The future of actuarial modeling

How a robust model conversion strategy can support a successful long-term transformation
Creating the vision

Vendor-provided actuarial modeling software packages typically come equipped with an innovative architectural design or other features that promise future improvement to one’s current state. The enhancements could come in the form of updated regulatory requirements or an advanced technology stack that increases efficiency or automation.

Attempting to leverage these enhancements in isolation, without consideration of a broader future state end-to-end processing vision, without respect to either current or in-flight end-to-end capabilities, is likely to prevent a company from unlocking maximum value from the systems implementation effort. For best results, we advise that time be set aside in the planning phase of an actuarial model conversion effort (potentially during a software selection project, which is typically used to survey the market and formulate a modeling platform decision) to determine, articulate, socialize and ultimately document a future state modeling vision that can both guide selection of the tool and lead to principles to inform the implementation project.

When formulating this vision, consideration needs to be given to the full end-to-end modeling process, associated functions, such as finance and IT, and associated technology components, such as source data inputs, calculation engines, reporting systems and process facilitation. The vision should also include considerations for changes to the people model and organizational structure that support this end-to-end process, along with the presence of change management protocols.

As an example, a vision statement of a company may read:

Modernize actuarial processes to expedite quarterly valuation close process and produce more accurate results. Replace calculation engine with a more modern platform with better assumption management and automation. Remove manual processes needed for data preparation for model inputs and preparation of output entries to be fed to the general ledger and subledger.

Having a future state vision articulated can help organizations choose and prioritize which components of a conversion they want to take on first, which ones to defer and which ones to not tackle as part of the conversion at all. For example, an organization whose main motivation to convert is compliant with US GAAP long-duration targeted improvements (LDTI) can narrow project scope to configure the modeling system for LDTI and modifying the reporting system to handle additional disclosures while keeping changes on the input data side limited to a “minimum viable product” strategy, sourcing just additional data needed for the LDTI calculations and reporting and stopping short of doing something more transformative.

Similarly, an organization that has an overly manual data transformation process might decide to prioritize revamping the front-end data processes along with other parts of the conversion.
The company may also just need to define what the proper modeling and end-to-end process future state is prior to breaking ground, accounting for moving targets, such as technology road maps, changing regulatory environments and new products, in an effort to “set their aim” for the conversion effort. Definition of the desired future state can help better define conversion scope, in particular for items that dwell more into the finance or IT space like source data and reporting.

A potential approach to consider is provided in Figure 1, which shows a company selecting a few discrete “states” for various elements of the end-to-end process.

**Figure 1: Continuum of future states**

Range of options from core to full transformation

<table>
<thead>
<tr>
<th>Core</th>
<th>Strategic</th>
<th>Full transformation</th>
</tr>
</thead>
</table>
| **Summary definition** | ▪ Focused on must-have items  
▪ Tactical improvements to reduce pain points and model limitations | ▪ Incremental to core strategy  
▪ Broad improvements are made to reduce pain points (e.g., removing manual processes) | ▪ Optimal level of model rationalization and harmonized data sourcing, data ingestion and conformance  
▪ Introduce capabilities, such as master data management, single source of truth, automated enrichment/integration for finance subledger, etc. |
| **Considerations** | ▪ Expediting timelines by reducing dependencies from critical path  
▪ Does not solve all pain points  
▪ May require rework if company undertakes a full transformation in the future using approach that is not aligned with the strategic approach | ▪ Requires added effort for build and test (e.g., for data transformation to eliminate manual processes)  
▪ May require rework if company undertakes a full transformation in the future using approach that is not aligned with the strategic approach | ▪ Longer-term approach but can make continued incremental improvements leveraging enterprise IT capabilities  
▪ Must be undertaken as a coordinated effort with actuarial, finance, risk and IT |
| **Example — LDTI** | | |
| **Production** | ▪ Use existing legacy toolsets to handle LDTI calculations | ▪ Use combination of in-flight converted models and legacy toolsets | ▪ Convert all LDTI calculations to future state platform |
| **Staging** | ▪ No changes to data processes except sourcing additional data needed for LDTI calculations | ▪ No changes to data processes because the current process can be carried forward for a few years and there is currently no appetite to undertake a revamp of data processes due to competing priorities | ▪ Rework admin feeds for automated and better-quality data removing all manual touchpoints  
▪ Promote data quality and consistency using enterprise master data management |
| **Reporting** | ▪ No changes to reporting processed except creation of additional reports under the current process to enable LDTI reporting and disclosures | ▪ Significant revamp to reporting systems to enable better and quicker analysis of financials – one of the major pain points of the company | ▪ Rework reporting processes by leveraging big data to enable single source of truth, automated reporting and feeds to finance subledger |
For each of these states and corresponding elements of the end-to-end process (such as source data, staging, calculations and reporting), the organization can then attempt to articulate what these various states would look like. It is advised that as a part of the exercise, the company also consider other influencers, such as accounting for in-flight conversion efforts, or other business constraints. With this grid filled out, the organization now has some perspective on where to “set their aim” in that continuum; in other words, attempt to articulate how much transformational rigor they wish to exert for a given component of the end-to-end process as a part of the conversion project.

