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Big Data Analytics in Life Insurance

Leveraging Big Data across the Life Insurance Value Chain

People matter, results count.

Contents

1 Highlights

Big data is a big way for life insurance companies to enable big improvements. For this reason the life insurance industry has been experimenting with ways to harness big data.

Much like other industries, the life insurance arena tends to collect a substantial amount of customer data during the application process. Unlike other industries, however, no data is obtained during the customer/policy lifecycle. This is partly due to limited customer interactions once the application process is completed.

The latter trend is slowly changing due to recent increases in customer touch points and a broader scope of data collection opportunities. Increased use of technology and inter-connected devices is giving rise to the Internet of Things (IoT[1]). The IoT is playing an increasingly important role in the collection of customer behavioral patterns and other relevant information in the form of big data.

Harnessing big data is key

Because big data helps identify problems and project performance-related decisions, it will likely impact the entire insurance value chain. While many insurers have invested in big data utilization, a number of big data sources are still under-utilized despite available data. To make better use of all this data, insurers are expanding their data warehousing architecture and data governance programs to better balance the dynamics among the various ways to analyze big data.

Processing and analyzing such vast and disparate amounts of data in order to gain more actionable business insights could pose significant challenges for insurers' business operations. While they are aware of the challenges of adopting big data, the right talent and tools are not yet advanced enough for this industry, nor are they readily available. Most of the challenges for insurers lie in big data's inherent characteristics—velocity, variety, volume, and veracity—which increase the complexity of managing and analyzing it.

[1] Internet of Things (IoT): People, places, and things (typically machines) use a multitude of interconnected devices that exchange digital information and data. This exchange is known as the Internet of Things, and the information generated is exploding exponentially. A rudimentary example might be something such as a sensor in a car that alerts you that you are too close to the car ahead of you and automatically applies the breaks.

Four stages of adopting big data

This paper outlines the challenges and benefits of harnessing big data and introduces a big data analytics framework specifically for life insurers.

From initial start-up through full optimization across the firm, the framework suggests four growth stages:

- Internal performance management
- Functional area management
- Value proposition enhancement
- Business model transformation in utilizing big data analytics

Life insurance firms can leverage analytical tools to monetize simple and complex data, and reap benefits that can:

- Identify potential markets and distribution opportunities
- Detect retention risk
- Promote new products in specified markets
- Create cross-sell opportunities
- Generate long-term customer relationships

2 Overview of Big Data

Proliferation of customer touch points has led to an increase in data collection capabilities in life insurance. Customer relationship and experience management during the policy lifecycle are the major sources that generate analytical data. A carefully incentivized program can lead to a positive customer experience, while also collecting a significant amount of data from different sources.

Few data collecting sources during customer relationship management include:

Web (Public) – Research products, receive a quote, find an agent, request information, capture survey data

Microsites – Receive a quote, maintain customer profile, buy, renew, maintain a policy, make payment, submit a claim, see status, view policies and statements, request information, marketing offers

Social Networks – Research company, share experiences, recommend gain knowledge, new product suggestions, etc.

Interactive Voice Response – Reset PIN/password, policy status, claim status, make payment

Call Center – Request a quote, buy a policy, billing, claims processing and servicing, including inquiries, submissions, making payments, logging complaints, requesting information, and managing accounts

Few data collecting sources during customer experience management are listed below

E-mail – Alerts, marketing offers, policies and statements, inquiry responses

Direct Mail – Alerts/prompts, marketing offers, inquiry responses

Agent – Receive a quote, buy a policy, renew a policy, maintain policy, make payment, submit a claim, request info, and respond to offer

