab Spring for the companies.

Thirdly, it is worth mentioning that the insurance of the companies, even all-risk insurances did not cover such an unexpected civil war. This shows the existence of an inefficient insurance system for Black Swans. The companies need a more inclusive insurance system for unexpected extreme events.

Fourthly, as a nature of Black Swans and result of their complexity, there is always a lack of information and limited resources to confront their risks. The statements of the respondents show up the insufficient of the risk analysis. Employees imply how the current risk proportions were irrational for the event and useless during the riots. This condition supports the idea of LeMerle. He claims that due to this breadth and complexity, current risk strategies do not have enough capacity to monitor the potential Black Swans continuously and also cannot cover the whole area and identify Black Swan risks due this fact (LeMerle, 2011).

Lastly, when considering the situation of Company Z and statements of the Embassy members about the consequences at the small companies, the impacts of the internal disturbance affected small companies more negatively than larger ones. Also, interestingly, all companies attempted to come back to Libya to restore the balance, resolve the problems after the civil war. However, the second social explosion

occurred in 2014 just after 3 years of the event. Besides, while the larger companies treated with caution, smaller company attempted to conduct new projects. This may show that the small companies have a more optimistic view about the risks and hence they are willing to take them bravely.

Table 9: Main results of Q3-Q4-Q5 parts

	COMPANY						EMBASSY			
	X1	X2	Y1	Y2	Y3	Z1	Z2	G1	G2	G3
Progress of the event	Surprise extreme		Surprise extreme			Surprise extreme		Surprise extreme		
Did you predict?	Negative		Negative			Negative		Negative		
Success in Risk management	Negative		Negative			Negative		Positive		

4.6. Responses of the Q6 and Q7

In the sixth part and subparts, the strategies and approaches in the literature against the negative effects of the Black Swan events are collected into three titles. Interviewees are asked the possibilities of killing Black Swans or (at least) the utilities of the ways against them in general terms at the real life. In the seventh part, interviewees are asked about their new and remarkable thoughts for the future based on their positions.

The three approaches, which are mentioned in detail at Chapter 2, are all about the viewpoint and knowledge.

The first approach is about the decision boarder of the companies. According to the view, an experienced decision board, with historical data and statistics, precise probabilities and predictions, can avert the unpredictability of the Black Swan events. Therefore, the construction companies are offered to build up and enrich the

board members with the more experienced directors who have already proved themselves at the similar hazards. Moreover, experienced and practiced decision boards may catch the signals, and accordingly, they can offer reliable solutions in different cases in order to increase the level of preparedness against the surprising catastrophic events.

The second approach has a pessimistic view. It means that all or a part of the risk managers in a company is supposed to interpret pessimistic results by tackling the weakest points and vulnerabilities of the systems and drawing the imaginary wrong conclusions. Practically, this view can be applied before or during the management by changing the initial plans, and affecting the designs and models with regard to company's unknown vulnerabilities. Also, during operation, this approach may diligently watch the operation and give some tactical insights to the managers.

The third approach is about the wider perspective and builds a roof model for all three approaches. If the managers can view the coming or current events from wider standpoints, then they will obtain more information against the Black Swan events. According to the approach, collective works with other organizations about Black Swans may be useful and by the help, a company may catch the precursors and the signs of the unexpected events before coming or may realize how far it will go after the first attacks.

Respondent X1: He states that the first approach would not be useful adequately. The first reason which he points out is that the company is not able to employ the high-level experts to cover the whole purpose of this approach. Secondly, the company needs to take serious and higher-up decisions to respond to what comes from such board. All reasons make a significant cost increase and reduce global and local competitive power of the company. On the other hand, Respondent X1, similar to Respondent X2, believes that a pessimistic view would be helpful to draw attention to the weakest points and vulnerabilities of the company before the event. For the third approach, the respondent X1 expresses that an expert company will be useful and they definitely will consult there.

Respondent X2: Similar to Respondent X1, he points out the prices of the approaches. He expresses that even if the company had had such a decision-making mechanism, it would not help to the company to provide awareness against the Arab Spring due to tempting prices and attractive offers of the area. Also, he adds that even if companies had been aware of the risks, they would still have entered the region due to the economic crisis in Turkey at that duration. He also believes that a pessimistic view on his company would be helpful, but not be useful to give tactics after the beginning of the event, because the event was irreversible. Respondent X2 also states there should be a review and a special topic about Black Swans at the countries' risk reports.

Respondent Y1: He states that if all risks excluding Black Swan effects are taken into account, a high-level cost table will ensue and this picture causes a company to fall behind the rivals. Besides he believes, similar to Y2, that it is already impossible to know all the risk by looking to past deeply, because the nature of Black Swans are very complex and the relative factors are also changed during time. Similar to the view of LeMerle (2011), he states that companies should map their second and third-order relationships and even hidden relations with the suppliers. For the second approach, Respondent Y1 supports the idea and points out the lacking of the pessimistic view and mentions some companies who came to Libya without completion of their agreements due to similar reasons. He concludes that such a pessimistic view would be helpful against the improvidence.

Respondent Y2: He points out the practical experience of the construction world. He believes that people in the construction world actually get enough experience to predict the Black Swan events. So, the general work policy and work discipline are two significant factors for the purpose. He also critiques the corruption of the current insurance systems in Turkey. He compares Turkish systems with the systems of developed countries such as the USA and Europe. He brings the conclusion that Turkish systems have such an insurance system that does not include even political risks while other systems involve some Black Swan threats partially. For the second

approach, he believes that this approach would not be enough to block a company from entering the region, because the biddings were attractive and lucrative. Positively, he considers that this approach would probably force the company to be more careful. For the third approach, Respondent Y2 states that every serious company will be glad of getting the experts' opinions and advice. However, they cannot change the result because the company cannot put the advice into practice. As a result, companies enter the region carelessly though the risks. Additionally, he upgrades the approach and claims that the government should provide the same service to the companies. To support this, he critiques the current roles of the government and Turkish Contractors Association (TCA) and compares them to the Europe systems. Western countries, dissimilar to Turkey, perform such services and protect their companies against any unexpected extreme events as far as possible. He advises that his government should review and design the current insurance systems accordingly and facilitate the private sector to build new independent experience companies about the Black Swan events.

Respondent Z1: Similar to others, Respondent Z1 states that an experienced decision board would be helpful for shortsighted shortcuts especially at the beginning of the event and during the process. However, he considers that the mechanism of the event was unique and the event had not just politic reasons but also so many spillover effects. So, he believes that the prediction of this event was impossible even though a deep historical analysis would have been performed by a special decision board. On the other hand, Respondent Z1 asserts that, expert and pessimist managers will be useful to catch precursors and little signals by researching and criticizing the region. Moreover, Z1 points out that for the small companies the price of such services should be low and the government should support and courage the entire relative companies without considering their volume or type of their works.

Respondent Z2: He mentions the small companies and adds that they have no private teams to manage the risk analysis. So, they pay more attention to the advice and reports of the independent consulting companies about Black Swans. He also agrees the idea of Respondent Z1 about the uniqueness of the event's mechanism.

Respondent G1: He considers that all approaches would be helpful but reviewing insurance system must be considered as a more essential part to minimize the negative effects. Additionally, he points out the Turkish Employment Agency protects the personal rights of the labors in any case. He states that most of the labors had difficulties to claim their own personal rights due to lack of supervisions. Also he mentions the role of Libya and he says “Libya had become an indispensable member for Turkish contractors.” Hence, he concludes that no matter how much risky the region had, the contractors would still have come to Libya.

Respondent G2: He criticizes the business character of the Turkish contractors. He expresses that the region had already lots of politic risks and each company in Libya had known this fact very well. But they still did not pay attention. Also, he mentions the existence of Exim Bank* and adds that the companies did not insure themselves against the politic risks via Exim Bank. (*Exim bank means Export Import Bank. It is a government agency that ensures the safety and growth of a country’s foreign trade. It provides customized financial instruments to safeguard the interests of exporters against default/nonpayment from the importers)

Respondent G3: He encapsulates the general view of the Turkish contractors about the hard areas and says that his contractors explicitly opt for predictable risks. For this reason, the awareness of Black Swan risks and unexpected dangers would be beneficial for the contractors to be more careful. Respondent G3, similar to all respondents at the Embassy, agrees the idea that the consultant companies can direct the contractors to intensify their precautions. He also states that Turkish government may support the risk reporter to prepare the countries’ risk reports.

