



Inspiring a Mindset of Resilience

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Extended Report

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An Interactive Qualifying Project of the Worcester Polytechnic Institute

For the Danish Institute of Fire and Security Technology

Advised by Professor V.J. Manzo and Professor Lauren Mathews

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Abstract

The Danish Institute of Fire and Security Technology (DBI) aims to increase the business resilience of Danish companies by developing a new business area within DBI. In making this new business area, DBI found that most Danish businesses, as well as DBI employees, are generally unfamiliar with the topic and do not understand its importance. Therefore, DBI needs to educate Danish businesses about business resilience in order to inspire them to become resilient. We developed informational materials to address knowledge gaps that we identified among DBI employees regarding business resilience. We proved the effectiveness of the informational materials by testing them on DBI employees.

Acknowledgements

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Authorship

The attribution of authorship to specific authors can in no way describe the level of teamwork and integration our team had in writing this report. All teammates contributed equally and collaboratively to this work.

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1.0

Background

1.1 Definition of Terms

As we discuss the topic of business resilience throughout this report, we use two other key terms, which are disaster and disruption. They are defined as follows:

Disaster



a sudden incident such as an accident or a natural catastrophe that causes great damage or loss of life (Oxford Dictionaries)

examples: terrorist attacks, tornados, cyber attacks

Disruption



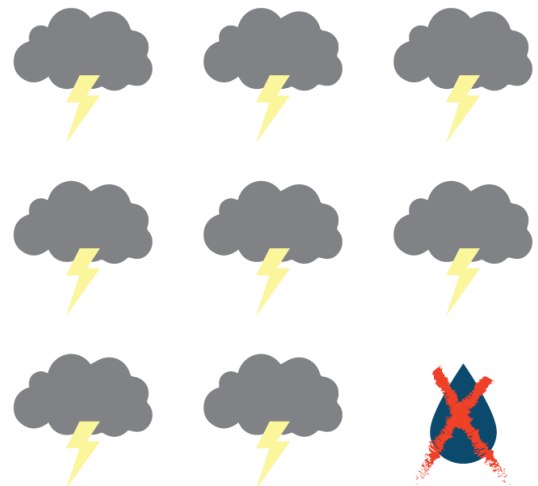
the impact of a disaster on an organization which is controllable to various extents

examples: employees unable to go to work, disrupted supply chains, destruction of buildings

1.2 The Changing Nature of Business and the Impact of Local and Global Disasters

Denmark is not a country where natural disasters occur frequently. In a country with little previous experience dealing with natural disasters, it can be hard for business owners to understand the impact a natural disaster can have on their operations. Since 1981, there have only been nine major disasters: eight storms and one drought (Denmark Country Profile, 2016). Natural disasters are highly unpredictable and should be considered when evaluating the security of a company. In 1999, the cyclone Anatol severely impacted the infrastructure and economy of Denmark. The cyclone had wind speeds of up to 51 meters per second; the highest recorded wind speed in the country. Although such events are uncommon in Denmark, cyclone Anatol caused seven fatalities (Denmark Country Profile, 2016) and losses of about 14 billion Danish Kroner (around 375 million USD) (Munich Re Group, 2002).

Figure 1: Disasters in Denmark since 1981



On July 2, 2011, Denmark experienced its next largest natural disaster (Højgaard, 2015). A cloudburst- a short, high volume rainfall- precipitated 135.4 mm of rain onto central Copenhagen in two hours (Højgaard, 2015). Cloudbursts are becoming more common to Denmark due to climate change. This storm brought record amounts of rain with some recording as much as 4.5 mm of rain per minute (Højgaard, 2015). Copenhagen's drainage system quickly overflowed because of limited green space to absorb the water, flooding metro tunnels, basements and ground level businesses and homes (Højgaard, 2015). It took almost 12 hours to restore power to 10,000 homes and 50,000 people lost heat for up to a week (Højgaard, 2015). Over 90,000 insurance claims were filed totaling over 6.2 billion Danish Kroner (over 1 billion USD) (Højgaard, 2015). Insurance companies could not process the large quantity of claims fast enough, delaying the insured from getting the help they needed (Højgaard, 2015). Delayed processing and distribution of equipment such as pumps and dehumidifiers led to additional losses from mold and water damage (Højgaard, 2015). Insufficient preparedness of the insurance companies and lack of state plans for coping with this type of event enabled unnecessarily high levels of damage from the

cloudburst.

Flooding is a significant risk in Denmark due to its unique geographical characteristics. Denmark is a lowland country, only about 173 meters above sea level (European Environment Agency, 2010). The Danish Meteorological Institute predicts that due to climate change, the sea level is expected to rise around 0.3 to 0.6 meters within this century (Climate Change Adaptation,

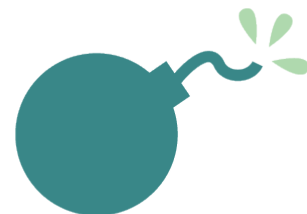


2015), which could potentially cause extensive flooding in the 70 small populated islands (World Atlas, 2016) around Denmark. On January 2017, Denmark experienced “once-in-a-century” floods, causing water levels to reach 177 centimeters in parts of Copenhagen and 157 centimeters in southern Denmark (W, 2017). According to the Danish

Meteorological Institute, as climate change continues, these events that statistically occur only once every century are expected to become more frequent (W, 2017).

Natural disasters such as floods are not the only source of risk for a business. Man-made disruptions such as terrorism are just as important. For example, in November 2015, Paris declared a state of emergency following terrorist attacks in six locations. It was considered the most professionally organized attack by the Islamic State in the region (Jałoszyński, 2015). Although France was on high alert for terrorism because of recent terrorist attacks, French authorities failed to stop the catastrophic consequences of the November attacks which resulted in about 130 deaths and over 350 people wounded (British Broadcasting Company, 2015). In addition to the human loss caused by this event, the tourism industry of France and Belgium was severely impacted (Walker, 2015). In Brussels specifically, the capital of Belgium and a city tourists tend to travel to when they visit France, 40% of hotel bookings were cancelled following the Paris attacks (Walker, 2015). Furthermore, these cancellations had an effect on services such as taxis, restaurants, shops, and tourist attractions (Walker, 2015).

The threat of terrorism also affected Denmark in 2005 when a series of graphical representations of the Prophet Muhammad were featured in the Danish newspaper Jyllands-Posten. This angered some Muslims because the Prophet Muhammad is forbidden from being depicted for religious reasons. The depiction sparked a series of protests and riots in Muslim countries that resulted in over 200 deaths (Berkeley Center for Religion, Peace, and World Affairs at



Georgetown University, 2017) and incited boycotts of Danish goods. A supermarket in Cairo, Egypt, posted signs stating they were not selling Danish goods “in solidarity with Muslims and Egyptians” (Associated Press, 2006). Henriette Soltoft, Director of International Market Policy for the Confederation of Danish Industries, said this situation “causes great concern from our members” (Associated Press, 2006). Since the controversial publication, Denmark has been considered a high priority target by militant Islamists (Center for Terror Analysis, 2013). The global repercussions of this Danish publication were significant, and although no terrorist attack has occurred in Denmark, the Danish Defense Intelligence Service lists terrorism as one of Denmark’s biggest threats (OSAC, 2016).

Businesses in Denmark are highly dependent on the Internet (Centre for Cybersecurity, 2017), therefore another significant threat the businesses face is cyber-attacks. In this highly-digitized age, companies rely heavily on the Internet for rapid communication. Despite its benefits, dependency on the Internet leaves companies vulnerable to cyber-attacks. The goal of the Danish Centre for Cybersecurity is to strengthen the Information and Communication Technology

infrastructure that supports telecommunications, energy, water supply, transportation, and other industries. The Centre for Cybersecurity conducted an assessment in which it determined that Denmark is at high risk for cybercrime and cyber espionage.

Cyber espionage is the collection of private information such as intellectual property or trade secrets, commonly used to steal information from companies or government agencies (Centre for Cybersecurity, 2017). Cyber espionage is difficult to detect and can occur for prolonged periods of time. For instance, one Danish company and its service provider, whose names are protected by the Danish Centre for Cybersecurity, were victims

of espionage from 2014 to 2015. The hacker group responsible for this attack accessed trade secrets and recorded audio from built-in microphones in the company’s computers. The Centre for Cybersecurity expects research-intensive sectors to be especially at risk for similar attacks (2017).

Another type of cyber-attack is cyber-crime: any crime committed through a computer or network, for example fraud or cyber extortion through ransomware, a program that prevents the victim from accessing data on his or her computer until a ransom is paid (Centre for Cybersecurity, 2017). Ransomware attacks are relatively easy for hackers to implement because ransomware



developer tools can be accessed online (Centre for Cybersecurity, 2017). In 2015, cyber criminals attacked the Danish postal company PostNord's system and sent emails to customers informing them that their package could not be delivered (Centre for Cybersecurity, 2017). If the customer clicked the enclosed link, a malicious program encrypted all data on the user's hard drive rendering the computer useless. The data could only be made accessible again by paying a ransom to the cyber criminals (Centre for Cybersecurity, 2017).

In addition to man-made disruptions, Denmark is also increasingly susceptible to the effects of global natural disasters. Like most Nordic countries (Ortiz-Ospina and Roser, 2016), almost half of Denmark's gross domestic product comes from international trade (Campbell, 2007). The 2010 eruption of the Eyjafjallajokull volcano in Iceland (see Figures 1 and 2) resulted in a 19.2% reduction in Danish airline passengers as compared to the same time the previous year (Copenhagen Airports A/S, 2010). This delayed international travelers and stifled international commerce, especially for businesses dependent on rapid shipments (US Department of Homeland Security, 2016). One year later, on May 23-25, 2011, another eruption occurred at the Grimsvötn volcano, but European airlines were much better prepared. Olivier Jankovec, the European Airports Council International Director General, stated that procedures were developed following the first volcanic eruption that were ready to be implemented in countries across Europe, sparing disruption and ensuring safety (Learmount, 2011). Despite the eruption, Copenhagen International Airport saw record-setting numbers of over two million passengers that month (Copenhagen Airports A/S, 2011). This example illustrates the importance of preparation for disasters that can occur anywhere in the world since the highly-networked nature of business increases sensitivity to disruptions.

Figure 2: Coverage of the Volcanic Ash in Relation to Copenhagen (British Broadcasting Corporation, 2010)

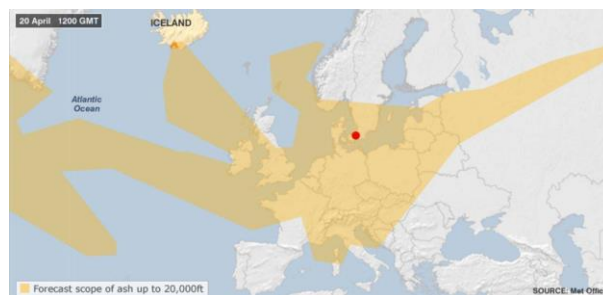


Figure 3: Eyjafjallajokull Volcano Erupts (ITV News, 2013)



1.3 Introducing Business Resilience in a Climate of Uncertainty

Business resilience is the ability of an organization to successfully respond and adapt to disruption. By developing techniques to increase resilience, companies will be better prepared when disruptions occur and therefore efficiently solve problems and adapt to new conditions. Companies need resilience to cope with a range of external environmental changes from small disruptions to high impact events such as natural disasters (Winnard, 2014). Although literature and studies surrounding business resilience have become more abundant, considerable ambiguity remains about the concept and its definition. Most commonly, the term “business resilience” is used to refer to the vigor, perseverance, and restoration of both an organization and its employees when confronting hardship (Linnenluecke, 2015). The term is not only used in business practices, but it is also an increasingly common theme in academic research, public policy, and the popular press (Linnenluecke, 2015). In a review of the literature on business resilience published between 1977 and 2014 (n=399 individual studies investigating business resilience), Linnenluecke (2015) found that the number of publications exponentially increased over the 37-year period. Some of the first major contributions to literature regarding resilience were developed through observation of organizational responses to external threat triggers (Linnenluecke, 2015). Later, research shifted from external threats and their impacts to the prevention of small internal disruptions (Linnenluecke, 2015). Resilience research continues to evolve and in order for it to be useful for businesses, it is necessary that businesses have a strong understanding of the concept of resilience, its components, and how it can be assessed, maintained, and improved (Linnenluecke,

2015).

There is no agreement on what a resilient organization is (Bhamra et al, 2015) or how the concept of resilience should be assessed within the context of an organization. There is also a general lack of understanding of how resilience varies from other related concepts such as vulnerability, adaptation, coping ability, and other topics (Bhamra et al, 2015). Consequently, there are a number of ways to analyze the resilience of an organization. One way to do this is through IBM's Resilience Maturity Asset Framework, which analyzes a business's environment in the context of six solution layers:

strategy, organization, business and IT processes, data and applications, technology, and facilities and security (IBM

Business resilience is ability of an organization to successfully respond and adapt to disruptions

Corporation, 2007). Each solution layer has specific attributes that are analyzed against industry standards such as Six Sigma and the IT Infrastructure Library framework (IBM Corporation, 2007). By analysis of each solution layer, management can gain greater information into its current state and the steps needed to mitigate risks and continue to grow as a company (IBM Corporation, 2007).

Another way to analyze business resilience is through Snyder's (2013) subsets: business continuity and crisis management. Business continuity is defined as the ability of a company to continue to offer normal services during a crisis (Snyder, 2013) and crisis management is defined as an organization's response to a disaster, whether a man-made or natural event. Man-made events that require strategic response include terrorism, bomb threats, chemical attacks, and many other situations that can occur with little to no warning (Snyder, 2013). Natural events include weather-related incidents, some of which can be forecasted and others that can happen abruptly (Snyder, 2013). For example, global climate change presents challenges for businesses that could require significant adaptations in resource use, supplier location, and settlement of new locations (Nelson, 2007). Although climate change is slow, it can lead to new and unpredictable natural disasters and other potential environmental threats. Ability to successfully adapt to a changing environment is crucial for businesses to remain competitive.

It is important for businesses to acknowledge the need to improve and maintain business continuity after a disruption. In many cases, achieving business continuity is the next step in resolving an incident at a company once the immediate impacts of a crisis have been controlled (Snyder, 2013). By analyzing their risks and vulnerabilities, companies may reduce the impact of

interruptions in operation. For example, a company may decide to use multiple material suppliers or store excess stock in warehouses that may be sold during times of delayed production if they notice it poses a potential threat to operation. Having multiple methods to access goods helps a business operate continuously. Businesses that develop business continuity plans discuss their risks and strategize to develop a plan of action.

An example of the importance of crisis management planning is evident in the nuclear disaster at Fukushima, Japan. On March 11, 2011, a magnitude nine earthquake created a tsunami that hit the Fukushima Daiichi Nuclear Power Station. The tsunami destroyed the power plant's main cooling systems resulting in a series of explosions and meltdowns (Kingston, 2014). Although the nuclear accident was caused by a natural disaster, poor risk management escalated the severity of the repercussions (Kingston, 2014). The Rebuild Japan Initiative Foundation led an independent investigation that reviewed how organizations including the Japanese government and Tokyo Electric Power Company responded to this crisis (Funabashi, 2012). The investigation concluded that there was a major lack of preparedness for the disaster (Funabashi, 2012). The tsunami and earthquake that caused the nuclear disaster were not properly anticipated (Funabashi, 2012) and each organization's response to the disaster was insufficiently planned. The communication gap between the government and nuclear industry caused severe consequences. This disaster led to the largest discharge of radioactive material into the ocean in history and massive radioactive contamination of the Japanese mainland (Funabashi, 2012). All cities, homes, and businesses within a 498-kilometer radius of the meltdown were evacuated (Funabashi, 2012). Greater preparation and communication could have significantly reduced the effects of this disaster.

Employees are a significant part of organizations and must be resilient just like processes and buildings. The value people contribute to an organization through their knowledge and skills is known as human capital. Human capital is affected when natural disasters and other crises prevent employees from doing their jobs (Campbell, 2007). When a crisis strikes, people often feel shocked, helpless, and are unable to resume work in a timely manner (Head, 1994). Head (1994) explains that an effective way to reduce the effects of a disaster on human capital is to train employees. Head suggests that companies should hold discussions with employees and present facts about potential disasters to stimulate conversation among coworkers. These directed



conversations will prepare employees for the likely effects of disasters and will be better able to cope with the damage and return more quickly to normalcy (Head, 1994).

1.3 Current Approaches to Addressing Business Resilience

Given the expansive impacts of disasters on national and global economies, investing in resilience measures is important on all levels and all should work together. Nss and colleagues (2005) investigated government agencies in Norway in charge of crisis management with a specific focus on responses to the floods in southeastern Norway in 1995. The sample included 27 officials in the area of planning and emergency management and 7 representatives of interest groups including environmental organizations and planning consultants. Nss and colleagues determined that the governmental structure provides Norwegian communities with few incentives to be proactive about flood management and that local level knowledge is important to carry out appropriate response measures in the future (Nss et al, 2005). These findings show that businesses should not rely solely on their government to manage unforeseen risks and therefore need to find effective ways to increase their resilience to disasters on their own.

Researchers are exploring various approaches for businesses to effectively increase their resilience. In 2011, Thailand suffered from its worst floods in over 50 years. Based on a business survey conducted by the Bank of Thailand (2012), some 43% of businesses reported that impacts would likely be short-lived and usual operations could be restored within three months, while 46% said they would be able to restore operations within four to six months (Chongvilaivan, 2012). About 11% of respondents said that the floods would have effects on their businesses that would last more than six months (Chongvilaivan, 2012). Chongvilaivan (2012) examined the impact of these floods and identified strategies for business to increase the resilience of their supply chain. The first strategy he considered is building up redundancy of suppliers and inventory alike. Redundancy can be built up by having larger stockpiles, multiple-sourcing strategies, and backup production sites. Another strategy is to build up flexibility so businesses are capable of anticipating disruptions and then responding to them well and in a timely manner (Chongvilaivan, 2012). Finally, management needs to assess their vulnerabilities and be aware of possible disruptions (Chongvilaivan, 2012).

Researchers at the University of Liverpool conducted an experiment with eight small to medium sized enterprise (SME) owners to evaluate the benefits of a collaborative approach among businesses to increase resilience (Dee Gray & Jones, 2016). The study analyzed the

potential effects of three approaches to improving business resilience: business alliances, shared coaching, and a forum. The business alliance was created by organizing a support network between the participating SMEs to foster greater organization within individual businesses as well as increased resource sharing. Shared coaching involved employees of one company presenting to another company ideas on how to increase productivity, improve customer service, stimulate employee motivation, and improve collaboration. Finally, a forum provided a platform to stimulate conversation between participants on common problems the companies had experienced. The forum resulted in the documentation of best practices companies had used in past problems and increased communication among SMEs.

Assessment of Dee Gray & Jones' (2016) approaches in the eight participating companies revealed that resilience is not considered a priority by business owners. Business owners reported difficulty justifying taking time away from their companies for programs they did not see as specifically supporting their businesses (Dee Gray & Jones, 2016). Their perception was that most organizations offering such resilience and strategy services were only concerned with making money and were not truly passionate about the material. None of the eight companies saw value in workplace coaching, however, employees did see a benefit in short term support between companies in times of need. The employees and owners explained that cooperation was uncommon given the competitive culture of SMEs. Most notably, ratings of confidence in expanding their businesses on a scale of one to seven showed an increase of one to four points after completing the program. Interviews before the experiment indicated seven of the participants believed a lack of a clear vision of the company's future was limiting growth. All eight participants claimed increased motivation, idea generation, and improved communication skills as a result of the exercises. An owner's success in running a company is directly influenced by the clarity of their business plan; for a company to remain resilient and financially stable it must not only continue normal operation, but also be able to make decisive choices in business expansion. The business owners especially benefited from learning how other companies dealt with similar issues in the past and found great value in having an outside perspective from other companies on their current problems. This study revealed that networking can be an effective method for SMEs to increase business resilience and efficiency. Since a large majority of industry in the European Union comprises of SMEs, collaborative solutions may be a viable choice for companies seeking to reduce risk.

