

### 3 A resilience lens for enterprise risk management<sup>1</sup>

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#### Enriching corporate risk management

What happens when a fire strikes at the manufacturing plant of the sole supplier of semiconductors used in millions of cell phones? What can a food company do when the natural environment from which it draws its resources is increasingly degraded? And how can a company increase its fitness with respect to unforeseeable challenges? To survive and thrive in the face of stress and disruption, a company can seek for **enterprise resilience**, which we here define as *the capacity of business to survive, successfully adapt and prosper in the face of change and uncertainty related to disturbances with a high impact and a low probability.*

Natural disasters, economic crises, political turmoil, terrorist attacks, environmental degradation and disruptive technologies are just a few examples of the **many kinds of stresses and disruptions** that can impact a company's bottom line. In a global, interconnected world such shocks become more complex, have increasingly big consequences and leave less time to react. Seemingly harmless events, which arrive with little or no perceived warning, may turn out to have serious consequences. It is sometimes only in hindsight that the root causes become visible.

Striving for resilience requires a systemic approach – a strategic and operational perspective that treats the company as a system, and emphasises criteria applicable to any system. A resilience lens in enterprise risk management empowers a company's structural *ability to 'bounce back'* after

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a shock or disturbance. It also strengthens the firm's capacity to survive, continuously develop and transform to prosper in complex environments. It prominently does so through *widening the system's horizon*, including social, environmental, economic and emergent factors that a company may not 'own' and be unable to directly control. Finally, to foster the resilience of a company also means to build its *long-term adaptive capacity*. In short, a resilient company can absorb disruption, acknowledge its interconnectedness and proactively change.

Company boards recognise that both the speed with which risk events unfold and their impact on business appears to escalate. They express concerns that their current risk practice no longer adequately protects their company.<sup>6</sup> 'Black swans'<sup>7</sup> or 'fat tails' have been recognised for some time now, yet much of risk management still heavily relies on traditional *Value at Risk* (VaR) analysis assuming normal risk distributions and to a large extent neglects uncertainty, i.e. risks with hard-to-define probability. A company that **ignores fat tails** underestimates its total risk exposure. On the other hand, the effective anticipation of rare high-impact disruption can lead to a competitive advantage, and thus should be viewed as a business opportunity.

Traditional enterprise risk management is optimised to assess and mitigate risks that follow normal statistical distributions, i.e. that are well defined, linear and measurable. However, it does not account well for risks that are difficult to model because of their non-linearity, multi-dimensionality, propagation over multiple scales or by their mere rareness to actualise. A resilience perspective in enterprise risk management shares many traits with traditional Enterprise Risk Management (ERM) – it supports the survival and thriving of business. It enhances a more traditional focus by applying a systemic approach and by emphasising low probability, slowly accumulating, discrete or unknown risk, dynamic developments, feedback loops and thresholds. The main goal of enterprise resilience is to ensure the adaptability of a company – subjected to an acute or chronic stress, and with a long-term perspective.

We propose a set of resilience lenses grouped in three dimensions or levels: **Structural resilience** focuses on the systemic nature of the company itself, with a view to improve business continuity management. *Redundancy*, *modularity* and *requisite diversity* are important aspects to this. **Integrative resilience** emphasises the complex interconnections of the company

6 PwC (2011), 3

7 Taleb (2007)

with its environment. We highlight *multi-scale interaction*, *thresholds* and *social capital*. Finally, **transformative resilience** adds a longer time scale and so opens the range even more, to ensure and enhance a company's transformability. Here we discuss *distributed governance*, *foresight capacity*, and *innovation and experimentation* as enablers. One can also frame the presented lenses as different facets of the same prism providing different ways to look at the same thing: the resilience dynamics of an enterprise. The structuring in levels – from structural to transformative – allows shifting focal scale: from (1) the company through (2) its interconnections with its environments to (3) long-term adaptability.

