

Charting a Course for Profit in a Sea of Volatility

Actuarial Systems Market Update*

February 2016

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I. Executive Summary

The State of Actuarial Systems in 2016

Actuarial systems are changing as a wave of actuarial transformation takes place, moving work from manual, ad-hoc processes to IT-like production systems. To stay competitive, consistent, and efficient, insurers are updating or replacing actuarial platforms, particularly aging and homegrown systems. That explains why 85% of insurers plan to adopt at least one new system in 2016 or 2017.

Supporting the need for actuarial transformation, our 2014-15 technology adoption and investment survey shows that more than one-third of insurers do not have an enterprise actuarial system for one or more products, a percentage that has doubled since 2011. This occurs when a firm quickly issues a new product using ad-hoc processes instead of a dedicated actuarial system.

Carriers are also embracing emerging technologies like the cloud, in-memory processing, and hadoop to capture computing power, as well as model transformation and spreadsheet control systems, to add structure and safety to actuarial computing.

Insurers can gain four key benefits by using IT-like production actuarial systems:

- 1. Capture Competitive Advantage:** The ability to bring new products and features to market faster and in a more repeatable fashion to meet agent and distributor demands for competitive products.
- 2. Lower Operational Risks:** Increased efficiency, consistency, and auditability of enterprise risk management as regulation tightens due to ORSA, Solvency II, and in some cases, Dodd-Frank (SIFI).
- 3. Grow Revenue and Cut Costs:** The move from highly customized systems to configurable, usable solutions helps insurers reserve and price more precisely, growing revenue and lowering capital costs.
- 4. Capitalize on Scarce and Expensive Talent:** The maximization of actuarial talent letting "actuaries be actuaries" and focusing on interpreting calculations rather than computing them.

II. Market Trends

Actuarial Transformation: a Holistic Approach to Actuarial Systems

Since our 2012 Actuarial Systems Technology Analysis, insurers continue to take a more holistic approach to actuarial computing using a variety of tools along with traditional modeling systems. They have also accelerated actuarial transformation, standardizing and modernizing modeling, platforms, and risk data management. To help insurance executives in IT and finance who buy actuarial systems, our report provides an overview of:

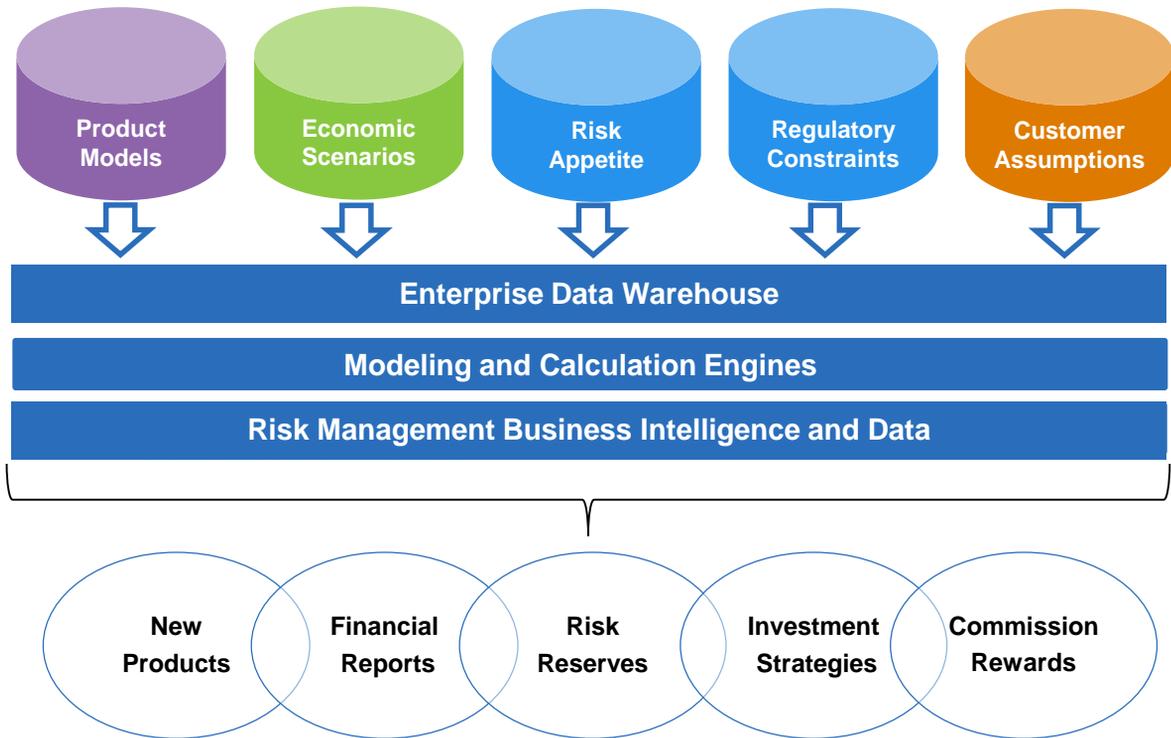
1. Actuarial modeling systems
2. Economic Scenario Generators (ESGs)
3. Risk analytics

Modernizing these solutions helps L&A and P&C insurance carriers drive to a more tightly integrated actuarial risk management environment (Figure 1).