Another method for increasing business resilience is laid out in the research of Ismail, Poolton, and Sharifi (2011). Their research covers two case studies in which they put into practice

a step-by-step process for increasing business resilience. Their form of business resilience integrates risk management and innovative business development, and their approach to increasing resilience uses the concepts of “strategic agility” and “operational agility” (Ismail et al, 2011). This approach empowers companies to take a proactive stance when dealing with disruptions and increasing resilience. The process of implementation includes listing all potential sources of disruption, current strengths and weaknesses of the company and potential products or services that the company could offer in the future (Ismail et al, 2011). These lists are then used to create growth plans for the company, which allow the company to efficiently operate and seize opportunities (Ismail et al, 2011). During the study, one of the companies experienced reduced demand in its industry, but despite this it fared better than its competitors. Although the overall quantity of sales for that company reduced by 18%, they increased their number of active customers by 25% (Ismail et al, 2011). The other company in the case study achieved a 35% increase in productivity and improved customer ratings (Ismail et al, 2011). These examples show the power of the resilience mindset and active development of business strategies.

Private consulting organizations are beginning to expand in the business resilience preparation marketplace to fill the knowledge gaps. Private organizations are now offering consultancy-based services to increase resilience of other companies, and although there are variations among consulting groups, popular services include resilience reviews and improvement programs, accreditations, and online courses and workshops. An example of such an organization is the Resilience Advisors Network, a group of advisors that share their expertise and offer various resilience services. They offer reviews based on metrics set by the International Standards Organization (ISO), an organization that develops international industry standards (The Resilience Advisors Network, 2017). After this review, the Advisors create a personalized risk profile in which companies can see their best and worst practices and offer improvement programs for companies to strengthen their operations (The Resilience Advisors Network, 2017). Although Danish companies have access to resilience services through service providers located in other countries, currently there are no providers of resilience services in Denmark.

1.4 Business Resilience in Denmark

The Danish Institute of Fire and Security Technology (DBI) aims to develop solutions that will be implemented at the operational and strategic levels of companies to increase business resilience. DBI is not the first group to provide resilience services to companies but they are the



first to do so in Denmark (DBI, personal communication, 2017). DBI will look at resilience within three main areas of an organization. These areas are the physical structures and IT systems, human resource resilience, and planning strategies. DBI will assess the resilience of physical structures and IT systems by assessing the effectiveness of emergency plans, emergency warehouse storage facilities, cyber security protection, and strength of infrastructure. Planning strategies focuses on plans designed to continue normal business operations in time of crisis by looking at external dependencies such as supply chain management. Human resource resilience refers to the mentality of the employees with respect to their ability to collaborate with one another, think critically throughout work tasks, develop throughout their career, and respond effectively in events of crisis. Human resource resilience can be strengthened through constant training and encouragement of these resilient qualities. Head (1994) suggests that targeted conversations with employees will better prepare employees for the effects of disasters and will better equip them to cope with the damage and return more quickly to normalcy. All these aspects of resilience are important because it allows a company to use fewer resources in case of a disruptive event and it provides competitive advantage over competitors that did not anticipate and plan for possible disruptions.

DBI's business resilience program originated in December 2016 after Laura Melkunaite, who now heads the business resilience program at DBI, became involved in the European Union's IMPROVER Project. The IMPROVER Project aims to strengthen the resilience of critical infrastructure such as hospitals and railroads in the European Union (IMPROVER Project, 2015). This resilience framework, much broader than business resilience, encompasses societal, organizational, and technological resilience concepts (IMPROVER Project, 2015). Working with this project sparked Melkunaite's and DBI's interest in developing an area of resilience that can be applied to businesses (Melkunaite, personal communication, 2017).

Today, the business resilience program is led by Laura Melkunaite and Terese Urth. Urth joined the Business Resilience team at DBI in October 2016. The program is under development and is experimenting with different services and gauging interest from different companies. The first business resilience workshop DBI offered was on March 9th, 2017 and despite being the first one, there were multiple attendees who reported that they enjoyed it and provided valuable feedback for future workshops. DBI is also developing the Business Resilience Assessment Model (BRAM), a framework which can be used to determine the resilience of a business. Their work to

date on this program revealed that companies in Denmark are largely unaware of what business resilience is or the value it can provide. Melkunaite and Urth also found that companies are unable to differentiate business resilience from other risk management activities they are already doing. According to Melkunaite and Urth, outside of the business resilience team, DBI employees are largely unaware of business resilience and the program that is in development. Melkunaite and Urth work separate from other related groups such as security and risk management who could serve as good resources for the program. Since the program is in such early stages, the majority of DBI is not aware of it and as a consequence, DBI employees miss a valuable opportunity to educate other companies about the concept. (Melkunaite & Urth, personal communication, 2017)

1.5 Effectiveness of Short Educational Programs

Lack of information stand as a barrier to the implementation of processes associated with risk reduction (Caring for Climate, 2015). Short educational programs are a common way to increase knowledge on topics that can result in improvement in a specific area. For example, a study was conducted on patient education to support asthma therapy (Marabini et al, 2002). The program aimed at improving patient knowledge about the disease and encouraging a partnership between the patients and physicians (Marabini et al, 2002). This study included 77 patients aged 18 years or older selected from the outpatients attending the asthma clinic at the University of Perugia in Italy (Marabini et al, 2002). All subjects had been diagnosed with the disease at least a year prior. The subjects were randomly put into two groups, Group A received the usual treatment and Group B received the usual treatment plus the educational program (Marabini et al, 2002). The educational program included basic information about asthma, information about asthma medications and how to use them, and identification of asthma warning signs and potential triggers (Marabini et al, 2002). A Quality of Life (QOL) assessment was taken by all of the patients that participated in the study before treatment as well as three months after (Marabini et al, 2002). Due to a much larger improvement in scores of patients in Group B, Marabini et al (2002) concluded that the educational program was effective (Marabini et al, 2002). Health-related topics are not the best comparison to our study on business resilience, for people may pay more attention to health-related topics because they directly affect their life, rather than something they do not have a personal connection to. While we understand this is not the best comparison, we believe it is beneficial to look at studies regarding educational programs to know what material can be most effective.

Ellis and Childs (1999) conducted a study in which the effectiveness of three different video styles were analyzed with an audience of SME employees. All videos educated viewers on the laws regarding harassment and discrimination in the workplace. One video showed the “complete story,” while the other showed short segments of the same story accompanied by questions. Both videos recreated office scenarios and intended to show the “law (against harassment and discrimination) in action” (Ellis and Childs, 1999). The format of the third video was “talking heads,” and included a person speaking directly to the camera for a longer period. The effectiveness of the video was analyzed by conducting questionnaires and focus groups with the participants. Participants believed that a video in general was more informative and interesting than reading, and enjoyed viewing the subjects as the narration occurred (Ellis and Childs, 1999). The participants believed the video with short segments and accompanying questions was effective because they “did something” with the information they received (Ellis and Childs, 1999). The participants did not believe that the “talking head” video was effective because it was hard to remember and monotonous (Ellis and Childs, 1999). It can be concluded from this study that videos are an effective and well-liked way to inform people about a concept. Furthermore, it can be concluded that longer videos with persons speaking about the same concepts are not as effective as videos with storylines.

Brosius and Donsbach (1996) conducted a study about the effectiveness of text-picture combinations in increasing knowledge about a topic or event. The study investigated the use of text-picture combinations in the communication of information in television news. The study compared standard event photos to pictures that match and illustrate the news text itself. The experiment included 100 participants and four separate forms of text-picture combinations in each newscast. Participants viewed one of the four newscasts and then after completed a two-part questionnaire regarding retention of the news stories in the newscast immediately and later on as well. Brosius and Donsbach (1996) found that the combination of text and pictures enhanced the communication of information in television news. The results show that standard pictures, which suggest authenticity and actuality but do not correspond to the information in the text, do not facilitate retention of news content. However, corresponding pictures illustrating news text successfully improves the retention of information.

Studies have shown that short educational programs, videos, and text-picture combinations are an effective way to educate audiences about a concept (Marabini et al, 2012; Ellis and Child, 1999; Brosius and Donsbach, 1996). After little success contacting companies themselves, Melkunaite and Urth are attempting to use DBI's large network of customers as a new resource to gain access to Danish companies. This network can be accessed most effectively through DBI's employees who interact with customers directly. However, since DBI employees are not knowledgeable on business resilience, an informational material is needed first. The purpose of the informational material is to inform DBI employees about business resilience so those employees can then inform customers about business resilience and its importance.

This project is intended to enable the Danish Institute of Fire and Security Technology (DBI) to increase knowledge about business resilience and its importance by developing informational materials for Danish companies.

2.0 Detailed Methodology

2.1 Objective 1: Assess the current knowledge of DBI employees regarding business resilience

The purpose of Objective 1 is to assess the current knowledge of DBI employees in relation to business resilience. This was accomplished through one set of semi-structured interviews. We chose this method because it was an effective way to discover interviewees' knowledge gaps and/or misunderstandings about business resilience, if any. Semi-structured interviews enabled us to have directed conversation with some digression to explore unexpected but relevant topics. We used the results of the interviews to guide the making of informational material prototypes that can teach DBI employees and people at other companies about business resilience.

Topics addressed in the interviews included the definition of business resilience and familiarity with the three areas of an organization that resilience can be applied (see Appendix 1: Interview Script for interview questions). We identified six DBI employees using purposive sampling to discuss these topics with us. Participants were chosen based on their involvement with DBI's business resilience program and their professional expertise. The goal of our sampling was to interview employees with a variety of backgrounds and knowledge of business resilience in order to provide us with a wide range of perspectives. We classified interviewee knowledge of business resilience by those who are directly involved with the business resilience program and those who are not. Classification on knowledge of business resilience, department, and job title are listed below in Table 1 for each interviewee.

Table 1: Interviewee Background Information

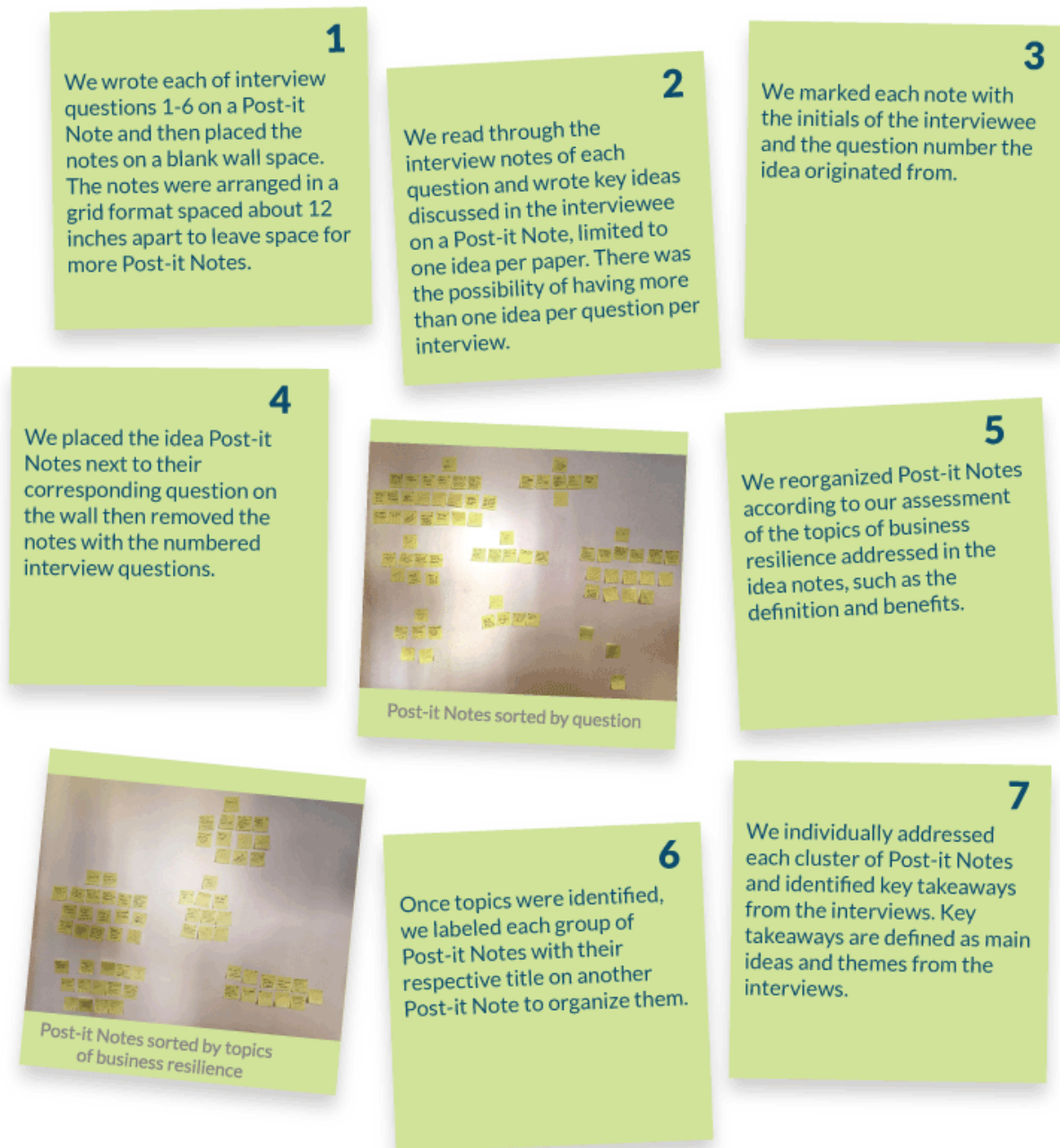
Interviewee	Job Title	Department	Knowledge of Bus. Res.	Contribution
Hans Wichmann Madsen	Head of Customer Relations Department	Sales	Uninformed	Sales perspective and advice for making appealing informational material
Anne Thøgersen	Marketing Consultant	Marketing	Uninformed	Marketing perspective and advice for making appealing informational material
Terese Urth	Research and	Research and	Directly	Previous experience reaching

	Innovation Consultant	Development	Involved	out to companies about resilience
Jesper Florin	Security Department Head	Security and Investigation	Uninformed	Perspective of the head of a key department related to business resilience services
Lauge Vithner Jensen	Risk Consultant	Security and Investigation	Uninformed	Perspective of potential advocate to other companies
Laura Melkunaite	Strategic Resilience Consultant	Research and Development	Directly Involved	Resident expert on business resilience
Christian Fundby Schou	Research and Innovation Consultant	Research and Innovation	Uninformed	Research and innovation consultant

We recorded data from the interviews through typed notes with audio recordings when given consent from the interviewee (consent form may be found in Appendix 1). Typed notes were the primary form of data collection with audio recordings used for reference during analysis as a supplement to typed notes. Interviews were conducted with one interviewer and one note taker. In the event audio recording was permitted, an interviewer’s cell phone was used for recording. All interviews were conducted in person at DBI’s facility.

To analyze the interview results, we divided the interview questions in two sets. Questions 1-6 refer to concepts of business resilience and questions 7-9 refer to the informational material. We developed a unique process to analyze the interview results and categorize the qualitative data, then used that information to make effective informational materials. The following process, repeated once per set of interview questions, was used to analyze the information gathered from the interviews:

Figure 4: Post-it Note Method Description



Interviewees' initials remained on the Post-it Note throughout the entire analysis process. During analysis, we considered interviewees' knowledge level regarding business resilience when drawing conclusions. We especially considered information from experts regarding concepts of business resilience as well as information from less informed interviewees about areas of confusion. All interviewees, without consideration of their knowledge of business resilience, background, involvement in the business resilience program, or any other variable, were consulted

in order to generate ideas about effective informational materials. Key takeaways from the interviews guided the development of the informational materials addressed in Objective 2.

2.2 Objective 2: Develop and assess informational material that DBI employees can use to self-educate as well as inform other Danish companies about business resilience

In order to make the informational materials, we used the key takeaways from the Objective 1 interviews as well as our own understanding of business resilience to establish learning objectives and therefore the content of the informational materials. We determined that our informational materials must generally provide:

- A clear definition of business resilience,
- A complete understanding of the scope of business resilience,
- A clear explanation of the differences between business resilience and other risk management fields,
- Knowledge on how to improve a company's business resilience so the user can take action, and
- The information users need to communicate the value of business resilience to others.

After interacting with the informational material, participants will be able to meet the following learning objectives (Figure 5):

Figure 5: Learning Objectives

Learning Objectives

- 1 Define the concept** of business resilience.
- 2 Describe the relationship** between business resilience and related business and risk practices.
- 3 Describe the value** business resilience adds to existing risk management fields.
- 4 Describe how resilience can be applied** to different areas of an organization.
- 5 Describe the benefits** of business resilience when it is applied to different areas of an organization.

We used these learning objectives to develop two assessments which evaluated the effectiveness of the informational material. The assessments included one pre assessment administered one day before and one post assessment administered immediately after participants viewed the informational material. The assessments had similar length and format, and addressed the same learning objectives. The purpose of the pre assessment was to evaluate interviewees' pre-existing knowledge and the post assessment to evaluate the interviewees' learned knowledge of business resilience with respect to the learning objectives. Questions specific to the post assessment include Likert scale questions about participants' perception of the educational value of and their enjoyment from using the informational material. We also solicited feedback for prototype improvement.

To identify media for the informational materials, we brainstormed possible options. Then, each team member used his or her own prior experience and knowledge to select one option he or she considered most viable and interesting. Each team member then developed a prototype of that option. We presented these models within our team and gave each other feedback. We modified our prototypes accordingly then consulted Melkunaite and Urth, repeating a similar process of soliciting feedback and making refinements. When appropriate, we eliminated

prototypes that showed little promise of fulfilling the learning objectives or were otherwise perceived as unappealing to interact with. We narrowed down our selection to two prototypes for further assessment.

We conducted a pilot test on 13 students from Worcester Polytechnic Institute to refine our initial pre and post assessments and prototypes. Pilot test participants were contacted through email and sent a pre assessment link to complete one day before viewing the informational material. We then followed up with participants in person to show them the material and give them the post assessment. We allowed participants to ask clarifying questions only about the meaning of the questions while taking the assessment. Following the post assessment, we had individual discussions with each participant to ask for feedback regarding the assessments and prototypes.

We graded the pilot tests to see which questions warranted modification. For any given question, if the pre and post assessment scores were both high, either the learning objective was common knowledge or the wording of the question made the answer too obvious (I-TECH, 2008). Conversely, if the pre and post assessment scores were both low, the topic was not clearly explained in the informational material or the wording of the question was too difficult (I-TECH, 2008). Ideally, the pre assessment score would be low and the post assessment score would be high, demonstrating that our learning objective was not assessing common knowledge and that the content was effectively explained in the informational material (I-TECH, 2008). After completing our analysis of the assessment results, we made changes to the assessments and prototypes and prepared them for formal testing. Table 12 and Table 13 in the Results and Discussion chapter shows finalized questions.

With these revised materials from the pilot test, we formally conducted the formal assessments of the final two prototypes. To establish a sample population, we assumed that DBI employees approximately reflect the average knowledge level of business resilience of employees at other Danish companies. We excluded any DBI employees from the sample population that previously participated in an Objective 1 interview or who were heavily involved in the business resilience program. We recruited participants for our study by emailing a request to DBI employees and leveraging personal connections of Melkunaite and Urth. This resulted in twenty DBI employees who we had sign up for one 30 minute viewing session each. Once signed up for a session, participants received an email with the pre assessment. We instructed them to complete the pre assessment one day before their viewing session. In cases where participants were unable to complete the pre assessment before the scheduled session, participants completed the pre

assessment at the beginning of the session.

