Resilience Best Practices 2022

Research and Report by Prof. Dr. Stefan Vieweg

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Content

1 Executive Summary

Motivation for Research

Increasing challenges such as the COVID 19 pandemic, geopolitical tensions, the collapse of supply chains, cyberattacks, a shortage of skilled workers, and the consequences of climate change are causing problems for many companies. Improving resilience through best practices is and will continue to be a key success factor for organizations.

With the ongoing digitalization trend, there are new opportunities for companies to position themselves powerfully.

However, indications from the market side and previous studies indicate that there is:

1. a mismatch of awareness and willingness to invest and execute preventive measures, and
2. a significant unrealized digital potential.

But what are resilience best practices**, and how far does the digital potential contribute to achieve organizational resilience**? This was the guiding research question.

Research was conducted through a survey administered to senior management employees with decision-making competencies. Over 200 individuals participated in the survey from a variety of countries, with some focus on European (not exclusively) markets.

The real impact of significant critical events for businesses within the last two years were looked at (dependent performance variables) and linked to the organizational drivers, clustered in visionary and execution maturity. The underlying model with some 27 independent factors (and linking them back to systemic organizational development drivers) could be solved with artificial intelligence (AI)-based algorithms to predict a company's vulnerability against critical events and to identify adequate counter measures.

The model can be used to identify the current resilience status of an organization and potential areas of improvement and quantify the monetary effects (a measure called "unrealized resilience exposure" (URE) has been introduced).

Key Takeaways

The survey found that critical events (CE) have a significant negative monetary impact, not much damage is averted despite being at least moderately prepared, and recovery takes months, adding to opportunity costs:

Top 3 Critical Events	Negative Financial Impact	Level of Preparedness	Amount of Damage Averted	Time to Recover
1. *Pandemic (Covid-19)* 2. *Cyber incidents* 3. *Market Developments*	**51%** *of the equivalent of annual sales*	**45%** *felt at least "moderately prepared"*	**25%** *of damage averted (weighted average)*	**67%** *took "months"or "weeks" (rather than "days" or "hours") to recover*

Figure 1 Key Findings from The Survey

1. *Resilience has a significant impact on the bottom line:*

Top performers suffer the equivalent of a loss of 7% of annual sales, almost 20 times less than laggers (145% of annual sales).

2. *Money is not everything in resilience:*
   Top performers spent less on investments in resilience that equaled third quartile companies.
3. *Talking seems easier than execution:*
   Visionary maturity is easier than execution maturity, which ultimately delivers performance.
4. *There is a reason for resilience among top performers:*
   With top performers, the degree of resilience maturity in terms of vision and execution outpaces all others.
5. *An excess of spending does not significantly help:*
   There is a clear nonlinearity between resilience maturity (i.e. its implementation) and resilience funding.
6. *The sweet spot of resilience investment:*
   Optimum financial effort is within 10-25% of revenue and allowed some 30% damage aversion; smaller companies (<50k FTE) performed slightly better.
7. *Digitalization and automation matters:*
   The higher the degree of digitalization, the higher the perceived preparedness (though perceived preparedness is not a good indicator for resilience performance).
8. *AI-based models help spot improvement areas:*
   Already comparatively simple supervised algorithms provide reasonable predictive strength to implement resilience improvements.

2 Introduction

The current circumstances of business are far from being stable. According to the World Economic Forum 2022, the overall confidence is rather worrying (see Figure 2). While the relative importance of different risk categories varies year to year, there is a pattern of current major risk areas, with increasing environmental risks associated with climate change and natural catastrophes (see Figure 3). Cyber Incidents have reached the top of the list, the COVID 19 pandemic is somewhat leveling off, and new geopolitical risks are likely to emerge.

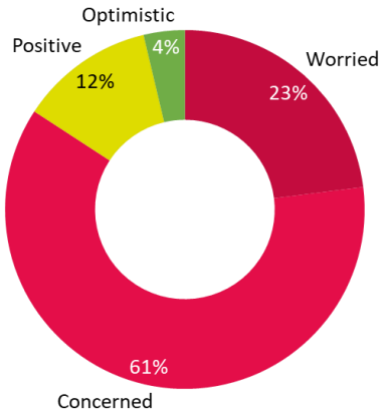


Figure 2:World Outlook 2022, (Franco, 2022)

Figure 3: Top 10 Global Business Risks (own presentation based on annual Allianz Global Risk Barometer)

Realized losses of cyber incidents alone are significant and real: 48% of all companies reported a cyberattack, with the median cost per attack rising by 29% to around $17,000. It is apparent that resilience expertise is beneficial in reducing costs: the median costs of attacks by “cyber novices” are 2.5 times higher than other (s.n., Hiscox, 2022).

While expertise in handling critical events (CE)properly is important for resilience, many companies seem to struggle, resulting in significantly high losses.

As the well-known prospect theory of Nobel Prize laureate Daniel Kahneman (Kahneman, 1979) suggests, irrationalities lead to overconfidence, and according to prospect theory, gambling and risk-seeking behavior result in a potential loss situation.

On the other hand, more scrutiny is being placed on management to ensure that they prevent damage to their company. For example, in Germany, the supervisory board is being held personally responsible for ensuring that effective risk management systems are in place to prevent a company disaster. If not, even the popular directors & officers (D&O) insurance cannot make up for missing supervision. The costs associated with implementing and developing better resilience need to be reflected in the context of reduced risk exposure.
Similar to the Value at Risk (VaR) measure well-known in the investment space, a holistic view on Unrealized Resilience Exposure (URE) is suggested to reflect the monetary impact of resilience competencies of an organization. Such a business case, showing the monetary effects and how it pays off, will help decision makers embark on establishing a resilient organization.

In order to do so, the following steps are required:

1. Baselining and understanding the current resilience situation of an organization and its Unrealized Resilience Exposure (URE).
2. Compare actual capability to what is realistically achievable.
3. Identify areas of improvement. In this phase, the monetary effects can be made transparent (see Figure 4): the unrealized resilience exposure from the baseline will be lowered by specific implementation measures. Similar to an insurance or call option, a fraction of the exposure will be realized in the form of implementation costs (Resilience Implementation Costs - RIC) and the resulting URE can be calculated.
4. Implement improvement measures in the organization in an end-to-end manner: this comprises the "visionary maturity," encompassing cultural aspects as well as principles, and operational excellence or "execution maturity" with specific processes, practices, and digital tools.
5. Check & adjust: the resulting URE can be quantified, and corrective measures may be initiated to ensure continual improvement.

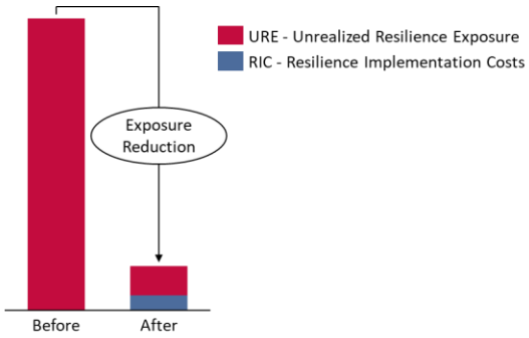


Figure 4: Principle monetary implications of resilience (indicative, own presentation)

The research study carried out here lays the foundation for the above steps. Based on scientific prework, a profound model has been set up. With quantitative empirical research carried out in 2022, the implementation degree of organizations has been identified. A prediction engine (in this case AI-based algorithms) is used to identify the resilience maturity level of a specific organization, the areas of potential improvement, and the monetary URE impact.

3 Research Design

Model Generation, Validation, and Predictive Use

To answer the research question, “What is resilience best practice, and how far is the digital potential utilized to achieve organizational resilience?”, incumbent industrial approaches and de facto standards have been analyzed and a comprehensive model derived. Input into the model generation includes, but is not limited to, the COSO framework (COSO, 2022) as the worldwide leading de facto standard on Enterprise Risk Management, the critical event maturity model (s.n., Everbridge, 2022) and research on organizational resilience (Vieweg S., 2019), (Vieweg S., 2018), (Vieweg S. M.-W., 2018).

Although the focus is on digitalization, it is highly advisable to apply a systemic approach to an organization which includes a holistic reflection of the organizational setup (Vieweg S., 2018), (Vieweg S., 2017). This approach is called the “HOT approach”: Human first, Organizational issues to follow, Technology details last.

Understanding an organization’s end-to-end system in the cybernetic sense shows that eight design elements typically define the system behavior and its output—good or bad—in terms of the three core processes: 1. Tasks (hard deliverables), 2. Social core, and 3. Individuals (Vieweg S., 2018). Actors, ii. Consequences (incentives & sanctions), iii. Decision making, iv. Information supply, v. Infrastructure, vi. Reflex & learning, vii. Responsibilities, and viii. Structure & processes, that are driven by the underlying motivation, i.e. objectives & strategies. In a dynamic situation, it is not advisable to modify everything at once (Kotter, 2012), as that would compromise trust within the organization.