Discussion of findings for Q6 and Q7:

Firstly, all interviewees commonly admit that they do not have real experience about this event, and accordingly, they are not aware of all the risks. They also point out

the complexity of the circumstance and then they support the idea that tackling the historical data and statistics, would not be enough alone to predict to Black Swans. In the frame of many respondents' answers, the system matches the description of the "complex systems" which is made by Komljenovic et al. (2006). Komljenovic et al. (2016) states that complex systems are the dynamic systems able to adapt in and evolve within a changing environment.

Similar to Lindaas and Pettersen's view, respondents commonly agree that the real problem is not only the predictability, but also lack of understanding of the unique risks (Lindaas and Pettersen, 2016). Moreover, their views support the idea that the traditional risk methods have not sufficient capacity for the Black Swan events (LeMerle, 2011). Moreover, their responses support the idea of Higgins too. Higgins suggests that managers should first understand the risks associated with the Black Swan events and then examine them independently (Higgins, 2013).

Furthermore, they all agree the idea of Aven (2014), Paté-Cornell (2012), and Miller (2010) that this event could be predicted by systematic risk analysis scenarios using statistical methods, reading unusual signals and precursors, quick detection and early responses. Moreover, they state the need for an appropriate risk approach and the necessity of having an experienced decision board. However, they also criticize their practicability and applicability. For example, many interviewees consider that such decision board would not be practicable because of the tempting prices and unfair competition. Additionally, they state that they have already realized that the political risks were high and the region had real security problems, but still they entered the region for its advantages.

Secondly, it seems that there is a lack of pessimistic view among all the company members. Generally, Turkish contractors enjoy the risks and do not hold themselves off from entering the risky areas due to the attractive offers. Similar to the definition of Taleb (2007) and Nafday (2009) about relation between human behavior and risk, people especially risk managers generally refuse to consider the uncertainty or do not like to be overcautious because of the linear logic. Accordingly, almost every

respondent agrees the idea of Janis (1972) that a pessimistic view and precautionary actions will be beneficial to draw attention to common faults, because the view helps to reveal the weakest points and vulnerabilities of the systems. Put simply, all interviewees typically believe the usefulness of a pessimistic view in decision boards for the progress of the project. On the other hand, it is a common acceptance that only a pessimistic view would not enough to take precautionary actions, and finally not enough to avert the Black Swan events alone for a company. This approach should be considered as a supporting component.

Thirdly, several interviewees interestingly mention the corruption of the current insurance system. They describe a necessity of a new and more inclusive insurance system in the construction industry. Also, although all respondents mention the requirement of an expert viewpoint, they believe that an expert opinion which has a narrow point of view will not be adequate to see all the complexity. Also, tempting prices and unfair competition environment will prevent the experts' advice to be practicable for the company individually. Hence, the interviewees support the idea of collective works. Similar to Aven (2014), they state that improving communication and transferring knowledge can be an adequate solution. In addition to this approach, some improvements are tacitly offered by several interviewees. To be more specific, it is an accepted opinion that a supporting consultant service should be performed by the government or under the government's backing rather than independent private companies.

In the following chapter, the findings will be summarized and some strategies are offered to the construction companies.

CHAPTER V

DISCUSSION OF THE RESULTS

The main goal of this chapter is to critically discuss the research findings of the case study. First, the fundamental consequences will be summarized and then some recommendations about Black Swans will be set forward.

5.1.Fundamental consequences of Black Swans

Under the findings of the research, the Arab Spring can be strongly accepted as one of the prime examples of the Black Swan events at the recent years. The Arab Spring can be considered as a surprise, a rare (for some points) and a severe event. Furthermore, the Arab Spring is a long-running, nonlinear, and asymmetric event. Moreover, the Arab Spring for the construction sector is a fragile event. In other words, the progress of the event displays the fragile variations having catalytic factors, and spillover effects. Those make the event become more extreme, and vulnerable, cause it to spread more quick.

Additionally, Black Swans have many uncertainties and complexities. The current traditional risk strategies attempt to protect the companies against the potential risks. However, these traditional strategies are not adequate to avert Black Swans due to the uncertainties, and complexities. As a nature of Black Swans, the Arab Spring has many unknown components and casual chains with many intervening variables such as technical, political, managerial, and regulatory interventions. Even a small movement in this complex connection can cause a butterfly effect. As a result, it is not possible to calculate and establish an accurate prediction with the traditional

methods. The robust and resilient solutions are needed to prepare the companies against Black Swans which have the high uncertainties and possible high impacts.

In addition to that, it has to be noted that not all the interviewees agree on the categorization of the Arab Spring. The chosen categories differ depending on the positions of the members and their viewpoints. In the interviews, all of the main three categories which are mentioned at Chapter 1 (i-unknowns unknown, ii-unknown known, iii-known but rare) are seen by the interviewees as appropriate for the Arab Spring event. The existence of signals and precursors are also accepted by the interviewees. According to Aven (2017), "unanticipated surprising events" are unforeseen events which are used to describe the two main categories of Black Swans which are unknown unknowns and unknown knowns. Therefore, the definition of "unanticipated events" will be more appropriate and inclusive for the Arab Spring based on the research findings of the case study.

On the other hand, although the Arab Spring is a surprise event, it has the signals and precursors which are supposed to be read correctly with a special framework. According to the responses, in order to mitigate the adverse impacts of Black Swans, the main targets of an appropriate strategy or approach should be specification of the priorities, reading the signals correctly, quick detection and early response to them.

Additionally, it must be mentioned the failures in reading the signals which is related to the volume and the age of a company. The Arab Spring as well as other Black swan events is nonlinear, asymmetric and fragile events. Accordingly, the shocks (especially primary ones) and the disturbances of the event are supposed to be absorbed immediately in any case. Vulnerability and fragility against such surprise events brings higher harm to small companies than the larger ones. For example, the incomplete projects and non-performing payments were the most extreme impacts of the Arab Spring on the companies. The consequences of the Arab Spring for smaller companies in Libya were completely drastic in terms of safety of the properties. However, larger companies were able to cover the property failures or the monetary losses easier than smaller ones.

Performances of the companies in case of the surprise events also differ according to their ages. Senior companies are more experienced than the younger companies in the field. Senior companies are able to consider different failure scenarios. They can cover the failures which are coming from the different and dependent spots easier than the younger companies. Also, when compared to the younger ones, older companies are much more aware of the signals, can read them more correctly and are able to predict some of the surprise effects. Here, experience is the key factor.

In addition to that, the inadequacy of the current insurance systems is another component of the failure dynamics. For example, in Arab Spring case, the insurance of the companies, even all-risk insurances did not cover such a civil war. Having a more inclusive insurance system should be the other target of an appropriate and large-scale strategy or approach which attempts to mitigate the negative impacts of Black Swans on the construction companies.

5.2.Existence of signals and precursors

This event was surprise for the construction companies, the local authorities and the Turkish Embassy officers. However, based on the research findings of the case study, the Arab Spring had many unusual footprints and signals which could be detected, observed and anticipated. The interviewees point out those signals and precursors of the civil war which were scattered in the region and time.

Those signals can be investigated under two main parts as long term signals and short term signals. For example, the rapid raising of political corruptions of the region, the economic injustice lately, and the global changes in the last few years and big mistakes of the local government in international area can be considered as the main examples for the long-term signals. Even, public signals which are remarked by the Embassy officers can be accepted as one of the long term signals. Those signals can be anticipated with the long-term observation of the historical records, the

careful evaluations of the global and local dynamics, and lessons learned from previous failures.

Moreover, the internal disturbance in Tunisia, the unexpected quit of the foreign controllers and the foreign companies from Libya, and the unusual behaviors of formal government agencies can be considered as major examples for the short-term signals. Those signals can also be evaluated and predicted by thinking the rare combinations of unique events and fast reactions. In this way, it seems possible to avert Black Swans or at least reduce the adverse impacts before the event.

Put differently, the signals can also be investigated as specific and general signals. Each company has particular dynamics and interdependencies based on age, volume, type of works, and agreements etc. Therefore, their vulnerabilities and weakest points are different. Accordingly, some signals of the Black Swans must be read specifically for each company. On the other hand, the reading of the signals and appropriate reactions should be performed before the event. After the beginning of the Black Swan events, the precautions will be inadequate to cover all the potentials. Because those events have generally spillover effects which cause that the negative consequences cascade and spread quickly after passing some certain thresholds. Also, the catalytic factors of the event affect the other dynamics in the area and make the impacts more widespread. Nonetheless, it can be said that the fast reactions and punctual precautions can be useful to minimize the life losses and property at the first strike.