At the time of each viewing session, participants arrived at the predetermined meeting room to view the informational material then take the post assessment. These sessions were completed in person to ensure timely completion of all parts of the assessment and to reduce the influence of extraneous variables on learning, such as independent participant research on the topic of business resilience. One member of our team who was available for each given session served as a proctor. The proctor informed participants about the study and that they were not able to ask questions about the test or informational material until after completing the post assessment. The proctor arbitrarily assigned one of the two prototypes to each participant such that an equal number of participants were assigned to each. The proctor showed participants their assigned prototype and allowed them to view the material without time constraints in an effort to simulate the choice of actual users to decide how much time to view the material. After completing the post assessment, the proctor answered any questions the participant had.

Two team members scored each assessment following the rubric in Table 14 of the Results and Discussion chapter. The rubric shows questions and if the graders had different results on a given question, a third grader scored the question without knowledge of the original scorers' grades. If the third grader agreed with one of the first two scores, that matching score was used. If the third scorer disagreed with both original scorers, that question was excluded from the assessment.

We analyzed the data from the assessment in a Microsoft Excel spreadsheet. Our data included both qualitative and quantitative responses. For our study, improvement in qualitative data means improving from an incorrect answer to a partially correct answer or correct answer, or from a partially correct answer to a correct answer. We first scored each participant's assessments individually and then calculated the total number of participants that failed to answer a given question correctly on the pre and post assessments. We performed a chi-square test of independence in Microsoft Excel to determine if participants met a learning objective. The test determined if significantly fewer participants answered a question incorrectly on the post assessment than on the pre assessment. For this analysis, we grouped all partially correct and correct answers to compare them collectively against incorrect answers. This was done because our informational materials were intended to help people gain basic knowledge, not expertise, on business resilience. Such basic knowledge was accomplished through partially correct answers. This grouping enabled us to perform a chi-square test with two nominal variables, each having at least two possible values (MacDonald, 2008). For this study, the two nominal variables were the

pre assessment and post assessment scores and the two possible values were correct and incorrect. We tested the null hypothesis that the proportions of the correct and incorrect answers between the pre and post assessment were different. For this test, we chose a significance level of 0.05 because it is the convention in research (MacDonald, 2008). A significance level is the probability of rejecting the null hypothesis when it is true. For example, a significance level of 0.05 indicates a 5% risk of concluding that a significant difference exists between pre and post assessment when there is no actual difference.

To analyze the Likert scale questions asked on both the pre and post assessments, we performed a paired t-test. We chose this over a generic t-test because we tested the same



VS



subjects twice- before and after viewing the informational material.

Once again, the level of significance was 0.05. The two nominal variables were the pre assessment and post assessment, and the measurement variable was the rating of their understanding that participants provided on a Likert scale. The null hypothesis for this test was that the mean difference between paired observations is

zero (MacDonald, 2008). In order to gain more insight on the Likert response questions asked only in the post assessment, we performed correlation analyses to see if there was a correlation between the reported participant ratings and percent of correct answers on the post assessment as well as the reported participant ratings and percent improvement in scores between pre and post assessments. The correlation coefficient (r) shows how closely the two variables are related. It ranges from -1.0 to +1.0. The closer r is to +1 or -1, the the stronger the correlation is and the more closely the two variables are related. If r is positive, it means that variables are directly proportional. If r is negative it means that the variables are inversely proportional. The coefficient of determination (r^2) gives the proportion of the variance of one variable that is predictable from the other variable. For example, if r^2 is 0.25, 25% of the total variation of the dependent variable can be explained by the linear relationship between the two variables. We calculated the p-values and used a level of significance of 0.05 to determine if any correlations were significant. For the correlations, a significant p-value meant that the value of one variable predicted the value of the other variable.

3.0

Detailed Results and Discussion

3.1 Objective 1: Assess the current knowledge of DBI employees regarding business resilience

The Objective 1 interviews enabled us to discover the current knowledge level of business resilience at DBI. By selectively interviewing employees with varying levels of involvement with the business resilience program, we detected a substantial gap in understanding between employees who are heavily involved in the program and those who are not. This information aided the development of the content of our informational materials.

The data from Objective 1 interviews, displayed in Table 2, is arranged according to the results of the Post-it Note method described in the Objective 1 method section. The left column lists each interview question; the middle column lists the key points related to each question which we recorded on the Post-it notes; and the right column shows the number of interviewees who made each point during the interviews.

After sorting the responses by interview question, we observed that participants had a wide range of responses to each question. To analyze the results more effectively, we sorted the Post-it Notes into groups according to common themes. These common themes and respective Post-it Note responses are presented in Table 3.

Using the common themes, we developed a set of key takeaways shown in Figure 6. These key takeaways summarize the most significant things we learned from the interviews as determined by our understanding of business resilience and the context of DBI.

Table 2: Objective 1 Interview Data

Question	Key phrase recorded on Post-it Note	Times stated
1. What is business resilience?	A salepoint	1
	Something a company chooses to be	1
	It keeps production going	1
	Advanced emergency planning	2
	An umbrella term for existing risk management tools	2
	Better to have fewer plans that adapt to many types of situations	1

	Positive spin on risk management	1
	Improving after disruptions	2
	A mindset of resilience	1
	How a company and its employees cope with change	1
	Gives management an overall view of vulnerabilities	1
2. Does our definition of business resilience seem clear to you?	Define basic terms and concepts (i.e. disruption and disaster)	1
	Definition provided is good	3
	A simple definition is better	3
3. What are some benefits of increasing your business' resilience?	Business resilience is obviously good for your business	1
	It changes a disruption to an opportunity	1
	Helps you plan so you can cope with market demand and survive	1
	Robust and agile; moving forward	1
	Make more money	3
	Get into new markets	2
	Improves quality of work for the employees	1
	Adaptability	1
4. Do you think there is value in employees knowing about business resilience?	Depends on the company	1
	Only important for decision-making, management type	1
	All employees should know about business resilience	2
	Would be nice for all employees to know	1
5. Can you tell us what you know about the resilience of physical infrastructure and IT systems? Human resource resilience? Planning strategies?	Physical and IT overlaps with business continuity management and other risk areas	1
	Being able to move people around departments	1
	Business resilience is strategic and business continuity management is tactical	1
	Business resilience is strategic planning	1
	Hire the right people	1
	Training employees to collaborate	1
	Employees must be able to adapt with the company	1

	Break down silos between departments	1
	The whole company must work together	1
6. Are there any aspects of resilience that you are more interested in learning about?	All parts of business resilience	4
	What is the selling point?	1
	How is it different?	3
	Practical steps to increase business resilience	2
7. Would you feel comfortable explaining the concept of business resilience?	Can explain it to friends	3
	Comfortable explaining it to people because it is not a well-known concept	1
8. Would you feel comfortable promoting business resilience?	Could not promote it	3
	Needs salepoint in order to feel comfortable	1
	Would be difficult because there is a lot more argumentation	1
	Not ready but would like to	1
9. What educational formats do you find most effective and engaging when you are trying to learn something new?	Animations are entertaining and memorable	2
	Something interactive	2
	Printed material will be left behind or not read	3
	A video is an effective resource	2
	Something engaging	4
	Printed material is an effective means to communicate	6
10. Any last remarks?	The more complex the topic, the shorter the explanation should be	1
	Examples are needed to convey message better	3
	As many graphics as possible in the material	1

Table 3: Objective 1 Interview Data Sorted by Topic

Topic	Post-it Note	Times stated
Definition of business resilience	Define basic terms and concepts (i.e. disruption and disaster)	1
	A simple definition is better	3
	Advanced emergency planning	2
	A mindset of resilience	1

	Something a company chooses to be	1
	Definition provided is good	3
Function of business resilience	Business resilience is obviously good for your business	1
	It changes a disruption to an opportunity	1
	Helps you plan so you can cope with market demand and survive	1
	Make more money	3
	Get into new markets	2
	It keeps production going	1
	Improves quality of work for the employees	1
	A salepoint	1
	Gives management an overall view of vulnerabilities	1
	Improving after disruptions	1
	Better to have fewer plans that adapt to many types of situations	1
	Robust and agile; moving forward	1
	Withstand disruptions	1
	Human resource aspect of business resilience	Depends on the company
All employees should know about resilience		2
Would be nice for all employees to know		1
Employees must be able to adapt with company		1
Being able to move people around departments		1
Training employees to collaborate		1
Break down silos between departments		1
Factors that make business resilience different from related fields	The physical and IT aspects of business resilience overlaps quite a bit with business continuity management and other risk areas	1
	Business resilience is strategic and business continuity management is tactical	1
	Adaptability	1
	An umbrella term for existing risk management tools	1
	Positive spin on risk management	1
	How is it different from other risk mitigation	1

	techniques?	
Implementation of business resilience	The whole company must work together	1
	Business resilience is strategic planning	3
	Only important for decision-making, management type	1
	Hire the right people	1
Comfort explaining business resilience to colleagues	Can explain it to friends	3
	Comfortable explaining it to people because it is not a well-known concept	1
Comfort promoting business resilience	Could not promote it	3
	Needs salepoint in order to feel comfortable	1
	Would be difficult because there is a lot more argumentation	1
	Not ready but would like to	1
Effective and engaging educational formats to learn something new	Animations are entertaining and memorable	2
	Something interactive	2
	Printed material will be left behind or not read	3
	A video is an effective resource	2
	Something engaging	4
	Printed material is an effective means to communicate	6
Last remarks	The more complex the topic, the shorter the explanation should be	1
	Examples are needed to convey message better	3
	As many graphics as possible in the material	1

Figure 6: Key Takeaways from Objective 1 Interview Data

Definition of Business Resilience

A shorter definition is better
People want to learn more about business resilience

Benefits and Function of Business Resilience

The majority of benefits of business resilience are financial
Business resilience turns disruption into opportunity

Human Resource Aspect of Business Resilience

The extent of the resilience program depends on the company
A company is only as resilient as its employees
Increased training of employees can increase resilience
Collaboration stimulates employee engagement and diversification of skills

What Makes Business Resilience Different from related fields?

An umbrella for other concepts
Positive spin on risk management
Differences are not obvious
People don't know the difference in part because they don't know what the parts are (ex: Business continuity management vs resilience)

Implementation of business resilience

It starts with a resilient mindset; it is more than just a resilient business
Most people think that resilience is only applicable on a strategic level

Telling Others about Resilience

Most people are comfortable talking to friends about resilience, but not talking to customers

Effective Types of Materials

Video and interactive materials are appealing
Quality is king: any medium can be good so long as it is good quality

Closing Remarks

Preference for materials that have examples, good graphics, a clear purpose, and are short
The more complex the idea, the shorter and simpler the material needs to be
Concrete examples can help us convey our message

As a result of the interviews, we found that employees who are not heavily involved with the program have some accurate ideas about business resilience but their understanding of the concept is limited. They were correct in assuming business resilience can help a company during times of crisis but did not address the aspects of disruption prevention, adaptability, or growth before and after a disruption. For example, two interviewees thought of business resilience as “advanced emergency planning,” and were unaware of how business resilience took preventive measures to avoid disruptions instead of only reactive steps. All participants who were not involved with the business resilience program said they were interested in learning more about resilience.

All participants, regardless of their previous knowledge, saw benefits in implementing business resilience in an organization. Economic benefits were the most obvious to all participants. They identified a variety of ways a company can benefit economically including an increased market share, greater investor confidence, and less downtime.

Participants who are not heavily involved with the business resilience program generally had difficulty explaining specifically how business resilience is applied in three primary areas of business resilience: an organization’s physical infrastructure and IT systems, human resources, and planning strategies. Interviewees who are heavily involved in the program did not have difficulty explaining these areas, however they acknowledged their complexity. To explain these areas effectively, they suggested we use examples.

All participants reported feeling comfortable discussing business resilience amongst their peers. However, those not involved in the business resilience program reported that they felt uncomfortable discussing business resilience with customers because the concept was too vague in their minds. They could not clearly explain the value which business resilience services bring to a company or how it differs from existing risk management practices.

All participants provided valuable feedback regarding effective informational materials. Six of the seven participants said that a video or animation is an engaging way for them to learn new material. Five participants said that printed material is also effective. Notable comments from participants include two people that said learning styles and preferences vary among people and that the quality of a given material is more important than the medium. One participant experienced in sales commented that when explaining complex concepts, it is more effective to achieve a basic understanding by limiting the information to a simple yet accurate explanation. The participant also commented that it is better to grab a person's attention on a topic initially and explain further through other means in order to reduce confusion and retain interest.

3.2 Objective 2: Develop and assess informational materials that DBI employees can use to self-educate as well as inform other Danish companies about business resilience

We developed various prototypes before deciding on two to proceed with for pilot testing and formal testing. The initial prototypes included a Prezi presentation, flyer, booklet, infographic, and stop motion video.

Prezi is an online program that allows the user to create dynamic presentations. These presentations are different to Microsoft PowerPoint presentations because they allow the user to choose from animated templates to create a more engaging user experience. We developed a Prezi presentation because we believed the program allowed us to make a more effective informational material than the more common PowerPoint software. We started to develop the Prezi presentation with bullet points outlining main ideas for each learning objective and found, after discussion among the team members, that it would be better to limit text and to insert more graphics into the presentation. However, inserting graphics into a Prezi presentation was ineffective because the graphics alone could not explain the concepts, and the presentation slides did not allow for enough space to include the text and the graphics. We decided to not continue

developing the Prezi because it was not possible to meet the learning objectives in an appealing way. Another drawback of the Prezi was that the user would have to click through the slides because autoplay is not an option. A picture of the final stage of the Prezi prototype when we decided to discontinue development is shown in Figure 7

Figure 7: Prezi Prototype in Progress



Another prototype we tested was a flyer. We designed the flyer to grab employees' attention as they walked by it. To make the flyer relatable, we used an image of a building on fire since DBI's primary field of business is fire protection. As we developed the learning objectives and discuss the prototype within the team, we realized that while a flyer could grab a passerby's attention, it could not effectively contain all the information necessary to make it an effective informational material. We ceased work on this prototype and turned our attention toward other options such as other forms of printed material. An image of the flyer in its final state is shown in Figure 8

Figure 8: Flyer Development in Progress



Another print material we tested was a booklet that could be handed out at DBI or placed on the shelving unit in the reception area with other printed materials. A booklet would allow for easy and quick dissemination within the company due to its small size and portability. It would also easily fit all our desired content since pages could be added or subtracted during development. As we continued to develop the prototype, we found that in order to give concrete examples, it would have to be extremely text-heavy. We tried adding more graphics, but the amount of text needed to explain all the topics necessary help participants meet the learning objectives was too large. We ultimately decided that even though a booklet would be very simple and easy to access, other graphical and printed materials would better engage users while communicating the same material. Figure 9 shows part of the booklet during development.

Figure 9: Booklet prototype in development



We then chose to prototype an infographic which is a type of image that combines graphics and text to communicate data and ideas. They generally communicate large amounts of information like a booklet with many visuals like a flyer. This would address feedback from Objective 1 interviews to use compelling visuals. Another feedback we addressed was to use a practical example of business resilience application. For this, we chose the example of financial services company Morgan Stanley's reaction to the terrorist attacks in New York City on September 11, 2001. Morgan Stanley's story describes how business resilience helps organizations learn from past disasters to better prepare for the future. One team member drew a first draft of the prototype and showed it to the other team members for initial feedback. The team found that the infographic needed changes in grammar and an improved arrangement of ideas. The team made appropriate changes and selected the infographic prototype to continue development and pilot testing. An image of the infographic we developed can be seen in Figure 10.

show scenes from the stop motion video.

Figure 11: Scene from stop motion video of employees learning about business resilience



Figure 12: Collaboration to increase human resource resilience from stop motion video prototype



After developing our prototypes, we conducted the pilot test to identify and revise questions that were unsuccessful in evaluating participants' knowledge according to the learning objectives. We found that four out of the nine open ended questions warranted some kind of modification. We made revisions on a case by case basis by either rewording the question or revising the content on the informational material. For three of these questions, we changed the wording in the pre assessment but chose to keep our original wording for the post assessment

because we received verbal feedback from pilot test participants that they felt the test was repetitive. We felt that both versions of the questions tested participants on the same material and that variation in the wording of the question would reduce the likelihood of participants getting bored. We did not want participants to become bored and put less care into their responses, which would negatively affect our assessments. The following Tables 4-11 present questions that needed to be revised and participants' responses.

Table 4: Pilot test results of the stop motion video for "How does business resilience relate to fields such as business continuity management, supply chain management, crisis management, etc.?"

Participant	Answer	Score
1	Business resilience is an umbrella term that captures and involves all of these concepts	Correct
2	Business resilience is the larger term for all three of the listed fields	Correct
3	It encompasses all of them into a single plan.	Incorrect
4	It involves all of those concepts but in a single plan to avoid repetition	Incorrect
5	When a company plans ahead and becomes resilient, it can prolong its continuity and make its supply more flexible. It can also avoid/survive crisis more easily	Incorrect
6	Business resilience is an overarching term used to cover other related fields, such as those listed above.	Correct
7	Business resilience is an overarching term which includes business continuity management, supply chain management, crisis management, etc.	Correct

Table 5: Pilot test results of the infographic for "How does business resilience relate to fields such as business continuity management, supply chain management, crisis management, etc.?"

Participant	Answer	Score
8	It is an umbrella concept that contains all these other fields	Correct
9	Business resilience is the umbrella term to encompass the three mentioned areas. It does not aim to eliminate those plans but	Correct

	rather integrate them	
10	Those are the branches of business resilience	Correct
11	Business resilience relates to crisis management because business resilience helps in dealing with crises. I'm assuming business continuity has something to do with sustainability and being able to keep working or something so that sounds like something that business resilience would prepare companies for. Lastly, I guess business resilience is related to supply chain management because of relying on other companies for supplies for your company? And if they have a disaster you want to be prepared to deal with that.	Incorrect
12	Business resilience combines all those things under one plan to make things more streamlined and easier to accomplish.	Incorrect
13	Business resilience applies to all of these fields and keeps them going through any sort of disruptions. By being proactive, companies will be able to adapt to disruptions before they happen.	Correct

In response to the question, “How does business resilience relate to fields such as business continuity management, supply chain management, crisis management, etc.?” three participants that viewed either informational material answered the question incorrectly (seen in answers from participants 3, 4, & 12 Tables 4 and 5 above) by emphasizing the combination and revision of all plans within a company to have a more cohesive single plan. Although this is true of business resilience, the question was intended to inquire about the relationship that exists between business resilience and related fields. When scoring responses, answers that were counted as correct had to included a description of this relationship and address the idea that business resilience is an overarching concept that includes these other risk related fields. We reviewed the prototypes and found that both the video and infographic clearly communicated the relationship between business resilience and related risk terms. Therefore, we concluded that the problem was the wording of the question. To avoid confusion in the formal assessment, we rephrased the question to be, “What is the relationship between business resilience and other fields such as business continuity management, supply chain management, crisis management, etc.?” By explicitly asking for the relationship between business resilience and related fields, we felt that the revised question provided more clarity for participants.

Table 6: Pilot test results of the stop motion video for pre assessment question
 “List some benefits of increasing human resource resilience.”

Participant	Answer	Score
1	I don't know.	Incorrect
2	They need to be aware of external issues faced by the company they work for.	Incorrect
3	I don't know.	Incorrect
4	By being educated and informing others.	Partially correct
5	Don't know.	Incorrect
6	Business resilience can occur at any level of the company. For example, training workers can help prevent machine malfunctions, which would impact the overall business.	Partially correct
7	I don't know.	Incorrect

Table 7: Pilot test results of infographic for pre assessment question
 “List some benefits of increasing human resource resilience.”