Practical implementation shows that a maximum of three out of the eight design elements should be modified at once (Vieweg S., 2018).

Thus, the derived resilience maturity model here looks beyond core technology questions such as the level of automation. The resulting maturity level towards resilience is fostered by the holistic, cultural characteristics of the organization (“Visionary Maturity”), and operational excellence (“Execution Maturity”) (see Figure 5).
Those two areas can be subdivided into specific clusters of organizational performance characteristics, which can be linked back to the systemic organization model explained above.

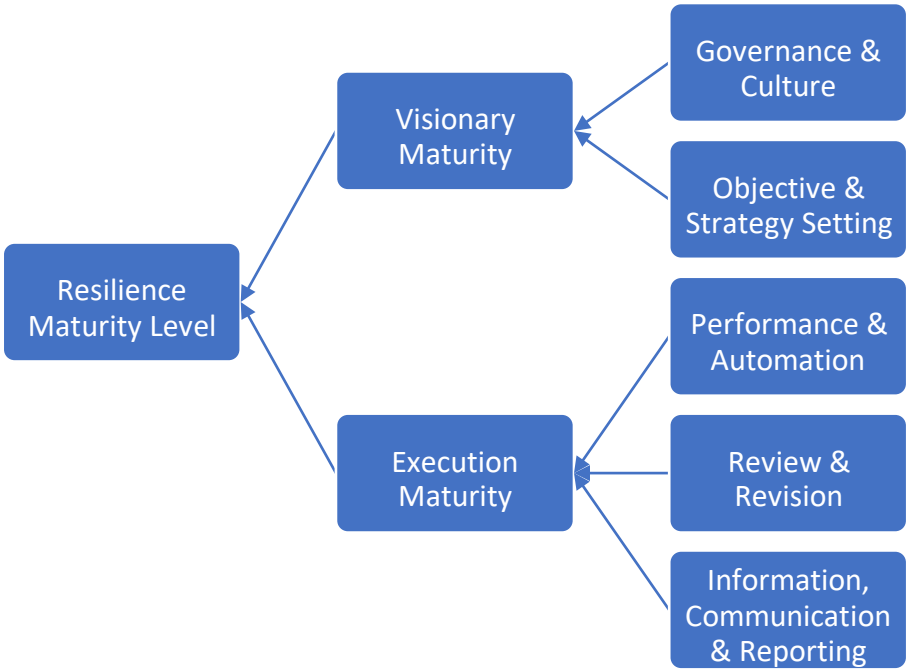


Figure 5: Resilience Maturity Model(own presentation)

Within the resilience model, the ultimate resulting resilience performance (dependent performance variables) are linked to the input (independent factors) of the model. As the section of potential independent performance variables are quite well known from literature and previous work, quantitative research in the form of a standardized questionnaire was used, which included questions on the independent factors as well as the actual level of resilience (dependent performance variables).

On the independent factors, in total 27 ordinal questions were included. The dependent performance variables identified that ultimately, the financial impact on a critical event matters most. Although the financial impact is significant, a lagging characteristic that cannot be influenced directly. For example, if a critical event leads to massive reputational loss (which by itself is difficult to separate from other effects and measure in financial terms), the size of this loss may only partially be influenced by direct actions of management (such as instantaneous, honest, and empathetic communications to avoid further loss in customers' trust).

Other performance characteristics that are directly influenced by the actions of a company include what has been prevented in a given situation as well as the time it took to recover. An organization that is basically paralyzed by a critical event, not reacting in an orchestrated and targeted fashion will most likely struggle more and take longer to return to normal. It goes without saying that an organization that takes longer to recover from a critical event will probably benefit less from its efforts to circumvent the aftermath, hence the averted loss share will be less explicit than we would expect from a truly resilient organization.

Similar on the independent factors side, where overarching, visionary characteristics will have their concrete operational merits.

Model Predictions (Deduction)

As explained in the previous section, the model in scope is quite advanced in complexity, and nonlinearities are to be expected. Therefore, not only should classical statistical modelling such as

linear regression be considered, but also more sophisticated approaches using machine learning AI-based algorithms to ensure the predictive power of the model. The study utilizes open-source Python-based libraries such as the well-known scikit-learn (scikit-learn, 2022), using Kaggle as an open AI-development platform. With these models, an organization's resilience maturity level can be assessed, improvement areas systematically identified, and the monetary effect on URE calculated.

Survey Design

Based on the Resilience Maturity Model (see Figure 5), a questionnaire has been set up for distribution to decision makers in various industries and countries. The questionnaire included some demographics about the participants and their organizations, as well as some nominal data (such as critical event types) and cardinal (metric) data for gauging real critical event monetary impact. The survey was pre-tested and sent out in various waves between 17 December 2021 and 1 August 2022.

In order to secure participation from various industries, the survey was sent out via partner management with the support of a professional campaigning agency and sales departments from the leading IT companies Everbridge and Atos. While the collection waves spanned a comparatively long period with some major geopolitical and financial events affecting various economies, it is deemed that the deterioration in model quantification is negligible.

4 Analysis

Demographic Statistics

The call to participate in the Resilience Best Practice survey was received by more than 200 participants with decision-making abilities. Participation focused on key European countries across various industries and incorporated small- and medium-sized companies, as well as large corporations (see Figure 6).

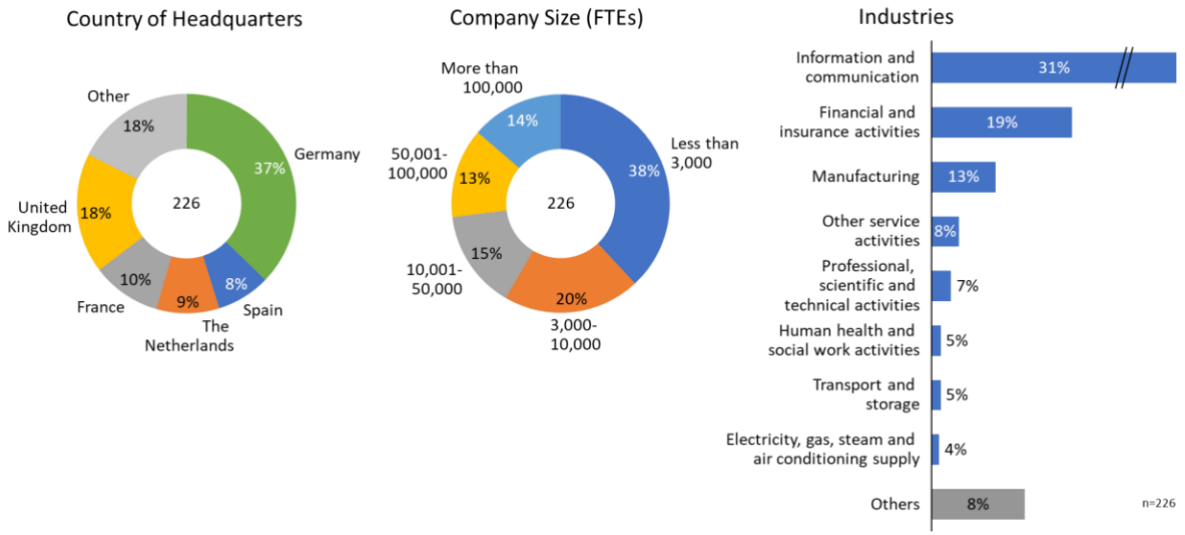


Figure 6 Demographic Statistics

Most individuals do not spend much of their time on resilience efforts, which is similar to the financial commitment organizations are making (see Figure 7).

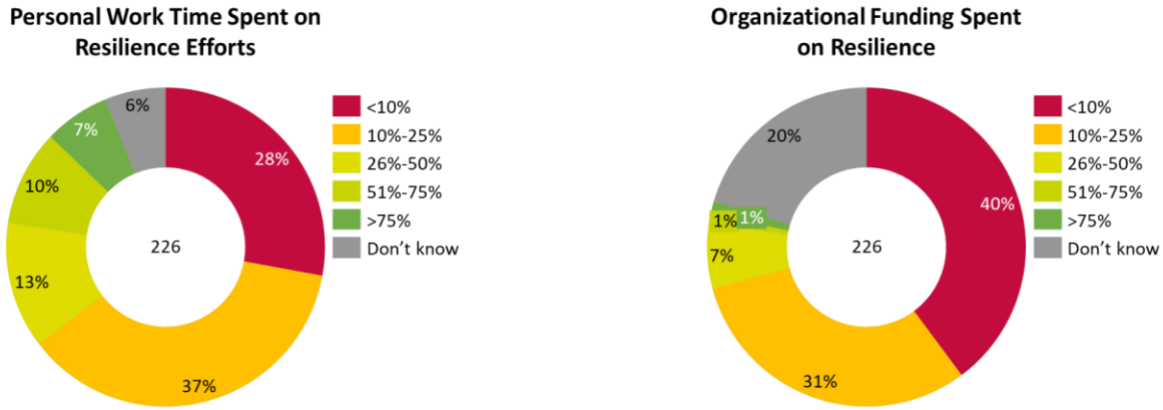


Figure 7 Personal Time Spent and Organizational Funding Spent on Resilience

Resilience – Effects of Critical Events (Dependent Variables)

Participants were asked to report on the two most critical events for the companies they represent within the last two years. Obviously, Covid-19 is the most significant event in the past two years, followed by cyber incidents and economic issues. Environmental effects also posed challenges (see Figure 8). These responses are within the expected range, referring to global business risks (see Figure 3). The majority of companies suffered from more than those two top CEs, with the average being 2.7 CEs per company.

