

Operational resilience: Actuarial reserving function

PRA guidance in the UK, state of the market, best practice

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In a changing work and regulatory environment, the operational risks facing actuarial teams have never been greater

Actuarial reserving is an essential business function for insurers. In this paper, we discuss the operational risks affecting actuarial reserving teams, how teams can assess operational tolerance and how they can invest in improving the risk management controls already in place. The aim is to provide a framework to maximise resilience to risk events and changing environments.

We have carried out a survey of Milliman clients to highlight the operational risks that firms' actuarial reserving teams are exposed to across the globe, which in turn could affect firms' delivery of their services and their commitment towards their customers.

Overview

The Prudential Regulation Authority (PRA) published a policy statement on the 29th of March 2021,¹ following the consultation paper on the 5th of December 2019,² outlining the approach to operational resilience that should be adopted within the financial services industry. The guidance is consistent with the approach developed jointly with the Financial Conduct Authority (FCA) and the Bank's Financial Market Infrastructure Directorate (FMID).

In light of the new challenges and disruption of business services faced on a global level due to the COVID-19 pandemic, operational resilience remains one of the PRA's top priorities of insurance supervision for 2022.³ This is to ensure the safety of customers and the soundness of firms, as well as the integrity and financial stability of the market, by promoting effective competition in the interests of customers.

Operational risk tolerance should be embedded into the risk management controls and business strategy of every firm. In this paper, we focus on the importance of the actuarial reserving function and how reserving processes should remain robust and resilient through potential disruption of services in the future, as well as in challenging reserving cycles.

Actuaries are familiar with the challenges of modelling operational risk, but they also have a role to play in supporting the organisation to manage and mitigate risks arising from operational failures.

Background

Operational risk is the risk of financial losses resulting from failures of business operations. Figure 1 shows a traditional framework for the consideration of operational risk, including factors such as systems, policies and processes utilised, the people interacting with the business and external events.

¹ Bank of England (3 June 2021). PS6/21 | CP29/19 | DP1/18: Operational Resilience: Impact tolerances for important business services. Retrieved 18 November 2021 from <https://www.bankofengland.co.uk/prudential-regulation/publication/2018/building-the-uk-financial-sectors-operational-resilience-discussion-paper>.

² Ibid.

³ Bank of England (24 May 2021). Prudential Regulation Authority Business Plan 2021/22. Retrieved 18 November 2021 from <https://www.bankofengland.co.uk/prudential-regulation/publication/2021/may/pru-business-plan-2021-22>.

FIGURE 1: RISK FACTORS AFFECTING OPERATIONAL RESILIENCE



OPERATIONAL RESILIENCE

Below, we discuss these factors in more detail and how they can create risks for the actuarial function.

SYSTEMS

Failure, inadequacy or duplication of systems, including both software and hardware, represent a significant source of operational risk. Ideally, systems should be flexible and resilient to different business needs, as well as establish suitability for intended purpose. Systems failure could generate errors and omissions during the process resulting in unreliable data, which will require additional reconciliations to ensure their credibility, reliability and relevance.

In reserving, the main systems utilised are:

- Internal systems operated by underwriters and claims handlers for policy and claims data recording
- Data warehouses to stage the data and assumptions required
- Systems used to manipulate and analyse data, including the reserving software used to project ultimate losses

Failure of these systems could lead to delayed, inappropriate or unreliable reserving outcomes, which could be misleading to management and ultimately to shareholders and the market.

PROCESSES

Another potential risk factor is inefficient and ineffective processes surrounding the execution, delivery and management stages of business services. Professional, regulatory and statutory rules applying at different stages of the process may differ, depending on the geographical area where each stage of the process takes place. This will alter the processes by either adding further complexity or restricting them.

Outdated or weak infrastructure of the reserving process and inadequate overall management review could create operational risk for the business, resulting in inappropriate levels of reserves projected. In addition, failure to comply with mandatory reporting, data protection and professional code of conduct could incur a fine or enforcement, which will further reduce market and public confidence.

An example of an operational process risk affecting reserving teams is the failure to properly aggregate reserving figures across a large group entity.