5.3.Reasons of the failure in reading the signals

As mentioned above, the Arab Spring has the signals and precursors which must be read correctly. The companies, despite noticing those signals, did not pay attention and react to them adequately. The following sections will investigate major reasons for the failure in reading the signals, and the failure in taking the appropriate actions against them.

5.3.1. Complexity of Black Swans' mechanism

The complexity of a system makes the assumptions and predictions almost impossible for managers in some aspects. As a nature of Black Swan, there are many interconnections, casual chains, feed-back loops and dependents that must be covered to scrutinize the signals properly. In other words, by the nature of the phenomenon, the Arab Spring event is associated with different disciplines such as politic, society, community psychology, international relations etc. In order to read the signals, especially the long term ones, managers should utilize some specific functions and components. Also, managers should have strong background which consists of various disciplines. Furthermore, the approaches and the strategies which are offered as a solution are needed to be tackled with an interdisciplinary study and viewpoint. Moreover, complexity of Black Swans brings forward the perspective problems as well. Strong background will not be enough to offer the effective and adequate solution. A wider perspective is also highly necessary to prevent the misdetection of signals.

Additionally, lacking coordination and collective works between the companies' members and the Embassy officers may have caused the failure in reading the signals completely and punctually. The interviewees point out different signals and precursors from each other. Although the general opinions of the respondents about the characteristics of the Arab Spring are roughly similar to each other, the signals which they mention are different associated to their positions, and point of views. Every respondent states the signals from their individual positions. In other words, the signals which are described are the signals emerging from different points to each other. For example, while members of the companies mention the existence of the signals among the business world, the Embassy officers highlight the signals among public and labors more loudly. Furthermore, even the signals which are determined by only the embassy officers are also slightly different from each other due to their different positions. Moreover, there are also differences among the type

of signals which members of the companies point out depending upon the volume of the companies. Even, the managers, owners and technical staffs realize and mention different signals from each other. In addition to that, almost all of them believe that there are other unseen signals which are known by some authorities and specialists from outside of the construction market. However, in practice, neither time nor staffs is adequate to read all the signals truly. Improvement on the communication and the transfer knowledge are required to satisfy this need.

In addition to that, the interviewees point out the complexity of the international markets and unfair economic problems. This circumstance prevents the applicability of any risk approach of Black Swans. For example, the companies had already realized some of the signals and warnings which came from the region and the managers had already known that the political risks were high and the region had real security problems, but they still conducted the projects anyway.

5.3.2. Unawareness about Black Swans

Black Swan concept is a fresh topic for the construction managers. Based on the responses of the interviewees and the existence of the catastrophic impacts of the Arab Spring, Black Swan threat is not one of the premium titles of the companies. In fact, the companies still do not know Black Swan phenomenon although they are badly affected from it. This means that almost no company which follows the traditional risk methods is truly aware of the existence of Black Swan risks. As a result, the unawareness causes the failure at quick detection and early response to the event. Also, companies are not prepared to this catastrophe and are not willing to attempt to read the signals. For example, despite all the signals and precursors which the interviewees point out, they believed that there were no rational reasons which force the company to be prepared against this chaos.

Furthermore, according to the responses of the interviewees, no managers or decision board members have real experience about once-in-a-lifetime events.

Therefore, they failed on reading the signals for early responses and accordingly they did not take the precautions. However, the signals can be read by the virtue of the experienced managers and the lessons learned from other experiences. Thus, they can raise the awareness of the risks and can reduce the losses with small precautions. For example, some construction sites of Company X were protected with the help of some precautions. It shows that it was quite possible to save the properties as well as the lives by taking little precautions, quick actions and early responses before the event.

Additionally, there seems a definitional ambiguity about Black Swan types for the beholders. This definitional unconformity shows itself at the explanation of the interviewees during the interviews. The ambiguity causes the misdetection of the signals. Also, different interpretations vary the priorities of the companies at the risk assessments. The interviewees define Black Swans and the Arab Spring with different interpretations. As a result, they do not realize Black Swans facts completely. Furthermore, it seems difficult for the interviewees to distinguish the categories from each other and from Perfect Storm metaphor. Different interpretations, different concepts and views among the members of the decision board make the signals readings more difficult and more complex for the risk managers.

5.3.3. Psychological effects

Definitions of the rare and extreme events are directly related with the view of the perceiver. In the construction sector of Turkey, companies have linear logic and a great optimistic view about the rare risks and they have passions to take these challenges. These characteristics are the strongest points of the Turkish construction companies in the international area. For example, Turkish construction companies are willing to take the risks and to enter the risky areas bravely as a result of this point of view. Thus, they can raise their competitive capacity and outdistance their rivals. On the other hand, this point is one of the biggest factors which bring the

great hazard and fragility to the sector. For example, despite the signals and precursors which they notice, they did not pay attention to them adequately and they entered the region in anyway. Besides, even after the civil war in Tunisia, which was one of the greatest warnings, still they did not saw the region enough risky, and as a result, they did not attempt to quit from the area quickly. This factor is also one of the major reasons that Turkish companies in the international area are not willing to take the manageable actions against Black Swans, even if they are aware their risks.

Furthermore, economic problems are the other factors forced the companies to enter this region even if they realize the signals and warnings. Tempting prices of the projects and unfair competition environment prevent the suggestions to be practicable for a company. For example, economic crisis in Turkey at that duration effected the decision of the managers. They ignored the signals or considered them as the normal signals which were very unlikely to be accounted for. In the case study, the interviewees state that even if companies had been aware of the risks, still they would have entered the region due to economic crisis in Turkey at that duration. Moreover, low risk barriers due to optimistic view of the companies cause the failure in the reading the signals and taking the actions. This circumstance shows the need of the high and solid risk barriers. Additionally, the differentiation in the level of risk barriers of the companies based on their sizes and ages cause the different results. For example, small companies have lower risk barriers, so they are not aware the signals as much as the larger companies. As a result, they become open targets and this circumstance brings much more impacts of the events to smaller companies.

5.4. Serviceable recipes

After the semi-structure interview, this thesis offers some recipes under two main headings as internal and external recipes. The external recipes are put forward to protect the market against Black Swans locally or globally. The main challenge of Black Swans is their invisibility. In this direction, the first aims of the external recipes are to unveil Black Swans and support the companies against them. On the

other hand, the internal recipes are offered to the construction companies to improve themselves against Black Swans and to mitigate the impacts which have potential to come to emerge from their connection chains. The external recipes are at market level, while the internal recipes are at company level. The main aim of the recipes is shifting the systems from fragility to antifragility which is the best way to mitigate Black Swans (Taleb, 2007). The recipes will be more suitable and more comprehensive for the construction market when applied together even if they will be useful for Black Swans when applied separately.

5.4.1. External recipes

Black Swans which have private signals and footprints can be theoretically predicted. However, to detect and catch the signals on time and properly is a very hard task and it is not a job which a company, no matter how large and power it is, can do individually. The external recipes will be proposed as a roof model on the construction market, in order to protect the construction companies against Black Swans, and support them for the adverse impacts. The main targets of these recipes will be to catch the signals, and accordingly describe the risky areas in terms of Black Swans and to support the market.

a. Independent consultancy services

The approaches which are offered at Chapter 4 (enriching the board, pessimistic view, and enlarging perspective) have particular drawbacks. Firstly, all respondents emphasized the need of an expert viewpoint. An inexperienced manager having a limited point of view will not be adequate to see all the complexity and long term signals. Also, the decision makers which have limited line of vision can ignore Black Swans. However, if they go a step further and acquire a wider perspective adequately, the signals may be perceptible, and then the managers can stand out against Black Swans. However, neither time nor the staff is available for the

companies to meet this need in practice individually. Secondly, for the construction companies, having private and high level experts who are able to interpret all the signals is difficult. Besides, tempting prices and the unfair competition environment at risky areas may cause the expert advices to become impracticable for the companies. High cost of such expert decision board will also be another problem. Improve communication and transfer knowledge can be an adequate solution. Thirdly, it is theoretically possible to foresee the signals of Black Swans by long term observation, geographical and historical analysis, particular statistical theories and mathematical consequences. Perfect Storm and many Black Swans, despite their negligible probability, have a potential to be predicted in an accurate manner under the aforementioned circumstances. Furthermore, comprehending the complexity of the social systems, focusing on the main and true targets will be useful to kill Black Swans and turn them into expected risks. After integrating and formulating inclusive approaches, Black Swans may be illuminated at a certain degree and transformed into the Grey Swans (Masys, 2012). However, individual attempts and enterprises do not adequately satisfy the all requirements to see Black Swans.