Other factors to consider are the time required to implement and the cost associated with each option. While undertaking a full transformation is aspirational, the timeline and cost associated with a full transformation make it prohibitive for most companies. While some companies may land on core requirements for select components, the incremental requirements under a strategic or full transformation approach may ultimately have a staggered approach to implementation, to be worked on over a longer period of time.

While not an exact science, this framework helps to develop a point of view on where the transformation’s aim is for major components before commencing detailed requirement gathering and architectural design efforts.
Data management

Data management plays a prominent role in the end-to-end modeling and reporting process but has been historically underserved when planning conversion efforts.

One of the best ways for data management and actuarial models to function as one integrated solution is to design them together when the models are converted or initially built, as opposed to standing up the model first and then trying to build a data management solution around the model. This is particularly important with some of the emerging regulatory requirements; for LDTI, creation of disclosures requires tight coordination with data elements made available from both the actuarial modeling system and upstream finance systems as well. The actual reserve bookings to the ledger also depend on the same upstream finance systems data, placing a heightened emphasis on the associated management and control of this information.

The resulting solution design and implementation road map will be unique for every transformation program based on a host of factors, such as current level of maturity, in-flight data management transformation efforts, and overarching time and cost constraints. It is imperative for transformation and modeling leaders to have a solid understanding of the key design considerations as well as the different implementation approaches regarding data management.

As prefaced in the previous section, construction of select discrete future state cases for elements of data management are advised to help a company “set its aim” for the transformation effort. An example of what this could look like for data management, using the same three states previously defined, is shown in Figure 2.

![Figure 2: Transformation continuum as applied to data management](image)

<table>
<thead>
<tr>
<th>Range of options from core to full transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core</strong></td>
</tr>
<tr>
<td>Data sourcing</td>
</tr>
<tr>
<td>• No foundational changes except developments needed to bring in the data required for the new calculations and/or modeling platform</td>
</tr>
<tr>
<td><strong>Strategic</strong></td>
</tr>
<tr>
<td>Data staging and preparation</td>
</tr>
<tr>
<td>• No foundational changes except developments to transform source data into the format needed for the new calculations and/or modeling platform</td>
</tr>
<tr>
<td><strong>Full transformation</strong></td>
</tr>
<tr>
<td>Data storage</td>
</tr>
<tr>
<td>• No foundational changes except developments to store the new model output</td>
</tr>
</tbody>
</table>

The future of actuarial modeling
Data management was historically given lower priority as actuaries tend to manage model conversion projects within the confines of the actuarial function. For example, it is still common for actuaries to make changes to data feeds from IT to either fit the model needs or perform topside model results to account for data issues or limitations. These changes introduce manual processes and additional risks in the reporting process, and yet they are long accepted as “the lesser of two evils” since the effort required to obtain better data is considered cost- and time-prohibitive.

In recent years, however, there has been an increased recognition by actuaries that data management supporting actuarial models is no longer something that can be managed by actuaries alone. Companies are increasingly rethinking their design and operating model over data processes at least partially due to the following drivers, which lean more toward the transformative end of the scale shown earlier.

1. **New technology for storing, managing and using data**
   - Technologies, such as the cloud, are enabling companies to store a much larger amount of data, both structured and unstructured, easily and at lower costs. The increase in available data is allowing companies to do more as the actuarial modeling processes are no longer bound by data limitations. However, working with a larger amount of complex data and dealing with the data security and privacy issues associated with the new technology will require specialized knowledge and greater utilization of IT resources.

2. **Enterprise-level solutions/single source of truth**
   - New data management technologies are often enterprise-level solutions, meaning that insurers will want to build data solutions at scale and allow different areas within the organization to access these solutions, thus reducing the need for actuaries to build and maintain these data processes. This is important for both reducing costs to manage and back up the data and maintaining a single source of truth within the organization without creating unmanageable data lineage problems. Also, to coordinate efforts and confirm consistency, many insurers are establishing enterprise-level data stewards, who are responsible for consistent data management across the enterprise.