PEOPLE

The people interacting with the business form another potential risk for the operational resilience of the business. Intentional and deliberate actions, market manipulation, key-person dependencies and improper employment practices could result in detrimental reputational damage.

Some examples of poor outcomes regarding reserving practice are inadequate communication with internal and external stakeholders and inappropriate advice regarding the release or adequacy of reserves due to poorly designed management incentives. Other examples include anchoring to an established view of reserves; failing to reflect the need for change; and lack of necessary expertise. All these risks confirm the importance of firms having a sufficiently independent and knowledgeable actuarial function which acts with integrity, but also sufficient resource and expertise for the actuarial function to discharge its responsibilities.

In the mitigation of these risks, a clear risk appetite statement and a conflict-of-interest policy could provide significant benefit for accountability purposes.

EXTERNAL EVENTS

The last factor we will consider is external events that could have secondary negative impacts on systems, processes and people by stressing business operations. Manmade catastrophes resulting from either deliberate or accidental human actions or natural catastrophe events could damage the condition of a firm's physical and intangible assets and severely disrupt its business services.

These events create challenges and uncertainty for actuaries in setting reserves, and firms consider this risk independently as reserving risk. Reserving risk occurs when historical experience is distorted, and the relevance of claims and expense development patterns is reduced. This could manifest as a claims-related event like latent claims, or a non-claims-related event like pandemic. They lead to pressures on business operations and force actuaries to apply judgement to a wider range of uncertainties at a time of change and with pressure to continue delivering results to a high standard. In addition, external events could place restrictions on actuaries' ability to access systems and data, which highlights why business continuity plans should incorporate these factors to ensure their mitigation.

Further examples of external events are changes in statutory and prudential regulation which impact the decisions made by reserving teams, as well as climate and technological change; with the latter leading to challenging cyberthreats.

Achieving best practice

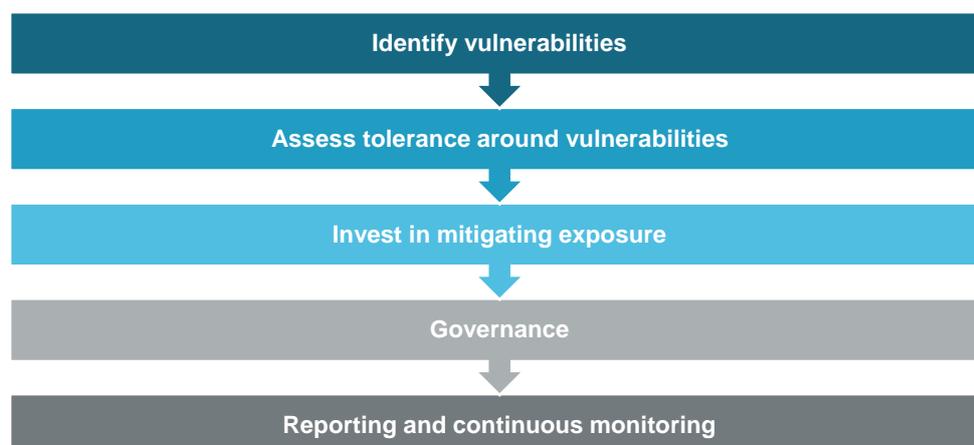
The PRA's policy statements⁴⁵ will come into force on Thursday 31 March 2022. Within the next three months, firms are expected to establish compliance strategies that satisfy the supervisory authorities' requirements and to put them into effect before the policy is enforced. Requirements include:

- Identification of their important business services and their vulnerabilities
- Setting impact tolerance limits, through mapping of their important business services and commencing a programme of scenario testing

A three-year implementation phase will follow, where more sophisticated scenario testing is to take place, alongside mitigation steps to ensure firms remain within their tolerance limits in a timely manner. In particular, firms must ensure that they can remain within their tolerance for each important business service in the event of a severe but plausible disruption.

The guidance suggests that firms could accomplish operational resilience by following the first three stages in blue colour introduced in Figure 2, which use an outcome-based approach. The next two stages are included here as individual steps for completion.