The project documented here is part of the Resilience Action Initiative (RAI). Privately launched at WEF 2012, RAI was set up with the vision of business, by working and innovating together, making their value chains and local economic partners (i.e. at city and regional level) more resilient to stresses arising from the energy-water-food nexus, amplified by climate change risk factors. This chapter turns the focus of resilience to the companies themselves, going beyond a mere focus on the energy-water-food nexus. The chapter represents a pioneering effort, stressing the importance of putting resilience on the enterprise risk management map. For the individual company, this chapter serves as a starting point to deal with resilience, from which its resilience approach can be 'customised' according to the specific environment and factors of importance for that company. Because specific resilience requirements may vary strongly between industries and companies, we here deliberately refrain from providing detailed practical advice on an individual company basis.

***Similar type of disaster – different effects: Deepwater Horizon vs Exxon Valdez***

The comparison of two equivalent high-impact low-probability events, the 1989 Exxon Valdez and 2010 Deepwater Horizon oil spills, illustrates how the risk landscape has changed in recent times. Both spills were the largest ever in American waters at their time, had a severe environmental impact and resulted in the pollution of vast stretches of US coastline. From an enterprise risk perspective, however, a strong contrast between the two disasters exists.

While the Exxon Valdez spill resulted in strong uproar amongst locals and environmentalists, other stakeholders largely ignored the incident. This gave Exxon ample time, first to handle clean-up operations and subsequently to take a strictly legalistic hard line on claims and regulatory issues. News of the Deepwater Horizon catastrophe, on the other hand, instantly spread around the

world and produced an outcry from stakeholders and the general public through digital social media that did not yet exist 20 years before. Extensive media coverage, including 24-hour webcam footage of oil spewing from the well, made the world's eyes turn to the incident and lead to close scrutiny of BP's reaction to the event.

In contrast to Exxon's 1989 spill, in 2010 BP only had a fraction of the time of its predecessor to react while the impact of the event was much more severe, both regarding environmental damage and from an enterprise risk point of view. The enterprise-wide reputational damage for BP was enormous, and the event's impacts have swept across the industry.

*Source: Adapted from PwC (2011)*

## Structural resilience

The focus of structural resilience, which is also known as 'engineering resilience', lies on *bouncing back faster after stress, enduring greater stresses, and being disturbed less by a given amount of stress*.<sup>8</sup> In other words, this first level of resilience is all about enhancing capacity to withstand disruption. It concentrates on resilience aspects that are internal to a given company, such as its strategy and organisational structure. Structural resilience aspects and measures are therefore easiest to implement and control, and form a fundamental step to increase resistance against disruption. Structural resilience comprises three different lenses – redundancy, modularity and requisite diversity – each of which will be discussed below.

### *Redundancy*

Before September 11, 2001, many financial service firms had a massive network of IT infrastructure in and around the World Trade Center, which formed an important connection to the US markets. When the terrorist attack on and subsequent collapse of the towers left Deutsche Bank's New York's facility in ruins, redundant IT systems in Ireland took over operations. On the very same day, the company was able to clear more than USD300 billion with the Fed.<sup>9</sup> Deutsche Bank used a conceptually simple and intuitive way of limiting the potential impact of disruption: the introduction of redundancy, i.e. putting in place **buffers** that can absorb the impact of

8 *Martin-Breen and Anderies (2011)*

9 *Sheffi (2007)*

a shock. Such buffers can be of many different kinds and generally come at a cost, such as the safety stock kept by a manufacturing company or redundant production capacity for a company's most important product lines. Redundancy also comes with company size: a large multinational has more physical and financial capital to absorb shocks of a given size than a medium-sized enterprise. It provides overcapacity that protects against critical failure or, more plainly put, keeps the company running when it receives a blow.

While redundancy is a simple and effective measure to increase resilience, it goes against the efficiency push many companies established over the last decades. Cutting inventories and building leaner supply chains resulted in a very high efficiency and a strong increase in quality of products and services. Rather than reversing the gains of these efforts, companies need to critically assess the **costs and benefits of redundancy** in its different forms and independently determine their own position in the trade-off between resilience and efficiency.