3. **The need for historical data**
   - Actuaries have long worked toward better ways of archiving actuarial models, but recent accounting changes, such as US GAAP LDTI, also heightened the need for better historical data. Nowadays, actuarial modeling software often has good built-in data transformation functionality, but management of a large amount of historical data sometimes still requires specialized data solutions.

4. **The emergence of big data**
   - Insurers are also looking to generate additional insights from big data, for example, using fitness data from wearable devices. Even though these data sources are most often used in underwriting and experience studies/assumptions setting, companies have started looking into enhancing their actuarial modeling with new data and the techniques applied to generate insights. For example, using macroeconomic data and predictive analytics/machine learning techniques to construct new dynamic lapse formulas.
Some of the key elements under this construct include:

Opening up legacy source data systems is usually a huge endeavor. The focus in a model conversion is, therefore, typically on reengineering data transformation and storage (“integrated data layer”) while leaving the source data as is.

The design of the data repository should adhere to the “single source of truth” concept. Since much of the data going into the actuarial models are also used by other functions, an enterprise-level repository, with different “regions” (e.g., actuarial region, finance region) within the repository, is a design that is gaining popularity.

Many actuarial modeling software packages in the market offer front-end data tools and capabilities in addition to the core calculation engine. Whether to use these tools, or use other data tools and then integrate with the core calculation engine, is an important decision that should be made centrally by the conversion project leaders for consistency.

While aiming toward the far end of the transformation spectrum for data management purposes can be costly and time-consuming, we do see a greater amount of attention being paid to it during model conversion planning projects. Accounting for the forthcoming or concurrent change on this respective agenda can bring added focus to the project scope and an increased likelihood of integration success when the future state becomes the current state.

Figure 3: A glimpse into the future of data management
As organizations think through transforming their data or modeling solutions, there will certainly be impacts to reporting tools and associated reporting processes. Beyond this, there are added incentives to reassess the reporting capabilities with parallel investments in data and/or models. These benefits include:

- Centralizing and rationalizing reporting sources ("single source of truth")
- Enhanced management reporting
- Enhanced automation, reporting processes and updated reporting operating models

Traditionally, actuaries have handled many of the reporting requirements manually using the actuarial model reporting interfaces and supporting tools, such as spreadsheets. Recently though, similar to the trends in modeling, companies are gravitating toward a more structured and centralized reporting toolkit. Actuarial vendor capabilities have also evolved and become more robust. The opportunity to modernize the reporting function is facilitated by companies’ investments to enhance their data management capabilities.

Continuing with the earlier approach, the construction of select discrete future state cases for elements of reporting capabilities is advised to help a company “set its aim” for the transformation effort. Figure 4 illustrates a representative continuum from a reporting perspective.

---

**Figure 4: Transformation continuum as applied to reporting**

**Range of options from core to full transformation**

<table>
<thead>
<tr>
<th>Core</th>
<th>Strategic</th>
<th>Full transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting metrics</td>
<td>Design and addition of reports to provide additional insights into business (i.e., enhanced management reporting capabilities)</td>
<td>Restructuring of reports and rationalization of metrics/variables, including considerations for upstream dependencies (e.g., model output, external sources)</td>
</tr>
<tr>
<td>• No significant changes with exception of development of additional reports needed by emerging requirements (e.g., LDTI reporting and disclosures)</td>
<td>• Opportunistic use of data visualization toolsets</td>
<td>• Integrated data visualization toolsets as primary sources of management reporting</td>
</tr>
<tr>
<td>Reporting processes</td>
<td>• Significant revamp to reporting systems to enable better and quicker analysis of financials</td>
<td>• Rework reporting processes by leveraging big data to enable single source of truth, automated reporting and feeds to finance systems</td>
</tr>
<tr>
<td>• No foundational changes to reporting processes except to accommodate for new requirements (e.g., multiple runs for LDTI disclosures)</td>
<td>• Improved controls and automation</td>
<td>• Fully automated reporting architecture linking models to final reporting</td>
</tr>
<tr>
<td></td>
<td>• Reduced dependency on model owners (often actuaries) for reporting</td>
<td>• Customers provided direct access to reports for reporting, analysis and validation</td>
</tr>
</tbody>
</table>

---
Given the prospect of a greater transformational “lift” from solid data and modeling solutions, companies can approach the modernization of their reporting solution in phases. The “must-have” requirements are represented by the “core” bucket in Figure 4 — often included in the first phase of a transformation. The development of more strategic enhancements could be staggered with improvements in data and models, depending on a company’s appetite to invest.