In addition to software investments, insurers plan to maximize the value of their existing actuarial talent. The goal is to let 'actuaries be actuaries' and focus on strategic business decisions rather than IT tasks.

To succeed, many are taking a 'division of labor approach' with IT, shifting assignments to remove basic tasks like data entry, cleansing, management, and even reporting from the actuary's role. Thus, our report includes guidance on how insurers can leverage service providers and business intelligence for actuarial efficiency.

Figure 1: A Tightly Integrated Actuarial Environment Enables Agile Risk Management Workflows



Source: CEB analysis.

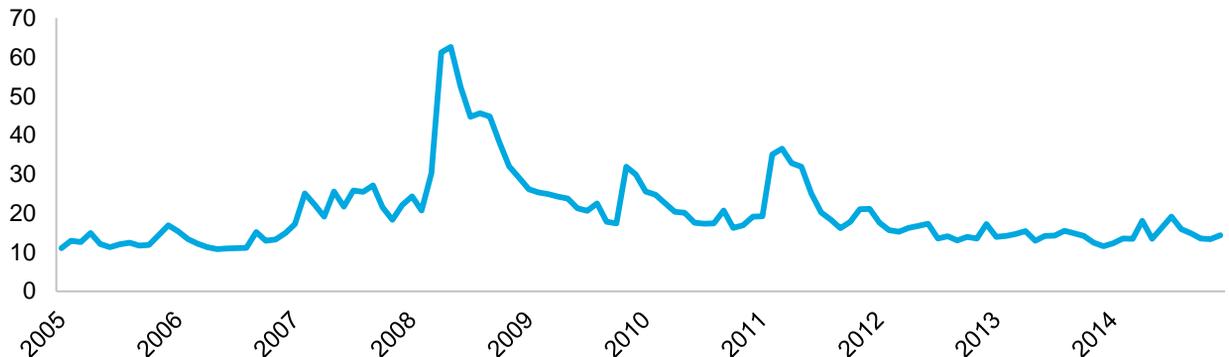
Volatility Externally and Internally

Insurance technology spending has been increasing slowly but steadily since the worst of the 2008 financial crisis. But one spending component has exceeded others as businesses compete within the constraints of regulatory oversight: investments in actuarial systems to price and manage risk.

To succeed, insurance executives must contend with two types of risk: financial and operational.

Increasingly interconnected financial markets have sparked greater volatility that insurers must account for in financial risk management (Figure 2). The growing economic interdependence between established and emerging economies increases market volatility and impacts investment income, creating a need for greater reserve cushions.

Figure 2: Equity Market Volatility

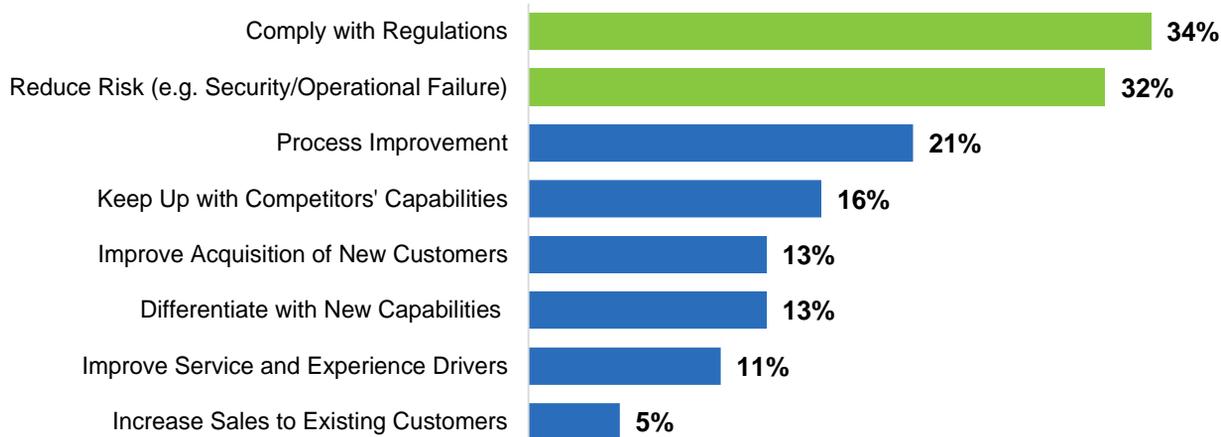


Source: VIX Volatility Index, Chicago Board of Exchange.