Sensor Data – Wearable devices, location-based intelligence

Chat Room – Real-time inquiry, call center access, agent access

Mobile – Alerts, profile access, location based services, apps

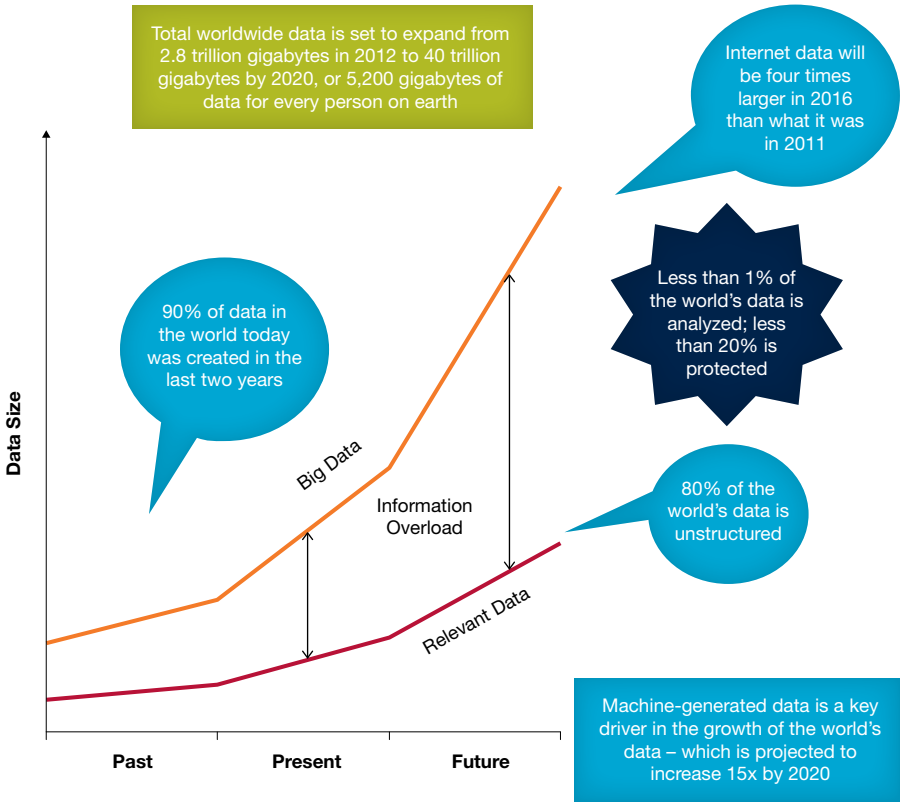
While adding new communication channels simplifies customer interaction and provides them with the convenience of multiple ways to communicate, it burdens insurers with the compounded difficulty of determining how to store and synthesize all this data efficiently.

One thing is certain, insurance companies now realize that to remain competitive, they need superior analytical tools that will help store, analyze, and parse this critical abundance of customer data.

2.1 Expansion of Data into Big Data

Increased data sources and volume (petabytes[2] and more) have made it extremely difficult to configure data using traditional database management tools. A major exponential growth in the size of data, alone, has resulted in information overload, giving rise to the buzzword *big data*.

Exhibit 1. **Expansion of Data into Big Data**



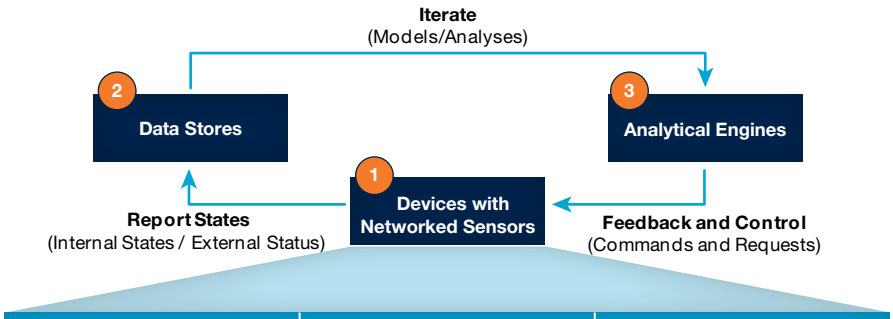
Source: Capgemini Financial Services Analysis 2014; IDC, Big Data and Analytics Roundtable 2013