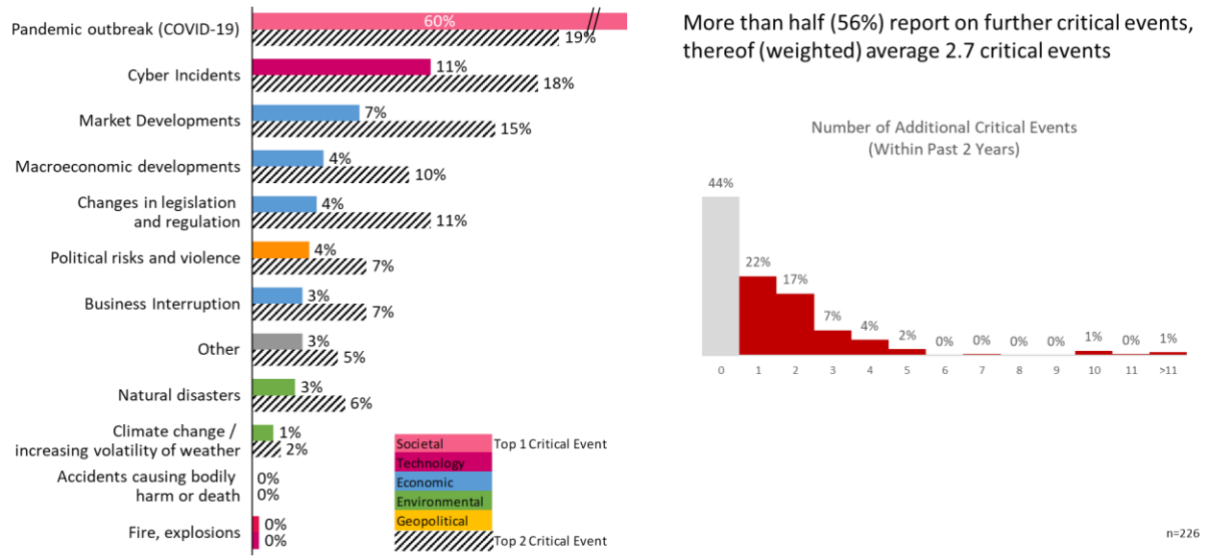


Figure 8 Most (Top 1 and Top 2) Critical Events Throughout the Last 2 Years; Additional Critical Events

The financial impact analysis of those two most important critical events shows that a majority (51%) suffered the equivalent to a loss of more than one-quarter of annual sales from their number one critical event, and 37% of companies suffered losses from their number two critical event (see Figure 9).

Taking into consideration the monetary dimension of those top two CEs, on average companies lost the equivalent of 56% of their annual sales due to their number one CE, and they lost 46% due to their number two CE. The real dimension should not be underestimated. Looking into companies that reported a very significant financial impact of the same or even higher order of magnitude of their annual sales, Out of 14% of companies that reported a very significant financial impact of the same or higher magnitude of their annual sales from their top CE (12% of number two CE), the "fat tails," half lost two to five times the equivalent of their annual sales.

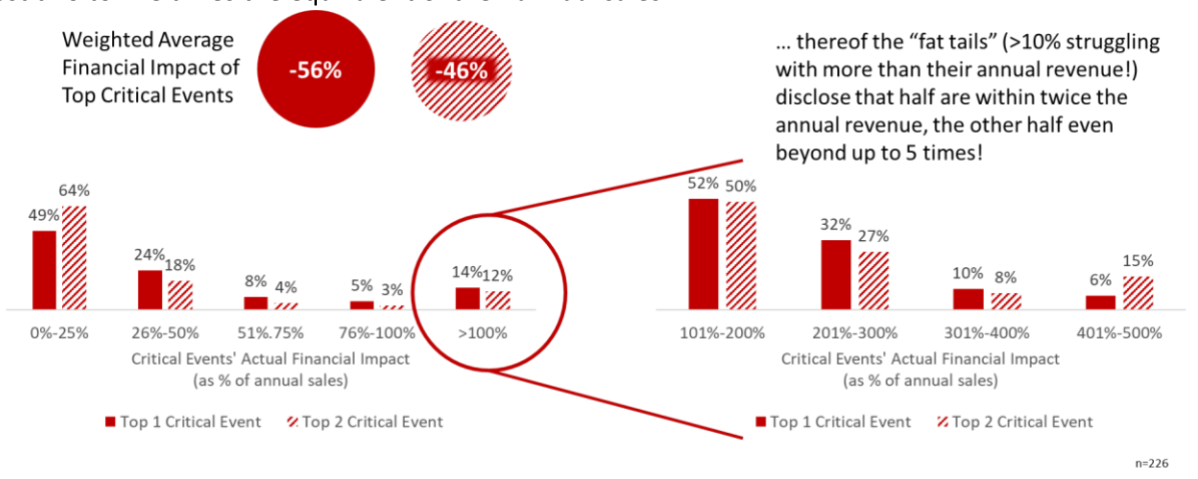


Figure 9 Financial Impact of Critical Events

These figures show the section of materiality of resilience.

Despite the hard facts, participants were asked about their level of preparedness before these critical events materialized. Nearly half of all respondents felt they were at least moderately prepared prior to their critical events (see Figure 10).

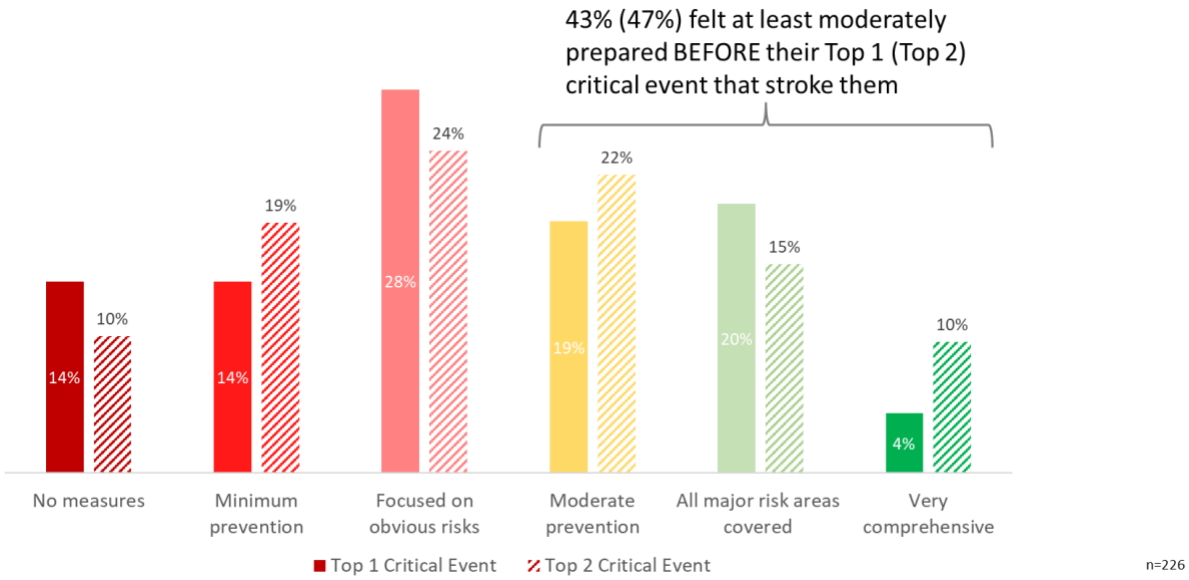


Figure 10 Level of Preparedness Before Realized Critical Events

This distressing information is topped by the fact that 24% of participants still felt well prepared.

However, not much damage from either critical event was averted, despite having felt at least moderately prepared (see Figure 11). Less than a quarter (number one CE) or one out of five (number two CE) companies were able to prevent more than half of the damage that occurred. With companies experiencing an average of 4.7 CEs and losing an average of half of annual sales, these figures illustrate the importance of resilience.