One operational risk stems from variations in internal practices which can lead to the use of inconsistent actuarial models for product development and risk management across the insurance enterprise; the “local” inconsistencies in a large insurance carrier can result in capital management strategies that are not optimal for the enterprise.

Our latest survey reveals that 74% of insurance executives contending with these challenges place high value on actuarial risk system technology because of its ability to solve risk challenges. The top two items driving the value of this technology were compliance and risk management (Figure 3).

Figure 3: Value Ascribed to the Adoption of Actuarial Systems

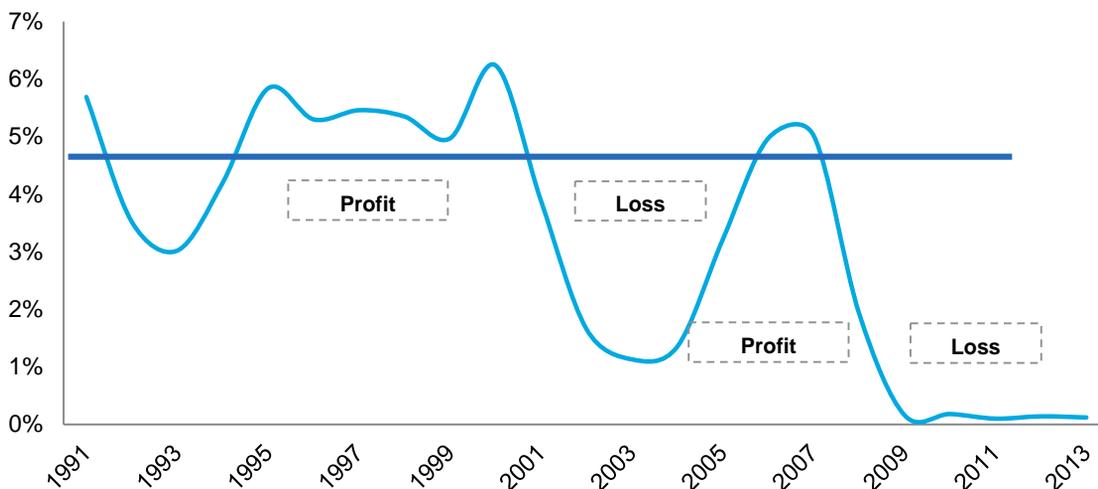


n = 38.
 Source: CEB 2014-15 Adoption and Investment Survey.
 Note: Respondents could select more than one option.

Another internal risk is the 50% decrease in the amount of life insurance policies that are being reinsured. With insurance profit margins shrinking in recent years, carriers have found it more economical to retain the risk of issued policies.

Compounding the challenge of increased risk retention are historically low interest rates. Insurers are obligated to invest conservatively and rely on safe, fixed-interest rate investments. But rock-bottom interest rates make it difficult to build capital to pay for long-term obligations like annuities and pensions (Figure 4). Indeed, 77% of insurance executives rated “Improving capital management for profitability and solvency” as a “most critical” priority in the next six to twelve months.

Figure 4: US Federal Funds Raise Compared to a Common Annuity Guarantee (3%)



Source: CEB analysis, Average Rates 1991-2013.

The Four-Year Adoption Wave

Over the past four years, our technology adoption and investment survey has measured insurance executives' intentions for actuarial technology investments. We've seen two key trends: an accelerated adoption and investment trend and a 50% increase in the number of executives reporting they do not have this technology for one or more products.

The first is evidenced by the decisive shift of respondents from "planning to replace," to adopting, to "not planning to change" across our recent surveys respectively (Figure 5). A number of needs are driving this, including the ability to bring new products to market faster, increased risk management consistency, process improvement, and the maximizing of talent, allowing actuaries to spend more time interpreting calculation results rather than computing them.