[2] 1 Petabyte = 1000 terabytes

Big data proliferation is further expected as even more data-capturing devices (or digital sensors) connect to each other and to the Internet, furthering the IoT. Because this technology enables insurers to analyze customer profiles, IoT will have a major impact on life insurance firms as they leverage it more and more. The value creation of the IoT lies in what connects the IoT's three components:

1. **Internal state and external status data and information** can provide a much more accurate, and sometimes previously unavailable, picture of the hazards and risks of what is being insured.
2. **Analytically driven findings** can look backward to improve pricing, underwriting, and claims decisions, while others can look forward and effect change on customer behavior and performance.
3. **Feedback and control processes** will force or request insured to change their loss-related behavior and activity.

Exhibit 2. **Components of the Internet of Things Impacting Life Insurance**



Sensors	Examples of Hazard Sensed	Risks
External biomonitors (including fitness bands, wearable technology, and smart contact lenses)	Abnormal: pulse, blood pressure, oxygenation, temperature Inadequate exercise Poor sleep patterns	Markers for impending health hazards Life Style Issues
Internal biomonitors	Abnormal blood and urine chemistry Drug use	Various diseases Slow healing from illness or injury
Genetic mutations	Increased likelihood of certain diseases	Illness, disability, death
Drone over flights Infrared (night vision) monitors Snow and ice accumulation	Inadequate lighting Undetected criminal or terrorist activities Slow reporting of fires and traffic accidents	Illness and death from environmental pollutants Crimes (or terrorism) against persons

Source: Capgemini Financial Services Analysis 2014; The Internet of Things and Life & Health Insurance, Celent, May 14, 2014

2.2 Big Data Analytics across Insurance Value Chain

Big data analytics is expected to play a crucial role in helping to improve life insurer performance across the insurance value chain.

Front office

Firms are looking to improve customer retention and satisfaction, as well as offer tailored solutions based on a deep understanding of customer needs and behavior. Through big data analysis insurers can also empower agents/distributors with tools to identify prospective business opportunities or service existing customers. Using agent/channel behavior/performance data, insurers can revise strategies or develop new products which may have more sales success.

Policy administration and underwriting

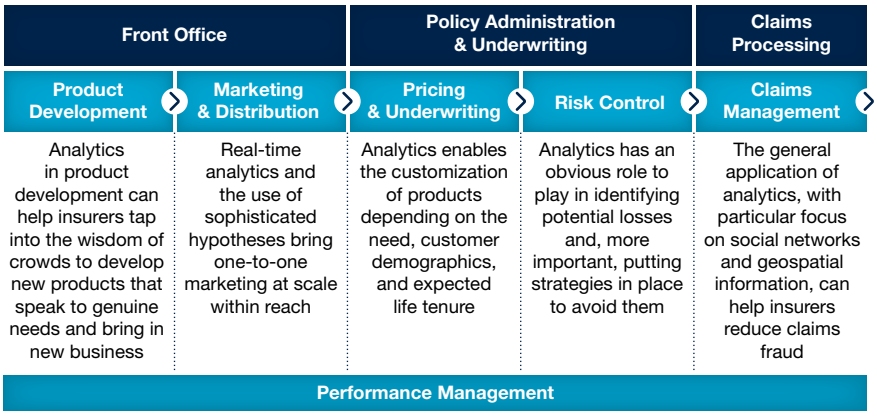
Insurance providers are looking for techniques to analyze beneficiary behavior through data sources beyond the firewall to use analytics based on external information (e.g., cohort analysis—using a person's social graph to look for similar activities among connected individuals), and considering networks of people rather than just individuals.

Claims processing

This is a key area where insurers can make an impact in customer experience. Whether positive or negative, customers will offer feedback among peers. Life insurers are implementing end-to-end claims management solutions to enhance data processing and reduce costs. This results in a differentiated customer experience, improved customer loyalty, and ability to attract new customers.

Insurance firms are also utilizing data analytics to determine fraud and make quick claims-related decisions.