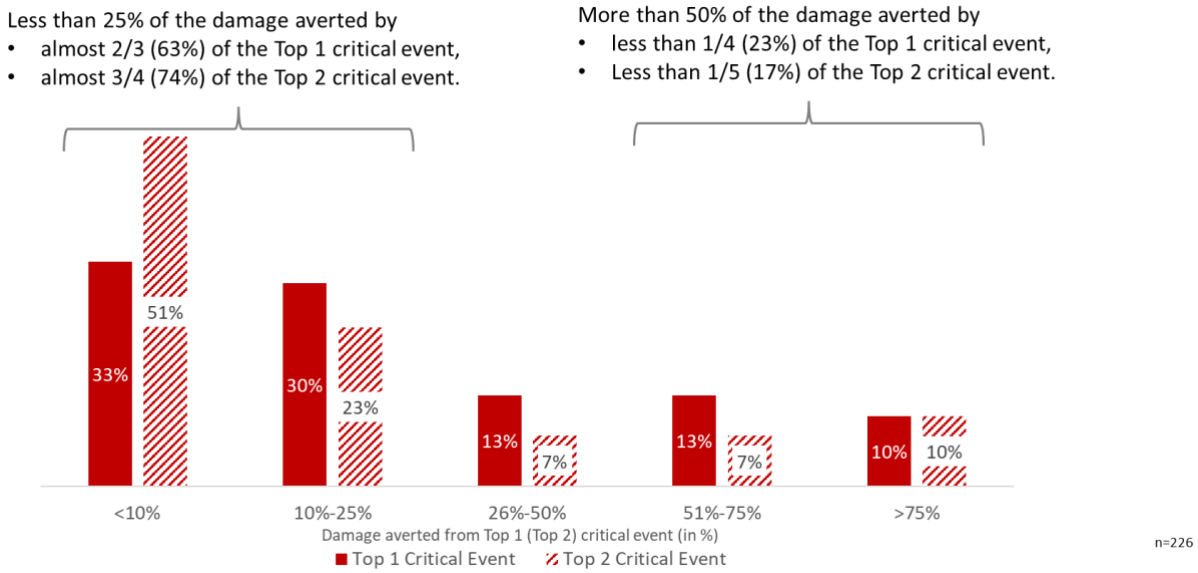


Figure 11 Level of Aversion of Critical Events

One important aspect in critical events is the time to recovery (TTR). The data disclose that recovery time from critical events spans weeks and months, rather than a quick rebound of hours or days (See graphic below). By its own token, this prolonged duration to return to normal adds to the overall costs. Not only is the immediate damage difficult to avert, but also the longer it takes, the more resources are allocated to cleaning up the situation, and additional opportunity costs emerge.

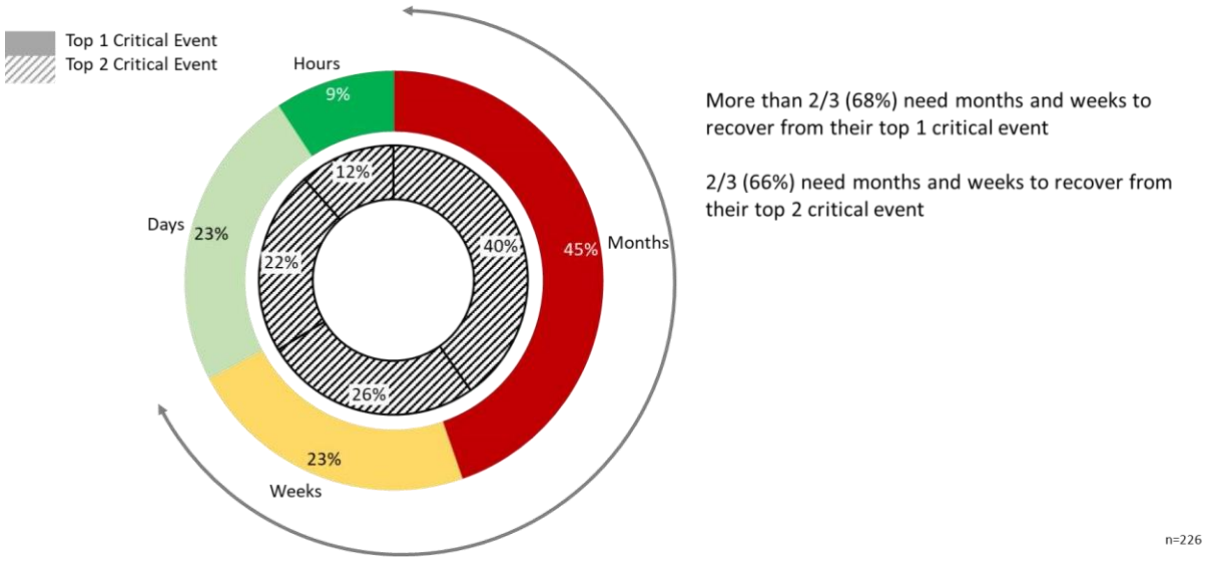


Figure 12 Dimensions of Time to Recover (TTR) From Critical Events

Resilience Competencies (Independent Factors)

Following the resilience maturity model (see Figure 5), the following analysis focuses on the independent factors that are potential drivers for the ultimate outcome.

In this section, using a six-item Likert scale, participants were asked to assess how much they agree or disagree with specific statements based on their experiences at their organization. The analysis shows differentials between the ultimate top quartile financial performers in critical events and the remaining three quarters. Obviously, the ultimate objective with regards to resilience management is to minimize the financial impact of a critical event. As can be seen from Figure 13, top performers are almost 20 times better off than the laggers (4th quartile). Therefore, identifying the link between such outcomes and independent factors should be looked at.

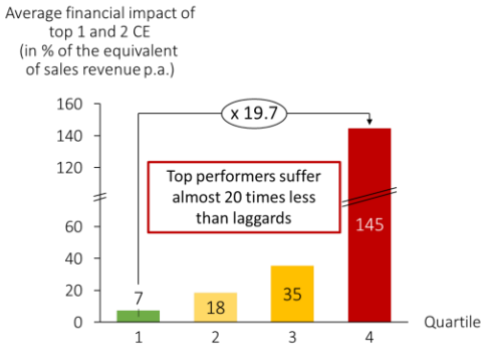


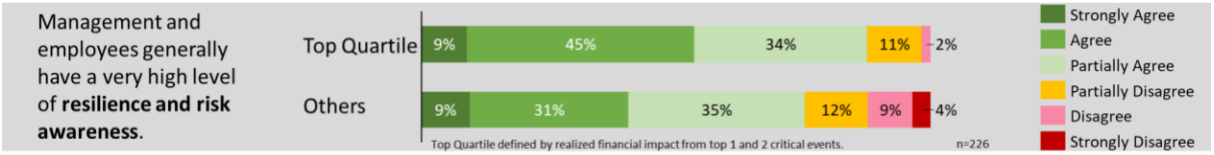
Figure 13 Financial Impact of Critical Events

Visionary Maturity - Governance & Culture

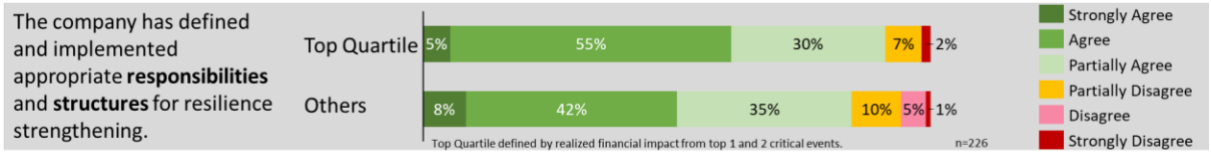
Governance and cultural aspects are the cornerstone of every organization\ and provide guidance in situations of distress. They are very efficient in that an organization, based on a core set of values, is able to more quickly circumvent unexpected threats and danger.

There is a clear differentiation between top performers and other companies, linked to the visionary maturity on governance and cultural aspects.

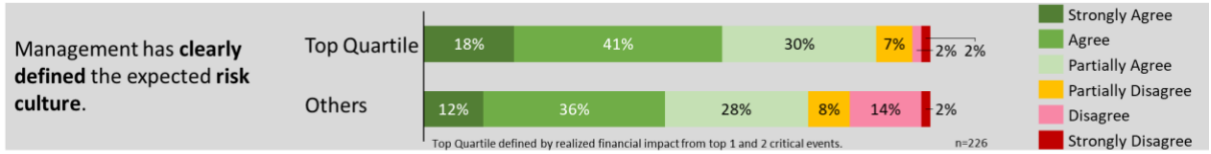
Top performers show higher awareness: 54% strongly see very high resilience and risk awareness in their organization, compared to 40% of others:



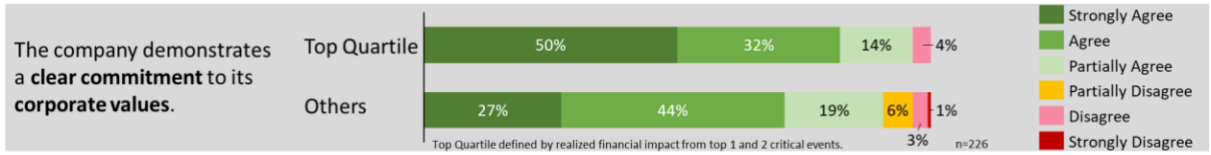
60% of top performers have appropriate responsibilities and structures in place, compared to 50% of others:



59% of top performers have a clearly defined risk culture, 11% more compared to 48% of others:



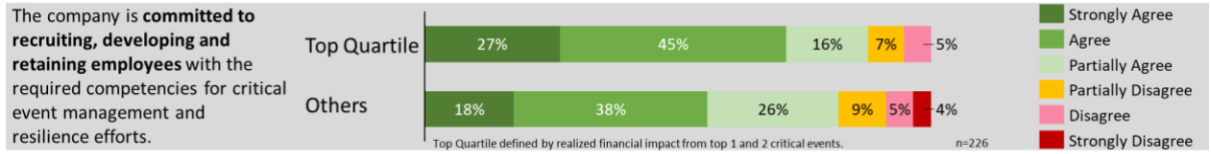
82% of top performers have a clear commitment to corporate values, 11% more than compared to 71% of others:



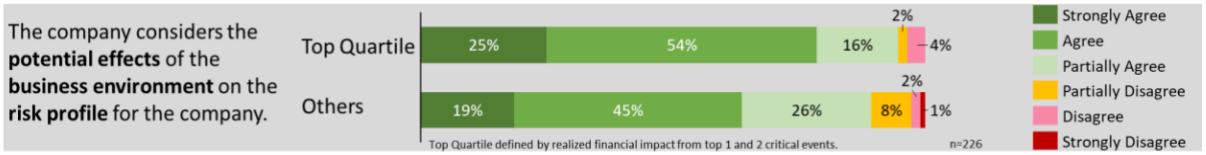
Visionary Maturity - Objective & Strategy Setting

On the next level of visionary maturity, specific yet far-reaching objectives are required to align an organization towards a common purpose. Strategic decisions act as a preparational way for effective and efficient execution of operations. Regarding resilience, this section discloses the positioning of the organizations. Similar to the previous section on governance and culture, there is also a clear differentiation between the top performing companies from the rest when it comes to objective and strategy setting.

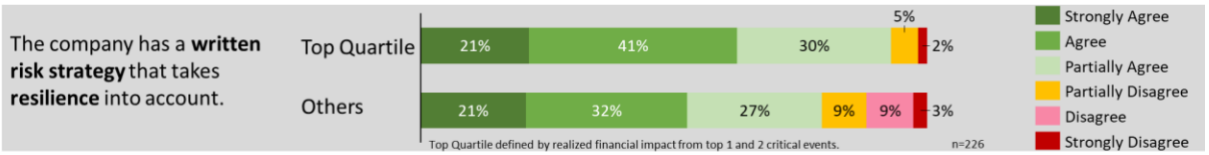
72% of top performers have a clear commitment to employees' competencies, compared to 56% of others:



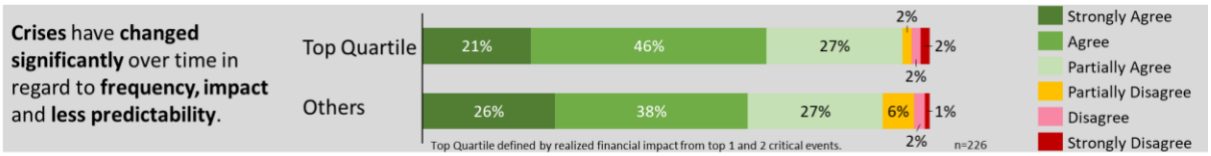
79% of top performers strongly consider the potential effect on the company's risk profile, compared to 64% of others:



62% of top performers have a clearly written risk strategy with resilience aspects, compared to 53% of others:



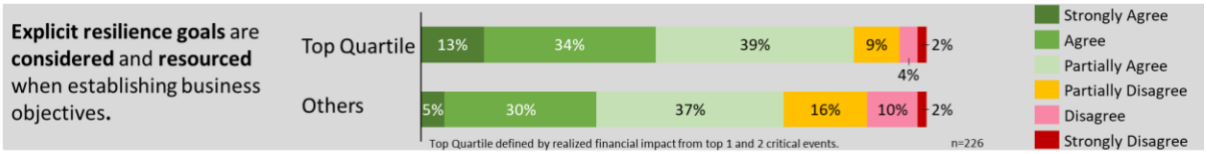
67% of top performers clearly see the crisis changes, compared to 64% of others



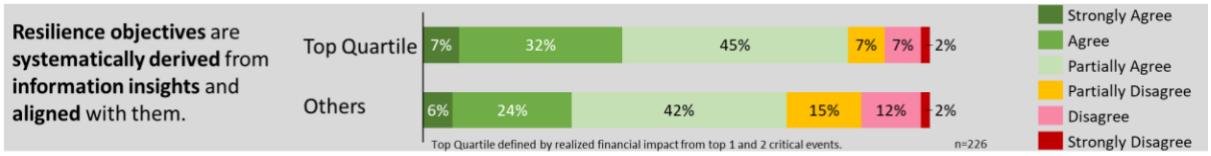
Execution Maturity - Performance & Automation

The operationalization competencies of an organization are key to executing the strategy and ultimately contributing to achieving the objectives. The first cluster of competencies is in performance and automation. Performance can only be measured if goals are clearly defined and executed upon. The data reveals that overall, the level is not yet thoroughly covered, with some slightly higher scores for the top quartile.

47% of top performers have explicit resilience goals operationalized, compared to 35% of others:



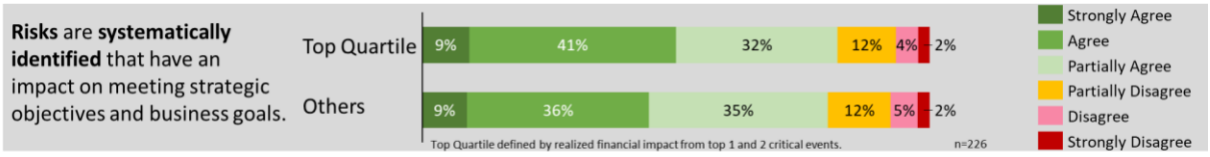
39% of top performers have explicit resilience goals operationalized, compared to 30% of others:



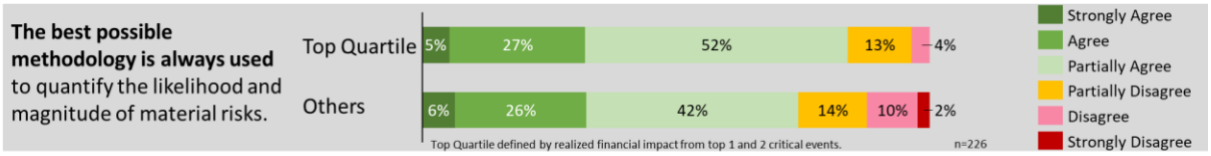
Execution Maturity - Review & Revision

The competency to review and adjust is on a comparatively moderate level for both the top quartile as well as the other companies.

50% of top performers have a systematic risk identification system in place, compared to 35% of others:



32% of top performers, as well as others, seek the best possible methodology on risk quantification:

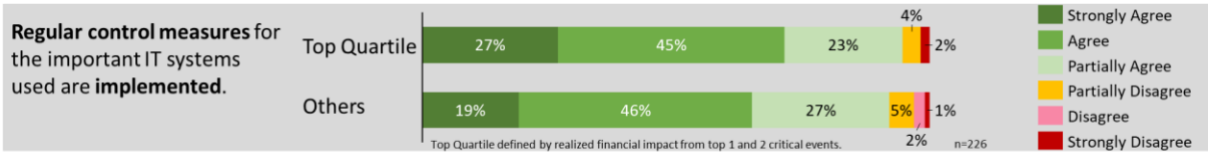


55% of top performers have established effective processes on risk management, compared to 46% of others:

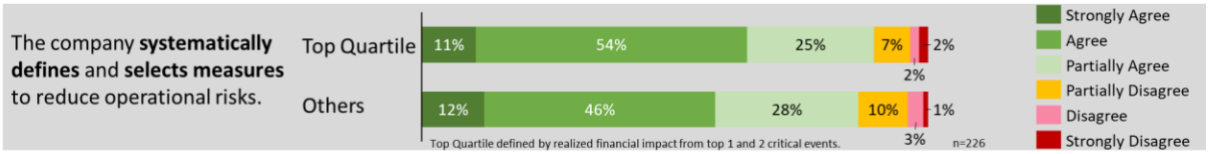
Execution Maturity - Information, Communication & Reporting

The section on information, communication and reporting concludes the execution maturity model. As can be seen from the data, a heterogeneous pattern in implementation practices prevails.