FIGURE 2: GUIDANCE TO IMPROVE OPERATIONAL RESILIENCE



⁴ Bank of England (29 March 2021). SS1/21 Operational resilience: Impact tolerances for important business services. Retrieved 18 November 2021 from <https://www.bankofengland.co.uk/prudential-regulation/publication/2021/march/operational-resilience-impact-tolerances-for-important-business-services-ss>.

⁵ Bank of England, PS6/21 | CP29/19 | DP1/18, op cit.

We discuss each step of the PRA guidance in more detail, below:

1. Identify vulnerabilities within the business model that could disrupt the delivery of the service and prioritise the activities of critical business operations. Internal processes should be assessed and mapped, as well as any reliance on third parties and outsourcing.⁶ Key considerations during the identification phase are:
 - Clear and structured definition of the risk event
 - Expected probability and severity impact of the event
 - Correlation with the delivery of the service and business performance as well as other processes
 - Additional business functions expected to exert influence, such as IT and finance
 - Jurisdictional and regulatory boundaries applied at different stages of the process across different locations
 - Overall magnitude of the compound severity impact after the above phases have been assessed
2. Assess the maximum tolerance level of disruption that can be supported and managed by the firm. Set measurable and objective standards tailored to the specifics of the business by testing exposure during severe but plausible scenarios, including risk scenarios, stress testing, reverse testing, back testing and variability analysis. The first point at which a disruption could occur⁷, the maximum length of tolerable time disruption as well as multiple disruption of services occurring simultaneously should also be considered, in addition to any other relevant metrics.

Less severe scenarios should already be evaluated through existing risk management frameworks. However, flexibility of tolerance levels should be contemplated and tested for sensitivities as they tend to change over time.

The first two steps of the operational resilience process should be initiated within the first 12 months after the publication of the final policy; followed by more sophisticated testing in the three-year implementation phase. PRA appreciates that this is an ongoing process expected to evolve and improve over time.
3. Invest to meet tolerance targets and increase resilience by taking decisive and effective actions to mitigate risk exposure towards any potential factor that could disrupt the business. The focus should be on back-up plans and effective recovery options available to sustain operational resilience and continuity of the business. Those vulnerabilities with greater potential impact should be prioritised and ensure the extent of disruption is limited.
4. Oversight and engagement of the board of directors and senior management across all three of the previous stages is essential for effective compliance. Accountability should be established in terms of risk management and governance using existing committees and roles in place and creating new ones if necessary.
5. Every step of the process should be clearly and regularly documented, alongside continuous monitoring and regular reviews to improve the firm's self-assessment. Annual reviews of vulnerabilities mapping should take place and regular testing at minimum, or sooner, if needed, following a significant change.

The strategy established should be proportionate to the size, scale and complexity of the business itself. After the 31st of March 2025, operational resilience of the company is expected to become a dynamic process, which will be communicated with the regulator.

APPLICATION TO RESERVING FUNCTION

The guidance provided by PRA should also be applied to the reserving function to ensure operational resilience. In the Background section above, we identify vulnerabilities that could arise from potential reserving-related operational risk scenarios.

Risks could be avoided, retained, mitigated or transferred to third parties, based on the tolerance levels that could be sustained and managed within each firm. Limits applied are subject to the management's risk appetite and reflect the characteristics of each firm.

⁶ Bank of England (29 March 2021). SS2/21 Outsourcing and third- party risk management. Retrieved 18 November 2021 from <https://www.bankofengland.co.uk/prudential-regulation/publication/2021/march/outsourcing-and-third-party-risk-management-ss>.

⁷ Bank of England (25 November 2021). CP21/21 - Operational Resilience and Operational Continuity in Resolution: CRR firms, Solvency II firms, and Financial Holding Companies (for Operational Resilience). Retrieved 14 December from <https://www.bankofengland.co.uk/prudential-regulation/publication/2021/november/operational-resilience-operational-continuity-in-resolution-amendments>

We will discuss some possible mitigating actions that could be implemented regarding maximising operational resilience in respect of some of the vulnerabilities mentioned above.