As a solution for some drawbacks, this thesis offers a special and experienced organization where the Black Swan events are scrutinized diligently with a long term observation and a wider perspective, and where different risk scenarios are drawing with a pessimistic view. Such special organization which is expert on reading the signals and precursors will be useful for the construction companies to avert Black Swans and manage their adverse impacts. Also, by the virtue of collective works with other organizations at different disciplines, and extensive sources, the consultancy service may provide a database including all relevant factors using, qualitative and quantitative data.

Understanding the complex systems of the construction industry and capturing the complexity of the interconnections will be possible with the help of such consultancy service. Thus, the risky areas can be determined, the precursors and signals of the unexpected events can be detected, or after the first attacks how far the event will go can be realized. Then the consultancy service can offer some strategies to the

companies individually or generally based on the judgment and experience of the experts. Such a consultancy service will also provide services to the organizations in which country's risk reports are prepared.

The Consultancy Service which is mentioned above should contain the following:

- be expert only at Black Swans,
- be independent from economic and rivalry concerns,
- have the expert managers, and pessimistic view,
- make long-term and systematic observations,
- analyze the regions geographically and historically,
- have a wide information network,
- use particular statistical theories, mathematical consequences,
- think creatively with different scenarios

b. Adaptation of the current insurance systems

Insurance systems cover the risks of the projects for the companies. However, as mentioned before, Black Swans is a fresh topic for the construction world and even the all-risk insurances do not cover Black Swans. For example, in the Arab Spring case, the incomplete projects, and non-performing payments of their completed parts caused the extreme impacts for the companies despite being insured. Unpaid progress payments and warranty letters problems were other great impacts of the financial losses for the companies. Also many interviewees point out the corruption and rigidity of the current insurance systems. Construction Sector needs a new and more inclusive insurance system against the risks of Black Swans. The new insurance system should also elaborate the countries separately for Black Swans with the help of specific risk reports. For this reason, the insurance companies should receive support from the independent consultancy services which are mentioned above to analyze the risks of Black Swans correctly, and to offer the new and inclusive offers. Furthermore, even in case of being aware, insurance companies may

avoid insuring Black Swan risks especially in the risky areas. Besides, even after insuring the companies against Black Swans, the prices will be raised and the companies may abstain from accepting the offers. For preventing these, government should improve and redesign the current insurance systems based on the relative risks.

c. Government promotions and supports

Economic concerns, such as possible high cost of the services and of the decision boards, are the factors which draw the companies avoid receiving consultancy service. Also, the competitive environment and the lucrative bidding will prevent the experts' advices to be practicable, because companies' global and local competitive power may reduce, and they may fall behind their rivals in that case. Increasing the popularity of the consultancy service is required to provide a balance at the competition environment. Furthermore, small companies which even have no private teams to manage the risk analysis are not able to utilize the consultancy service due to the high costs. Moreover, the companies, especially small ones must reach the information of the risks easily. In addition to that, insurance companies may avoid insuring Black Swan risks. For example, according to the interview, many companies did not insure themselves against the politic risks via Exim Bank. In case of insuring, the high prices of the new insurance systems might create other problems for the companies this time. Support and encouragement will be needed.

For these reasons, this thesis offers a recipe which includes some proposals to the government authorities. The government should perform such consultancy service itself or the consultancy service should be performed under the government's backing rather than the independent private companies. Also, by providing new promotions and policies, government should encourage and support the construction companies to utilize the new insurance systems and the consultancy service economically. Thus, the number of the companies receiving the consultancy service

and being insured against the risks of Black Swans will be increased. Then, the rise at the demand of such service will provide a balance in the competition environment.

Additionally, the signals of Black Swans which are detected by each organization and by each member of an organization differ from each other. Lacking information and warnings about Black Swans among the organizations, such as the Turkish Embassy and TCA, brings about unawareness and causes misreading of the signals. In order to have a wider perspective, the embassy members should share their information and experiences with the consultancy services and TCA. Also, an extensive database which is required to tackle Black Swans with all their components together may only be provided adequately by the exclusive collective works. For this, government should provide an effective flow of information among the organizations, the risk reporters and the risk managers (Figure 28).

Additionally, country risk reports basically assess a country's ability for work. The reports categorize the risks into three main headings as politic, economic and finance within the particular subcomponents. According to the responses at the semi-structure interview, there should be a review and a special topic about Black Swans at the risk reports. The consultancy service which is expert on Black Swan threats should transfer its findings to the risk reporters which investigate Black Swans as a new risk factor at the countries' risk report. As a result of the effective information flow, the risk reports will be more inclusive and available for the companies (Figure 28).

In addition to that, in the direction of the advices of the respondents, Turkish Contractors Association (TCA) should be promoted by the authorities for preparing the course of actions against Black Swans. According to the interview, due to lack of supervisions, most of the labors had difficulties to claim their own personal rights. "Turkish Employment Agency" should improve its dynamics to protect the personal rights of the labors inclusively in any case. In order to support those needs, in addition to the information flow, Government should also provide a collective work

among authorities at the related countries, independent consultancy service, countries' risk reporters and especially TCA.

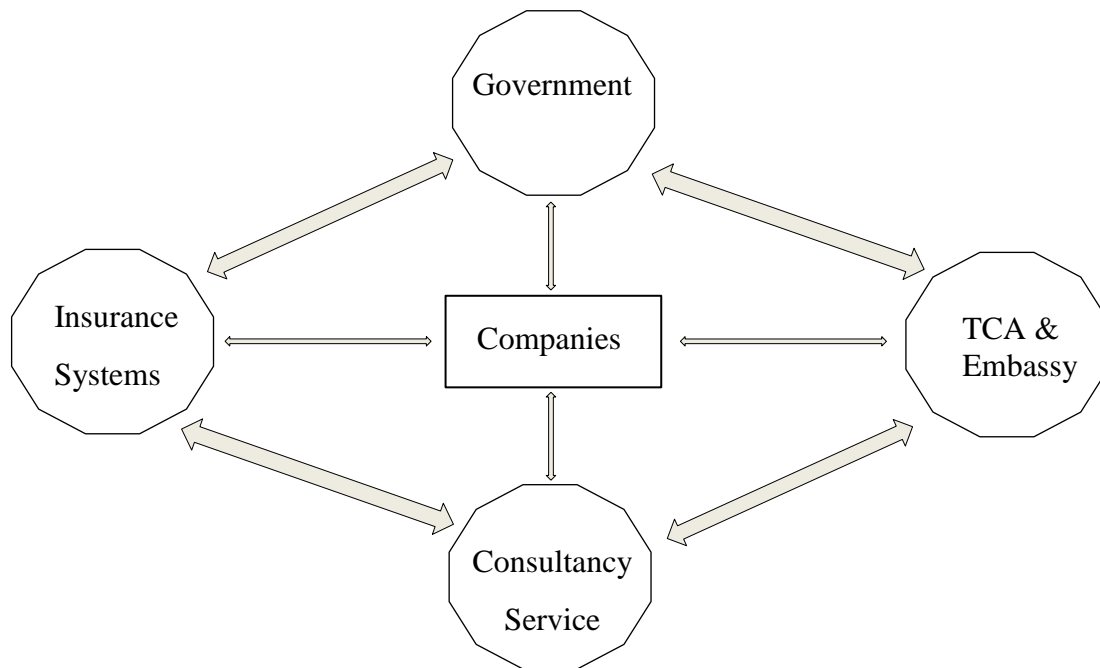


Figure 28: Flow of information and support among the organizations and government

5.4.2. Internal recipes

The recipes elaborated in this section are offered to the companies individually as the possible and complement strategies for Black Swans. Those are particular approaches which can be applied for each company without any external tools. The aim of the approaches under this heading is to provide the companies with opportunities to improve their systems, and to take precautionary actions against Black Swans. Thus, supply chains, internal operation, and weak steps can be made less likely to fail and more resilient. Also, by the internal recipes, companies will able to catch the private signals of Black Swans as well as some short-term signals.

These recipes will also play a bridge role between the external recipes and companies themselves in order to make the external recipes useful.

a. Expertise approach

General perspective of the sector and unrecognizing of the unique risks are the main problems about the Black Swans. First of all, companies must be aware of the threats of Black Swans and their signals. They should be familiar with the problem and wonder about Black Swans, so that they can comprehend the need of the new risk approaches. The companies should also understand the need of a special consultancy service or other external recipes which are offered in this thesis. Furthermore, companies should aspire to follow the internal recipes which are elaborated below properly. Otherwise, the recipes in this thesis will become useless for the companies.