72% of top performers have well-established regular control measures, compared to 65% of others:

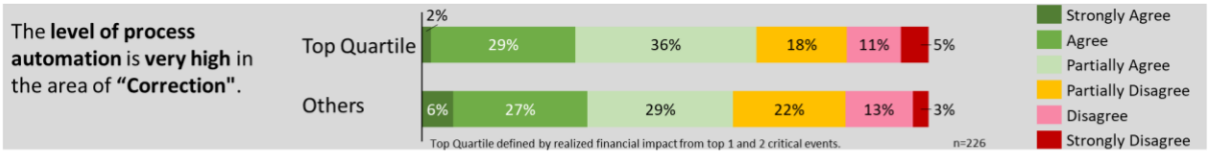


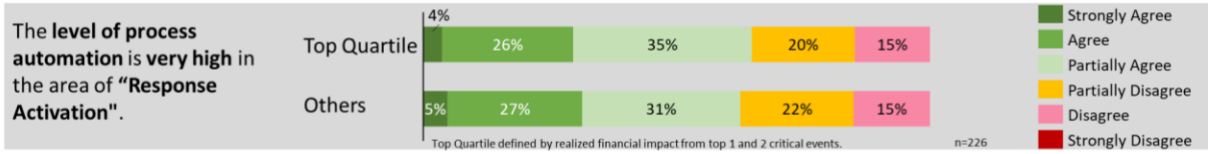
65% of top performers operate with risk-reducing measures, compared to 58% of others:

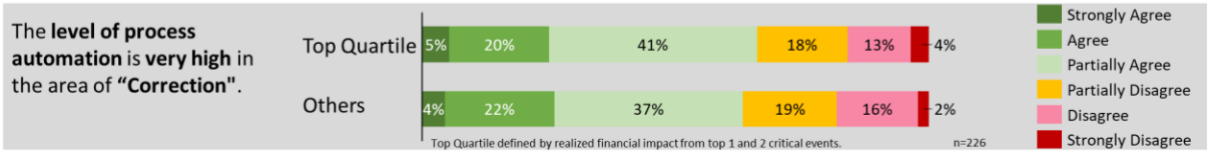


The overall level of process automation is similar, but not very high, for both top performers and others, suggesting that:

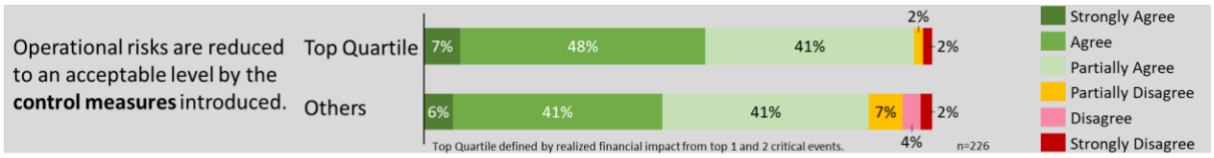
1. current performance is not just defined by automation tools.
2. there is significant potential to improve.



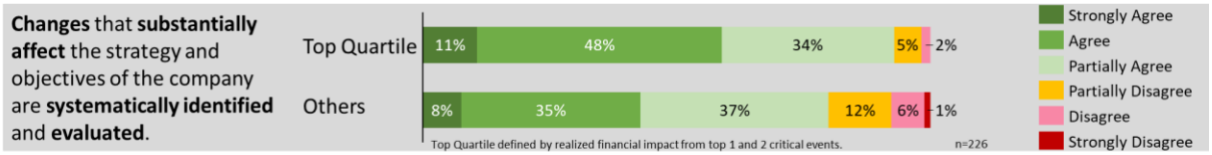




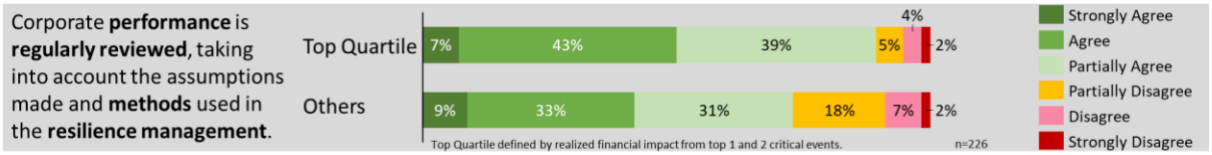
55% of top performers have operational control measures in place, compared to 47% of others:



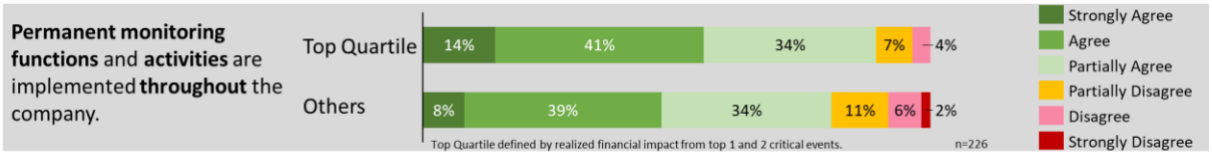
59% of top performers take substantial changes seriously, compared to 43% of others:



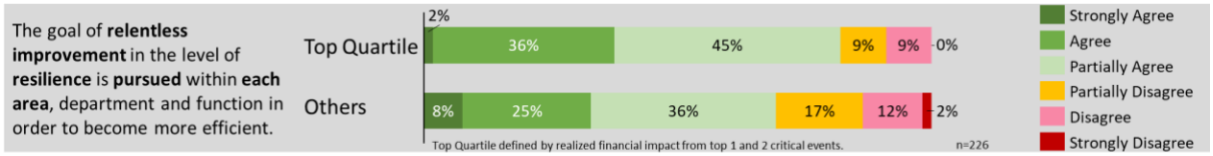
50% of top performers regularly review corporate performance under a resilient-oriented structure, compared to 42% of others:



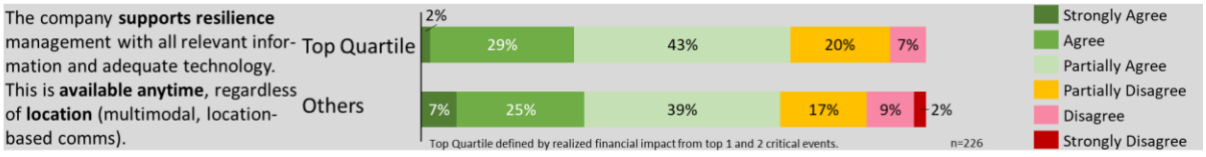
55% of top performers have implemented company-wide permanent monitoring, compared to 47% of others:



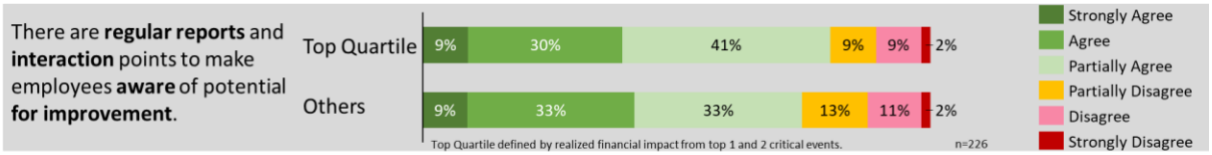
38% of top performers focus on relentless improvement, compared to 33% of others—a level likely to provide areas of improvement:



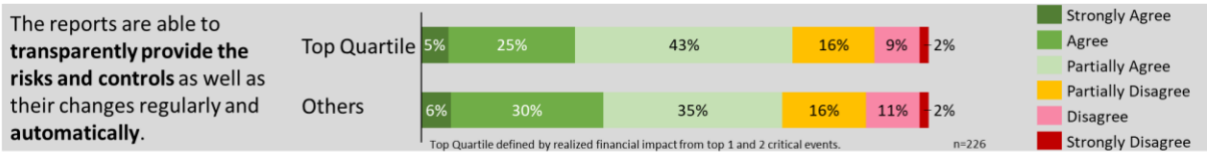
Top performers (31%) and others (32%) see management support anytime anywhere resilience—a level likely to provide areas of improvement as well:



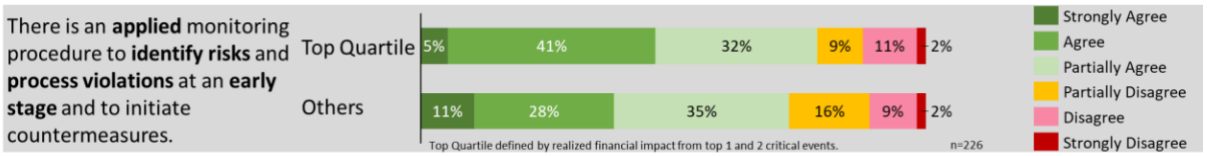
Top performers (39%) and others (42%) have established regular interactions and reports—a level likely to provide areas of improvement as well:



Automation of meaningful reports is only seen by 30% of top performers compared to 36% others—a level likely to provide areas of improvement as well:



46% of top performers have an early-risk warning system established, compared to 39% of others:



AI-based Predictor for Resilience Improvement Areas

Based on the independent factors captured in the survey, as well as the link back to the eight design elements of the systemic model:

1. a predictor of resilience exposure in terms of the dependent variables such as aversion rate (AR) and time to recovery (TTR) to use as benchmarks.
2. to identify the most probable areas of improvement by focusing on aiming for a higher resilience maturity level, which typically comes with other organizational benefits related to capacity and lower process costs.