For instance, operational risk generated by key-person dependencies during reserving could be mitigated by:

- ✓ Embedding different review layers internally to ensure more people are familiar with the process and figures
- ✓ Ensuring there are multiple people familiar with each process, software and system used
- ✓ Maintaining clear control documents describing processes, systems and software, including amendments
- ✓ Regular review of ownership from senior management to ensure circulation of knowledge within the team
- ✓ Internal sessions to spread knowledge across the wider team
- ✓ Training provided for the processes, systems and software used within reserving team

We have already highlighted that data should be a high priority within each firm. Reserving actuaries' professional opinions will be derived from the data trends observed; hence, the quantity, quality, relevance, reliability, accuracy and reasonableness of the data are fundamental considerations. Some mitigating actions that could be enforced are:

- ✓ Checking data sources feeding through reserving processes for reliability and credibility
- ✓ Validating and cross-checking external data when relevant
- ✓ Aiming for one integrated system, with adequate backups to improve the quality of the data
- ✓ Regular oversight and review of the data processes to identify areas of improvement and enhancement
- ✓ Ensuring automated built-in checks are in place to identify errors, omissions, format and type of data
- ✓ Improving data format to enhance understanding of the user and ensure consistency across different platforms through the establishment of data dictionaries

Four areas within an actuarial reserving function which can lead to potential operational risk are automation, software, use of advanced techniques, such as data science and machine learning, and availability and workload of actuarial resources.

Market practice

A recent survey of Milliman clients highlighted the operational resilience risk factors within reserving practices across the globe. Firms responded on their approaches around the automation of their in-house reserving processes and the adaptability and flexibility of their processes to changing environments, including new technologies and techniques.

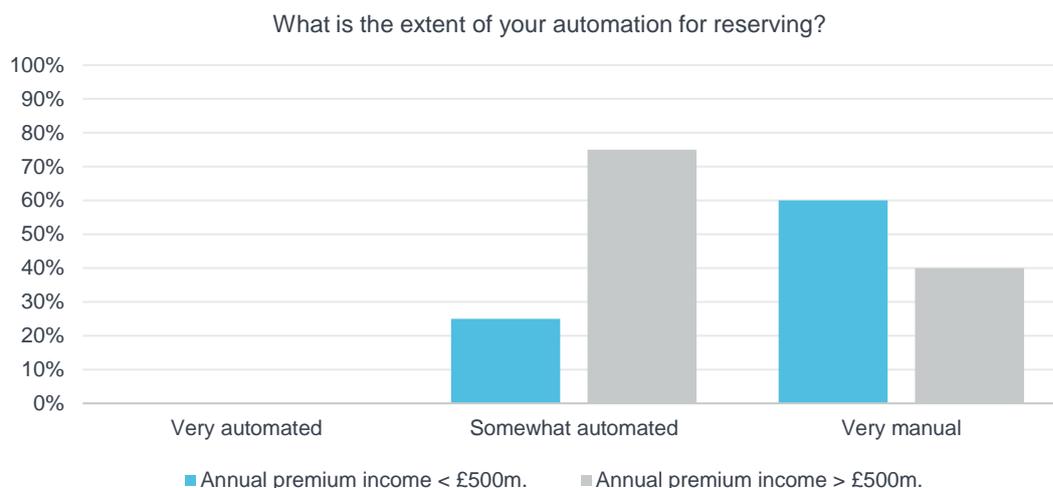
The survey was completed by insurance firms based in the UK, US and Asia. There were 64 respondents globally, 21 from the UK, 39 from the US and 4 from Asia.

Our respondents are either personal or commercial insurers, or both, including some operating in the London market. There was a reasonable distribution of insurers in terms of size. For the purpose of this report, we have defined "large" to be an insurer with annual gross written premium income greater than £500 million.