Exhibit 3. **Impact of Big Data Analytics in Life Insurance**



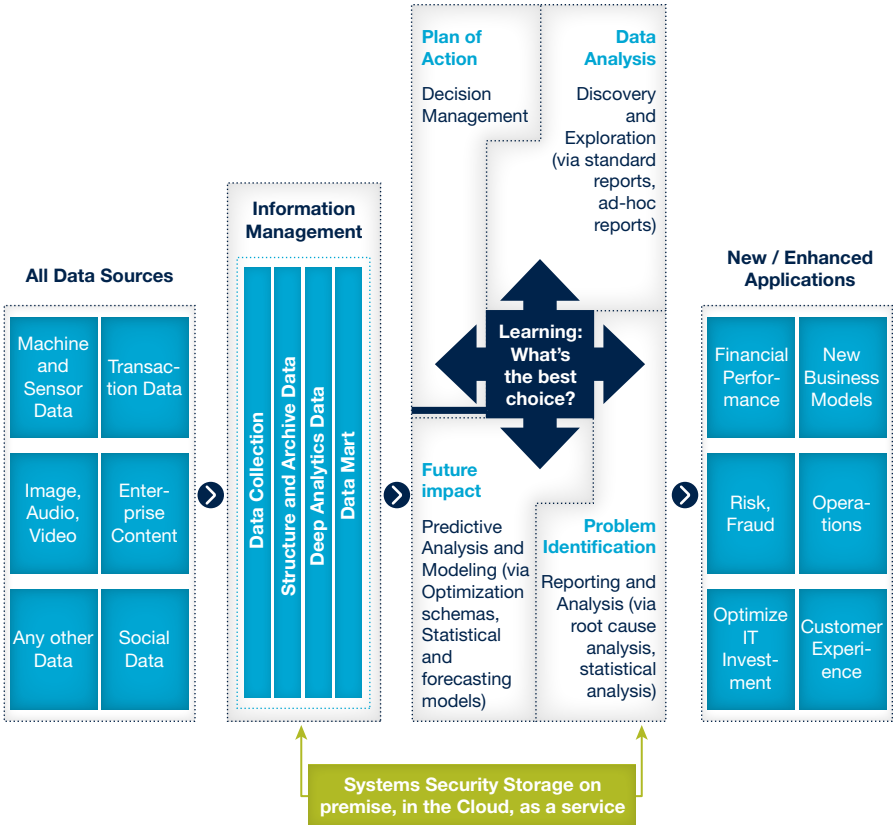
Source: Capgemini Financial Services Analysis 2014

Life insurers are still keeping pace with the impact of big data as firms fortify their efforts to tap this data more efficiently.

Analyses of different data types in insurance are useful in identifying clients, solving problems, and making future decisions. This data can ultimately result in new and enhanced business applications after advanced stage analysis.

Through analysis of wearable device data, insurers will be able to identify risk events proactively and possibly prevent claims. E.g. wearables could identify blood pressure fluctuations on a patient who is a heart attack risk, and trigger a notification to the patient that he or she needs to get to a doctor or hospital for further monitoring. Similarly smart homes or sensor devices can aid in assisted living by notifying authorities if, for example, a senior needs medical help.