Participant	Answer	Score
8	I don't know what that is	Incorrect
9	??? I don't know what that is	Incorrect
10	More business resilience. More people dependable, network security, dependability	Incorrect
11	I don't know	Incorrect
12	I'm not sure	Incorrect
13	I don't know	Incorrect

As detailed in Tables 6 and 7, no participants correctly answered the question, “list some benefits of increasing human resource resilience,” during the pre assessment. Of the 13 participants, five expressed that they did not know and the remainder wrote an explanation that was either incorrect or partially correct. We concluded that participants did not understand the meaning of the term “human resource resilience” because participants learning about resilience for the first time had not heard of that specific application of business resilience before viewing

the informational material. To minimize confusion, we replaced the term “human resource resilience” with “the resilience of workers and managers.” Thus, the question was rephrased as, “list some benefits of increasing the resilience of workers and managers” on the pre assessment.

*Table 8: Pilot test results of stop motion video for post assessment question
“What does business resilience add to an organization that other related fields do not? (Like business continuity management, supply chain management, crisis management, etc.)”*

Participant	Answer	Score
1	Business resilience encompasses all of these terms and is a better plan that gives businesses the ability to quickly bounce back	Incorrect
2	It makes a single cohesive plan without repetition.	Incorrect
3	A simplified version of all of these plans	Incorrect
4	it gives a cohesive strategy that is easier to communicate and also training of personnel is easier	Partially correct
5	A sense of security. More costs to the company	Incorrect
6	Business resilience is an overarching term used to cover other related fields, such as those listed above.	Incorrect
7	Business resilience is proactive.	Correct

*Table 9: Pilot test results of infographic for post assessment question
“What does business resilience add to an organization that other related fields do not? (Like business continuity management, supply chain management, crisis management, etc.)”*

Participant	Answer	Score
8	Proactive, not reactive	Correct
9	It actively considers disruptions and evaluates vulnerabilities to reduce them	Correct
10	It makes a company more competitive and decreases their down time when an incident does happen	Incorrect
11	It encompasses all of the above! (I think) Also it probably prepares a company more for other forms of day-to-day potential threats, like security or something.	Incorrect
12	It offers everything, each other field is vulnerable on its own.	Partially correct
13	Business resilience sets a mindset in place before situations arise	Correct

	<p>that require these management fields. This may help the business to be a stronger competitor when they are able to adapt to situations better than other companies. Business resilience also fosters employee growth & inter-departmental relations.</p>	
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The third modification was made in response to answers given to the question “What does business resilience add to an organization that other related fields do not? (Like business continuity management, supply chain management, crisis management, etc.)” We found that one out of seven respondents who watched the stop motion video correctly described that business resilience has proactive qualities, which is something we determined is very important because it is a major distinguishing factor when looking at the differences between business resilience and other risk-related fields. The complete data for video viewers can be found in Table 8. Of the six participants who viewed the infographic, four correctly identified this proactive quality of business resilience. The complete data for the infographic can be found in Table 9. Because participants using the infographic responded to the question correctly, we reviewed the stop motion video to determine if the correct content was included.

After review of the video, we realized that it did not explicitly state that business resilience adds proactive qualities to existing risk related fields. To clearly present this idea to viewers, we added a new scene. This scene compared a resilient company to a non-resilient one in the event of a flood. We made this distinction clear in the narration by stating that because business resilience is proactive and does not focus on post-disruption recovery (reactivity), the resilient business was better equipped to manage the flood. We also included text in the scene that said, “proactive solutions” and “post-disruption recovery” to emphasize the importance of these two points. We believed that hearing the narration as well as viewing the text on screen would aid in retention of this idea. Figure 13 shows an image of the new scene.

Figure 13: New “post-disruption recovery” scene in the stop motion video



Table 10: Pilot test results of stop motion video for pre assessment question
 “How can more resilient infrastructure and IT systems give a company competitive advantage over its competitors?”

Participant	Answer	Score
1	The company can bounce back before the others and steal the other company's customers	Correct
2	It gives consumers peace of mind the company will not go under.	Correct
3	They can recover faster, or stay in business	Correct
4	in case of an emergency or natural disaster, companies with a plan will have less losses and will be ready to continue their business while other companies may have their services interrupted	Correct
5	By being more resilient a company can last longer and therefore outcompete its competitors.	Correct
6	A resilient company appears to be more reliable, which assists it in making sales and being successful.	Correct
7	Resilient to crisis, such as Goldman Sachs during Hurricane Sandy. Ability to maintain operations, therefore more reliable.	Correct

Table 11: Pilot test results of infographic pre assessment question
 “How can more resilient infrastructure and IT systems give a company competitive advantage over its competitors?”

Participant	Answer	Score
8	When a market is struggling, they will be more prepared to deal with it	Correct
9	They can prevent their office from being unusable during certain crisis situations and can protect their IT systems from hackers.	Partially correct
10	Cuz when all your other competitors are out of power after a hurricane flood tsunami all your competitors will have no power but you put your backup generators on the roof so you’ve got power and you’re good to go.	Correct
11	That nice example you have in the presentation where only one company was up and running cuz they had a generator that wasn't in the basement. They get to keep working when other companies are probably losing money!	Correct
12	They can be more dependable	Correct
13	Well if other companies are experiencing widespread crisis, more resilient services will put your company in a better spot to reduce cost, waste, and overall keeps you more protected.	Correct

Tables 10 and 11 display the pre assessment responses for the question “How can more resilient infrastructure and IT systems give a company competitive advantage over its competitors?” We found that 12 out of 13 pilot test participants answered the question correctly on the pre assessment and one participant answered it partially correctly. Due to this high number of correct answers on the pre assessment, we decided that the wording of this question needed to be changed. The wording was changed to “List some benefits of increasing the resilience of IT systems and physical infrastructure:” in the pre assessment only.

Lastly, we received verbal feedback from participants regarding the questions “What is the relationship between business resilience and other fields such as business continuity management, supply chain management, crisis management, etc.?” and “What does business resilience add to an organization that other related fields do not? (Like business continuity management, supply chain management, crisis management, etc.)” To answer the question correctly, no knowledge of risk related areas such as business continuity management, supply chain management, and crisis management is required, but we received verbal feedback from

participants as they took the test that they did not know what those terms meant and questioned whether that mattered. After completion of the pilot test, we discussed adding clarifying definitions for each of the other risk terms mentioned. However, after writing definitions, we decided against clarifying statements because we believed they could help the participant answer the question.

Tables 12 and 13 display all of the final assessment questions used in the formal assessments. Table 12 shows the questions asked in both the pre assessment and post assessment and their respective question numbers. Questions 1 through 9 were open ended questions and question 10 was a Likert scale question. Questions 3, 7, and 8 had varied wording between the two assessments. These questions are numbered the same and the two question variations are displayed in the table. Table 13 displays the questions that were asked on the post assessment only. These questions were used to gather feedback once the informational material was viewed. Questions 11 through 13 are Likert scale questions and 14 and 15 are open ended. Question 15 was directed at infographic viewers only. Table 14 presents the pre and post assessment questions along with the grading rubric, stating what answers must contain to be considered correct. The full grading rubric with examples of correct answers can be found in Appendix 2.

Table 12: Finalized questions repeated in pre assessment and post assessment

Number	Question	Learning Objective
1	What is business resilience?	1
2	What is the relationship between business resilience and other fields such as business continuity management, supply chain management, crisis management, etc.?	2
3	Pre assessment: How does business resilience deal with risk differently than other related fields? (Such as business continuity management, supply chain management, crisis management, etc.)	3
	Post assessment: What does business resilience add to an organization that other related fields do not? (Like business continuity management, supply chain management, crisis management, etc.)	3
4	Why does the process of increasing business resilience include a review of physical infrastructure, equipment and IT systems?	4
5	How are workers and managers involved in the process of increasing business resilience?	4
6	How do practices for increasing business resilience affect existing risk mitigation plans such as emergency plans, business continuity plans, supply chain management, etc.?	4

7	Pre assessment: List some benefits of increasing the resilience of IT systems and physical infrastructure:	4
	Post assessment: How can more resilient infrastructure and IT systems give a company competitive advantage over its competitors?	4
8	Pre assessment: List some benefits of increasing the resilience of workers and managers:	5
	Post assessment: List some benefits of increasing human resource resilience below:	5
9	Why is one risk plan preferable compared to individual risk plans such as emergency plans, business continuity plans, supply chain management, etc.?	5
10	How would you rate your understanding of business resilience?	N/A (Likert Scale)

Table 13: Finalized questions asked on post assessment only

Number	Question
11	How much did you enjoy using this tool?
12	How much did you learn by using this tool?
13	Rate how likely you are to show this material to a customer
14	Do you have any suggestions on how we could improve the tool?
15	For the infographic, what did you think of the introductory example used?

Table 14: Finalized pre and post assessment rubric used for formal assessment

Number	Question	Description of correct answer
1	What is business resilience?	Correct answers must describe business resilience as a quality of a company or a company's ability to survive and adapt to disruptions.
2	What is the relationship between business resilience and other fields such as business continuity management, supply chain management, crisis management, etc.?	Correct answers must include the fact that business resilience is an overarching concept which encompasses all related risk fields.
3	Pre assessment: How does business resilience deal with risk differently than other related fields? (Such as business continuity management, supply chain management, crisis management, etc.)	Correct answers must describe business resilience as being proactive when dealing with risk.

	Post assessment: What does business resilience add to an organization that other related fields do not? (Like business continuity management, supply chain management, crisis management, etc.)	
4	Why does the process of increasing business resilience include a review of physical infrastructure, equipment and IT systems?	Correct answers must indicate that this review occurs because these are important areas of an organization and it will allow them to attend to any vulnerabilities.
5	How are workers and managers involved in the process of increasing business resilience?	Correct answers must include that it is through training and/or collaboration.
6	How do practices for increasing business resilience affect existing risk mitigation plans such as emergency plans, business continuity plans, supply chain management, etc.?	Correct answers must explain that business resilience improves plans and integrates them to a single plan.
7	Pre assessment: List some benefits of increasing the resilience of IT systems and physical infrastructure:	No rubric because question was disregarded.
	Post assessment: How can more resilient infrastructure and IT systems give a company competitive advantage over its competitors?	
8	Pre assessment: List some benefits of increasing the resilience of workers and managers:	All answers that described benefits of increasing human resource resilience were accepted as correct answers.
	Post assessment: List some benefits of increasing human resource resilience below:	
9	Why is one risk plan preferable compared to individual risk plans such as emergency plans, business continuity plans, supply chain management, etc.?	Correct answers must demonstrate understanding of the benefits such as removing redundancies and ease of understanding.

The pilot test also allowed us to gather feedback on our informational materials. We asked participants if they had ideas to improve the informational material. Participants responses to these questions can be seen in Table 15 for stop motion viewers and Table 16 for infographic viewers. From this feedback, we modified the stop motion video and infographic as described below.

Table 15: Pilot test feedback and improvement ideas for the stop motion video

Participant	Question: Do you have any ideas how we could improve the tool?
1	The video is really cool and cute but I think it's harder to learn from; at least for me, I would prefer to read these things so I can remember them better.
2	No, I enjoyed the video.
3	Give the viewer some time between certain sections to think about what they just heard. Some of the information seemed like it was coming too quickly.
4	Not really, it was very nice!
5	Simplistic (which I liked), introduced some concepts, but also skipped some definitions.
6	Not that I can think of, great job!
7	Video was easy to understand, "cute," and visually appealing. Audio at the beginning was a little quiet compared to the rest of the video.

Generally, the stop motion video was well received by participants. Five out of the seven participants who viewed the stop motion video had positive feedback regarding the video. Three out of seven participants gave suggestions for improving the quality of the video before the formal assessment. One comment was that audio at the beginning of the video was quieter than the rest. We considered this feedback before conducting the formal assessment and changed the narration to be louder.

Table 16: Pilot test feedback and improvement ideas for the infographic

Participant	Do you have any ideas how we could improve the tool?
8	No.
9	One some parts, I was confused as to what part I should read first. I was able to figure it out but you might want to shift some things down a little bit. Also, change the survey to allow for paragraph responses.
10	Do the italics mean emphasis? Right now you're telling a story and you can't really skim, which is good. Something I thought when i read it was that I wished the fonts and sizes were in some sort of hierarchy.
11	Some fonts are harder to read than others! That's all. It was great.

12	I liked all the different fonts and clear separation of topics. It was great.
13	It was really good!

The infographic was also well received by participants. Four out of the six participants that viewed it did not provide us with feedback on how we could improve and instead said that they enjoyed viewing it. Three participants commented on the font sizes and types, saying that sometimes they were hard to read and made the infographic hard to follow. We addressed this by making certain text bigger and spacing words farther apart to improve readability.

Other feedback requested we give more attention to our presentation of the September 11, 2001 terrorist attack example. We acknowledge that it is a dramatic and sensitive topic. Therefore, we rearranged the order of information presented in the introduction graphic in order to give background information before presenting the startling statistics to gradually introduce the topic. We did not think that the Danish audience would necessarily view this topic the same sensitive way some Americans would, but chose to be cautious in our presentation regardless. We also included a question in the post assessment to see what participants thought about the example. An image of the final version of the infographic used in the formal assessments can be seen in Figure 14 and in Appendix 4.

Figure 14: Infographic Prototype Version 2, Post Pilot Test



We completed revisions to the assessments and prototypes then conducted the formal assessments. The data from the formal assessments is found in Appendix 3.

Tables 17 and 20 present chi-square test results for the stop motion video and infographic, respectively. Asterisks indicate questions that showed statistically significant differences between pre and post assessments.

Table 17: Chi-square test of independence values for pre and post assessment results for stop motion video viewers

Question #	Pre assessment		Post assessment		Chi-square test statistic	Degrees of freedom	P value
	# Correct	# Incorrect	# Correct	# Incorrect			
1	6	4	8	2	0.95	1	0.32
2*	3	7	10	0	10.7	1	0.001
3*	1	9	9	1	12.8	1	0.0003
4	7	3	9	1	1.25	1	0.26
5*	3	7	9	1	7.50	1	0.006
6	4	6	8	2	3.33	1	0.068
8*	6	4	10	0	5.00	1	0.025
9	7	3	10	0	3.52	1	0.06

Note: There is no question 7 because we determined that it should be disregarded (reasoning discussed in the Results and Discussion chapter).

Question 1 asked participants “What is business resilience?” The results for this question show that out of ten participants, three showed positive improvement in their knowledge and defined business resilience better after viewing the informational material. Four participants had a correct understanding of the definition of business resilience prior to viewing the informational material and remained correct after viewing the material. There was negative change in 2 participants’ responses, while 1 participant maintained an incorrect understanding of the definition of business resilience after viewing the information material. The chi-square test showed that there was no significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This shows that either question 1 was not effective at assessing the learning objective, or the stop motion video was not effective in communicating the necessary information. We were hoping participants would understand that business resilience is a quality of a company, and not just a plan. Confusion in this matter could have been due to the fact that the stop motion video says that business resilience includes a plan, though it is not limited to it. To aid in participant’s retention, an option for the future would be to highlight the definition or restate it in the end.

Question 2 addressed the participants' ability to describe the relationship between business resilience and existing risk related fields. Out of 10 participants, 9 participants showed improved understanding of the relationship between these fields. All 9 of these participants provided a completely correct response. The remaining participant had a correct understanding of the relationship between these fields both before and after the video. The chi-square test showed that there was a significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This shows that the stop motion video was effective in causing participants to achieve learning objective 2.

Question 3 addressed the value that business resilience adds to an organization that other risk related fields do not. Eight participants showed positive improvement in their understanding of the value business resilience adds. The stop motion video effectively met this learning objective by helping 8 of the 10 participants describe the value business resilience adds to existing risk management fields. The chi-square test showed that there was a significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This shows that the stop motion video was effective in causing participants to achieve learning objective 3.

Learning objective 4 was divided into three areas, one for each area of an organization that business resilience can be applied to. Questions 4, 5, and 6 addressed each area of an organization separately.

Regarding the application of business resilience to physical infrastructure and IT systems, participants were asked in question 4 why the process of increasing business resilience includes a review of these areas. Three participants showed increased understanding of how business resilience can be applied to physical infrastructure and IT systems by acknowledging that it was to find vulnerabilities within the organization. Four participants had no improvement from a partially correct understanding, meaning they acknowledged that it is because these areas are important for the operation of a business, but failed to say the purpose of the review was to look for vulnerabilities. Two participants showed no improvement from an incorrect answer. One participant showed no improvement from an incorrect answer. We believe that the first part of learning objective 4 was not met because overall less than half of the participants showed improvement on this topic. The chi-square test confirmed this, showing that there was no significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This could mean that the question was not effective at assessing the learning objective, or that the stop motion video was not effective in communicating the necessary

information. The stop motion video could be revised to emphasize our point more strongly, by possibly adding an additional scene to include a more concrete and explicit example. Another option would be to have the rubric accept a wider range of answers as correct, since the desired answers from our rubric are specific to the wording of this question.

Question 5 was about the application of business resilience within the human resource area, out of 10 participants that viewed the stop motion video, 8 demonstrated a type of positive improvement and were able to correctly explain how workers and managers are involved in the process of increasing business resilience. One participant had a correct understanding both before and after viewing the stop motion video, while the remaining participant did not show improvement from an incorrect answer. Since the majority of participants demonstrated an increased understanding on the application of business resilience to human resources, we believe that the stop motion video effectively met this part of the learning objective. The chi-square test showed that there was significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This shows that the stop motion video was effective in causing participants to achieve the second part of learning objective 4.

Question 6 addressed third part of learning objective 4 which regarded the application of business resilience to the area of planning strategies. Seven out of 10 stop motion video viewers demonstrated an increased understanding of the effect business resilience has on other risk plans. One participant remained correct on both the pre and post assessments, while 2 others remained incorrect on both assessments. Although the majority of participants demonstrated an increase in understanding as observed by the team, the chi-square test shows that there was not a significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This means that the last part of learning objective 4 was not met. Overall, one of the three parts of learning objective 4 were met, so we can conclude that learning objective 4 was not entirely met.

Questions 7, 8, and 9 addressed the benefits business resilience. All three of these questions were parts of learning objective 5, one for each area of an organization business can be applied to.

Question 7 addressed the first part of learning objective 5 which regarded the benefits of increasing the resilience of physical infrastructure and IT systems. However, this part of the learning objective could not be evaluated due to wording change in the assessments. This question was worded one way in the pre assessment and another way in the post assessment in hopes to get responses that were not affected by question wording. The change in question wording was

made after the pilot test, and it was not until after the formal assessments that we realized the wording presented did not ask exactly the same question, so it did not warrant the same types of answers. Due to this, we disregarded the question because the pre and post assessment question responses could not be compared.

Question 8 asked participants about the benefits of business resilience when the resilience of workers and managers is increased. Six out of 10 participants showed positive improvement in their understanding, and were able to identify benefits such as creativity, flexibility, and problem solving skills. Three participants remained with the same correct understanding before and after the assessments, while one participant remained with the same partially correct understanding. Since the majority of the participants showed an increase in knowledge, we can infer that the informational material was effective at increasing the knowledge in this subject matter. The chi-square test showed that there was a significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This shows that the stop motion video was effective in causing participants to achieve the second part of learning objective 5.

Question 9 addressed participants' understanding of the benefits of business resilience to planning strategies. Out of 10 participants, 3 showed improvement in understanding between pre and post assessments. The remaining 7 participants had the correct understanding prior to viewing the video and remained with a correct understanding after. Because only 3 participants showed improvement, the chi-square test showed that there was not a significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments, meaning that the last part of this learning objective was not met. It is important to acknowledge that although there was no significant improvements, the majority of participants showed a correct understanding in the post assessment.