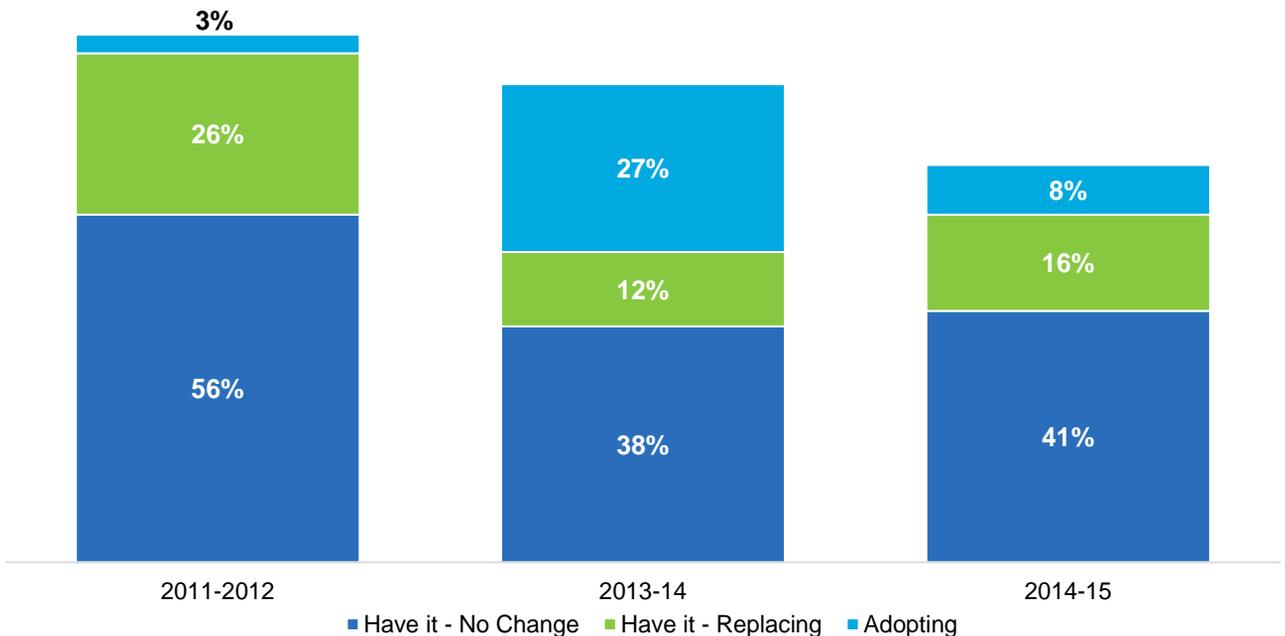
System age is another driver of the replacement trend. Older actuarial systems require difficult revisions and upgrades to fulfill strategic business goals. While the average age of actuarial systems has declined during this recent adoption trend, 44% of current actuarial systems remain at least 10 years old (in 2011 it was 53%). So the replacement trend has still has 'legs' and will continue.

Parallel to the adoption and replacement trend, our 2014-15 survey reveals that more than one-third of insurers currently do not have an enterprise actuarial system for one or more products, a percentage that has doubled since 2011.

This often occurs as carriers issue new products or features quickly and use manual spreadsheets instead of actuarial systems. In doing so, they risk enterprise-wide inconsistencies which can negatively impact strategic initiatives.

In order to remain competitive, CEB TowerGroup Insurance is seeing leading insurance executives preparing to act now. Our survey reveals that the adoption wave will peak in 2016 with 85% of insurers adopting a new actuarial system then. This peak reflects the Solvency II enforcement date of January 1, 2016.

Figure 5: Current State of Actuarial Systems



n = 72 (2011-12); 77 (2013-14); 64 (2014-15).

Source: CEB 2011-15 Adoption and Investment Survey.

The Regulatory Noose Tightens for Insurers

After the 2008 financial crisis, both the US and the European Union developed enhanced regulations to assess risks in their financial system, which have direct and indirect consequences to insurers globally. In the US, regulations including Dodd-Frank SIFI Designations, ORSA, potential IFRS Accounting Conversion and Principles-Based Reserving (PBR) provide parallels to Europe's Solvency II regulations in adding oversight of the use of and results from actuarial systems and tactical actuarial solutions, particularly spreadsheets.

For insurers these regulations necessitate a greater calculation capacity due to PBR and require a more tightly integrated modeling environment. It also requires risk management functions like dynamic hedging to be better defined and more repeatable.

Going forward, hedging functions will be subject to more review, approval, and audit. Finally, Solvency II, ORSA, and PBR will most likely push life insurers to hold higher levels of capital to cover all possible risks. These new capital and process requirements mean more hedging assets will need to be purchased and stronger hedging processes will need to be established. At worst, these new standards threaten to push small and mid-tier firms out of the profitable products like variable and indexed annuities.

Own Risk Solvency Assessments (ORSA)

ORSA assesses three capabilities:

- Risk management frameworks
- Quantitative measurements of risk exposure in normal and stressed conditions
- Group risk capital and the prospect for solvency

2016 was the first year insurers needed to submit ORSA reports providing deep visibility into their risk management practices. But the focus remains on ORSA regulations due to concerns over how regulators will use this information with many anticipating that it could result in more stringent reserve requirements.