Exhibit 4. **Flow of Data in Life Insurance**



Source: Capgemini Financial Services Analysis, 2014

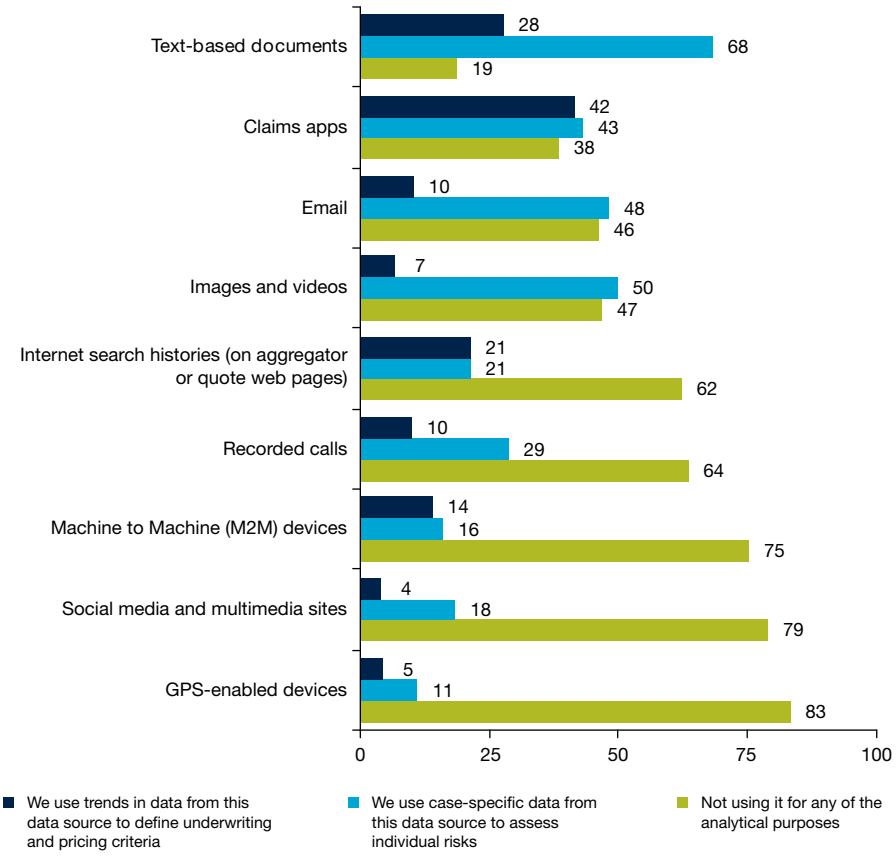
Life insurance information flow

As Exhibit 4 shows, data from all sources can be collected and segregated in categories— transactional data, enterprise content, social data, image, video, audio, data through machines and sensory devices, etc. Information management systems organize this data and run highly sophisticated analytics on it. The data is stored in a data mart where it can be utilized for future decision-making—problem identification, decision management, data analysis, and predictive analytics and modeling. This analysis can be further optimized in the form of new business models, operations, enhanced customer experience, optimized IT investments, risk and fraud identification, etc.

Analyzing big data requires firms to think beyond traditional relational databases and data warehouses. Instead it challenges firms to leverage advanced analytics techniques, such as text analytics, machine learning, and predictive analytics.

Insurers are aware of the importance of and processes for utilizing big data. Yet they have not fully scaled up their infrastructures and still lag behind other industries because they lack the infrastructure to collect, store, process, and analyze data. A recent survey[3] analysis has identified the usage of various big data sources by insurers.

Exhibit 5. **Big Data Analytics Sources and Usage, 2013**



Source: Capgemini Financial Services Analysis, 2014; The Big Data Rush – 2013, Ordnance Survey, 2013

[3] The Big Data Rush – 2013, Ordnance Survey

These results indicate that the usage of new data sources from digitally enabled devices remains low. Claims apps lead the way, with only 38% of underwriters who do not utilize this data source in any capacity—implying maximum usage among all data sources. Real-time location-based data, social media postings, internet click streams, and machine to machine (M2M) devices lag far behind, although a rise in data usage from M2M devices can increase usage levels of these sources. Underwriters are making greater use of data sources from text documents, recorded calls, e-mails, and images and videos, suggesting a higher level of comfort with data from more established media. Emerging technologies, such as M2M and GPS-enabled devices are creating new opportunities to map risk and price more accurately.

Implementation Approaches

At present there are two big-data implementation approaches prevalent and properly utilized: top-down and bottom-up approaches.

Top-down approach

As the name suggests the top-down approach is driven by a firm's top management. This approach helps management understand business problems and identifies relationships with existing data or by extracting relevant data for analysis. A top-down approach aids in business strategy and management planning. The essence is to look for hidden gems within the data that management can use to boost market share.