AUTOMATION

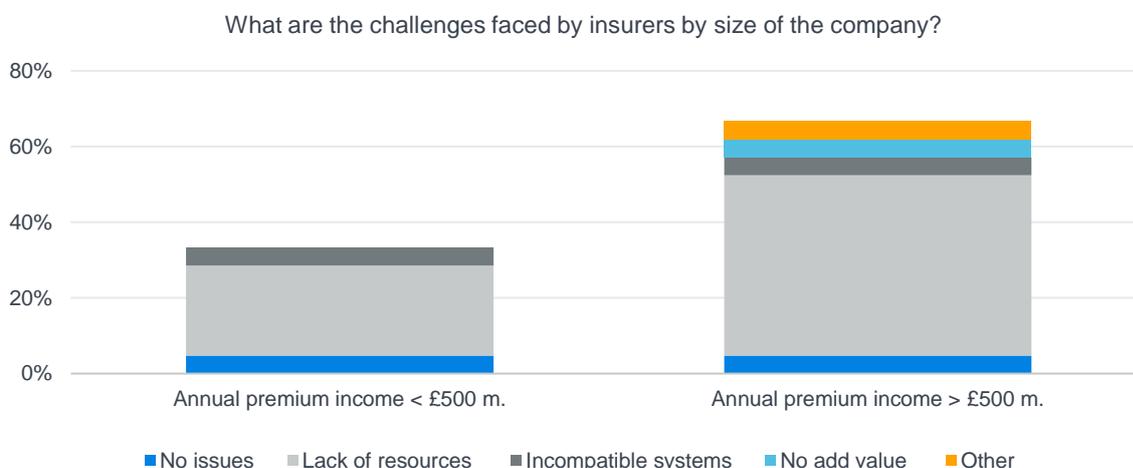
In general, slightly more than two-thirds of the respondents across the globe indicated that their reserving processes are automated reasonably but not extensively. The greater the size of the insurer the more automated the processes are internally (Figure 3), and the more emphasis is given to the efficiency and continuous improvement demanded. None of the respondents indicated that their reserving process is "very automated," though this may be expected due to the judgement involved in selecting the appropriate reserves.

FIGURE 3: AUTOMATION LEVEL WITHIN EACH FIRM



Most of the respondents are seeking greater efficiency and automation from their processes. The main constraints against advancing the automation process are lack of resources, associated costs and timeframe involved. Further reasons highlighted during the survey are incompatibility with their current systems and the frequency of changes to those systems, leading respondents to believe great value would not be added through automation (Figure 4). The challenges faced upon implementation are broadly irrelevant to the size of the insurer as Figure 4 confirms.

FIGURE 4: CHALLENGES FACED BY INSURERS



Automation could be a solution to resolving some of the potential operational risks discussed earlier, such as system and process failure, omissions, errors and mismanagement of the data. Control over the users allowed to access and adjust the data could improve efficiency and quality of the outcome.

However, automation brings its own risks if employees treat automated processes as a black-box solution due to the limited human input and judgement involved. As a result, employees may have little or no understanding of the process and calculations involved, leading to poor interpretation of the outcome itself. Another risk could exist if the automated system or process fails to identify an error and notify the user in time unless there was some degree of manual intervention.

Best practice could be achieved by balancing automation with the appropriate level of human review to ensure the quality of the outcome. Sense-checking, built-in checks, detailed reviews at different stages and the appropriate level of training provided are critical to ensure the robustness and soundness of the outcome.

SOFTWARE UTILISED

Regarding the software tools and packages used internally for reserving, half of the respondents confirmed the use of Microsoft Excel as the main tool used, especially by insurers that are not large. Excel is commonly understood, versatile and relatively affordable compared to other software packages available to firms, so this result is no surprise. However, its flexibility makes it vulnerable to errors and requires rigorous control processes around its use. The large insurers tend to use both Excel and reserving software packages developed by third parties, for which a subscription fee covers maintenance, as and if required. Only 10% of the survey respondents had invested in developing an in-house reserving software package.