Question 10 asked participants to rate their understanding of business resilience on a scale of 1 through 5 on both the pre and post assessments. A paired t-test was conducted to determine if the difference between mean ratings was significant between the pre and post assessments. For the stop motion video, the mean rating on the pre assessment was 1.8 out of 5 (SD = 0.6), while the mean rating on the post assessment was 3.5 out of 5 (SD = 0.4). The paired t-test showed that the difference between pre and post assessment ratings was statistically significant ($t = 6.53$, degrees of freedom = 9, $p\text{-value} = 0.00005$). The data from this test can be found in Table 33 Appendix 3.

Table 18: Stop motion video post assessment Likert scale questions mean ratings

Question Number	Mean Rating (SD)
11. How much did you enjoy using this tool?	4.6 (0.5)
12. How much did you learn by using this tool?	4.0 (0.7)
13. Rate how likely you are to show this material to a customer	3.7 (0.5)

We performed correlation analyses between the Likert scale questions in Table 18 above and two measures of knowledge about business resilience: participants' percentage of correct answers on the post assessment and participants' percent improvement between assessments. The results for the correlation analyses for participants who viewed the stop motion video are shown Table 19 below. The table shows the values for *r*, degrees of freedom, and the *p*-value. Correlations with significant *p*-values are designated by an asterisk.

Table 19: Correlations between Likert scale questions and assessment results for stop motion video video viewers

Correlation	Degrees of Freedom	<i>r</i>	<i>P</i> -value
How much did you learn? vs. Percent of correct answers on the post assessment	8	-0.266	0.45
How much did you enjoy it? vs. Percent of correct answers on the post assessment	8	-0.531	0.11
How likely are you to show it to a customer? vs. Percent of correct answers on the post assessment	8	-0.495	0.15
How much did you learn? vs. Percent improvement in score	8	0.126	0.72
How much did you enjoy it? vs. Percent improvement in score	8	-0.158	0.65
How likely are you to show it to a customer? vs. Percent improvement in score	8	0.288	0.43

We decided that, in order to conclude that there is a significant relationship between two variables, the *p*-value for the correlation analysis must be below 0.05. As can be seen in Table 19 above, *p*-values for all correlations calculated for the stop motion video results exceed 0.05, which

means that the value of one variable did not predict the value of the other variable.

Table 20: Chi-square test of independence values for infographic viewers' responses in pre and post assessments

Question #	Pre assessment		Post assessment		Chi-square test statistic	Degrees of freedom	P-value
	# Correct	# Incorrect	# Correct	# Incorrect			
1	7	3	9	1	1.25	1	0.26
2*	5	5	10	0	6.67	1	0.0098
3*	2	8	7	3	5.05	1	0.0246
4	8	2	9	1	0.39	1	0.53
5*	4	6	9	1	5.49	1	0.019
6*	3	7	8	2	5.05	1	0.024
8	6	4	8	2	0.95	1	0.32
9	7	3	6	4	0.21	1	0.63

Question 1, "What is business resilience?", addressed learning objective 1. The results for this question show that out of 10 participants, 3 participants showed positive improvement in their knowledge and defined business resilience better after viewing the informational material. Five participants had a correct understanding of the definition of business resilience prior to viewing the informational material and remained correct after viewing the material. There was negative improvement in 1 participant's responses, while 1 participant remained with an incorrect understanding of the definition of business resilience after viewing the informational material. The infographic does not show a large amount of improvement in this learning objective because 5 participants already had a correct understanding of the definition prior to viewing the video. This may have been due to the participants' prior knowledge or the rubric used for the question. If the rubric had been more specific, less answers would have been accepted as correct and greater improvement could have been observed. For the participants that had negative improvement or remained with an incorrect understanding, we were hoping participants would understand that business resilience is a quality of a company, and not just a plan. The infographic could be

improved by inverting the order of the definition so that it reads “Business resilience is the ability of an organization to successfully adapt and respond to disruptions,” rather than “this ability of an organization to successfully adapt and respond to disruptions is business resilience.” This allows readers to know sooner that they are reading a definition. The chi-square test showed that there was not a significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This shows that either question 1 was not effective at assessing the learning objective, or the infographic was not effective in communicating the necessary information.

Question 2 regarded learning objective 2 which addressed the participants’ ability to describe the relationship between business resilience and existing risk related fields. Out of 10 participants, 6 participants showed an improved understanding of the relationship between these fields. The remaining 4 participants had a correct understanding of the relationship between these fields before and after viewing the infographic. The chi-square test showed that there was significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This shows that the infographic was effective in causing participants to achieve learning objective 2.

Question 3 asked participants about the value that business resilience adds to an organization that other risk related fields do not. Out of 10 participants, 6 participants showed positive improvement in their understanding of the value business resilience adds. One participant remained with a correct understanding, while 2 participants remained with an incorrect understanding. The remaining participant showed negative improvement in their understanding. Since the majority of participants showed improvement, we can infer that the infographic effectively allowed participants to meet this learning objective. The chi-square test showed that there was significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This shows that the infographic was effective in causing participants to achieve learning objective 3.

As mentioned in the discussion for the stop motion video, learning objective 4 was divided into three areas, one for each area of an organization that business resilience can be applied to, and questions 4, 5, and 6 addressed each area.

Regarding the application of business resilience to physical infrastructure and IT systems, participants were asked in question 4 why the process of increasing business resilience includes a review of these areas. One participant showed increased understanding of how business resilience can be applied to physical infrastructure and IT systems by acknowledging that it was to

find vulnerabilities. Eight participants had no improvement from a partially correct understanding, meaning they acknowledged that it is because these areas are important for the operation of a business, but failed to say the purpose of the review was to look for vulnerabilities. One participant showed no improvement from an incorrect answer. We believe that the infographic was not effective at increasing knowledge in this question because overall fewer than half of the participants showed any improvement on this topic. The chi-square test showed that there was no significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments, therefore the first part of learning objective 4 was not met. This could be because either question 4 was not effective at assessing the learning objective, or the infographic was not effective in communicating the necessary information.

Question 5 was about the application of business resilience within the human resource area. Out of 10 participants that viewed the infographic, 7 demonstrated positive improvement and were able to correctly explain how workers and managers are involved in the process of increasing business resilience. Two participants had a correct understanding both before and after viewing the infographic, while the remaining participant did not show improvement from an incorrect answer. Since the majority of participants demonstrated an increased understanding on the application of business resilience to human resources, we believe that the infographic effectively met this part of the learning objective. The chi-square test showed that there was significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This shows that the infographic was effective in causing participants to achieve the second part of learning objective 4.

Question 6 addressed the application of business resilience to the area of planning strategies, and 7 out of 10 infographic viewers demonstrated an increased understanding of the effect business resilience has on other risk plans. One participant remained correct on both the pre and post assessments, while 2 others remained incorrect on both assessments. We believe that since the majority of participants demonstrated an increased in understanding due to score improvement, the infographic was effective in explaining the effect of business resilience on other risk related plans. The chi-square test confirms this because it showed that there was not a significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This shows that either question 6 was not effective at assessing the learning objective, or the infographic was not effective in communicating the necessary information. Overall, one of the three parts of learning objective 4 were met, so we can conclude that learning objective 4 was not entirely met.

Question numbers 7, 8, and 9 addressed the benefits business resilience. All three of these questions were parts of learning objective 5, one for each area of an organization mentioned in learning objective 4 but instead regarding the benefits.

As mentioned previously in the stop motion video discussion, question 7 was disregarded due to a wording change that did not make it possible to compare the pre and post assessment responses because they were not the same.

Question 8 asked the participants about the benefits of business resilience when the resilience of workers and managers is increased. Two out of 10 participants showed positive improvement in their understanding. Five participants remained with the same correct understanding before and after the assessments, while three participants actually showed negative improvement changing from a correct answer to an incorrect one. Since the majority of the participants' knowledge did not change, we can infer that the informational material was not effective at increasing the knowledge in this subject matter. The chi-square test showed that there was no significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments. This shows that either question 8 was not effective at assessing the learning objective, or the infographic was not effective in communicating the necessary information.

Question 9 addressed participants' understanding of the benefits of business resilience to planning strategies. Out of 10 participants, none showed improvement in understanding between pre and post assessments. Five participants had the correct understanding prior to viewing the video and remained with a correct understanding after. Two participants had a partial understanding both before and after the viewing, two participants remained incorrect after the viewing, and one showed negative improvement changing from partially correct to incorrect. This shows that our infographic did not cause confusion for participants. Because most participants either remained correct or showed negative improvement, we can infer that either question 9 was not effective at assessing the learning objective, or the infographic was not effective in communicating the necessary information. As verification, the chi-square test showed that there was not a significant difference in the proportions of participants answering incorrectly in the pre versus the post assessments.

A paired t-test analysis was done for question 10 on the pre and post assessment. For the infographic, the mean rating on the pre assessment was a 2 out of 5 (SD = 0.7), while the post assessment rating was a 3.5 out of 5 (SD = 0.9). The paired t-test showed that the difference between pre and post assessment ratings was statistically significant ($t = 5.09$, degrees of freedom

= 9, p value = 0.0003). The data from this test can be found in Table 48 in Appendix 3.

Table 21: Infographic post assessment Likert scale questions mean ratings

Question	Mean Rating (SD)
11. How much did you enjoy using this tool?	3.2 (1.1)
12. How much did you learn by using this tool?	3.2 (0.8)
13. Rate how likely you are to show this material to a customer	2.9 (1.4)

We performed correlation analyses between the Likert scale questions in Table 21 above and two measures of knowledge about business resilience: participants' percentage of correct answers on the post assessment and participants' percent improvement between assessments. The result for the correlation analyses for participants who viewed the infographic can be seen in Table 22 below. The table shows the values for r, degrees of freedom, and the p-value. Correlations with significant p-values are designated by an asterisk.

Table 22: Correlation values for Likert scale questions and assessment responses for infographic viewers

Correlation	Degrees of Freedom	r	P-value
How much did you learn? vs. Percent of correct answers in the post assessment	8	0.264	0.461
How much did you enjoy it? vs. Percent of correct answers in the post assessment*	8	0.730	0.017
How likely are you to show it to a customer? vs. Percent of correct answers in the post assessment	8	0.441	0.20
How much did you learn? vs. Percent improvement in score*	8	0.732	0.016
How much did you enjoy it? vs. Percent improvement in score	8	0.091	0.80
How likely are you to show it to a customer? vs. Percent improvement in score	8	-0.063	0.86

We decided that, in order to conclude that there is a significant relationship between two variables, the p-value for the correlation analysis must be below 0.05. As it can be seen in Table 22 above, the analysis indicated significant correlations for two comparisons for the group that viewed the infographic. Figure 15 shows the relationship between the percentage of correct answers in the post assessment and enjoyment level for the infographic. This suggests that participants' enjoyment level in viewing the infographic was directly related to their knowledge level after viewing it.

Figure 15: Relationship Between the Percentage of Correct Answers in the Post Assessment and Enjoyment Level for the Infographic

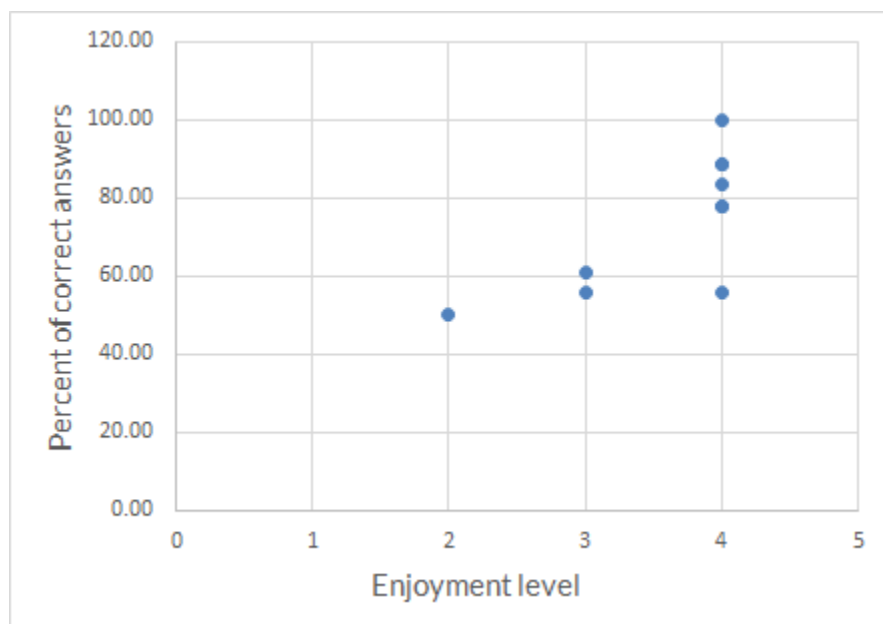
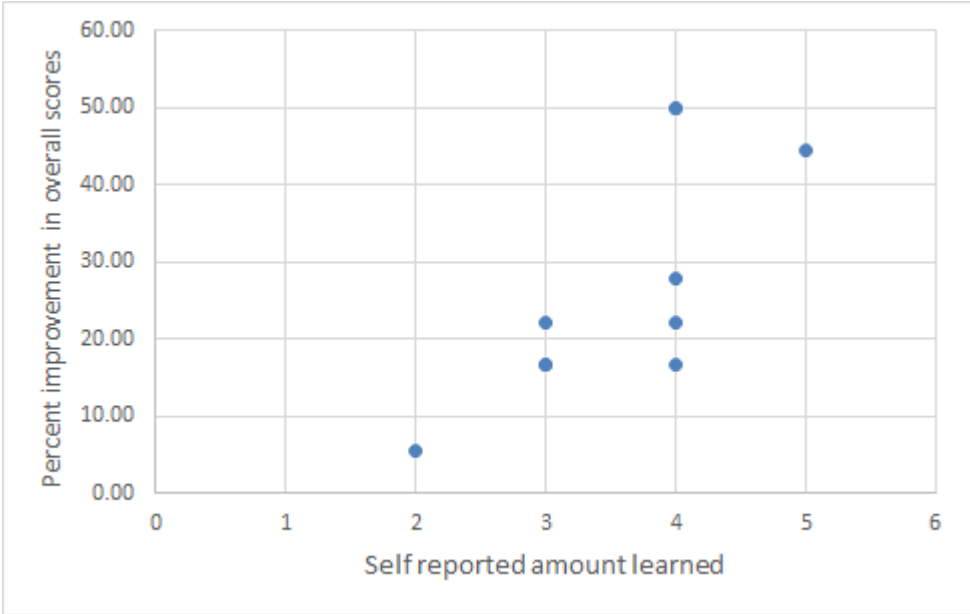


Figure 16 shows the relationship between the percentage of correct answers in the post assessment and self-reported amount learned for the infographic. This suggests that the amount participants that thought they had learned from viewing the infographic was directly related to their improvement in assessment scores before and after viewing it.

Figure 16: Infographic Relationship Between Percent Improvement in Scores Between Assessments and Self-Reported Amount Learned



4.0

Recommendations

Throughout our time working at DBI, we studied effective means of educating Danish employees about business resilience. While we found the infographic and stop motion video to be effective at fulfilling our objectives, we have additional recommendations on how to communicate the importance of business resilience better and share the materials we have created.

4.1 Modification of Materials

The informational materials we made and tested are subject to continued refinement and adaptation in response to user feedback. We invite DBI to continue modifying the materials in whatever ways are most useful to them. At the conclusion of our study, we identified areas for future material development in response to assessment results and feedback.

To continue developing the video, we suggest adding a final slide to summarize the main concepts and provide users a way to find additional information on business resilience, possibly by showing a phone number or email to contact or DBI's website. Alternatively, the final slide could have an excerpt of Laura Melkunaite or someone else involved with business resilience speaking about business resilience, giving a recap of the main points from the video and speaking about what DBI is doing in terms of business resilience and the services it plans to offer. This could also end with a link where viewers can find more information. The alternate scenes could be easily edited using Movie Maker which is the default program on most PC's. A simple tutorial to get started in Movie Maker can be found here: <https://www.youtube.com/watch?v=O99NXVHfqMs>.

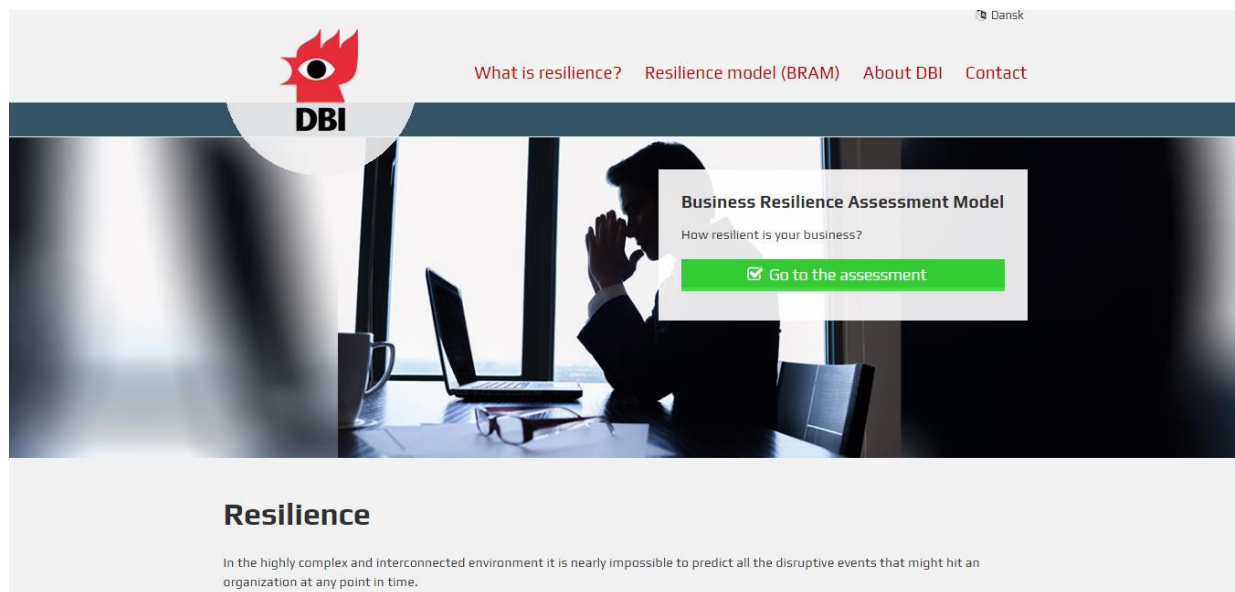
To continue developing the infographic, we suggest a few changes. We learned from the results of our assessments that the definition of business resilience was not sufficiently clear. Therefore, we believe that it would be appropriate to switch the order of the term "business resilience" and its definition to list the term first. Then the definition would read: "business resilience is the ability of an organization to successfully adapt and respond to disruptions." Doing so could help viewers identify the definition as important information before reading it and would they be more likely to pay special attention to it. In addition to this change, we suggest using an example other than the terrorist attacks of 2001 that relates more directly to Denmark. This could significantly help improve viewer engagement and enjoyment from viewing the informational material. Another suggestion is to use more graphics on the bottom portion of the infographic. While the text is highly explanatory, it does not excel in viewer engagement as evidenced by feedback we received. More information that could be added at the end of the infographic would be contact information for DBI such as their website and phone number.

4.2 Distribution Recommendations

For the informational materials to be effective, they must not only communicate concepts of business resilience but also be distributed to people who can benefit from business resilience.