The members of the companies in the case study stated the necessity of having an experienced decision board. Also, they now avoid conducting new projects in Libya because of their real experience which they gained after the event. Furthermore, the managers in the case study remarked that an expert company will be useful. Those statements show that in order to be more aware of the signals, and to understand the need of a special consultancy service, construction companies need experienced managers. For this purpose, the companies, first of all, should have expert board members who have a real experience, who had previously suffered the extreme events and who understand the unique risks of Black Swans to a certain extent. In this way, they can combine the signals which come to surface from different spots and they can determine the risky areas, and the risks of Black Swans. Moreover, the expert managers will detect some short-term signals or warnings, wonder about the advices of the consultancy service for the long term signals and read them properly. As a result, they will make the companies more resilient against the catastrophic events up to some extent.

b. Avoidance approach

Companies should have avoidance behaviors in the risky areas which are determined by the external recipes. These behaviors are the main gate of the defense mechanism against the signals. Adjusting the risk barriers and spreading the risks are two main parts of the avoidance approach.

Firstly, having low risk barriers for the construction companies is a main drawback against Black Swans. According to the research findings, companies have optimistic opinions about the rare risks and they easily enter the risky areas. Also lucrative offers and economic advantages of the risky regions make the risky areas more attractive for the construction companies. Companies need to have higher risk barriers such as physical, functional barriers which cover the signals of Black Swan threats to avoid from the risky areas although the regions have many advantages. Higher risk barriers may transform Black Swans into Near Black Swans by preventing the extreme outcomes. According to Aven, the Near Black Swan events are the events which have no extreme consequences for a company due to the risk barriers preventing their outcomes (Aven, 2014). Also the new high barrier walls of the companies will prevent the attractive offers from such areas. After specifying the frame of once-in-a-lifetime risks, managers or board members having real experience should redesign the risk barriers of their companies.

Secondly, in case that the advantages of the project pass over the heightened barriers and the project will be conducted, the construction companies should spread the risks. They should avoid shouldering by themselves all the risks which they notice from unusual signals. For this, companies need to disjoint the risks by choosing the appropriate agreement types. For example, the losses of the companies in the case study differ based on the agreement types. The losses of the projects which the companies conducted as subcontractors are less than the others. Also the managers in the case study believe that choosing the correct type of agreements which reduce the risks in the risky areas such as joint venture, will be helpful. In addition to the appropriate agreement types, the insurance systems act great role for transferring the

risks. For example, the main reasons of the financial losses of the companies in the interview are the incomplete projects, non-performing payments, and warranty letters. Companies should transfer these risks to the insurance companies as possible especially in the risky areas.

c. Pessimistic approach

In order to mitigate Black Swans, pessimistic view is another complement approach. Under the research findings of the semi-structure interview, it seems that there is a lack of pessimistic view among all the company members. It is highly possible that the companies will not give consideration to the relevant risks even after having an experienced decision board. Each company has many private and particular weaknesses and vulnerabilities in its connection chains and its risk barriers. Some of those critical components which have potentials to become as Black Swans may hide themselves in the details (LeMerle, 2011). The signals detected and announced by the consultancy service may not be adequate to cover private signals related to the company's dynamics. According to Janis (1972), and Taleb (2007), properly detecting all the secret and tiny vulnerabilities which are unseen in the details of a company's network will not be possible with an optimistic view. In addition to that, almost every interviewee in this case study agrees the idea of Nafday (2009) that precautionous actions with pessimistic view will be beneficial to pay attention to secret faults.

As a solution, the construction companies should change their perspective about the risks at all steps of the projects. They need vigilant decision boards as well as the experienced managers. Companies, with all their management systems together, should be convinced that the rare and surprise extreme events can happen at any moment from any spot. They should also believe that considering different scenarios and taking precautions can mitigate and avert the adverse impacts of the surprise events.

This special perspective may be adapted into internal recipes at the following method. First of all, similar to tenth man rule, at least one of the vigilant decision makers should play the role of "devil's advocate" in order to object the decisions which are believed as perfectly correct and stable by the other managers. Because, only a pessimistic view can find the weaknesses and pitfalls of the companies, the blind and ignored holes of the companies' risk barriers. Also, even after raising the barriers in the direction of the avoidance approach, some rare risk paths can still pass through the holes at the barriers. After having such view, in order to determine all the blind spots in the risk barriers, (similar to "mapping enterprise step" of LeMerle (2011) and "scenario planning method" of Masys (2012)) the decision board members should chart their all operational relationships which establish with the other sectors. While charting, they should also reconsider their structures, third-order and so on relations, and their competitive dynamics diligently. Afterwards, the decision board members should reactivate the pessimistic mechanisms and imagine worse paths and wrong conclusions to specify the possible rare scenarios. After getting the worst paths and imaginary failure scenarios, this approach should be utilized again as the further step by the experienced decision board managers to cover the holes on the barrier walls and critical points in the company's operation maps. By this way, the company can block out the paths of Perfect Storms and Black Swans passing on the holes of the risk barriers.

d. Cautionary approach

Under the semi-structure interview, the short-term signals which are mentioned by the owners, managers and technical staffs of the companies are different from each other. Each member has realized the different footprints or the different aspects of the signals. For example, while the managers mention vulnerabilities of the individual dynamics, operational staffs draw attention to the internal disturbance of the local government and unusual behavior of foreign controllers. Also sometimes, even a small factor which is already noticed as a signal or warning by the technical staffs might become one of the main cause which start the catastrophes irreversibly.

On the other hand, sometimes a little precaution can save the companies from some ruinous impacts of Black Swans. For example, company X was able to protect its construction site from the riots by the help of good relation with the local people. Only a pessimistic view will not be enough to reveal the weakest points of the company and to take cautionary actions and finally to avert Black Swan event for a company. The decision board members need to have inclusive information sources to detect the precursors and warnings and to pay attention to the common faults of the company.

For this, rather than the individual attempts of the decision board, a collective work among the members of the company must be applied by the expert managers. Collective work must include updated general work policies, strong work disciplines and flow of information between the company's members such as owners, risk managers, and operational staffs (Figure 29). With the help of the collective work, a company is able to observe the whole operational map inside the dynamics of the company and then catch the short term signals such as the internal disturbance of the local government, vulnerabilities of the individual dynamics, unusual behaviors of foreign controllers etc. Also, during the operation, this approach diligently will monitor the steps of the operation on a continuous basis and will give some tactical insights to the managers and decision makers.

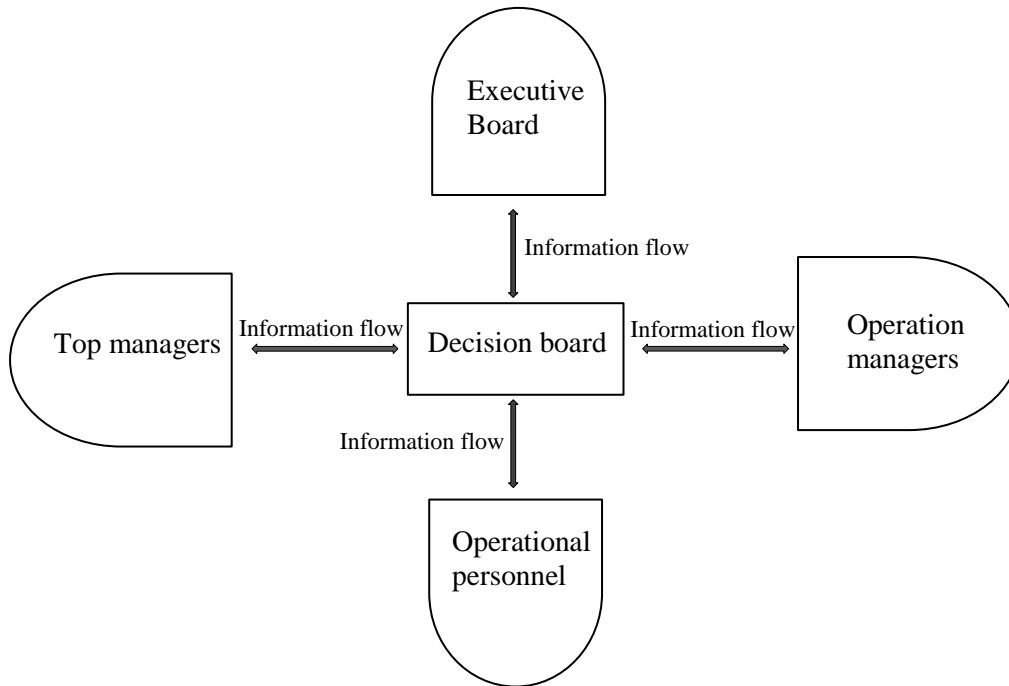


Figure 29: Flow of information and collective work among the members in a company

5.4.3. Collection of the recipes

The recipes that the thesis offers to the construction companies as the possible strategies (mainly getting consultancy service and government support, having experience decision board, thinking with pessimistic viewpoint, having avoidance behaviors) will improve the company against Black Swans and complement the traditional risk strategies. The internal recipes will be integrated to the traditional risk-based management and then, an adequate balance will be provided to obtain an appropriate risk approach. External recipes, on the other hand, will cover the system of the construction industry. In case of combination of all the recipes, they will become more inclusive and will be able to be succeeding to kill Black Swans by revealing their veils. On the other hand, complying with the offered recipes may cause some losses for a construction company. However, they will provide the main goal of the recipes by shifting the systems (i.e. shifting from fragility to robustness and from robustness to antifragility) in a certain extent.