### *Modularity*

In businesses that are internally strongly connected, shocks that initially only hit a small part of the company may propagate rapidly, causing extensive damage. Conversely, in an organisation with a modular internal structure, such **shocks can be contained**, and business is more easily restored. Modularity can be understood as a form of decentralisation, which has several additional advantages. Decentralised decision-making, such as in many franchises, empowers those who know the local business environment best. This ensures faster as well as more accurate and effective action than in a centrally governed organisation. Also, decentralised supply chains focusing on local suppliers are less vulnerable to shocks.

Another benefit of modularity is the **exchangeability of individual components**, which allows for dynamic reorganisation and more flexibility. Systems may appear complex from the outside but often have a surprisingly simple, modular internal structure consisting of components that plug into one another – much like Lego blocks – and, equally importantly, can be unplugged and reconfigured easily when necessary.<sup>10</sup> This allows for a much faster and more dynamic reaction to changing circumstances.

Additionally, a modular structure allows for **scaling up and scaling down** – the ability to flock or swarm – by increasing or decreasing the number of linkages between components or by breaking them, whichever

<sup>10</sup> Zolli and Healy (2012)

a specific situation might call for. This ability to flock or swarm increases a company's adaptive capacity – the ability to aptly react to a situational change. Cloud computing, for which linked, redundant servers are used to complete a specific task, forms a specific example.

A modular organisational structure, however, does have certain **disadvantages**. Increased independency of organisational modules can result in a loss of uniformity, which can cause problems with safety and risk tolerance. These disadvantages can be offset with a global governance framework based on principles, standards and a strong company culture. However, one should be aware of the danger in translating such global principles into local rules, as this can effectively annul the intended modularity. Introducing less visible links can make the modules act in concert. The 2008 financial crisis made it apparent that investment resilience through portfolio diversification often failed, as other financial instruments had forged strong de facto connections between portfolio elements. Similarly, if companies adopt modularity as a resilience strategy, they should critically inspect the implicit interdependencies between the modules. On a USD70 trillion global annual economy, the \$600 billion bankruptcy filing of Lehman Brothers in mid-September 2008 was a relatively modest event. However, through an epidemic of fear and uncertainty it led to a global collapse of the financial system. The crisis revealed that the system of financial companies and institutions, although modular, was (and remains) vulnerable because it was much more strongly connected than it was previously perceived.

### *Requisite diversity*

Diversity is most often discussed and applied in the human resources. Workforce diversity often refers to the gender ratio in a company or in its upper management, to the ethnical background or age of employees, to the representation of cultural and language groups, etc. Such aspects of workforce diversity all contribute to diversity of thought and skills, which stimulates discussion, fosters wiser and more considered decisions, and enhances creativity and innovation. In other words, they enhance **functional diversity** and allow a company to operate more effectively.

More important in the context of enterprise resilience, however, is what is commonly referred to as **responsive diversity**<sup>11</sup>: Various 'components' (i.e. employees, systems, strategies, suppliers, production methods, services, etc.) within a functional group respond dissimilarly to different kinds of disturbances. This is most valuable when disaster strikes. For example, a

11 Walker and Salt (2006)

diversified supply chain enables a company to cope much better with any particular disruption within that chain; a diverse set of strategies allows an enterprise to react more effectively to a change in market conditions. Analogously to a portfolio of financial products and irrespective of whether disruption is anticipated, a company with a whole range of diversified components is less prone to company-wide shocks because its risk is spread through responsive diversity.

Diversity may be associated with reduced short-term efficiency. Inhomogeneous subsystems (whether that is a workforce, supply chain, strategy or product portfolio) can demand more time and effort to manage because with diversity, certain advantages of economies of scale are lost. Diversity should not go unchallenged, and companies will be wise to ask what the appropriate focus and amount for diversity may be in particular circumstances. To increase its resilience, a company should constantly determine the right amount of diversity in all relevant components; it should strive for **requisite diversity**.