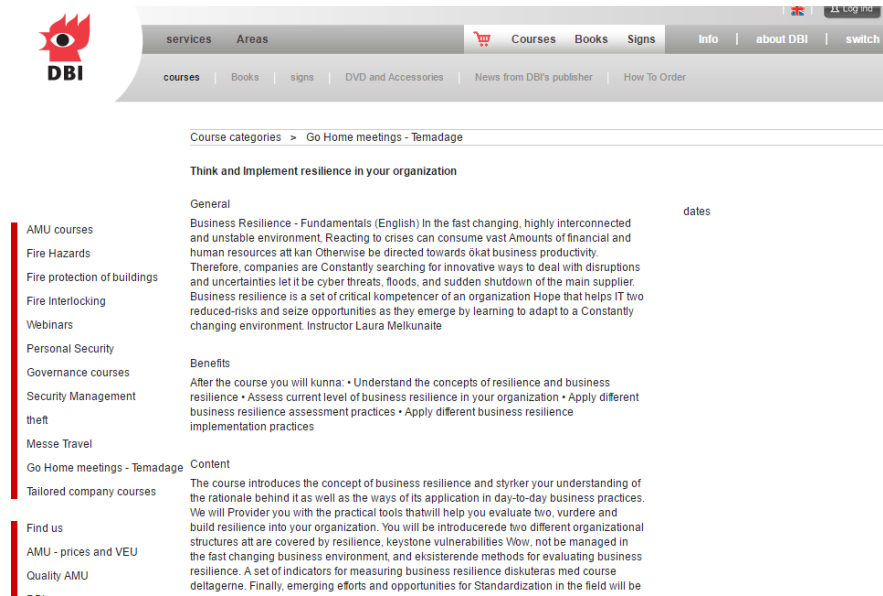
Both the infographic and the video could be distributed online several ways. It could be posted to social media accounts such as LinkedIn, where it would directly reach over 3,000 followers and be subject to continued sharing. Both materials could also be posted to both DBI's general website and business resilience website. In DBI business resilience website, the infographic could be posted under the "What is resilience" tab shown in Figure 17.

Figure 17: Screenshot of DBI's Business Resilience Website



In DBI's general website, where all of DBI's services are explained, we suggest that the infographic and the stop motion video are attached to the page explaining the business resilience workshop. The page can be seen in Figure 18:

Figure 18: Screenshot of DBI's General Website Page



Another way to share the infographic and the video online would be by adding a “new business areas” section to the bottom of DBI employees’ default email signature in which DBI could have brief explanations of products which are in development and links to more information on each service.

Due to the versatility of the infographic, it can also be printed and distributed in several ways. It can be displayed along with other flyers in the DBI lobby, where employees could see it as they pass through it as well as guests to DBI’s facility. Having multiple copies would encourage people to take one and read about business resilience further. Printed copies could also be distributed for DBI employees to bring with them when visiting customers. Figure 19 shows an image of the shelf where the infographic could be displayed:

Figure 19: Flyers in DBI's Lobby



We ultimately recommend that DBI take advantage of their existing network of employees and Danish businesses to promote both materials and encourage sharing.

4.3 Increased Interdepartmental Collaboration

During our seven weeks at DBI, we formed relationships with employees from various departments and learned more about their roles and responsibilities. We met employees from the Marketing and Sales, Security and Investigation, and Research and Incubation departments. We noted that employees from these departments have diverse skills that could benefit the business resilience program.

We learned that many DBI employees from the Security and Investigation department work in fields related to business resilience. We noticed that currently there is very limited interdepartmental collaboration and we feel that business resilience is closely related to other services offered at DBI and it would be beneficial for the business resilience department to collaborate with and gain insight from other employees. During the interviews and personal

conversations, we gained valuable insights that we believe can help Melkunaite and Urth develop the business resilience program if they collaborate with the participants further. For this recommendation, we considered the work of employees that we found overlapped with the business resilience program at DBI in more detail. We acknowledge that since we did not talk to all employees at DBI, there may be more employees beyond the ones listed that could be valuable resources for Melkunaite and Urth in the development of the program.

From the assessments we completed for the second objective, we met Per Wulff Flatau, who is the Chief Consultant and Lead Auditor for Sikkerheds Branchen (The Danish Trade Association) which is located in the same building as DBI. He is involved with the international standard for quality management systems (ISO Standard 9001:2015). The purpose of this standard is to set requirements for a company's ability to demonstrate continuous provision of goods and services and to enhance customer satisfaction through quality management systems (International Standards Organization, 2015). When he viewed the video, he commented that the work he was doing was similar to business resilience in that it looked for opportunities within disruptions. He did not use the term "business resilience" when speaking about his work which was interesting because it sounded very similar and useful to the business resilience program. This shows that the level of overlap between business resilience and related fields is significant and ideal for collaboration between disciplines. We believe that collaboration with Flatau can help Melkunaite and Urth learn more about this standard and how it relates to business resilience.

During our initial round of interviews with DBI employees we spoke with Jesper Florin, Head of the Security and Investigation Department. Florin's experience working within the fields of business continuity management and emergency planning is very applicable to the work in the business resilience department. Collaborating with him can give Melkunaite and Urth greater insight into planning strategies for business resilience.

We believe that since business resilience encompasses many risk fields it would be beneficial for the resilience team at DBI to spend more time understanding what the disciplines offer so they can more easily develop the business resilience services.

4.4 Interactive Teaching Material

Through the research we have conducted for our project, we found that business resilience is an extremely complex concept and that there is a lot of ambiguity surrounding its meaning. After analyzing our formal assessments, we determined that our two prototypes were

successful at educating employees on the basic concepts of business resilience. However, there is a need for a more in depth informational tool. We received feedback in our initial interviews that an interactive material would be extremely engaging and useful. This is consistent with the research of Hockicko, Krišt'ák, and Němec (2015) and Yang, Wang, and Chiu (2015), which supports interactivity as a pedagogical tool. While a promising method, we chose not to pursue this type of informational material because implementation was not feasible given our project constraints. Interactive programs can be complex to make and require more time than we had in our project to learn the tools necessary to make such material. Given the challenges of implementation, we pursued other types of materials, but because business resilience is a very complex topic, we recommend that DBI continue educating people about resilience through an interactive material.

One way to make the interactive material more engaging is through “gamification”. In gamification, elements of video games such as point-scoring and badges are integrated into non-game activities to promote engagement and productivity (Huan and Soman, 2013). To apply gamification to learning effectively, Huan and Soman (2013) have laid out the following steps:

1. Understand the target audience
2. Define learning objectives
3. Structure the game experience
4. Identify resources
5. Apply gamification elements

The first step is to understand the target audience and their skills. This interactive material should be aimed at employees who are interested and have the ability to implement business resilience in their organization. These are the employees involved in the strategic planning of an organization. We can assume that someone who is interested in implementing business resilience and strategic planning has a basic understanding of risk practices, but no assumptions should be made when developing the informational material.

The next step involves defining learning objectives. The learning objectives that we developed for our informational material serve as a good foundation for the informational material. But for the audience suggested above, we recommend going into more detail about each concept. For this audience, it is important that DBI give a thorough explanation of how business resilience differs from other risk management fields. In our stop motion video and infographic, we limited this explanation to saying business resilience is proactive instead of reactive. This was done to avoid confusion among beginner learners. However, after using the interactive material,

users should know specifically how business resilience is different than other risk management plans their organization may have. The interactive material should also thoroughly explain how DBI plans to work with organizations to help them increase their resilience. After using the interactive material, the viewer should have actionable steps to take, such as:

- Contact DBI and inquire further about more detail on what service is most appropriate for the needs of their organization.
- Register to learn more about business resilience through a workshop.
- Complete the Business Resilience Assessment Model (BRAM) online.

After the learning objectives have been defined, the next step is to structure the experience. By structuring the experience, Huan and Soman (2013) refer to setting “stages” for the users. Each stage can have different objectives. The following example demonstrates one way to apply this concept to the learning objectives we have developed:

Stage 1: Basic concepts of business resilience

Objective 1: Describe the definition of business resilience.

Stage 2: The scope of business resilience

Objective 2: Describe the relationship between business resilience and existing risk related fields.

Objective 3: Describe the value business resilience adds to existing risk related fields.

Stage 3: Business resilience in an organization

Objective 4: Describe how business resilience can be added to different areas of an organization.

Objective 5: Describe the benefits business resilience can have in different areas of an organization.

Depending on the audience, additional stages or objectives could be added. It is recommended that the first stages are easier, and the level of difficulty increases with each one (Huan and Soman, 2013). The benefits of setting stages is a greater understanding of the context of the learning objectives and areas where students may have difficulties (Huan and Soman, 2013).

The next step is to identify which stages can be gamified and how. In this step several considerations must be taken. The developer of the program should consider how users’ progress will be measured. One way would be to give users a deadline or a time-limit to complete each stage if they wished to qualify for the next stage.

The last step is to add game elements to the interactive material. These elements could be

points and achievement badges to encourage users to compete with themselves and focus on learning the material. The material could be made to make users pretend they are faced with making decisions that can affect the resilience of their business. Decisions in the material would be common business practice decisions so any business could relate, but also include specific examples so users could see the value in business resilience. For example, it could present users with two options when a business discovers a threat from a disaster. If the user selects the “resilient” option, the program will tell them “Correct!” and give a brief explanation why the user was correct. If the user selects the other option, the program will go through the wrong option explaining what would go wrong if it was chosen and why the other choice was the more viable one. We believe that if DBI wants to move forward with business resilience education and eventually implementation, an interactive program would be very beneficial to them in gaining customer interest.

4.5 Conclusion

Organizations in Denmark need to understand business resilience so they can be prepared to manage disruptions. Through our interviews we found that DBI employees are largely unaware of business resilience, but are interested in learning more about it. We believe that employees of other Danish companies will also be interested in learning more about business resilience and will benefit from an informational material. We believe Danish businesses will be able to benefit greatly from business resilience services and the added stability they can provide to an organization beyond existing risk management practices. Our work has shown the effectiveness of both a video and infographic in explaining business resilience and shown that there are many different ways to develop and deliver business resilience services to Denmark.

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6.0

Appendices

Appendix 1: Interview Documents

Preamble

We are a group of students working on a project intended to help us understand how to communicate concepts of business resilience effectively. We are developing informational material to inform people about business resilience and why it is important. We would like employees to understand how it can be applied to their company and the possible benefits. This material will be made and tested within DBI for its employees to educate themselves on the topic then be able to communicate its importance to people outside the company.

Our goal for this interview with you today is to learn about what you would specifically like to know about resilience and what information would help you speak to others about it.

We would like to record our conversation to aid the accuracy of our analysis and to capture any points missed in our notes. The recording will not be shared with anyone. Is it ok if we record the audio of this interview?

If at any time you would like to stop the interview or would like us to delete the audio recording please let us know and we will do this. Any identifying information will remain confidential.

Read consent form below to interviewee.

Consent Form

Investigators: Benjamin Freed, Estefania Trinidad, Rachel Welch, Kaitlin Travers

Contact Information: business-resilience@wpi.edu

Title of Research Study: Inspiring a Mindset of Resilience

Sponsor: Danish Institute of Fire and Security Technology (DBI)

Introduction: You are being asked to participate in a research study. Before you agree, however, you must be fully informed about the purpose of the study, the procedures to be followed, and any benefits, risks or discomfort that you may experience as a result of your participation. This form presents information about the study so that you may make a fully informed decision regarding your participation.

Purpose of the study: The purpose of this study is to determine an effective method to educate DBI employees about business resilience so they are empowered to tell the companies they work with how to increase their company's resilience.

Procedures to be followed: To accomplish this, we are holding interviews with DBI employees to understand what their knowledge gaps are about business resilience as well as the best methods through which to communicate those concepts.

Risks to study participants: There are no major risks associated with participating in this study. If you are uncomfortable answering any questions, you may choose not to answer at any time.

Benefits to research participants and others: The results of our research will help Danish businesses become more aware of the concept of business resilience and its benefits.

Record keeping and confidentiality: We will take written notes during the interview, and with your consent, we will also take an audio recording for our later reference in analyzing the interview material. Records of your participation in this study will be held confidential so far as permitted by law. However, the study investigators, the sponsor or its designee and, under certain circumstances, the Worcester Polytechnic Institute Institutional Review Board (WPI IRB) will be able to inspect and have access to confidential data that identify you by name. Any publication or presentation of the data will not identify you.

For more information about this research or about the rights of research participants, or in case

of research-related injury, contact: business-resilience@wpi.edu. Additional contacts include the IRB Chair (Professor Kent Rissmiller, Tel. 508-831-5019, Email: kjr@wpi.edu) and the University Compliance Officer (Jon Bartelson, Tel. 508-831-5725, Email: jonb@wpi.edu).

Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty or loss of other benefits. The project investigators retain the right to cancel or postpone the experimental procedures at any time they see fit.

By signing below, you acknowledge that you have been informed about and consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

_____ Date: _____
Study Participant Signature

Study Participant Name (Please print)

_____ Date: _____
Signature of Person who Explained this Study

Interview Script

Interview questions read to the interviewee are in bold.

- **Can you tell us about the work you do at DBI?**
- **Have you been involved with the business resilience area? If so, how?**
- **Could you tell us what you know about the term business resilience?**
 - The responses to this question were either their own definitions or saying they don't know what it is. Either way, unless their definition aligned with our pre-determined definition, we read the definition to help them understand.
 - Read our definition to them: Business resilience is the ability of an organization to successfully respond and adapt to disruption.
- **Does our definition of business resilience seem clear to you?**
- **After learning more about the concept's meaning, what do you think may be some benefits of increasing a company's business resilience?**
- **Depending on response: So do you think there is value in employees knowing how business resilience can be applied to a company?**
- **Read: DBI is hoping to develop this area to create services that will cover three main areas of an organization.**
 - Resilience of physical infrastructures and IT systems
 - Human resources resilience
 - Planning strategies
- **Have you heard of? Can you tell us what you know about?**
 - **the resilience of physical infrastructures and IT systems?**
 - **human resource resilience?**
 - **resilience planning strategies?**
- **Are there any aspects of business resilience that you are interested in learning more about?**
- **Would you feel comfortable explaining the concept of business resilience to someone who hadn't heard of it? Why or why not?**
- **Would you feel comfortable promoting business resilience on DBI's behalf in appropriate situations? Why or why not?**
- **What educational formats do you find most effective and engaging when you are trying to learn something new?**

- Effective meaning most engaging and educational
- **If you were given a pamphlet, video, or PowerPoint about business resilience, which one, if any, would you see/read?**
 - Do you have feedback on any of these to make them most effective?

Appendix 2: Pre and Post Assessment Grading Rubric

1. What is business resilience?
 - a. Correct answers must describe business resilience as a quality or measure of a company's ability to survive disruptions.
 - i. Examples of correct answers:
 1. "The ability of an organization to successfully respond and adapt to disruption"
 2. "Umbrella for existing risk management tools"
 - ii. Examples of incorrect answers:
 1. The participant shows they know that business resilience has to do with dealing with and planning for unforeseen disruptions.
 2. Any type of just "planning" in general
 3. Any other types of risk management including BCM, crisis planning, etc.

2. What is the relationship between business resilience and other fields such as business continuity management, supply chain management, crisis management, etc.?
 - a. Correct answers must include the fact that business resilience is an overarching concept which encompasses all related risk fields.
 - i. Examples of correct answers:
 1. Umbrella concept that takes under itself related business and risk practices
 2. Encompasses related practices
 - ii. Examples of incorrect answers:
 1. They are not related
 2. There is no difference between these fields
 3. Business resilience falls under risk management (or another concept) as a subtopic

3. On pre assessment: How does business resilience deal with risk differently from other related fields? (Like business continuity management, supply chain management, crisis management, etc)
On post assessment: What does business resilience add to an organization that other related fields do not? (Like business continuity management, supply chain management, crisis management, etc)
 - a. Correct answers must describe business resilience as proactive
 - i. Examples of correct answers:
 1. Proactively evaluates and reduces vulnerabilities of an organization
 2. Turns disruption into opportunity
 - ii. Examples of Incorrect answers:
 1. More expenses

2. Employee training
 3. Crisis management plans
4. Why does the process of increasing business resilience include a review of physical infrastructure, equipment and IT systems? (What do these reviews look for?)
- a. Correct answers must indicate that this review occurs because these are important areas of an organization and vulnerabilities must be attended.
 - i. Examples of correct answers:
 1. To find vulnerabilities within a company so they can be fixed to save money and reduce downtime.
 2. To ensure there are plans in place for each
 3. Because they are important components of an organization
 - ii. Examples of incorrect answers:
 1. Because it's required by state law
5. How are workers and managers involved in the process of increasing business resilience?
- a. Correct answers must include that it is through training and/ or collaboration.
 - i. Examples of correct answers:
 1. Through collaboration between departments and increased worker training.
 - ii. Examples of incorrect answers:
 1. They are not; it's for executives only
6. How do practices for increasing business resilience affect existing risk mitigation plans such as emergency plans, business continuity plans, supply chain management, etc.?
- a. Correct answers must explain that business resilience improves plans and integrates them to a single plan
 - i. Examples of correct answers:
 1. Reviews and improves current plans
 2. Encourages integration to reduce the number of plans
 - ii. Examples of incorrect answers:
 1. Business resilience involves starting from scratch on all existing plans
 2. Replaces existing plans
 3. Removes existing plans
7. Question was disregarded. Discussion can be seen in Results and Discussion chapter.
8. On pre assessment: List some benefits of increasing the resilience of workers and managers:
- On post assessment: List some benefits of increasing human resource resilience below:
- a. All answers that described benefits of increasing human resource resilience were accepted as correct answers.

- i. Examples of correct answers:
 - 1. Stimulates creative thinking and teaches employees new skills.
 - 2. Allows employees to fluidly switch departments in the case of colleague absences.
 - 3. Resilient employees will think critically under pressure and respond better during disruptive events.
 - ii. Examples of incorrect answers:
 - 1. Any benefit not related to human resources resilience
9. Why is one risk plan preferable compared to individual risk plans such as emergency plans, business continuity plans, supply chain management, etc.?
- a. Correct answers must demonstrate understanding of the benefits such as removing redundancies and ease of understanding.
 - i. Examples of correct answers:
 - 1. Removes redundancies
 - 2. Simplifies
 - 3. Catches gaps between plans
 - ii. Examples of incorrect answers:
 - 1. Any benefit not related to having a single plan

Note: All answers with an “I don’t know” response were marked as incorrect.

Partial credit given to answers which only included some aspect of the correct answer but were not fully correct at grader’s discretion.

Appendix 3: Formal Assessment Results

The responses to the questions in the pre and post assessment and respective scores can be seen below. Table 23-37 includes results of participants who viewed the stop motion video and Tables 38-53 include results of participants who viewed the infographic.