With that, an organization's resilience maturity level can be assessed, and improvement areas identified, as well as the monetary effect on URE calculated.

As the resilience maturity models suggest and the descriptive statistical analysis reveals, it is a multidimensional nonlinear system that can hardly be solved with a classical, deterministic approach such as linear regression. Therefore, AI-based approaches that allow pattern recognition and predictions without tremendously large data sets have been chosen (Vieweg S., AI for the Good, 2021).

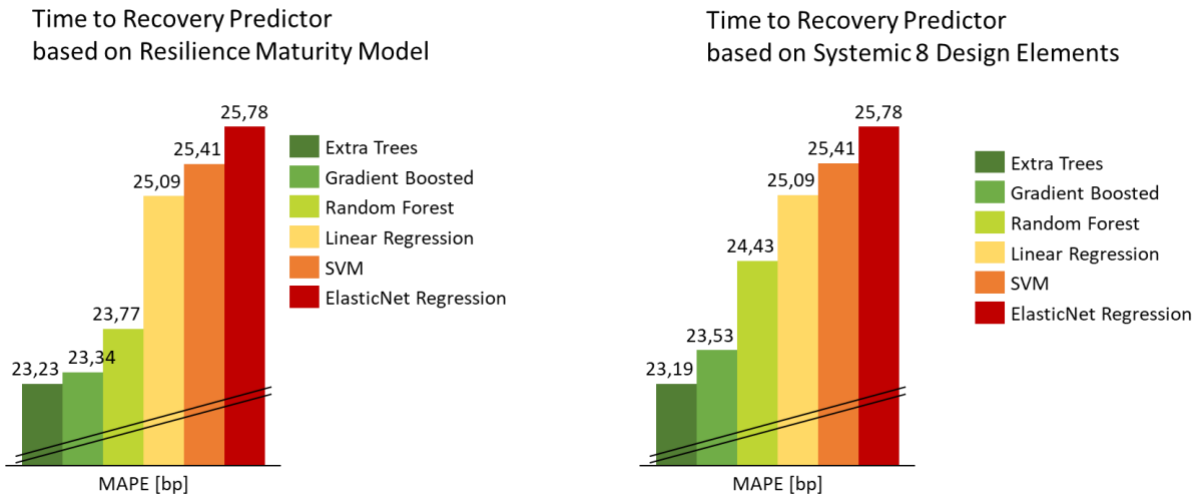


Figure 14: TTR prediction accuracy (MAPE) using different supervised algorithms.

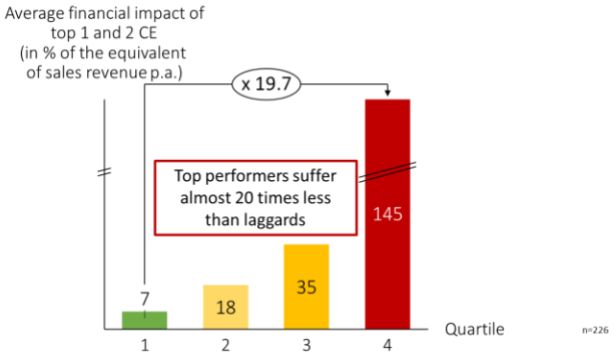
As an example, with a set of supervised learning algorithms, stable output with avoidance of overfitting could be achieved with a link between the resilience maturity model (see left diagram in Figure 14) and the eight design elements (see right of Figure 14): the
Extra Trees Regressor (scikit-learn) for extremely randomized trees is one ensemble method for a combination of several predictions.

5 Key Findings and Concluding Recommendations

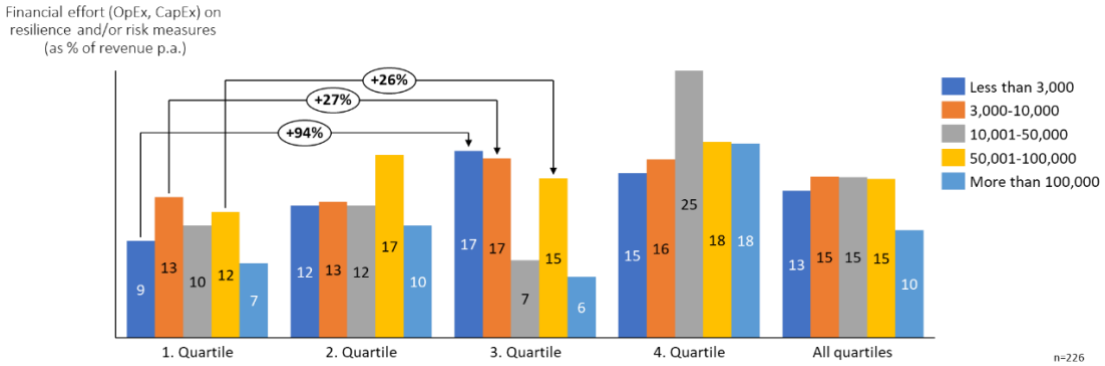
In the following section, eight important findings are presented and concluding recommendations are given.

Key Findings

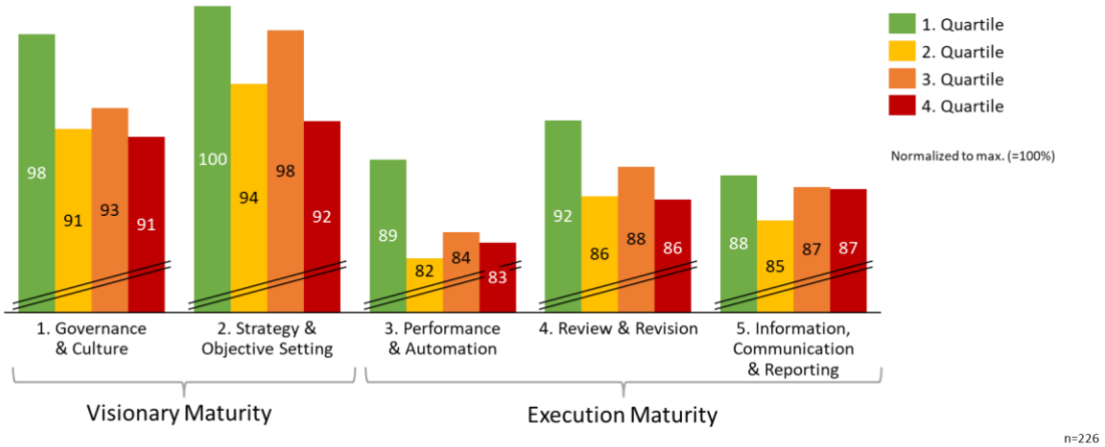
1. *Resilience has a significant impact on the bottom line:*
   Top performers (top quartile) suffer almost 20 times less than laggers (last quartile).



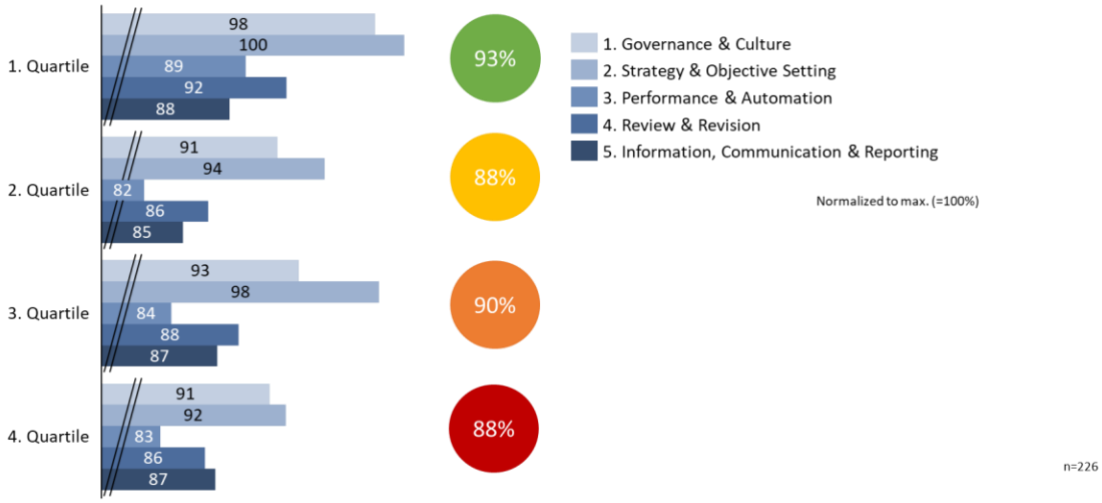
2. *Money is not everything in resilience:*
   Larger investments into resilience at small (<3,000 FTEs) and large (>100,000 FTEs) organizations, with minimum spending between 3k-10k, in almost all sizes of organizations, more is spent in underperforming companies (third quartile) than in the top quartile.