South Korean electronics giant Samsung believes it can leverage on its diversity range of products and strategies. While it is challenging to be successful in many businesses at the same time, it gives the company an advantage over its more specialised competitors in several ways. For example, Samsung adjusts more easily to the common trend of blurring lines between product segments – as, for example, is the case for mobile phones and tablets. Further, a diverse range of relatively similar products, combined with a high reaction speed to the market's response, allows the company to discover and cater for new markets quickly. The successful combination of diversity and agility proves useful both to seize opportunity and to adjust to shocks – it adds to the company's adaptive capacity and, therefore, to its resilience.<sup>12</sup>

***Structural resilience: Rabobank's unique organisation***

Rabobank ranks amongst the top-20 banks in the world by equity and is one of the few that remained relatively unscathed during the 2008 financial crisis. Unlike many others, it did not require government support. Can we pinpoint the origin of its higher resilience?

Its origins in 1890 as a cooperative agricultural micro-finance bank endowed it a unique cooperative structure. Today, it is a network of 140 member banks,

12 Nisen (2013)

which in turn have thousands of individual members. But the recognition of its importance waxed and waned, with a full-fledged effort to convert it into a conventional structure with a stock market listing in the 1990s ultimately resulting in a recommitment to the membership structure in 1998. Its strongest binding factor is the cross-guarantee, under which any individual Rabobank guarantees the obligations of all other member banks. The power balance within the Rabobank Group is a delicate equilibrium between the local banks on the one hand and the central organisation on the other. Although Rabobank lost its rare AAA credit in 2012, its unique structure is seen as a key resource for managing uncertainty in turbulent times and it has been ranked amongst the ten safest banks in the world.

In general cooperative banks with their distributed governance structures have had superior performance during the financial crisis. There are a number of explanations for their higher resilience, in which the corporate governance structure plays an important role in dealing with systemic risks. Member ownership entails a conservative banking approach with a longer-term perspective and a focus on retail banking. Cooperative banks are characterised by relatively lower risks, lower volatility and more stable returns. CEO Smits writes: "It is the task of the top-management to manage these multiple hierarchies and to keep them in a future-proof balance."

*Source: Adapted from Boonstra (2010) and Van Dijk (1999)*

## **Integrative resilience**

Any enterprise is embedded in a complex natural-social-economic system, which is constituted and influenced by many different factors and stakeholders – such as competitors, the financial markets, the natural environment and the general public. Many firms, in turn, possess the ability to influence this overall system. A company and its surrounding system are interconnected in many different, often poorly understood ways. Integrative resilience therefore requires an opening of focus from the individual company to the larger system it is embedded in or linked to. In order to become more resilient, a company needs to acknowledge this mutual dependency, and to understand its inherent risks and opportunities. *Multi-scale interaction*, *thresholds* and *social capital* are eminent concerns of *integrative resilience*.

### *Multi-scale interaction*

Consider the 2007 'tortilla riots' in Mexico – a series of public protests against the strong price rises of corn, the main ingredient of tortillas. The

corn price spike resulted from a strong dependence on American corn suppliers, which were able to sell their excess corn below production cost due to NAFTA. In the USA, corn prices went up as production was switched to fuel ethanol in many places, in response to a disruption in oil production in the Gulf of Mexico because of Hurricane Katrina, which hit the area in 2005. This example shows that seemingly disconnected events, such as a rise in food prices, result from the complex interaction between multiple system scales, which include financial, political, social and environmental aspects that each move at different speeds.<sup>13</sup>

Systems thinking<sup>14</sup> acknowledges that a natural-social-economic system consists of many different scales. It is the **interaction between different scales** that drives the emergent behaviour of the system in which a company is embedded. Changes on one of these scales influence the processes in others, which is why it is unhelpful to treat any of these scales or processes in isolation. All too often, decisions are made without understanding their broader, long-term and systemic impact. A simple way to look at this is to establish the **focal scale**, take a step up and a step down in scale, and map the interactions.