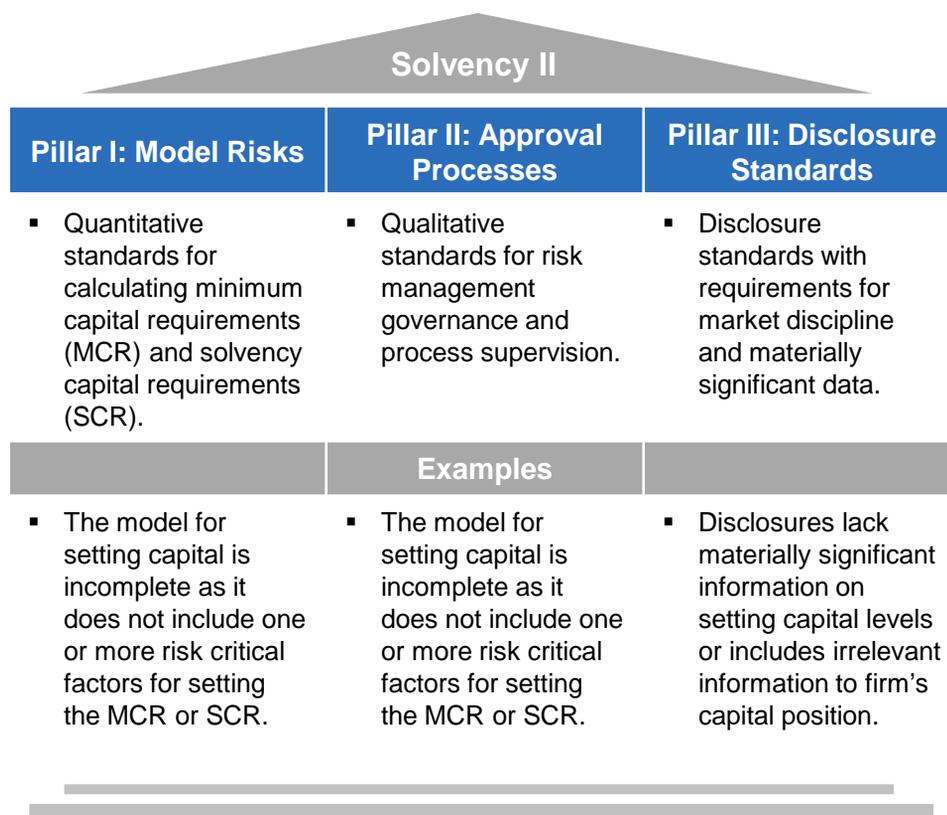
Interestingly, 74% of Chief Risk Officers (CROs) say that ORSA has added value to their firms beyond simple compliance. Some of the reported benefits include:

- Identification of possible gaps in risk management practices
- Alignment of stress-testing assumptions through the business unit
- Promotion of more comprehensive risk communications with the business.

Solvency II

On January 1, 2016 Solvency II came into effect in the European Union. These regulations, announced in 2012, aim to prevent the default of insurance companies by setting both capital and process requirements. These requirements are broken down into three pillars shown in Figure 6 on the following page.

Figure 6: The Three Pillars of Solvency II

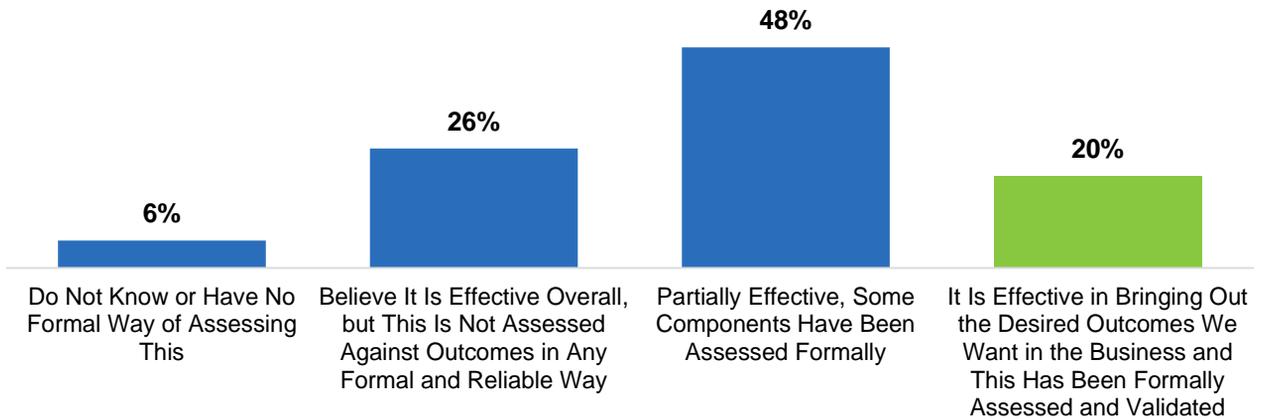


Source: "A Primer on Solvency II," Numerix.