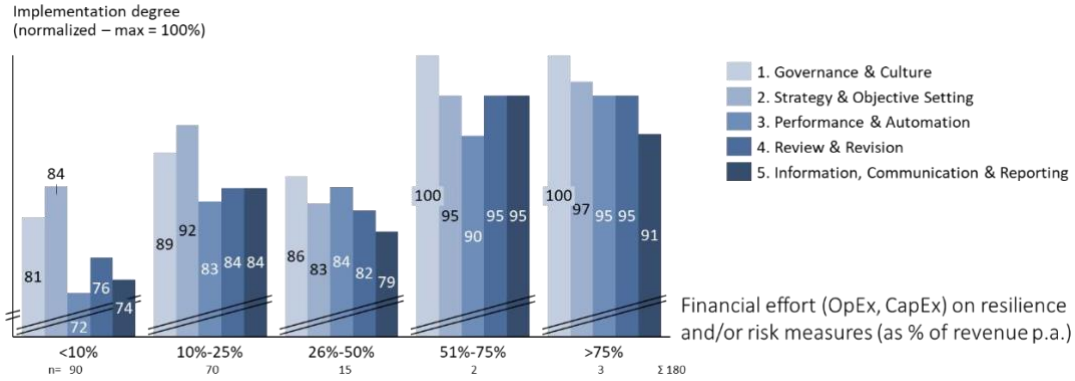
3. *Talking seems easier than execution:*
   Visionary maturity, in the model defined in sections 1. Governance & Culture and 2. Strategy & Objective Setting, is easier than execution maturity, in the model defined in sections 3. Performance & Automation, 4. Review & Revision, and 5. Information, Communication & Reporting):



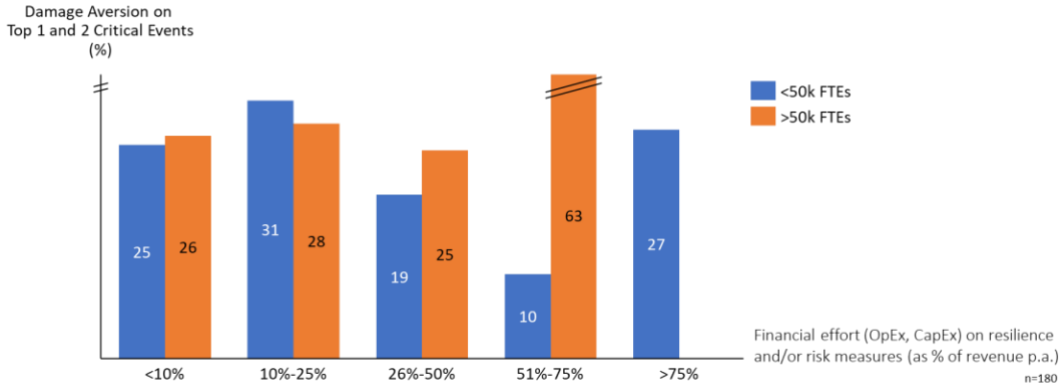
4. *There is a reason for resilience among top performers:*
   The implementation degree of resilience measures in visionary maturity as well as execution maturity outpaces all other quartiles.



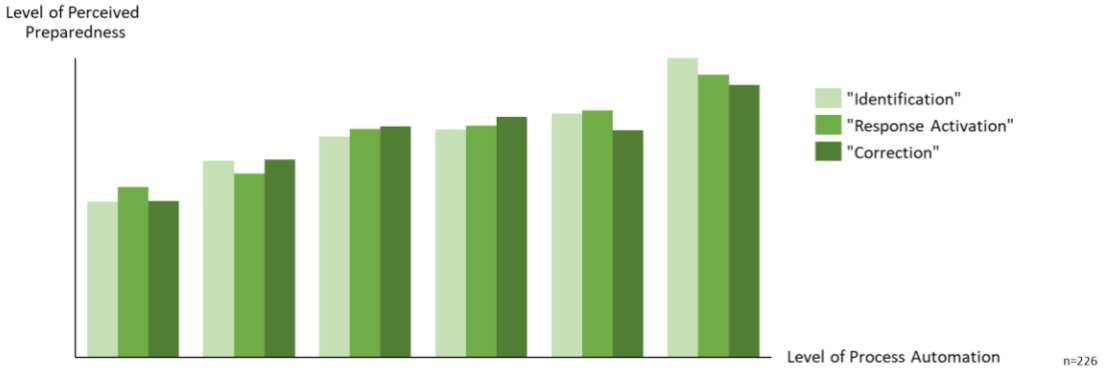
5. *An excess of spending does not significantly help:*
   Nonlinearity between maturity implementation (all five sections) and resilience funding. An increase beyond 25% of annual revenue does not necessarily pay off.



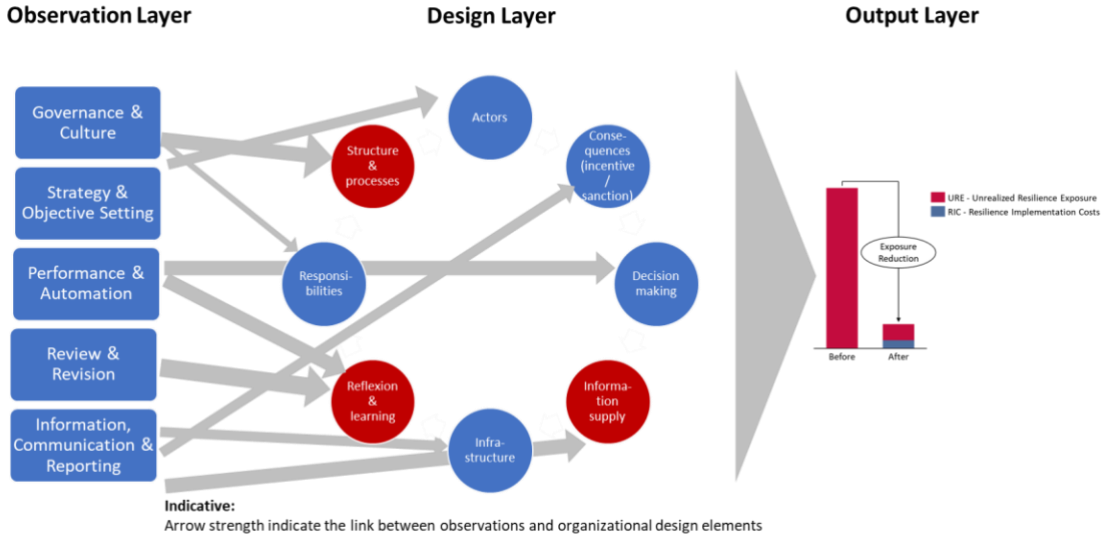
6. *The sweet spot of resilience investment:*
   Optimum financial effort within 10-25% of revenue allowed approximately 30% damage aversion, with smaller companies (<50k FTE) performing slightly better.



7. *Digitalization and automation matters:*
   The higher the degree of digitalization, the higher the perceived preparedness (particularly in the identification of critical events).



8. *AI-based models help spot improvement areas:*
   Already, comparatively simple, supervised algorithms provide reasonable predictive strength to implement resilience improvements. This will allow a focused and efficient implementation of effective measures toward a more robust and resilient organization.



Concluding Recommendations

As can be seen from the survey results on resilience best practices, there is significant potential for improvement.

1. Critical events are a reality and organizations tend to suffer significantly without placing an emphasis on resiliency. At the same time, perceived preparedness does not meet real performance (organizations more often overestimate their capability of handing a critical event) and the overall aversion level of real critical events is comparatively low.
   Hence, aligning the organization with key components outlined in this quartile will drive a more resilient organization.
2. Applying a quantifiable end-to-end view in accordance with the Unrealized Resilience Exposure (URE) will provide transparency for complex topics.
3. Digitalization can significantly support the identification, response, and corrective actions of upcoming critical events. Thus, wisely selected digitalization will pay off quickly, as can be seen from the lowering of the Unrealized Resilience Exposure (URE).
4. Start with assessing the organization's specific needs by utilizing the above framework.

Following the above recommendations will help ensure an organization's resiliency when dealing with critical events.

6 Acknowledgements

The author thanks the following organizations (in alphabetic order) for their support in the recruiting of participants and utilizing their network:

Atos Unify is the family name for remote and distributed work offerings and solutions from Atos group. By combining our own OpenScape communication platforms and strategic partner offerings including Unify Office by RingCentral and Cloud Contact Center powered by CXone, we help enterprises to work from anywhere using best-in-class communication, contact center, and collaboration tools.

CANDID COUNSEL is a boutique research and strategy consultancy providing direct, clear, data-driven guidance.

everbridge helps manage critical events for 6,300+ customers globally. Over 6.9 billion interactions delivered in 2021. Serving more municipalities, states, and countries than any other provider.

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He is the founder of Dr. Vieweg Consulting, focusing on sustainable transformations in the digital age. He is a managing partner of TCI Network.

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