Any publicly listed company faces the time-scale related conflict of ensuring sustainable, long-term company success with delivering immediate results to shareholders. Conflicts and trade-offs between short- and long-term targets naturally affect the quest for resilience itself. Many of the resilience aspects discussed here reduce rather than improve a company's short-term efficiency, yet prove very beneficial in the long run. A difficult but necessary step towards resilience is the **focus on diverse time scales** for success.

In 2002 Anglo American, one of the world's largest diversified mining companies, introduced a comprehensive AIDS prevention programme in the workplace that addressed the problem on multiple levels. On an individual employee basis, the company offered voluntary counselling and HIV testing. Awareness, education and prevention campaigns were run and AIDS drugs made available for the whole workforce as well as all their dependents. Addressing the issue on a wider community level initially was a huge financial leap of faith, but it paid off – the efforts had a very positive economic impact and enabled Anglo's business to thrive and grow.<sup>15</sup>

13 Zolli and Healy (2012)

14 Attempts to formulate a transdisciplinary General System Theory go back to the interwar period. Since the 1960's systems thinking became a recognised paradigm to integrate both natural and social sciences, but also other fields like engineering, Systems thinking defines unifying principles, valid for all systems across fields. See von Bertalanffy (1968) or Senge (1990).

15 Voice of America (2010)

### *Thresholds*

Any system has boundaries. Once these are crossed, the system functions in fundamentally different ways. Although such system boundaries or thresholds can be approached both very slowly (e.g. climate change or fundamental shifts in consumer tastes) or very rapidly (2008 financial crisis), when the threshold is reached, change within the system occurs very rapidly in either case. Crucially, many thresholds can only be crossed in one direction – there is often no way back. In order to be resilient, a company must therefore identify its systemic position and trajectory, increase its **own capacity to adapt**, but it may as well strive to **strengthen the surrounding system's resistance** against undesirable change.

A nautical chart does not help much navigating the ocean without any tools for determining a ship's location. Similarly, for a company it is only of limited use to identify critical thresholds of its natural-social-economic environment without knowing where it is with respect to those thresholds. It is therefore essential that relevant, regular and reliable – in other words, appropriate – **feedback loops** (with appropriate sensors) are in place, through which essential information arrives and can be interpreted by the organisation.

Often, a company alone cannot influence the system sufficiently to prevent it from adverse change (e.g. prevent climate change from happening) and in that sense does not have a real choice. In order to survive, adaptation is the only option. As a first step however, it is important to **be aware** of the system's drivers and their respective thresholds. Effective adaptation and risk mitigation need time, which is why early detection, best-possible understanding and effective communication of risks are essential.

After decades of optimisation, farmers in the Goulburn-Broken Catchment in Australia have become some of the world's most efficient in producing high-quality, low-priced milk in large quantities. However, most of the dairying depends on the irrigation of pasture, which also flushes salt down that gets left behind as pastures take up water. While a decrease in irrigation would result in salt accumulation towards the top two metres of soil, an increase would result in a groundwater level rise that brings the salt up as well – which is currently only stopped by pumping. Clearly, the system is on a tight balance between two thresholds, and can only continue to function as long as no major shock occurs.<sup>16</sup>

16 Walter et al. (2009).

### *Social capital*

The importance of social capital reaches further than merely avoiding social unrest by being a good neighbour.<sup>17</sup> Maintaining a good relationship with all stakeholders – not just with local residents but also with governments, customers and suppliers – is essential to a company’s business,<sup>18</sup> whether to support its licence to operate, or to keep the local customer base satisfied. In the age of social media, local social problems can turn into global reputation risks at a speed that was unimaginable even ten years ago. However, most companies today also recognise that the potential benefits of investing in a good relationship with external stakeholders reach **beyond downside risk mitigation**. Customer advice and ideas help to improve products; environmental and safety issues may be discovered and reported by attentive local residents. Active collaboration with customers, suppliers and local communities can provide a great amount of added value, which is why the investment in social capital should also be considered an opportunity.