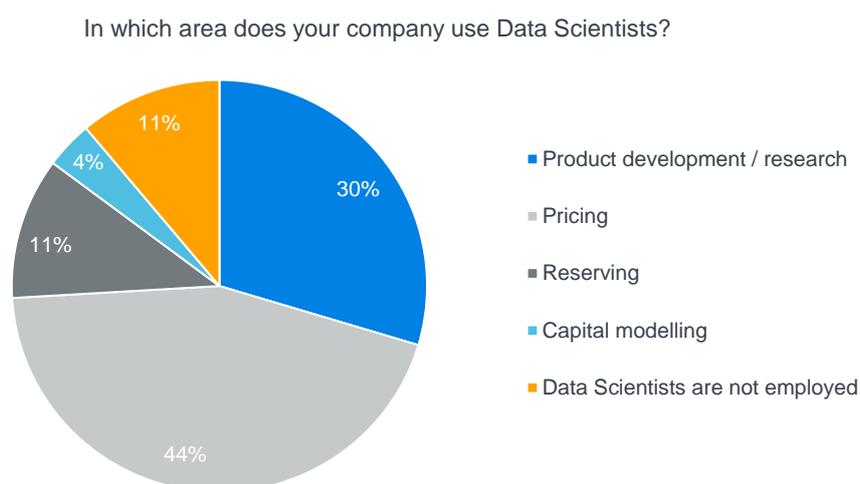
New technological software available in the market could be less time-consuming to run, less expensive and more efficient, accurate and user-friendly. An example of this could be a new reserving software that recognises data in any format, or one where the proprietary language used allows it to be faster. However, software may fail to provide the service promised, either in terms of timing or outcome. For example, a new feature may have been added to the third-party reserving software with which actuaries are not familiar.

Any software used should be supervised and reviewed regularly to ensure it is still fit for purpose. Additionally, acquisition of the appropriate level of storage, a schedule of regular backups on the cloud and a load of non-reliant heavy infrastructure locally will improve the software's speed of performance, reliability and accessibility. Adequate training should be provided to fully understand the power of its capabilities. If the software used is easy to learn and navigate, with no extensive coding needed in proprietary languages, then this should ensure the full utilisation of the asset, better interpretation of the outcome and a support debugging and review process of the software. Maintenance, including automatic updates with backwards compatibility, and easily accessible support, will also prove beneficial.

TECHNIQUES APPLIED

The survey suggested that actuaries in the US use a wider range of traditional methodologies in their reserving practices compared to the UK, as well as techniques incorporating predictive analytics. Data science tools and machine learning techniques have already been used extensively in pricing, product development and research practices, but to a lesser extent in reserving and capital modelling (Figure 5). None of the survey respondents indicated that they were using machine learning or other data science techniques as part of their reserving processes. However, firms in the UK favour recruitment of employees with data science and machine learning skills.

FIGURE 5: DATA SCIENTISTS ACROSS ACTUARIAL PRACTICES



According to the survey, the ability to improve and explore new techniques varies by the size of the firm. The larger the firm the more likely it is to invest in research and development. This is not unexpected, due to the considerable amount of time needed to investigate a technique and develop and personalise it so that the characteristics of the business are reflected in it and then to validate the outcome.

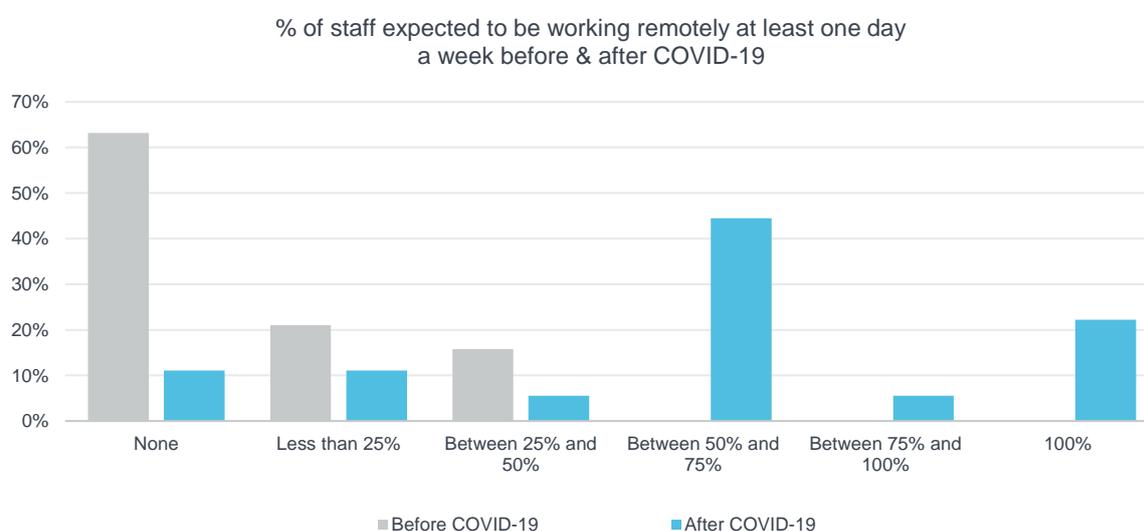
Developing new techniques allows for comparisons with existing techniques embedded in the process and encourages confidence in the outcome. Additionally, new techniques provide an opportunity to retain or acquire a competitive edge against peers, either through following trends or uncovering a niche insight.