Risk management approaches might change depending on the dynamics of the events. The dynamics of Black Swans are different for each category which are mentioned at Chapter 2 (i-unknown unknowns, ii-unknown knowns, iii-known but rare). It is also possible to offer an appropriate and specific approach for each category to a company and then to add and mix to its traditional risk method. For example, the first type of Black Swans (unknown unknown) might be mitigated by the pessimistic view approach. Mitigate of the second type of Black Swans (unknown known) requires a wide perspective and an experienced decision boards. Long-term observations, systematic works with wider perspectives and quick detection might be helpful in order to react to the signals on time. Moreover, only an expert consultancy approach can adequately consider the rare combinations and conditional probabilities of Perfect Storms. In addition to these, cautionary and precautionary approaches which have careful evaluations, the rare combinations of unique events and fast reaction might be helpful against Black Swans. Additionally, taking lessons from failures, anticipating the worst cases and monitoring them will make the companies more robust. On the other hand, it should not be forgotten that providing the adequate balances among the categories might be required to obtain the appropriate risk approaches.

5.4.4. Steps of a practicable process plan

This section offers a process model which includes the recipes above to the construction companies. Figure 30 illustrates the steps of the process model. It should be noted that the pessimistic view must watch all the steps at the background. Also, construction companies must receive the dynamic helps of the consultancy service during the process. Now, all steps will be elaborated successively as the following:

Step 1: Experienced decision board. In the direction of expertise approach, construction companies should have expert managers, and board members,

who have a real experience, and suffer the extreme events before. Thus, the companies will understand the unique risks of Black Swans, take lesson from the failures, comprehend the need of the consultancy, and can apply the process properly.

Step 2: Receiving external services. Experienced managers should receive the consultancy service, thus company will able to determine the risky areas in connection with Black Swans and take particular advices and tactical insight individually. Extensive risk reports and government aids will also be useful to unveil Black Swans in this step.

Step 3: Heightened risk barriers. After the risky areas are determined, experienced managers should raise the risk barriers in the direction of avoidance approach in order to resist against the attractive offers, and economic advantages. Thus, companies will accomplish avoiding from the risky areas.

Step 4: Spreading the risks. After deciding to undertake the project, the construction companies should spread the risks to reduce possible adverse impacts. Companies should choose the appropriate agreement types and transfer the risks to the insurance companies as possible.

Step 5: Mapping the company's network. Before beginning the project, in order to find out the weaknesses and pitfalls and the blind spots in the risk barriers in details, experienced decision board should map all company's relationships of the other sectors in operation with a pessimistic view.

Step 6: Improved the risk barriers. After mapping, in order to cover the holes on the barrier walls and blind spots in the company's operation maps and block out the critical paths, worse risky paths, possible rare scenarios and wrong conclusions should be imagined by a pessimistic approach.

Step 7: Adapting the risk management approach. Decision board should receive the information about the dynamics of possible Black Swans in the region and some tactical insights. After that, experienced managers should offer an appropriate approach according to the types of Black Swans separately and then should add and mix to the traditional risk method of the company.

Step 8: Observing and monitoring the system. In the direction of cautionary approach, expert managers should observe the whole operational map, monitor the steps on a continuous basis in order to detect of the short term signals, and response quickly during the operation. For this, expert managers should put a collective work and provide information flow among the members of the company into practice.

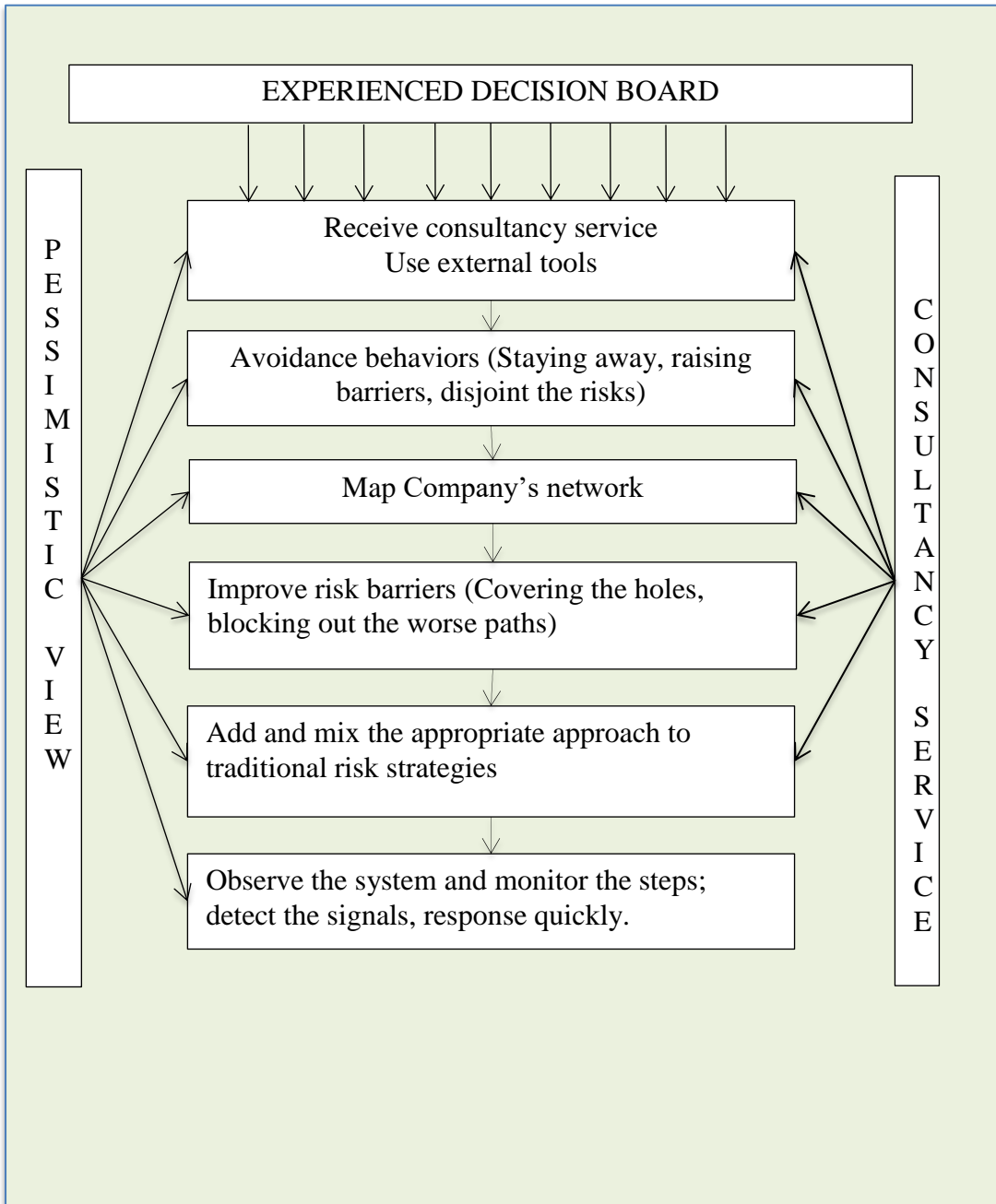


Figure 30: Steps of a possible action approaches for a company against Black Swans

CHAPTER VI

CONCLUSIONS

6.1. Summary of the findings

This thesis explored the Black Swan events and their impacts on the construction companies based on the research findings. Also, in order to mitigate the adverse impacts of Black Swans, it was aimed to be adapted the current strategies in the literature, which are offered against Black Swans, into the construction industry. As a case study, this work investigated the Arab Spring which can be denoted as an example of the Black Swan events.