Our last actuarial systems report, which coincided with the announcement of Solvency II, showed that executives were anticipating that the new regulations would have a decidedly negative impact. But the end reward from Solvency II is much more than checking the box of regulatory compliance. Done correctly, insurance leaders are telling us that it can enhance the capital efficiency of insurers and boost both profits and working capital to reinvest in business development.

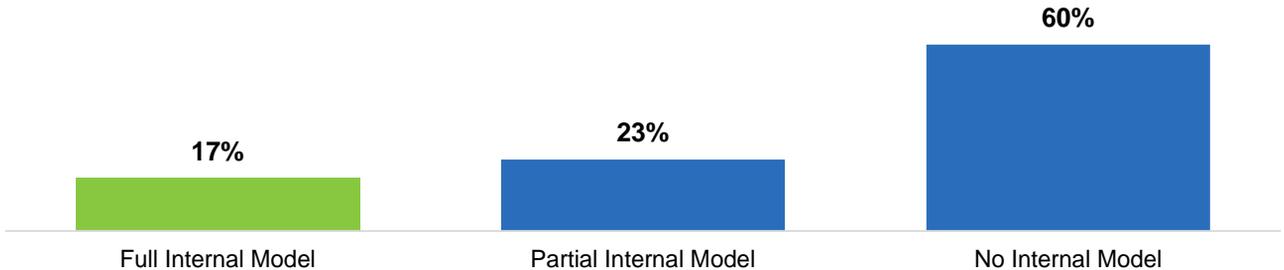
Unfortunately, many firms are still struggling to meet both quantitative and qualitative requirements set in Solvency II. Indeed 76% of companies say they have only partially met or have yet to meet any requirements thus far. Automation of many risk management activities, particularly reporting, remains relatively low and only 20% of companies have determined their risk management system is effective through a formal assessment (Figure 7). In addition, 83% of companies either don't have or only have a partial internal model, and are still manually reporting and calculating key risk management metrics (Figure 8).

Figure 7: Effectiveness of Risk Management System



Source: European Solvency II Survey, 2014, Ernst & Young.

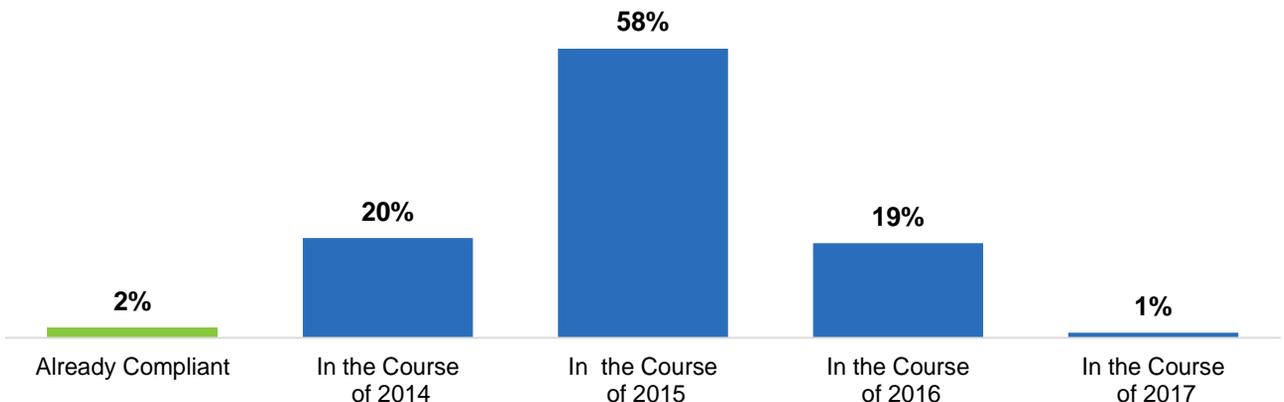
Figure 8: Internal Model Development



Source: European Solvency II Survey, 2014, Ernst & Young.

However, to extrapolate that insurers are disorganized or panicked would be inaccurate. Instead, these figures tell us that they clearly recognize the work ahead of them and have established clear paths toward compliance. Some are closer than others, but 99% anticipate full compliance by the end of 2016 (Figure 9). It is also clear that even those currently compliant will be adjusting their models and processes beyond the January 1, 2016 deadline; improved risk management spurred by the regulatory noose will remain a long-term focus for all insurers.