Bottom-up approach

The bottom-up approach collects all available data—internal and external— applies software tools to process, analyze, and make sense of it, and then determines what to do with the results. The key to the bottom-up approach is to allow the data to speak for itself. In other words, surface not only obvious correlations and connections, but unexpected ones as well.

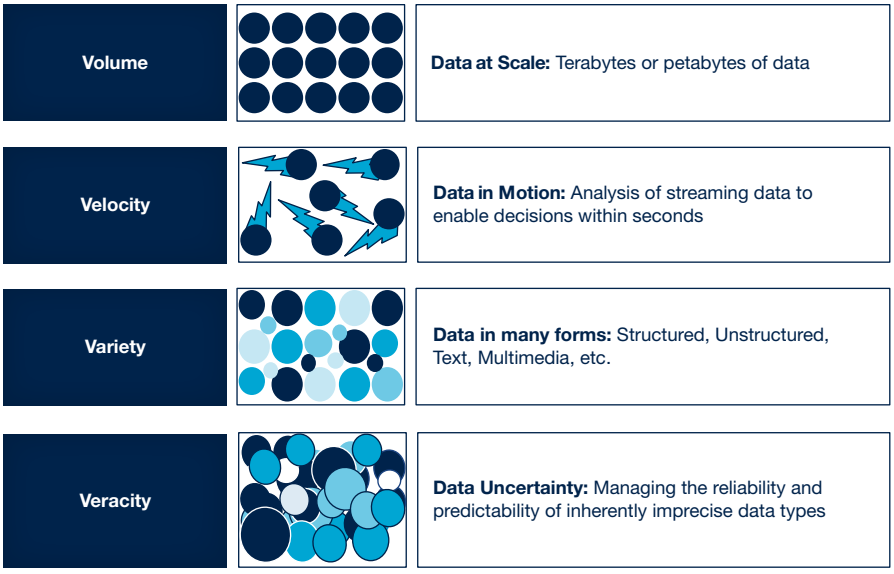
Happy medium between the two

Forward-thinking insurers are expanding their data warehousing architectures and data governance programs to better balance the dynamic between these two approaches.

3 Characteristics and Challenges

Big data transcends the capabilities of traditional data because of the inherent characteristics of hyper-connectivity and the way it has evolved over the past few years. The four V's (volume, velocity, variety, and veracity), outlined in Exhibit 6, are primarily responsible for challenges insurance firms face as a result of the increased complexity of managing and analyzing big data.

Exhibit 6. **Four Big Data Characteristics**



Source: Capgemini Financial Services Analysis 2014

Volume

With the explosive proliferation of connected devices, data is growing at a hyper exponential rate. Terabytes and petabytes of data are adding unwieldy volumes to already overwhelming data stores. Life insurance companies understand that having access to this data helps them make more precise decisions and predict financial health and growth, thereby improving their ability to manage risk more effectively. It's vital that insurance firms embrace this opportunity as soon as possible.

Velocity

Business processes, machines, networks, and human interactions with social media, mobile devices, etc., clearly illustrate that data is always in motion. This real-time data can help researchers and businesses make valuable decisions that provide strategic competitive advantages and ROI—if firms are able to handle the velocity.

Variety

Data comes in the form of e-mails, photos, videos, html/xml, PDFs, audio, etc. which give a dimension of extensive variety to it. This refers to the many sources and types of data both structured and unstructured.

Veracity

Biases, noise, and abnormality in data being stored and mined are inherently unpredictable and unreliable. Veracity determines how these imprecise intangibles are managed and used.

Under-utilization and the growing complexity of managing data sprawl[4] are throwing continuous challenges in reaping big data benefits. Big data characteristics are the reason for the majority of all the above challenges identified.

The four V's make it more difficult for insurers to protect, store, save, and process data to generate decisive insights. They tend to create a fragmented data environment which makes it difficult to collect data quickly, and poor data quality, which makes it difficult for carriers to analyze and use.