For this purpose, firstly an extensive literature review about Black Swans was made. In order to construct a general framework of the study, and gain an early understanding of the case, several researches and discussions with the academic supervisors have also been conducted. Then, to formulate the theoretical framework, an interview form consisting of a set of questions has been prepared. In this research, semi-constructed interview method was attempted. The interviews were conducted with 2 large and 1 relatively small Turkish construction companies which conducted the projects in Libya at relevant time and 3 attachés who worked at Turkish Embassy in Libya at that time interval. In total, 10 interviewees responded to the questions in the semi-structured interview form. As a result, this work offered some recipes to the construction industry under two main headings such as external recipes (which are namely expert consultancy, inclusive insurance systems, government support) and internal recipes including some complement strategies and perspectives like expertise approach and avoidance behaviors.

The main findings of this thesis are as follows:

-Arab Spring can be strongly seen as one of the prime examples of the Black Swan events at recent years.

-The definition of "unanticipated events", which cover all three main titles (i-unknown unknowns, ii-unknown knowns, iii-knowns, but rare), is more appropriate for the Arab Spring.

-Arab Spring is a surprise event but has unusual footprints and signals which have to be detected, observed, and read correctly, with a special framework.

-Lack of coordination and collective works in the companies, the complexity of Black Swans, and inexperienced and unaware managers are the major reasons of the failure in reading the signals and the failure in taking the appropriate actions against them.

-Current traditional strategies and approaches of the construction companies are not adequate to catch and read Black Swans. Robust and resilient complement solutions are needed to prepare the companies against Black Swans.

-The main aim of the recipes which the thesis offers is shifting the systems from fragility to antifragility which is the best way to mitigate Black Swans.

-In order to mitigate the adverse impacts of Black Swans, a more inclusive insurance system, having an appropriate and large-scale strategy or approach, and government promotions are external requirements.

-Expertise, avoidance, pessimistic and cautionary approaches are offered to the companies as internal recipes individually to provide robust systems for them against Black Swans.

-External recipes are at market level. They attempt to catch the signals and protect and support the construction companies. Internal recipes are at level of company and offer individual approaches to the construction companies in order to protect the company and improve the traditional risk strategies against Black Swans.

-When applied together, the recipes will be more inclusive and effective for the construction companies and construction industry.

6.2. Benefits for the academia and the industry

For general purposes, there are many studies in the literature that examine the Black Swan events with case studies. From the perspective of the construction industry, a case study is needed about which strategies can be effective or how they can mix and adapt for the construction industry. However very few case studies explicitly mention the extensive analysis of the Black Swan events which are related with the construction market directly. This thesis fills this gap by investigating the Arab Spring case.

Also, many strategies and approaches against Black Swans which are offered by different authors are located dispersedly in the literature. Furthermore, many of them are not specifically related with the construction companies and construction market. This thesis fills this gap by collecting the strategies for the construction market and construction companies under three headings (enriching the decision board, pessimistic view and wider perspective).

Moreover, construction companies have fragile environment and are open targets for the Black Swan events. In order to be well prepared against Black Swans, need collective and comprehensive process guides including the relevant approaches which are mentioned in the literature, and the offers which are recommended to the organizations to catch the signals. This work fills this gap by the external and

internal recipes and offering a practicable process plan which are prepared in the direction of the literature and case study.

In addition to that, this thesis mentions, as a new offer, a new expert consultancy service where the Black Swan events are scrutinized diligently. This special service may solve the complexity of the interconnections, determine the risky areas, and catch the precursors, and signals of the unexpected events. With this consultancy service, it will also be possible to carry out extensively the strategies and approaches in the literature which try to avert Black Swans properly and systematically. Also, this service can offer particular strategies to the construction companies and support them in the time of need.

Additionally, this study investigated particularly how Turkish construction companies affected from Black Swans. Therefore, this work and the recipes will provide a special benefit for the Turkish construction companies to mitigate the adverse impacts of Black Swans in international area. Construction companies, if putting the recipes into practice, might find an appropriate and safe environment against Black Swan threats. Also, the recipes might provide a fair competition area, an inclusive shield especially for smaller companies in the international market.

6.3.Limitations of the research

In this study, the interviews were carried out with 2 large and 1 relatively small Turkish construction companies and 3 attachés. In total, 10 interviewees were involved in this study. After the semi structure interview, it is hard to generalize the research findings which are obtained. This difficulty causes a limitation for this research. In order to acquire a deep, wide-ranging, and extensive findings, much more people and companies' opinions and their perspectives are needed. In order to overcome this difficulty, this work needs communication with more interviewees from various positions such as the managers, the decision makers, and related staff

of the different organizations based on their responsibilities, volume of works, strategic positions.

In addition to that, the chosen method of this case research brings other limitations. . The aim of this research is to understand the experience of people who live through the problem. However, this work is an explanatory research. It does not provide conclusive results due to lack of statistical strength. In order to provide a conclusive result, this research must be tested. Additionally, providing objectivity is another limit of this method. The semi-structured interviews are more flexible than other types because of having lots of the personal and open-ended questions. In point of fact, during the interviews, it was quite possible to lead and manipulate others (either interviewee or interviewer). Especially for the face to face interview type, it was hard to make the conversation in an objective way.

6.4.Recommendations for further studies

As a summary, this thesis might be helpful for the further studies which will prepare the course of actions which aim to protect the construction companies against the surprise and catastrophic events. The thesis points out the need of expert views and draws a route map of a new consultancy service. It may be useful for authors who plan to consider this concept in their studies. Below are some recommendations for the future:

In order to scrutinize the case properly, the interconnections and dependents of Black Swans must be investigated diligently. In other words, the Arab Spring event in Libya is associated with different disciplines such as politics, society, community psychology, international relations etc. Unfortunately, most of them have engineering background. Also, the approaches which are offered as the solution or the strategy are required to tackle with an interdisciplinary study and viewpoint. In order to scrutinizing Black Swans threats on the construction world, interdisciplinary works will be more suitable in further studies due to complexity of the phenomenon.

The thesis offers a new consultancy service. However, this work only shows the ways that are theoretically possible to detect the signals. Historical and geographical analyses should be scrutinized with some specific frameworks. Also, some theories such as complexity theory, which are utilized for reading the signals of the surprise extreme events at the complex social movements, might be tackled for the purpose of detecting the signals and precursors at the further works.

Finally, although risk management is a widely studied topic within the construction management, process models and techniques are usually suited for “known unknowns”. Management of extreme events and uncertainty management should be considered as a part of risk management and new process models and approaches should be designed and tested. Further studies about risk management incorporating management of black swans and perfect storms are urgently needed.

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APPENDIX A

COMPANY X

Company X Construction carries out road, railway, metro, port, house, industrial facility, and irrigation and dam projects on all sides of Turkey from Çanakkale to Gümüşhane, Trabzon to Şanlıurfa, İzmir to Artvin. For 40 years, Company X is steadily growing up by spreading its services. Company X maintains its activities on a large geography from Libya to Azerbaijan and Uganda ensures access for its services through foreign offices located in Baku/Azerbaijan, Libya/Tripoli, Uganda/Kampala, Algeria/Alger, Saudi Arabia/Al-Khobar and Kuwait/South Al Mutlaa.

Scope of Activity

1. Transportation and Infrastructure Projects
 - a. Transportation and Infrastructure Projects
 - i. Roads, Highways and Motorways, Railways, High Speed Railways, Metro, Bridges and Tunnels
 - ii. Ports, Airports, Urban Infrastructure
 - b. Energy Projects, Natural Gas and Electricity Distribution
2. Agriculture and Hydraulic Projects
 - a. Dams
 - b. Irrigation Systems
 - c. Flood Control
 - d. Water Conveyance System
 - e. Energy and Communication Projects

- f. Hydroelectric Power Plant (HPP)
 - g. Water Treatment Facilities
3. Housing, Building, Industrial Projects
- a. Residential Projects
 - b. Housing Developments & Business Center
 - c. Hospitals, Schools
 - d. Embassy Building
 - e. Touristic Facilities
 - f. Hotels, Touristic Complexes
 - g. Recreational Facilities
4. Industrial Projects
- a. Factories and Industrial Facilities
 - b. Pipelines
 - c. Industrial Investments
 - d. Port and Shipbuilding Yard
 - e. Military Projects
 - f. Administration Buildings
 - g. C/B Protected Blast Resistant Buildings
 - h. RFI Shielded Facilities
 - i. Energy and Communication
 - j. Environment Oriented Projects
 - k. Sewage Treatment

Construction Sites in Libya

1. Design and Construction of two Pump Station and Water Conveyance Pipelines for Wadi al Gattara, Ghout es Sultan and Benghazi Plain Project

Location : Benghazi / Libya

Date of Contract : 11/1/2007

This Project, which is a part of the Libya's and the world's largest construction project aims to take water from the reservoir and supply the agricultural regions of Rajma, Ghout El-Sultan and Benghazi Plain. The project main components are as follows: Main Pump Station and Main Pump Station Break Pressure Tank: Geotechnical study, Design, Supply and Construction for civil, mechanical, electrical, control and communication Works of the Main Pump Station with 6 pumps with a capacity of 2,764 m³/h each.