Figure 9: European Solvency II Readiness as of 2013



Source: European Solvency II Survey, 2014, Ernst & Young

Feature Audit continued

	ClusterSeven
AUDITABILITY	
Detailed Policy Audits	●
GAAP Reserve Support	●
Outlier Reports/Scans	●
Statutory Reserve Support	●
Tax Reserve Support	●
CALCULATIONS	
Canadian MCT	●
Deterministic Calculations	●
Hindsight Development Ratios (Carried)	●
Hindsight Development Ratios (Incurred)	●
Hindsight Development Ratios (Paid)	●
Reserve Adequacy	●
Risk-Based Capital	●
Stochastic Calculations	●
COMPLIANCE	
AG 33 (CARVM Fixed)	
AG 35 (CARVM EIA)	
AG 38	

	ClusterSeven
COMPLIANCE (CONTINUED)	
AG 43 (CARVM Var)	
C-3 Phase II	
PBR (Principles-Based Reserving)	
Solvency II	●
INFRASTRUCTURE	
Cloud	○
GPU Capability	
HPC Compatible	
Mid-Tier/Linux	
PC/Windows	●
INPUT/OUTPUT	
Customizable Data Inputs	●
Customizable Data Outputs	●
Standardized Data Inputs Using External Formats	●
Standardized Data Outputs Using External Formats	●
PRODUCT SUPPORT	
Dedicated Consulting	●
Operational Risk Management	●

● Standard Native	A feature contained in the base package of the solution. Standard native features are provided by the firm, a third-party firm, or partner.
● Premium Native	A feature that is only available at an additional cost or as an addition to the base package of the solution, and is provided solely by the firm.
● Third-Party Premium	A feature that is only available at an additional cost or as an addition to the base package of the solution, and is provided by a third-party firm or integration partner.
● Plan to Offer in 12 Months	A feature on the firm's product roadmap with plans to offer within the next 12 months.
○ Plan to Offer in 24 Months	A feature on the firm's product roadmap with plans to offer within the next 24 months.

Source: ClusterSeven; CEB analysis.

Feature Audit Definitions

AUDITABILITY	
Detailed Policy Audits	The solution provides an evaluation of current policy details and costs, a review of projected policy performance and cash value, an assessment of contractual guarantees, or lack thereof, recognition of potential estate or gift tax concerns based on changing tax laws, and an assessment of the insurer's financial strength.
GAAP Reserve Support	The system complies with the most up-to-date generally accepted accounting principles (GAAP).
Outlier Reports/Scans	The system can produce scheduled or ad-hoc reports on unusual customer/transaction behavior, and trigger further investigation of any outliers.
Statutory Reserve Support	The system complies with state-regulated reserve requirements.
Tax Reserve Support	The system offers ongoing support for tax reserves for both P&C and L&A insurers.
CALCULATIONS	
Canadian MCT	The solution provides the necessary calculations to meet the Canadian Minimum Capital Test requirements.
Deterministic Calculations	The system can make deterministic calculations based on algorithms that measure distinct inputs and identify with a given output.
Hindsight Development Ratios (Carried)	The solution can calculate the ratio of the industry's hindsight unpaid loss and defense and cost containment expense to the initial carried loss and DCCE reserve at 12 months of development.
Hindsight Development Ratios (Incurred)	The solution can calculate the ratio of the industry's hindsight unpaid loss and defense and cost containment expense to the incurred loss and DCCE reserve at 12 months of development.
Hindsight Development Ratios (Paid)	The solution can calculate the ratio of the industry's hindsight unpaid loss and defense and cost containment expense to the paid loss and DCCE reserve at 12 months of development.
Reserve Adequacy	The solution can determine whether the amount of assets held are able to support future benefit payments, often used as a basic reserving threshold.
Risk-Based Capital	The solution can assess the amount of capital based on an assessment of risks that a company should hold to protect customers against adverse developments.
Stochastic Calculations	The system can make stochastic calculations based on streams of random data inputs in order to identify an output over time.

Source: CEB analysis.