Table 23: Stop motion video viewers pre and post assessment Question 1 responses

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
1	A company's ability to overcome any crisis (and keep the business running)	Correct	A Proactive plan to minimize the result of a disruption	Incorrect
2	The company's ability to foresee all potential risks and hazards and their ability to act with the right mindset before, during and after incidents on organizational and personal levels.	Correct	The ability to to foresee and respond to disruption. BR is an overall "umbrella" covering all other emergency plans etc	Correct
3	A company's ability to handle unforeseen events	Correct	The ability to handle disruption	Correct
4	It is the business way to cope with unexpected external disasters	Incorrect	It is the ability to prevent that any external disaster will shut down your business	Correct
5	Something to do with managing unexpected factors that may interrupt the business	Incorrect	Tools to avoid business disruption due to unexpected events	Partially Correct
6	Risk management for businesses.	Incorrect	Proactive measures against disruption of any kind	Partially Correct
7	rapid re-establishment of a business with minimal losses	Incorrect	Have pro active plans if disaster strikes	Incorrect
8	A company's ability to take on interference beyond "normal" production	Correct	A proactive tool to help when "disasters" strike	Partially Correct
9	The ability for a business to bounce back after a disaster or error has	Correct	The ability for a business to prepare for and overcome disruptions	Correct

	occurred.			
10	the ability of a given business to maintain itself in a given crisis	Correct	the ability of a business to face disruptions	Correct

Table 24: Stop motion video viewers pre and post assessment Question 2 responses

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
1	?	Incorrect	Business resilience is pro active and covers all the other plans	Correct
2	I see the above as planning tools and "checklists" whereas business resilience includes another level of awareness on a daily basis.	Partially correct	See above. BR is over-arching them all, delivering one coherent plan	Correct
3	At the end it's all about money	Incorrect	Business resilience should cover all the other fields	Correct
4	Business resilience has to be an embed part of the risk assessment	Incorrect	Business resilience brings them all together under the same umbrella	Correct
5	I think they are quite similar, and I don't know the difference between these fields	Incorrect	Business resilience include or cover all the other listed fields.	Correct
6	I don't know.	Incorrect	Business resilience combines all other fields into one solution	Correct
7	More or less the same?	Incorrect	They are not proactive	Correct
8	Resilience is the ability to overcome interferences, whereas BCM, SCM and CM are the things that come it to play when the "problems" occur.	Partially correct	BR covers all the above mentioned, but is proactive instead of post active	Correct
9	Supply chain management, crisis management and so on are all parts of business resilience.	Correct	Business resilience contains all of these fields.	Correct

10	no idea	Incorrect	business resilience contains them all	Correct
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Table 25: Stop motion video viewers pre and post assessment Question 3 responses

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
1	?	Incorrect	Proactivity	Correct
2	I am not sure.	Incorrect	A more agile way of preparing the business for disruptions	Partially correct
3	Don't know enough about the other areas	Incorrect	Business resilience is more proactive	Correct
4	I do not know	Incorrect	It adds a combined plan for all the areas and makes the business able to stay open after the disaster hits.	Partially correct
5	Don't know	Incorrect	Business resilience is proactive. On contrast to other fields, which deals with the disaster after it had occurred	Correct
6	I don't know.	Incorrect	Proactive measures; single solution instead of many separate ones	Correct
7	Don't know	Incorrect	One Plan only	Partially correct
8	I do not know that	Incorrect	RB is proactive and take all risks into account BEFORE this occurs	Correct
9	Business resilience also focus on learning from and understanding when something went wrong. How can we learn from this disaster.	Partially correct	It focuses on the preparing for a disruptions and taking countermeasures. Not just handling a crisis after something went wrong.	Correct
10	no idea	Incorrect	it proposes a single pan for all these problems, thus simplifying procedures and avoiding overlaps	Correct

Table 26: Stop motion video viewers pre and post assessment Question 4 responses

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
1	Because they are vital for the business	Partially correct	To be able to take any necessary actions if a disruption should occur. eg. the flooding situation in the video	Correct
2	As above mentioned, it is an organizational mindset and therefore you should look into all critical processes and assets.	Partially correct	Because all of it is part of the critical infrastructure for the business	Partially correct
3	Fatal for an on-going business	Partially correct	They are essential for an on-going business	Partially correct
4	Because they are the most fragile systems	Partially correct	To find out what areas is exposed to the different threats in connection with a disaster	Correct
5	don't know	Incorrect	All of these systems are vulnerable and can lead to business disruption.	Partially correct
6	To protect against threats trying to steal IP.	Partially correct	To find proactive measures against for example natural disasters	Partially correct
7	Because IT systems is core for almost all business ?	Incorrect	in order to make an overall plan	Incorrect
8	Because every aspect of interferences should be reviewed, depending on what's most important for the company	Partially correct	Because all aspects needs to be covered and are equal important	Partially correct
9	Because a disaster og attack on a business can hit any part of the company. It can be a natural disaster like a tornado or a cyber attack from a hacker. Here the physical infrastructure is important both for crisis management but also to take it into account for how fast a business is able to "bounce back".	Correct	It is important to be able to overcome any form of disruption and one could be that the infrastructure suddenly is unavailable.	Partially correct

10	this is part of the company's assets	Incorrect	physical infrastructure etc. are also prone to disruptions which can severely affect the business	Correct
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Table 27: Stop motion video viewers pre and post assessment Question 5 responses

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
1	?	Incorrect	To share knowledge, and being aware of areas where there are a limited number of people with the knowledge	Correct
2	I guess that depends on the individual company policy?	Incorrect	Each has part of the responsibility, among other the obligation of working with colleagues and helping others in case of disruption	Correct
3	All need to be a part of the plan	Partially correct	They should be able to cover for each other	Correct
4	I do not know	Incorrect	They all have to be aware of their role in the event of an emergency	Partially correct
5	Managers should build a resilient team.	Partially correct	Closer cooperation between employees will make the organization more elastic, and people will be able to perform each others duties easily.	Correct
6	I don't know.	Incorrect	They can get additional training or are motivated to collaborate between sections as proactive measure	Correct
7	Don't know	Incorrect	?	Incorrect
8	?	Incorrect	Knowledge about the company and production increases the ability to take on other tasks and therefore increases BR	Correct
9	Business resilience is also about work culture and emergency plans. The employees and managers needs to be aware of the different plans that	Correct	It is important to have people working together and to have contingency plans in case en employee quits etc.	Correct

	should keep the business afloat during a crisis.			
10	no idea	Incorrect	building teamwork so that people can cover up for each other and (here I make assumptions) use all knowledge available to foresee issues and take action	Correct

Table 28: Stop motion video viewers pre and post assessment Question 6 responses

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
1	I think Business resilience plans are more on the overall strategic level, where the others are more on the tactical level	Incorrect	They are all put together in one plan	Correct
2	I don't know	Incorrect	It helps them becoming more coherent. Improving the fit with organizational structures	Correct
3	Should support each other	Partially correct	Only one plan needed	Correct
4	They have to support each other, so in an event of an emergency that they will not collide	Partially correct	Business resilience will make sure that they all work together	Correct
5	don't know	Incorrect	don't know	Incorrect
6	I don't know.	Incorrect	They are combined into one solution	Correct
7	Don't Know	Incorrect	?	Incorrect
8	The practices should be a learning experience and be used to develop the existing plans to the better	Correct	By taking all/most risks into account the company should have a better chance of going "back on track" as the plans worked together	Correct
9	You need to make sure that the different plans and management roles correlate.	Partially	Business resilience creates one big cohesive plan that makes sure every plan to protect against disruptions work together even after a disaster strikes.	Correct

10	no idea	Incorrect	resilience encompasses them all and simplifies these separate procedures to include them into a general strategy. thereby resilience makes these separate plans obsolete.	Correct
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Table 29: Stop motion video viewers pre assessment Question 7 responses

Participant	Pre Assessment Answer	Score
1	Not so vulnerable. Decrease the chance of hacker attacks	Correct
2	No ideas	Correct
3	Faster recovery when stuff happens	Partially correct
4	To ensure a stable operation	Correct
5	don't know	Correct
6	Protection against 'hacking', better working conditions	Correct
7	Don't Know	Incorrect
8	Less exposed to cyber attacks, more knowledge among the employees on social engineering,	Incorrect
9	Keeping employees and their information safe from ill willed people and having contingency plans in case of emergency.	Incorrect
10	lower risk of theft, keeps some functionality in a crisis situation	Correct

Table 30: Stop motion video viewers post assessment Question 7 responses

Participant	Post Assessment Answer	Score
1	If the competitor doesn't have a plan, they could get out of business if a disaster occur. Then you can take over their customers	Correct
2	The business would be better prepared in case of disruption, reducing losses and time out of market.	Correct
3	Company will be able to survive and even take over business from unlucky competitors	Partially correct
4	If your competitor has to shut down because of the disaster, and you can continue your operation as normal	Correct
5	Customers will choose more reliable company. Company without business disruptions	Correct

6	Disruptions might eliminate competitors while your company is prepared	Correct
7	They can easily continue business even when disaster strike	Incorrect
8	If the company's resilience is better than the competitor it has a good chance of surviving a disaster. Might be able to overtake the competitor's business/production/customers.	Incorrect
9	If something happens like a cyber attack the resilient business will have plans to overcome the disruption and probably have other systems ready to take over in case of emergency, where other businesses might close down and lose customers.	Incorrect
10	in case of a foreseeable disaster that has been accounted for, a more resilient infrastructure would still be up and running where others would shut down	Correct

Table 31: Stop motion video viewers pre and post assessment Question 8 responses

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
1	More stable organisation.	Partially correct	Knowledge sharing. Flexibility. not so vulnerable to employees who chose to quit or get sick	Correct
2	No ideas	Incorrect	In order to make your employees act in a more resilient way, you will have to focus on their skills and competencies. This is a well-known factor for improving their well-being and thereby their performance	Correct
3	Faster recovery when stuff happens	Partially correct	Work force will be able to cover for each other	Correct
4	To ensure that the employees know what to do in the event of an emergency	Partially correct	More efficient resilience response time	Partially correct
5	don't know	Incorrect	It is easier for others to cover the tasks of a person during the leave (during the illness, maternity leave etc.)	Correct
6	I don't know.	Incorrect	Tasks can be mitigated in case of sickness	Correct
7	Don't Know	Incorrect	Easy to continue with business	Partially correct

8	More productive, less stress, better communication, better service, working environment	Correct	take on another employee's job when fx. sick, more skills = better resilience	Correct
9	Everybody is working towards the same goal and can work better together, also during a crisis.	Correct	You don't lose knowledge when a person leaves the company. Everyone can support each other and share knowledge across departments.	Correct
10	operations in crisis situations closer to normal business	Correct	efficiency in daily work; easier staff management; easier to face increase/decrease of workload	Correct

Table 32: Stop motion video viewers pre and post assessment Question 9 responses and scores

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
1	To ensure that no plan works "against" each other	Correct	You do not say they same stuff twice	Correct
2	No ideas	Incorrect	It will reduce the case of collision between plans	Correct
3	Makes it more simple to learn and update	Partially correct	No dependencies, only one plan to learn and update	Correct
4	I do not know	Incorrect	It is easy to remember and incorporate one plans than many different	Partially correct
5	If the risk probability is low, one single plan to deal with all risks would provide more chance to exercise and improve the plan. Also, maybe different risks often occur at the same time and individual plans may interact with each other in unexpected ways.	Correct	Because with one plan it is possible to avoid overlaps of a number of plans. It is easier to implement one single plan.	Correct
6	Because it can make use of overlapping	Correct	It eliminates overlaps between plans	Correct

	risks/solutions.			
7	Don't Know	Incorrect	Everybody involved only need to take one plan into consideration if disaster strike	Correct
8	Because all plans should be able to work together if/when more problems occurs	Correct	One plan to rule them all! With one plan it is easier to adjust and update to find the right way to solve a problem/overcome a disaster	Correct
9	To make sure that they correlate and work together so they don't counteract.	Correct	One big cohesive plan makes sure that the different plans doesn't counteract each other and makes sure everyone is working towards a common goal.	Correct
10	one plan may encompass all these issues and consider their interdependence	Correct	one risk plan is simpler, avoids overlaps, and highlights interdependencies between parts of the business	Correct

Table 33: Stop motion video viewers pre and post assessment Question 10 responses

Participant Number	Pre assessment Rating	Post assessment Rating	Difference
1	2	3	1
2	2	3	1
3	2	5	3
4	2	5	3
5	1	2	1
6	1	3	2
7	2	4	2
8	3	4	1
9	2	4	2
10	1	2	1
Sample mean (SD)	1.8	3.5	1.7

Table 34: Stop motion video viewers post assessment Question 11 ratings

Participant Number	Rating
1	5
2	4
3	4
4	5
5	5
6	4
7	5
8	5
9	4
10	3
Average rating	4.56

Table 35: Stop motion video viewers post assessment Question 12 ratings

Participant Number	Rating
1	5
2	3
3	4
4	5
5	4
6	4
7	4
8	4

9	3
10	3
Average rating	4

Table 36: Stop motion video viewers post assessment Question 13 ratings

Participant Number	Rating
1	4
2	4
3	3
4	4
5	4
6	4
7	4
8	3
9	3
10	2
Average rating	3.67

Table 37: Stop motion video viewers post assessment Question 14 responses

Participant	“Do you have any suggestions on how we could improve the tool?”
1	No, it's fun and educational
2	No
3	Depending on who the receivers are :-)
4	
5	It is important to make the implementation of the tool in a way that people won't forget it. For example repeating it every few months or similar. a number of different tools may be good to use to explain the same ideas with different words.
6	
7	More details

8	Longer video
9	Maybe add some headlines. Maybe some subtitles, some people learn better when reading.
10	show a bit more how a resilience plan takes into account all the other plans; tell more about practical implementation

Table 38: Infographic pre and post assessment responses for question 1

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
11	The ability of a company to withstand a plethora of threats	Correct	A company's ability to successfully mitigate disruptions and threats	Correct
12	The ability to handle foreseen as well as unforeseen disruptions and turn them into business opportunities	Correct	The ability to handle foreseen as well as unforeseen disruption and turn it into opportunities. Furthermore it offers an opportunity to assess vulnerabilities in the general business system and corrected to the benefit of everyday operations.	Correct
13	It is having a systematic approach to the threats and associated consequences that it could have for your business. A company with a high business resilience has ensured that the risk of operation being stopped or slowed down is low (avoid money loss and minimize potential money loss).	Partially correct	Ability to react to threats in an efficient way	Correct
14	The ability for companies to withstand or remain immune against external threats or a plan for dealing with various types of threats.	Correct	The ability for a company to handle internal or external threats.	Correct
15	How good a company is to deal with threats	Correct	How a company can respond to and adapt after a major	Correct

			crisis	
16	Business resilience is from what i've heart, a plan for what could be a catastrophe for the company. Like a risk analysis of what can go wrong and a plan for how to handle it.	Incorrect	Business resilience er et vaerktoej til at vurderer risi for virksomheder. Her kan man oege stabiliteten ved forskellige foer uforudsete haendelser.	Correct
17	The company's ability to adapt to threats	Correct	Business resilience helps the company adapt when threats or changes occur	Partially correct
18	crisis management	Incorrect	An emergency plan, what I would normally call a crisis management plan	Incorrect
19	expect the unexpected	Incorrect	It's about avoiding risk, innovation, be better prepared, make your processes smother and and less time consuming	Correct
20	It is a term for how well the company is overcoming losses or problems so that it will sustain, so a good business resilience will result in a more sustainable company.	Correct	Business resilience is a term for a business being prepared for unforeseen events and be adaptive to risks and be prepared for its effects.	Correct

Table 39: Infographic viewers Pre and post assessment responses for Question 2

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
11	My perception of it is that Business resilience is an umbrella strategic activity (overall), whilst the others are more granular in approach.	Correct	BR acts as an overarching strategic activity i.e. umbrella	Correct
12	Business resilience is an umbrella concept covering the other concepts	Correct	Business resilience is an umbrella concept gathering the other concepts.	Correct
13	In my opinion, business	Correct	Business resilience is an	Correct

	resilience is a collection of mentioned fields		umbrella that covers the other fields mentioned	
14	I am guessing business resilience is the umbrella term, with the others being subfields.	Correct	Business resilience is the umbrella term, which integrates the other fields.	Correct
15	I don't know	Incorrect	its an umbrella for all the other fields	Correct
16	I do not know this answer. I would guess that business resilience is a more wider matter. Business resilience is a matter that crosses those fields.	Partially correct	Der er forbindelse imellem div. risiko analyser. Business resilience er et samlet vaerktoej som ogsaa omhandler de omtalte omraader.	Correct
17	I don't know	Incorrect	Business resilience should be applied in the different business fields to prepare the company to threats	Partially correct
18	I have no idea	Incorrect	Business resilience is an umbrella term	Correct
19	Don't know	Incorrect	They all go in hand. You will be able to react faster and more correctly. You must changes together, otherwise you have a missing link, and the you lose the benefit.	Correct
20	Business resilience is a key for business continuity because of its link to a company's sustainability and factor in overcoming problems as well as loss.	Incorrect	It is a collective of all of it, it stands as an umbrella solution that ensures that all aspects are involved and it mixes all of the plans together so you have a singular and much more simple plan.	Correct

Table 40: Infographic viewers Pre and post assessment responses for Question 3

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
11	I don't know.	Incorrect	It perceives disruptions and threats as an opportunity	Correct
12	Business resilience is focusing more on	Incorrect	Agility and ability to handle the unforeseen	Partially correct

	consequences than probabilities.			
13	No, risk = likelihood times cost.....also on moon I believe	Incorrect	looking at the resilience in a company from a helicopter	Partially correct
14	Not a clue.	Incorrect	It provides an overall effective strategy for on an organizational and personnel level to deal with unforeseen incidents.	Partially correct
15	I don't know	Incorrect	I don't know	Incorrect
16	Business resilience deals with risk in a more abroad way. It is more about what around the company then what goes on inside. I would guess that business resilience also handle such as nature catastrophe and societal problems that could impact the business	Partially correct	Business resilience add f.eks. risiko for terror eller naturkatastrofer som andre risk assesment ikke ville omhandle.	Incorrect
17	I don't know	Incorrect	I don't know, but it creates a safer environment and it makes it possible for the company to remain competitive if a threat occurs	Partially correct
18	don't know	Incorrect	I would argue that business resilience is just another term for crisis management	Incorrect
19	don't know	Incorrect	Structure, responding time is faster than before.	Correct
20	I assume it is more focused on the preceding procedures compared to being based on solving a crisis or problem it rather makes sure the problem will not happen in the first place, based on being on prepared and informed of the risks.	Correct	It completes a more simple and complete plan. It makes a single plan compared to several, and therefore has a united plan.	Correct

Table 41: Infographic viewers Pre and post assessment responses for Question 4

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
11	Because they are fundamental pillars for any type of business	Partially correct	Because it is an integral part of a company's day to day work	Partially correct
12	The physical infrastructure is the necessary foundation for communication, production, security and so on. If it doesn't work you will be out of business.	Partially correct	Because all elements is necessary to run a business. It is the core infrastructure of running a business.	Partially correct
13	Avoid loss of money and minimize potential loss of money – losing any of the mentioned items will affect your business operation	Partially correct	it has an impact on the the resilience of the company	Incorrect
14	To evaluate whether or not changes are needed in order to increase their resilience against external threats (perhaps also against internal threats, now that you mention IT)	Correct	Physical infrastructure, equipment and IT-systems are all needed for a company to maintain productivity and move forward, which they are key components to secure against unforeseen incidents.	Partially correct
15	Because that's you production facilities	Partially correct	Because that's the company's vital assets	Partially correct
16	I would guess that a process like that would be done to keep company secrets more safe. Could be to make a better firewall against hackers. Equipment and physical infrastructure could be reviewed to reduce sick days or accidents due to wrong equipment and physical infrastructure.	Correct	Dette er to af de tre hovedpunkter som Business resilience vedroerer. Det handler om at goere den arbejdsplads mere fleksibel og sikker.	Correct
17	I don't know	Incorrect	Because these are vital elements when running a	Correct

			business and it is therefore important to have a backup plan if challenges occur e.g. if an IT-system broke down	
18	don't know	Incorrect	In order to optimize emergency procedures	Partially correct
19	To avoid risk and maintain uptime	Correct	Everybody employee works on an IT platform, and therefore IT is critical for an organisation. Processes for users and disaster recovery is controlled by IT infrastructure.	Correct
20	Because these are fields that are at risk, it is fields where you can prepare your company in order of preventing loss or other problems.	Correct	It does so because of the importance these matters have on a company's resilience, the infrastructure and IT Systems are a vulnerable way into a company and can be of rather great danger if these are not protected in the right manner.	Correct

Table 42: Infographic viewers Pre and post assessment responses for Question 5

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
11	I don't know that they are. My experience is that companies seldomly utilise first hand knowledge of employees	Incorrect	By participating in training sessions	Correct
12	Bottom-line humans are the most important component in creating agility and business resilience. People can communicate, be creative, solve complex problems, establish alternative infrastructures, and so on	Correct	They provide resilience through creativity, collaboration, communication, problem-solving, craftsmanship. You can not be resilient without people.	Correct
13	Yes	Incorrect	involved in the identification of threads and mitigation strategy	Partially correct