In a resilience context, it is important to realise that many external risks just cannot be mitigated by a company in isolation, but requires a reservoir of good will and the cooperation of multiple stakeholders across corporate boundaries. For example, a company can closely cooperate with its suppliers in response to supply chain disruptions, as the intense cooperation between Philips and Nokia after a disruptive fire in a production plant has proven. A recent study looking at climate impact to the US Gulf Coast calls for concerted action by the private sector, government and general public to fight the consequences of climate change.<sup>19</sup> The prior establishment of trust and strong networks – building bridges between stakeholders – are essential factors to enable such effective cooperation that is necessary for **risk mitigation at a systemic level**.

Coca-Cola has dedicated itself to global water neutrality, is tackling its packaging, recycling and global carbon footprint and tries to help its communities wherever they are – not merely to fend off public scrutiny but, as CEO Muhtar Kent put it, because “the beauty of [such efforts] is that they’re actually very good for business, too”.<sup>20</sup> Clean, accessible water obviously is essential for Coca-Cola’s beverage production but also connects the company to local ecosystems and the health and economic prosperity of communities that host the bottling plants. Coca-Cola recognises that these same com-

17 Turnbull et al. (2013)

18 Starr et al. (2003)

19 Entergy et al. (2010)

20 Ignatius (2011)

munities also form its consumer base. It sells its products where they are made, which means that if communities stay strong, business stays strong.

## Transformative resilience

Abruptly changing market conditions, climate change-induced environmental conditions or disruptive social and cultural developments – companies become subject to sudden, drastic changes in operating circumstances. If a company does not anticipate and proactively respond to changes in the system it is embedded in, it will risk going out of business. To adapt to both abrupt and slow but critical changes therefore is the key to the ultimate level of enterprise resilience. We here refer to the ability of an enterprise to reorganise, restructure, and even reinvent when appropriate, both in response to and in anticipation of system changes, as transformative resilience. Evaluation of *governance models*, *foresight capacity* as well as *innovation and experimentation* each support in a specific way the proactive adaptation embodied in *transformative resilience*.

### *Governance models*

According to its size, principal line of business, internal differentiation etc., a company may evaluate different models of governance – conventional and unconventional ones. *Distributed governance* e.g. implies management that is undertaken from multiple centres of authority at different levels, rather than from a single decision-making unit. This concept is also known as ‘polycentric governance’,<sup>21</sup> which is well known in the public sector – for example, in the context of irrigation systems and forest management. Compared to classic, hierarchical governance, distributed decision-making can lead to better results for complex and ambiguous tasks: for simple linear tasks, top-down control is often most effective, particularly in the short term. In distributed governance, within clearly defined boundaries of authority, decisions can be made independently, immediately and can be implemented at their most effective level. The agility and flexibility of such a governance system as a whole allows it to cope very effectively with a diverse range of risk events, to adapt itself to change and even to evolve over time, in line with new problems that arise. In a continuously changing risk landscape, this capacity to **dynamically reorganise**<sup>22</sup> is crucial in securing long-term resilience.

21 Ostrom (2010)

22 Zolli and Healy (2009)

Distributed governance works if effective interconnections and alignments exist between the interest and behaviour of individual stakeholders and that of a system as a whole – and consequently for all stakeholders. A simple example can be drawn from resource management. Sustainable water usage in water-scarce regions requires the cooperation of all stakeholders from both within and outside the company. While it may be in the short-term interest of any individual stakeholder to use more than its fair share of water, in the long term, such behaviour will deplete the resource and cause the system to collapse. Multiple governing authorities at different scales enable holistic management of such issues, whether environmental, economic or social, but require trust and effective communication between all stakeholders and decision-makers. An example for such multi-stakeholder partnership is the Cities for Climate Protection (CCP) programme, a transnational municipal network aimed at reducing urban greenhouse gas emissions that involves both state and non-state actors. The programme operates globally but is governed on national, regional and municipal levels that simultaneously address climate change issues on different scales.<sup>23</sup>

It is important to acknowledge that with governance models, one size does not fit all. Just as this is the case for other aspects of resilience, the fact that **every organisation is different** means that there is no single most effective governance system. Companies themselves should be purposeful in their governance and go beyond the simplicity of single point accountability as a panacea. Many different factors should be taken into consideration, such as the type of industry, business, or product of the company as well as the degree of dependency on the system it is embedded in.