Feature Audit Definitions continued

COMPLIANCE	
AG 33 (CARVM Fixed)	The system complies with regulations for fixed annuity products subject to the Commissioner's Annuity Reserve Valuation Method (CARVM).
AG 35 (CARVM EIA)	The system complies with regulations for equity indexed annuity products subject to the CARVM.
AG 38	The system complies with the reserve requirements for all universal life products that employ secondary guarantees (ULSG), with or without shadow account funds.
AG 43 (CARVM Var)	The system complies with regulations for variable deferred annuity products subject to the CARVM.
C-3 Phase II	The system complies with regulation for all individual VA products.
PBR (Principles-Based Reserving)	The system can support principle-based reserving for more complex products for all lines of business written, based on state and federal laws.
Solvency II	The system complies with all financial requirements, governance and supervision, and reporting and disclosure regulations in the European Union.
INFRASTRUCTURE	
Cloud	The system can be deployed as a software-as-a-service, with data hosted on a shared or private cloud.
GPU Capability	The system features a modern graphics processing unit (GPU).
HPC Compatible	The system uses high-performance computing (HPC) to run parallel processes that improve the solution's efficiency and reliability.
Mid-Tier/Linux	The system operates on a Linux/Unix platform utilizing one or more CPUs that are more powerful than those in personal computers.
PC/Windows	The system operates using a single-unit processor.
INPUT/OUTPUT	
Customizable Data Inputs	The system allows the user to customize the data the models use in calculations.
Customizable Data Outputs	The system allows the user to customize the way the models end calculations and recommendations are formatted and displayed.
Standardized Data Inputs Using External Formats	The system utilizes standard inputs from external formats like text flat files or .xml files for their model calculations.
Standardized Data Outputs Using External Formats	The system utilizes a standard format to display model calculations and recommendations.
PRODUCT SUPPORT	
Dedicated Consulting	The technology provider has focus and staff that provide implementation and ongoing support for P&C and/or L&A insurers.
Operational Risk Management	The system has transparency around IT staff/actuarial staff actions within the tool and can generate necessary operational reports and audit trails.

Source: CEB analysis.

Key Statistics

Founded: 2003
Company Type: Private
Headquarters: London, UK
FY 2014 Revenue: Not disclosed

Company Overview

ClusterSeven provides a suite of software products designed to provide a complete risk management solution for financially oriented end-user computing applications. As a result it is used by multiple business sectors, but there is a particular emphasis on financial services companies where regulations are demanding better scrutiny of financial reporting processes. ClusterSeven clients include retail and investment banks, insurers, and asset managers with adoption among the broader CFO community.

Product Overview

The ClusterSeven suite includes four modules: an Enterprise Spreadsheet Manager (ESM), Access Database Manager (ADM), Inventory Management System (IMS) and “Discovery.” Discovery locates and analyzes many end-user computing file types (spreadsheets, Access databases etc.).

Recent Updates

ClusterSeven released the latest versions of its ESM and IMS modules this year replacing those from 2013. A software as a service (SaaS) offering and deeper integration across elements is planned for the future.

CEB View

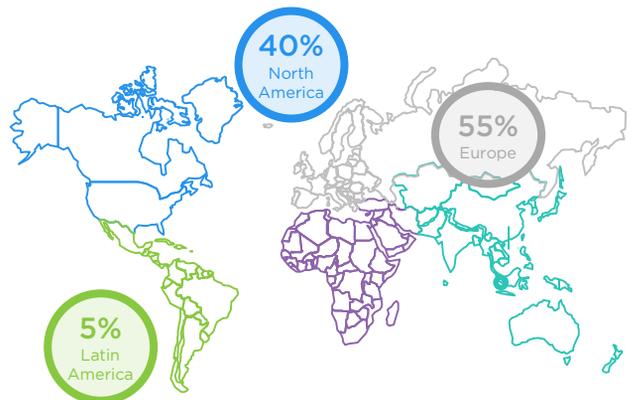
ClusterSeven brings a new approach to an old problem. Instead of replacing spreadsheets with an application system, ClusterSeven adds the needed controls and production system best practices to the ad-hoc and unstructured world of Microsoft Excel-based modeling. The application has a wealth of insurance uses beyond financials.

Customer Success Story

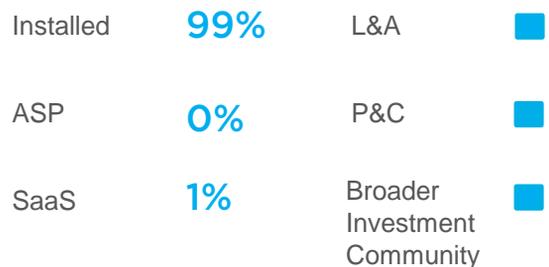
Janus Capital Group's Operational Risk Team coordinated an exercise to self-identify the use of spreadsheets by department. Its findings indicated the operational dependency of many processes on spreadsheets coupled with a weak control environment.

Using the ClusterSeven ESM solution, Janus gained visibility of the “spreadsheet universe” to improve controls and provide consistent Reporting and Oversight. Within a month of implementing ClusterSeven, Janus experienced improved operational performance and insights. Janus has leveraged the solution’s functionality to quickly provide updates regarding period-over-period changes for quarterly reporting. What once was a laborious side-by-side comparison process is now easier. The improvement of the controls over spreadsheets has had a positive impact on Janus’ risk profile, and its business areas are now more aware of their spreadsheet use on a much larger scale.

Clients by Geographic Location



Clients by Service Model & Line of Business



Source: ClusterSeven.