14	Don't know. I am guessing workers are included to identify processes on the tactical level, in an effort to identify where improvements can be made, and managers included to identify the same on the strategic level, e.g. in regard to implementation of a new policy.	Partially correct	Workers and managers are involved to optimize processes and have a common basis for creating resilient thinking amongst employees.	Correct
15	I don't know	Incorrect	By collaboration	Correct
16	Everybody involved needs to maintain the changes that business resilience analyse do bring.	Partially correct	Vi er noed til alle at vaere indvoldveret for at hoejne sikkerhedsniveauet.	Correct
17	I don't know	Incorrect	I don't know	Incorrect
18	don't know	Incorrect	Trying and explaining of potential crisis management	Partially correct
19	?	Incorrect	We are informed if changes are happening, if we need to know. Both workers and management are participants in changes, if they need to be involved.	Correct
20	They need to be both aware and informed of the risks in the company as well as being prepared themselves as the employees and managers are a liability and risk just as the IT systems and infrastructure are.	Correct	They are key, as they stand as a vulnerability in any company, seeing as they are the operating force and must be both informed and aware of both risk and solutions to problems.	Correct

Table 43: Infographic viewers Pre and post assessment responses for Question 6

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
11	I don't know	Incorrect	By increasing the effectiveness of the response	Partially correct
12	If would increase the focus	Partially	It extends the understanding	Correct

	on training and preparing for agility.	correct	of vulnerabilities. It increase the focus on human capabilities.	
13	If it affects the threats or consequences for the business, a management may consider changing the procedures in certain areas also the mentioned	Partially correct	they are an integrated part of business resilience	Partially correct
14	Don't know. I am guessing it may affect policy-wise, i.e. update/improvement of policies and practices.	Correct	Business resilience affect existing plans by integrating them, making it a more holistic approach to incident response planning, thus covering all of the above and more into one integrated plan.	Correct
15	I don't know	Incorrect	??	Incorrect
16	This is just a matter of how well or badly the company takes out. There may come changes but i think that business resilience mostly is about external risk.	Incorrect	Det kan ændre paa eksisterende planer saafremt man finder ud af ved gennemgangen, at planerne ikke er optimale.	Correct
17	I don't know	Correct	It evaluates them and improve them	Correct
18	don't know	Incorrect	they optimize them	Correct
19	?	Incorrect	It depends. How big a change are we doing. Some changes you won't notice, and some will have greater effect on how we work or react.	Incorrect
20	It should not affect it by that much as it is more based on preparing and informing so that workers, managers and systems are prepared for the risks. So except for the investments in training and preparation there should not be a lot of investments into resilience.	Incorrect	They dont affect them, they involve them. Business resilience is a collective of all of these plans.	Correct

Table 44: Infographic viewers Pre assessment responses for Question 7

Participant	Pre Assessment Answer	Score
11	Several; compliance, anti-reputation losses, fines, InfoSec, CyberSec etc.	Correct
12	Excess capacity in case of increasing market needs.	Correct
13	A stable, maintained and well-functioning IT system and physical infrastructure is vital to any company. No bills => no money => no company	Partially correct
14	provides better security for being to operate the day-to-day business, perhaps more secure against both internal/external threats (insider threat, burglary, hackers, fires, etc.)	Correct
15	Your data are more safe	Correct
16	The company and the workers would be more safe from a wider aspect of risks. We would basically minimize our risks and plan for what could happen.	Correct
17	I don't know	Incorrect
18	don't know	Incorrect
19	Be aware of threats and make sure your hardware is up to date	Correct
20	Avoiding cyber threats, avoiding threats based on the infrastructure, such as robbery, hacks, e-mail scams, workers safety, workers privacy.	Correct

Table 45: Infographic viewers post assessment responses for Question 7

Participant	Post Assessment Answer	Score
11	for instance by mitigating threats that would have a negative impact on the perception of said company	Correct
12	If you are up and running after a disaster and they are not you will have a competitive advantage. Furthermore resilient organisation will experience more strategic agility.	Correct
13	the company that survives or live on with less damage is the winner	Correct
14	Daily operations are in many companies dependent on working IT systems and basic infrastructure. A more resilient infrastructure and IT secures operational stability that competitors may not have, in case of a sudden incidents.	Correct
15	It can start up faster after crises	Correct
16	Der behøver ikke at være tale om store ændringer. Men det er vigtigt at man har fokus paa hvad og hvordan man skal	Incorrect

	forholde sig.	
17	It can improve the competitive advantage because the company easily can adapt to changes and/or threats when being resilient	Correct
18	By being able to continue working without disruption the company will mitigate potential losses	Correct
19	Small changes in the way you work can give quite a benefit, you have more quality in processes, which in the end can save time in the end. If everybody follows the same process, your are saving time.	Correct
20	It does so by being prepared, and having backup plans if the company is suddenly faced with adversity, it can provide a fast way of rebuilding and or a new and better way to conduct business on the other side of a problem.	Correct

Table 46: Infographic viewers pre and post assessment responses for Question 8

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
11	Ensures effective response in apt situations	Correct	Increasing effectiveness of response by engaging staff through training	Correct
12	Skills in creativity, problem-solving, communication...	Correct	Creativity, Problem-solving skills. Communication, Collaboration.	Correct
13	Job security and social security	Correct	Business continuity, client trust	Partially correct
14	Not a clue.	Incorrect	More resilient human resources means more responsive employees to unforeseen situations, which may decrease the amount of mistakes made during a crisis, and a greater common understanding for how situations should be dealt with.	Correct
15	??	Incorrect	??	Incorrect
16	That would be the same answer as above.	Correct	Stoerre sikkerhed, fleksibilitet, sikring af arbejdsplads.	Correct
17	I don't know	Incorrect	Motivation of employees	Correct

18	To save business money	Partially correct	saving human lives, mitigating business loss, planning ahead of a potential crisis, creating procedures for potential crises	Correct
19	?	Incorrect	?	Incorrect
20	Workers safety, workers privacy, infrastructural safety, robbery and IT systems being better protected.	Correct	It will benefit the company's ability to be productive even in crisis, it makes the workers more safe, it provides more secure work spaces.	Correct

Table 47: Infographic viewers pre and post assessment responses for Question 9

Participant	Pre Assessment Answer	Score	Post Assessment Answer	Score
11	Increase effectiveness	Partially correct	To ensure effective and correct response, as well as the ensuing debriefing	Partially correct
12	Because everything is connected in a system = company. It allow us to draw on all resources. It creates an overview.	Correct	Coordination and prioritization of action plans will become easier. It will be easier to use the full set of organisation resources. Vulnerabilities and inter-dependencies will become more transparent.	Correct
13	If you have not included a security plan for the area that become critical, it does not matter to have security plans for others events, even though you thought they were important. You need overview to have the right set of security plans that mitigating your risks	Partially correct		Incorrect
14	For the sake of having one holistic overview, rather than segmented or compartmentalized plans, which may be inconsistent and provide opposing instructions to the same	Correct	Individual risk plans may have opposing strategies to the same problem, whereas one overall plan can encompass various plans that are synchronized to make it more effective,	Correct

	dilemma/challenge.		more straight forward and a resilient policy that secures that key employees all act in accordance with the overall plan.	
15	??	Incorrect	??	Incorrect
16	If you do one risk plan you minimize the risk of individual plan to not interact well.	Correct	Det er altid bedre at samle risikoanalyser/planer, saaledes at man sikrer, at der ikke er modstridende oplysninger.	Correct
17	I don't know	Incorrect	i don't know	Incorrect
18	don't know	Incorrect	Although you have once umbrella term, you still need to divide the plan into various steps and sub-plans. Hence, it would be advisable to have a subdivision of the plan.	Incorrect
19	Because of a general wish of simplicity for both workers and managers, it is preferable as it makes it more likely that all parties understand the plans, and can easily be educated in them.	Correct	Well, if the fire alarm goes off, everybody should be aware of what to do. If you have 1 plan, everybody knows the plan. If you have 25, you have people going in each direction.	Correct
20	Because everybody should follow same strategy. You can't contain 75 different risk plans	Correct	It simplifies and makes it easier for workers and managers to be informed in a more simple way.	Correct

Table 48: Paired T test results for the infographic

Participant Number:	Pre assessment rating:	Post assessment rating:	Difference
1	1	2	1
3	3	3	0
6	1	5	4
7	2	3	1

10	1	3	2
11	2	4	2
13	2	3	1
14	2	4	2
19	2	4	2
20	2	4	2
Sample mean (xbar)	2	3.5	1.7

Table 49: Infographic viewer ratings for question 11

Participant Number	"How much did you enjoy using this tool?"
2	4
4	4
5	3
8	4
9	2
12	4
15	3
16	4
17	1
Average response	3.20

Table 50: Infographic viewer ratings for question 12

Participant Number	"How much did you learn by using this tool?"
2	4
4	3
5	2
8	3
9	3

12	4
15	4
16	4
17	2
Average response	3.20

Table 51: Infographic viewer ratings for question 13

Participant Number	“Rate how likely you are to show this material to a customer”
2	5
4	4
5	3
8	3
9	1
12	4
15	3
16	2
17	1
Average response	2.89

Table 52: Infographic viewer responses to question 14

Participant	“Do you have any suggestions on how we could improve the tool?”
11	explain how business resilience integrates existing plans (i.e. removing redundancies) this response was given verbally and paraphrased by Ben
12	I think you lack a better example on what Morgan did on the physical infrastructure.
13	I don’t know how. but i would like to make it more personal to me or my situation.
14	Infographic was good. More colors could create basis for dividing the story-line a bit. Other than that, it was great.
15	
16	It would improve to have at deeper dialog along the tool.
17	

18	Very nice design, less info / people tend to forget the start, by the time they have reached the bottom of the infographic. Also, people tend to read in an F-structure.
19	
20	No

Table 53: Infographic viewer responses to question 15

Participant	“For the infographic, what did you think of the introductory example used?”
11	A fitting example that we can all unfortunately relate to.
12	It is a good example. I would suggest to look for one that are more likely, for instance a bridge or road being closed, a fire in the production facilities, or similar.
13	WTC is life and death and very dramatic. Business resilience is "only" money and business - important issues but still "only" business.
14	A bit political, but sends a strong message. In a European context, I think the message is a bit too strong. Perhaps a little more conservative approach could be considered. From an American perspective, I completely see the relevance of using the above example.
15	It's a little too noisy - too much is happening. Don't use all that digits for the cost. Reminding me of adverts for doubtful products
16	It was great. I could use a little more time.
17	It is a good example because everyone knows about 9/11
18	I liked the case as an ice-breaker; however, the intro could be summed up more to the point.
19	It was very good. I think everybody understand the concept pretty fast.
20	It is a good example as it is a area where we all know what happened and therefore can see the subject as important.

Appendix 4: Prototype Pictures

Figure 20: Infographic

on 11 September 2001,



2 airplanes flew into the World Trade Center buildings in New York City, marking the most deadly terrorist attack in history. This attack

killed **2.753** people

and cost **416.190.000.000 DKK** in site damage

Companies throughout the World Trade Center responded in a variety of ways in order to protect their employees. One of those companies was **Morgan Stanley**

8 years prior, there was a smaller scale attack on the World Trade Center when Morgan Stanley realized employee evacuation *wasn't fast enough*

they reduced evacuation time



4 hours to
45 minutes

and they *practiced practiced practiced practiced*

Morgan Stanley and other companies *adapted* and *responded* to a disruption so when that disruption happened again, **they were prepared.**

this ability of an organization to successfully adapt and respond to disruptions is called

BUSINESS RESILIENCE

there are **3** main areas of business resilience which Morgan Stanley addressed

<p>PHYSICAL INFRASTRUCTURE AND IT SYSTEMS</p> <p>identified vulnerabilities and corrected them after first attack</p>	<p>HUMAN RESOURCES</p> <p>frequently practiced building evacuation and emergency responses</p>	<p>STRATEGIC PLANNING</p> <p>backup work location was ready at a moment's notice</p>
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business resilience is an **umbrella** for related concepts like **risk management**, **business continuity management**, and **emergency planning**

It doesn't ignore existing programs and plans. Instead, it *makes them better* by encouraging **integration**.

It's different from other fields because a company with a **resilient mindset** seeks *opportunity in disruption* and proactively evaluates and *reduces vulnerabilities* of an organization.



All employees, whether workers or managers, should **get involved** through *collaboration* between departments and increased *employee training*.

Why should my business have a resilient mindset?

There are many benefits, including:

Competitive Advantage	Resilient infrastructure and IT systems enable an organization to continue work after a disruption with little delay and therefore outlast competition .
Human Resources	Training and encouraging collaboration among employees stimulates creative thinking and allows employees to fluidly switch departments as needed. Resilient employees think critically under pressure and respond better during disruptive events.

BUSINESS RESILIENCE

is a vital concept to all organizations. Is your business resilient?

Sources:
<http://edition.cnn.com/2002/09/11/09/september.11.usa.twin.tower.attack/>
<https://www.kobal.com/sites/occupational/2014/09/04/will-your-business-recover-from-disaster/#7222257222c>
<https://www.01.com/strategy/they-almost-011>
<https://www.01.com/strategy/they-almost-011>

Designed By **RACHEL WELCH**

Figure 21: Stop Motion Video Screenshots



BUSINESS RESILIENCE

is the ability of an organization to successfully respond and adapt to disruption

A Resilient Mindset

Business resilience is the ability of an organization to successfully respond and adapt to disruption. It is an umbrella concept that takes under itself normal business practices. Resilience is not something you have, rather it is something you are. A resilient mindset looks at how to recover so a company is no longer vulnerable to the same type of disruption rather than only restoring the previous level of operation.

Goes Beyond Reaction

While other business practices focus on reaction and response to disruptions, business resilience goes beyond reaction to proactively evaluate and reduce vulnerabilities within an organization. A resilient mindset enables an organization to turn disruption into opportunity.

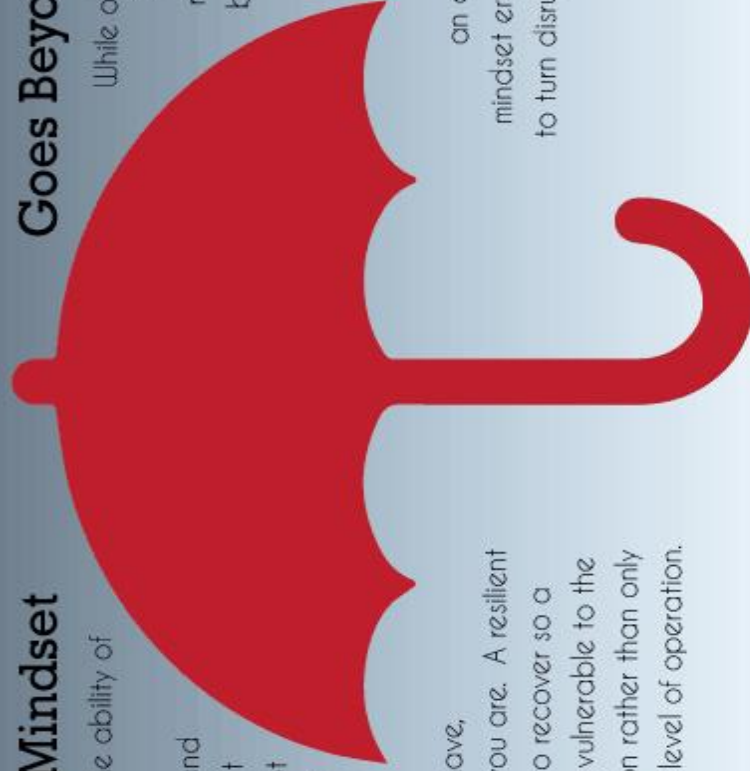


Figure 22: Booklet

Figure 23: Flyer

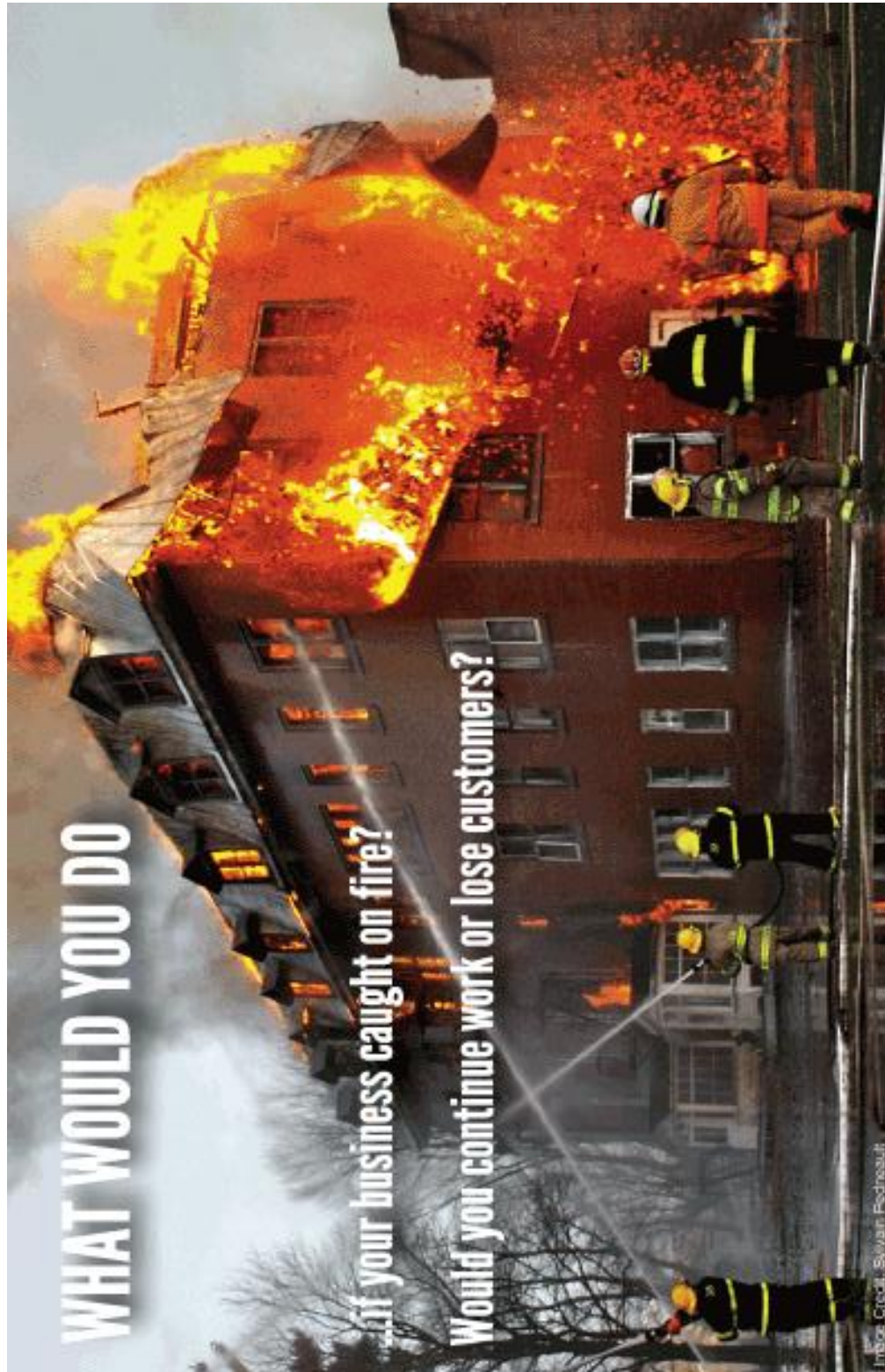


Figure 24: Prezi