### *Foresight capacity*

Foresight refers to a company's effort to actively engage itself with future events that are inherently uncertain and have an unquantifiable probability of occurrence. Foresight is fundamentally different from forecasting – the prediction of the future based on the extrapolation of data from the past. It is not only that there is not enough data to know the future, but many aspects are in fact unknowable. Although an effective foresight strategy can shape itself in different ways, it generally serves two purposes: foresight can **decrease corporate risk exposure** and helps to **identify business opportunities**. Describing multiple plausible futures and understanding

<sup>23</sup> For more information on the Cities for Climate Protection programme, go to: [http://en.wikipedia.org/wiki/Cities\\_for\\_Climate\\_Protection\\_program#Decentralisation\\_of\\_the\\_CCP\\_program](http://en.wikipedia.org/wiki/Cities_for_Climate_Protection_program#Decentralisation_of_the_CCP_program).

their impacts on present decision-making, allows the company to integrate uncertainty into their planning and actions.

An effective foresight strategy may comprise scenario planning,<sup>24,25</sup> emerging risk detection, modelling, war-gaming<sup>26</sup>, visioning, reverse stress testing,<sup>27</sup> red team simulations<sup>28</sup>, or any other means of engagement with the future, depending on the specific needs of a company and the character of the economic system it operates in. Irrespective of its exact form, such **foresight activity increases resilience** because it allows a company to adapt to and reduce vulnerability against potential disruptions and their common consequences before these actually occur. As the Shell Scenarios team has famously shown during the 1973 oil crisis<sup>29</sup>, even if no specific mitigation measures are taken, mere awareness enables a quicker reaction that can be enough to give the company a crucial edge over its competitors – that is, as long as challenges such as obtaining the sincere interest of upper management and dealing with too high expectations about taming the future are met.

Tackling a security threat, even before it becomes an issue to be dealt with – that is what Singapore's Institute of Policy Studies aims to do with its Prism scenarios. The scenarios present a set of alternative stories of how the country may govern itself over the next ten years based on three driving forces – credibility of government, society's definition of success, and distribution of resources. Rather than a prediction of the future, the scenario-planning method is designed to help question assumptions and develop flexible mental models for operating in the future.<sup>30</sup>

### *Innovation & experimentation*

In 1999, the chairman of home appliance market leader Whirlpool set out to make innovation a core competence at the company. Over a period of three years, the company involved roughly 10,000 employees in the search for innovation breakthroughs. Some 7,000 ideas were created, which spawned 3,000 small-scale experiments and led to a whole stream of new products and businesses. The success of this focus on innovation transformed the company for good. Today, Whirlpool continues to be recognised for its

24 Wilkinson and Kupers (2013)

25 Dunn Cavelty et al. (2011)

26 Starr et al. (2003)

27 PwC (2011)

28 Sheffi (2007)

29 Wilkinson and Kupers (2013)

30 IPS (2012)

innovation. It actively manages a broad pipeline of ideas, experiments, and major projects from across the company.<sup>31</sup>

Any company that wants to survive in an uncertain future has to be ready to react swiftly to a wide range of possible scenarios. A resilient company therefore does not depend on a single product, strategy, technology or supplier but rather aims to create diversity in every aspect of business – analogous to a financial portfolio.<sup>32,33</sup> Under continuously changing circumstances, whether these comprise an abrupt shock such as a financial crisis or a slow system shift like climate change, previously successful activities of an enterprise may no longer be beneficial. In this regard, innovation and experimentation are crucial as they enable the creation of new ideas and options – they increase diversity in all aspects of the business portfolio. A resilient company has the capability to self-renew over time through innovation – aimed at **invention, not optimisation** – and experimentation, by reinventing business models as strategies and circumstances change.<sup>34</sup>

#### ***Long-term resilience: The Subak system of Bali***

Examples of successfully harnessing risk for long-term resilience are rare in the corporate world, but we may draw inspiration from the terraced rice field systems in southern Bali known as the Subak. This millenary system manages known risks such as pests and water, but also unknown risks from internal warfare, colonisation, natural disasters, the Green Revolution and, increasingly, tourists.