When deciding a company’s particular placement on this continuum, companies will want to consider the numerous benefits from residing at the right end of this spectrum. We have observed a greater amount of scope afforded in actuarial model conversion projects to reporting enhancements. Companies aiming for this end of the spectrum seek to enjoy some of the following benefits:

- A single source/reference for all reporting variables for the current and previous reporting periods is needed.
- Reporting requirements across use cases often will share the same output variables, requiring consistency. Rationalizing the report development will limit each unique variable to a single source for a given run set of parameters. This effort paired with a redesign of the model runs/output will also reduce the stress on models to produce duplicative sets of output.
- Big data solutions, including use of reporting repositories, can be leveraged to support these efforts through both (a) the use of the same technology to structure the model output and (b) the need to merge model output with other data sources (e.g., admin information).
- Actuaries are getting a greater volume of requests for more granular, real-time analyses from their models. Strategic investments in reporting capabilities can facilitate the production of ad hoc model runs and analysis.
- Visualization tools can be linked to output data repositories to provide added functionality supporting report development.
- Added data structure provides the users with the ability to better automate the reporting process, thus eliminating manual touchpoints and improving controls.
- Automation also allows for the transition of responsibilities to non-actuarial resources to execute the activities, reducing a key dependency.

Figure 5 provides a rationalized view of what the future of reporting processes could look like for companies able to make investments in updating the supporting systems and processes alongside their actuarial modeling work.

Figure 5: A glimpse into the future of reporting
With this type of paradigm, there are a few key elements to point out:

- From the models, one of the more foundational elements is that actuarial models are configured with the appropriate granularity and range of metrics to accommodate all back-end reporting needs. Time is more ideally spent in a model conversion project inventorying and configuring these data elements into the model, in lieu of expending effort to configure any native reporting capabilities or build spreadsheet-based back-end tools.

- With data emerging from the models at the proper level of grain, we see increased adoption of data repositories to store and manage large sets of data. This promotes consistency and provides a “one-stop shop” for reporting data to which other toolsets can connect.

- There is increased adoption of business integration tools that connect to reporting repositories, offering powerful alternatives to spreadsheet or actuarial vendor-based reporting solutions. These toolsets are raising the bar on the depth and breadth of reporting capabilities available to insurers.

Companies are preparing to deal with more complex reporting requirements with the regulatory shifts toward principles-based reserves, LDTI and International Financial Reporting Standards requirements. Many companies are using this disruption as an opportunity to make significant investments in data and financial models. We see large-scale modeling projects (e.g., conversions, LDTI implementations) serving as a catalyst for actuaries to refine their modeling vision, including elements beyond the immediate reach of their actuarial models. While companies can choose to develop their capabilities at various ends of the transformation continuum, the current industry trends certainly point to significant advances across the end-to-end reporting processes.

**Bringing it all together**

Active planning and visioning around data management and reporting may bring greater definition to insurers’ transformation scope and position them for greater success. Careful planning and coordination with other in-flight initiatives, including those driven by finance and IT organizations, will also help give a more fulsome picture of project scope, timing and cost. Among everything else, careful consideration of these factors will also minimize “buyer’s remorse” on the behalf of stakeholders, as the solutions will be better tailored to a more complete vision of the desired future state.

**Contacts**

Dave Czernicki  
Principal  
Ernst & Young LLP  
dave.czernicki@ey.com

Francis Rahil  
Senior Manager  
Ernst & Young LLP  
francis.rahil@ey.com

Marshall Lin  
Senior Manager  
Ernst & Young LLP  
marshall.lin@ey.com

Vikas Sharan  
Senior Manager  
Ernst & Young LLP  
vikas.sharan@ey.com
About EY

EY is a global leader in assurance, tax, strategy, transaction and consulting services. The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over. We develop outstanding leaders who team to deliver on our promises to all of our stakeholders. In so doing, we play a critical role in building a better working world for our people, for our clients and for our communities.

EY refers to the global organization, and may refer to one or more, of the member firms of Ernst & Young Global Limited, each of which is a separate legal entity. Ernst & Young Global Limited, a UK company limited by guarantee, does not provide services to clients. Information about how EY collects and uses personal data and a description of the rights individuals have under data protection legislation are available via ey.com/privacy. For more information about our organization, please visit ey.com.

Ernst & Young LLP is a client-serving member firm of Ernst & Young Global Limited operating in the US.

© 2020 Ernst & Young LLP.
All Rights Reserved.

2010-3602650

US SCORE no. 10986-201US

ED None

This material has been prepared for general informational purposes only and is not intended to be relied upon as accounting, tax or other professional advice. Please refer to your advisors for specific advice.

ey.com