The advantages of a new technique or tool should be viewed in light of its limitations, time needed and associated costs for development to appraise the overall value added to the business.

FLEXIBILITY AROUND WORKING PATTERNS

Due to the COVID-19 pandemic, firms' adaptability and flexibility around different working environments has been put to the test. Firms that had already implemented working from home and invested in technology support were more easily and quickly able to deal with such a sudden shift in working practices at minimal cost, compared to those who were lacking the IT infrastructure to make this feasible on such limited notice. The survey suggested that there is clearly a shift in the attitude of employers, as respondents have indicated that they would expect most of their staff to be working from home at least once a week after the COVID-19 pandemic (Figure 6).

FIGURE 6: COMPARISON OF EXPECTATIONS REGARDING WORKING REMOTELY BEFORE AND AFTER COVID-19 OUTBREAK



Most firms have introduced more flexible and agile working environments, and new entrants in the market have encouraged this trend even further.

On the one hand, employees are attracted to benefits based on their personal well-being and flexibility against their lifestyle, which could be reflected in greater productivity and efficiency. Firms trailing behind new trends in the market could risk losing good talent and damaging a competitive edge against peers.

On the other hand, virtual and physical risks of theft and cyberattack may potentially be higher in an environment where a significant proportion of the workforce is working from home. For example, burglary risk due to the lack of professional security in place could result in potential loss of a firm's physical assets. Ransomware attack is an example of a cyberthreat that has significantly increased through the COVID-19 outbreak, driven by the reduced firewalls and secured corporate networks, which could lead to data breach by accessing a firm's systems. It is also uncertain how employee behaviour might change, for example as absenteeism is less visible. Furthermore, social contact with work colleagues often plays a critical role in employees' overall well-being and development. Professional staff such as actuaries, for whom discussing and sharing ideas is an essential part of their role, may find it more difficult to implement in a virtual environment.

Best practice is to find the right balance between flexibility and the well-being of the employees and the business itself. This should remain a key consideration in the business strategy of every firm after COVID-19 pandemic with the impact on operational resilience as they design long-term working patterns.

Summary

When considering operational resilience, whether within or outside the actuarial reserving team, businesses should:

1. Identify key areas of potential vulnerability and assess the probability of occurrence alongside severity impact.
2. Assess tolerance levels around vulnerabilities that could be managed and sustained by the firm.
3. Invest in meeting targets of tolerance by embedding risk management control maximising operational resilience.
4. Ensure oversight and engagement of management, alongside roles of accountability.
5. Documentation and continuous monitoring will play an essential part of demonstrating compliance of the firm.

Reserving practice can be severely affected by operational issues and achieving best practice should be a key consideration for all firms. The survey confirmed that reserving remains a key area of development for firms, which evolves over time through new innovative techniques and methods applied. The robustness and reliability of the outcome, as well as the process itself, are critical for management decisions and the overall performance of the business.

How we can help

Milliman has extensive expertise on reviewing governance and oversight of a variety of functions for a wide range of clients and regulators. Our professional advice is based on the sound understanding of our clients' businesses and needs to improve and maximise operational resilience.

Reserving consulting is a core element of Milliman's business strategy in the UK and globally, including independent assessment of the adequacy of reserves, review of reserving process and design, variability analyses, risk and senior management oversight. Milliman has also developed a powerful tool that can be used for reserving purposes, called Arius, which embeds stochastic approaches.

If you have any questions or comments on this paper, on the operational resilience subject or on any other aspect of your risk management framework, please contact any of the consultants below or your usual Milliman consultant.



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