Traditional Balinese techniques for water control and terrace management are based on principles nearly opposite to those of the top-down control structures favoured by the planners. The Balinese manage things from the bottom-up, by means of nested hierarchies of water temples that cooperate in setting irrigation schedules. These temples are ritual places where farmers make decisions on water flows and construction. Since the whole system is deeply interconnected, both through the spread of pests and water; no decision stands in isolation.

The Subak system has been simulated 'in silico' in order to understand its resilience to changing circumstance. Not only does it perform in the computer as in the rice fields, but more strikingly the simulation shows how governance system itself will co-evolve with the nature of the problems. As such the governance is not only multi-scalar and polycentric, but it is also itself adaptive to

31 Hamel & Välikangas (2003)

32 Välikangas (2004)

33 Zolli and Healy (2012)

34 Reinmoeller & van Baardwijk (2005)

emerging risks. In June 2012, the Subak has been designated a UNESCO cultural landscape world heritage site, throwing a new problem – that of tourist hordes – at the adaptive capacity of the system. UNESCO aims to identify and preserve such cases of resilient resource governance.

The risk management approach of the Subak holds lessons and provides new science-based tools to be adapted in corporate structures for resilience to systemic risks.

Sources: Fox (2012), Lansing (2006), Lansing (1993), Schmuki (2009)

## Conclusion

We have introduced a concept of enterprise resilience that builds on three pillars or levels. For each resilience level we described different relevant aspects or **resilience lenses**, and we gave examples of adaptation measures. Note that these measures should be considered as examples only, since their relevance and effectiveness strongly depends on the character of the specific company and the system in which it is embedded. However, this does not take away from the fact that the resilience lenses themselves are relevant for business across industries.

*Structural resilience* is about internal adaptation measures that a company can adopt to become more resistant to disruption. It includes the assessment of cost and benefits of *redundancy* and determines trade-offs between resilience and efficiency. It identifies adequate *modularity*, such as the decentralising of service and production chains. Shocks reveal whether enough responsive diversity is in place, and they can be dealt with and avoided by cultivating functional or *requisite diversity*.

*Integrative resilience* acknowledges that companies are embedded in a social-environmental-economic system, with which they need to interact both to cope more effectively with disruption and be more agile when it comes to seizing opportunity. As companies are part of complex *multi-scale interactions*, effective enterprise resilience allows the establishment of an adequate focal scale (including time scales) for each and every problem, and the mapping of linkages ‘up/further’ and ‘down/closer’ from or to this scale. It is adopted to identify *critical thresholds* and closely looks into feedback loops, not least to monitor system status with respect to thresholds. Finally, it’s crucial to build public trust or *social capital* well in advance of crises, as it will be difficult to impossible to develop these relationships under stress.

*Transformative resilience* builds on the former lenses, but additionally calls for continuous adaptation and transformation needed to survive and thrive under new operating circumstances. *Distributed governance* allows for sustainably self-organised adaptation. Compared to classic, hierarchical governance, distributed decision-making leads to better results for complex and ambiguous tasks – and allows for emergent response in turbulent times. Resilient enterprise management creates and safeguards a safe space to explore options under various *scenarios*. *Foresight capacity* increases awareness and alertness that reaches beyond specific mitigation measures. Last but not least, continuous *innovation and experimentation* allow a company to learn faster than its competitors – it increases adaptive capacity.

# Turbulence

## **A Corporate Perspective on Collaborating for Resilience**

EDITED BY  
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