2. Phase I Benghazi Plain Region

Location : Benghazi / Libya

Date of Contract : 5/31/2008

The aim of this project is to take water from the Beninah tank and convey to the agricultural regions of Benghazi. The project main components are as follows: GRP pipeline with associated chambers of approximately 83 km with diameters ranging from 250 mm to 1,400 mm carrying out approximately 2,183 l/sec water for irrigation purposes to be distributed to 9 fields, irrigation networks with associated chambers approximately 415 km long uPVC pipes with a diameters ranges from 450 mm to 63 mm, 45 turn-out head works chambers connecting the irrigation networks to the main GRP pipeline, 738 circular reinforced concrete tanks with a capacity of 250 m³.

3. Main Infrastructure Works for National Housing Project in Tajurah

Location : Tajura / Libya

Date of Contract : 2/27/2010

The project involves all earthworks, roadworks of 40 km, rain water drainage network of 200 km, sewerage network of 50 km, water supply network of 140 km, irrigation network of 40 km, construction of bridge, construction of electrical and telecommunication distribution network, construction of pump stations, chlorination plant, street lighting and landscaping works of 830 ha. public housing area.

APPENDIX B

COMPANY Y

Company Y has been operating since 1979 in the sector. Company Y constructs infrastructure, roads, tunnels, metros, industrial plants, steel buildings, shopping centers, residences, mass housings, and hotel and business centers. Since its establishment up to date, Company Y's structure has completed many projects in Turkey and abroad. Company Y has been specialized especially in metro construction, tunnels, oil and gas pipelines, industrial facilities, road and railways. Completed in previous years, construction of 12,000 housing units, 4 hospitals and 9 hotels are representing experience of Company Y in structure projects. Company Y is also actively involved in tourism and production sectors, as well as the construction sector.

Construction Sites in Libya

1. Abu Zayyan-el Ruhebat Water Supply Project

Location: Gharyan / Libya

The project is a design and build project with the purpose of supplying potable and irrigation water to Jebel Al Gharbi area near Tripoli City. The main line is GRP pipe with a length of 120 km. The diameters of pipes are between 800-2400 mm. The project supplies water to 10 towns and 38 villages. There are 2 water storage tanks, one 27.000 m³ capacity and the other 13.000 m³ capacity. There is also automation in the whole system.

Start Date: 08.06.2006

Finish Date: 10.11.2010

2. Construction of infrastructure network of Badr town/Libya

Location: Libya

Construction of all infrastructure network of Badr Town including sewage system, drinking water system, fire water system, agricultural water system, city traffic network, pedestrian roads, storm water network, electrical works, telecommunication systems, natural gas system.

Start Date: 11.07.2008

Finish Date: Suspended

3. Sabratha Cancer and Training Hospital

Location: Sabratha / Libya

Turnkey project of Education and Training Hospital and Cancer Hospital will be renovation and re-construction. Under the project a total of 41,000 m² of renovation and 20,000 m² will be a new hospital building.

Start Date: 12.03.2010

Finish Date: Suspended

4. Renovation of Al Agalat Hospital

Location: Tripoli / Libya

Renovation of all architectural, mechanical and electrical systems of the 136 beds-capacity hospital located in 14.500 m² area in Al-Agalat Town 70 km distant from

Tripoli and increasing the bed capacity to 166 by the construction of annex ward building with international standards.

Start Date: 04.07.2010

Finish Date: Suspended

5. Tripoli University

Location: Tripoli / Libya

The project includes construction of Arts, Languages, Mass Media and Humanities Faculties of Tripoli University Nasr (B) Campus, The total covered area adds to a total of 58.000 m².

Start Date: 19.07.2008

Finish Date: Suspended

APPENDIX C

COMPANY Z

Company Z has been operating since 1996 in the sector. Company Z is a relatively small construction company and carries on its business at Istanbul now. Company Z constructs residences, housings, infrastructure and roads. Company Z has been specialized especially in housings. It has completed many projects in Istanbul/Turkey. After 2011, Company Z preceded its projects in Libya by conducting housing and infrastructure works. During the revolution, it stopped its works and came back to Turkey. Then, between 2013 and 2015, it turned to Libya in order to resume on its works.

Construction Sites in Libya

1. Al Qardabaa Village Infrastructure and Transporting Works

Location: Tobruk/ Libya

The project includes pipelines, roads and signalizations of a special area in Al Qardabaa. The total length of the work is 15 km². Company Z was sub-contractor of this project.

Start Date: 05.06.2011

Budget: 27 million USD

Finish Date: Suspended

2. Tobruk Water Treatment Project

Location: Tobruk/ Libya

The project includes a full system of water treatment facility in Tobruk.

Start Date: 05.06.2013

Budget: 5 million USD

Finish Date: Suspended

APPENDIX D

INTERVIEW FORM

Q1. Surprising extreme events are described as Black Swan and they come from unknowns and cause the extensive damages. These are the events that are terribly hard to predict and mitigate. According to its specific definition, Black Swan type of events saliently has three characteristics as distinguished from regular extreme events: a) outlier, b) widespread and c) with very low probability of occurrence.

Do you believe that the Arab Spring was one of Black Swan examples?

Q2. In the literature, the Black Swan events have been clustered under three titles based on knowledge levels of respective team.

-unknown unknowns (which means as completely unknowns)

-unknown knowns (some authorities excluding related ones know beforehand somehow)

-known knowns (decision makers know the events, nevertheless ignore due to very low probabilities)

Based on this classification, which title is the best place for the Arab Spring?

Q3. The Arab spring began in Tunisia at 2010 and spread to Libya, Egypt and Syria quickly and changed every corner of the business world dramatically.

How Arab spring process was developed in Libya? And what were the impacts at the end of the day?

Q4. Arab spring was an event which is notoriously difficult to predict before coming. Within the frame of the responses of the first question, could you have found any chance to predict the event before appearing in Tunisia or the impacts during the process? And did you foresee that spark would trigger the bigger events and spread to Libya?

Q5. After the internal disturbance arriving to Libya, which part or parts of the management was the most challenge for you? And to what extent at the process of management did you success?

Q6. In the literature, many different and seemingly effective ways are mentioned by the authors. This work attempts to explore whether the current strategies in the literature which have already offered for various markets or general purposes can be applied to the construction world to strengthen the uncertainty management.

It is expected to know your general opinion (effective or not etc.) (If they would have been effective or not) about those strategies which will be mentioned briefly as follows:

Q6.1. According to some authors, if the historical data are focused on in detail, and the lessons are taken from failure, Black Swans can be described. Also, after mentioned the inadequate of the current classic risk management methods, they offer a new, complement and alternative risk managements which are special to Black Swans. Hence, the companies and the organizations will be able to create new scenarios with different probabilities, and they will be able to develop various risk

strategies by solving the relevant chain of events. If Black Swans had been considered before the Arab Spring, with the help of the historical analysis deeply, could it have been possible that the construction companies would provide the various scenarios including the Arab Spring threat.

Q6.2. In literature, many authors mention a new approach under different names. This approach offers to form a new team who always supposes the consequences without success, and additionally focuses on the scenarios in case of those failures. Finally, this team attempts to create the safe strategies against those negative scenarios. In other words, the purpose of this special team is to develop a new road map by thinking the former strategies as the worst case, no matter how low the probability has. Supposedly the Arab Spring was known before happened but ignored due to low proportion, do you believe that such approach can raise the awareness of Black Swans, and compelled the companies to develop new strategies?

Q.6.3. There is two popular offers that shed the light to Black Swans. One is to enrich the decision board by having the experienced managers who are experts against the unexpected extreme events. Other is to work collectively with the institutions that have macro perspectives and the expert members. What do you consider about the decision teams of the companies in Libya? Do you believe that they were experienced enough for the Arab Spring? In case of not enough, and in case that the companies had enriched their decision boards with quite experienced and practiced people against Black Swans, or with the collective works, in what extend were the results changed?

Q7. From now on, what do you recommend to the construction world? Do you have new thoughts or strategies to avert Black Swans or permit more rapid recovery after the impacts?