Here are some primary challenges.

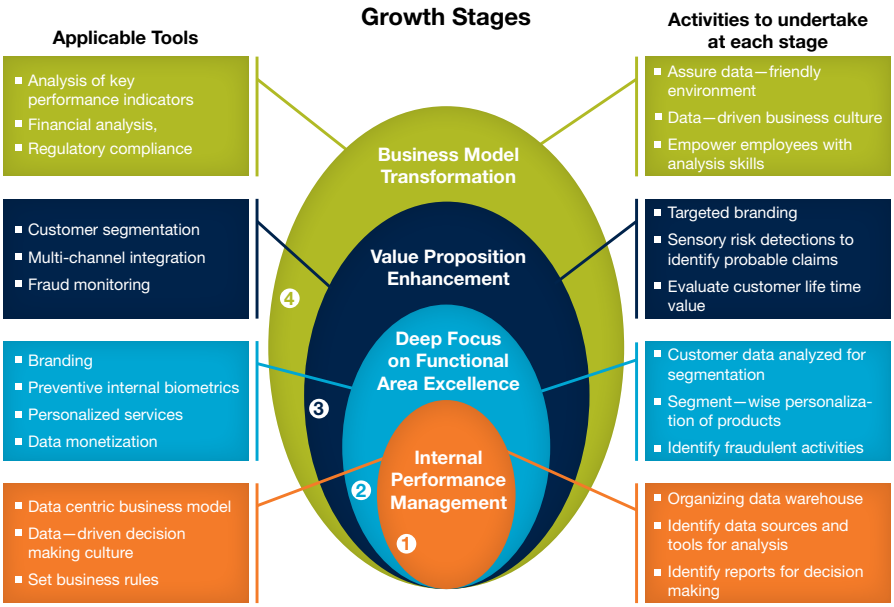
- **Privacy Concerns –** The data available with life insurers often involve concerns around privacy, as the data contains health, financial, lifestyle, and other sensitive information, which is tightly regulated in many countries.
- **Technology Concerns –** There's a dearth of understanding around how to select and use the right tools and technology available to harness big data.
- **Data Availability –** Life insurance companies usually have little direct data about their customers because they have limited interactions with them and partly because firms do not receive much additional data once a policy is sold (although data can be accessed indirectly through other channels, third parties, supermarkets, etc.). To overcome this, insurance companies will have to identify new and easily available data types they can use.
- **Skill Shortage –** As with other industries, life insurers need a specialized talent pool that understands how all the disparate information comes together and learn how to analyze it to derive insights. A shortage of this talent availability poses acute challenges for life insurers, in particular.
- **Aged Infrastructures –** Many firms are currently dealing with inflexible legacy IT infrastructures that are not equipped to handle the volume, velocity, or variety of data. Nor are they fully prepared or equipped to drive the mindset shift of organizations, business models, and processes.
- **Data Inconsistency –** While big data analysis involves analyzing structured as well as unstructured data, life insurers face the added problem of inconsistent data stemming from different sources, such as agents, brokers, banks, and other channels.

[4] Data sprawl refers to the accumulation of velocity, variety, and volume of enterprise data

4 Framework for Adopting Big Data in Life Insurance

Life insurers are willing to use big data capabilities to improve decision- making, gain unique insights, and improve management planning. To successfully adapt to the culture of big data analysis and overcome the challenges explained, insurers can leverage the big data analytics framework outlined here. This framework offers a way to optimize big data analytics and utilize applicable tools and activities during various stages.

Exhibit 7. **Big Data Analytics Framework for Life Insurance**



Source: Capgemini Financial Services Analysis 2014

The framework outlines four growth stages life insurance firms can adopt to optimize big data analytics.

1. Manage internal performance of the firm including analyses of financial performance, while remaining compliant with regulatory bodies, which will form the base for future stages
2. Leverage all data sources to focus on customer segmentation, personalization, designing tailor-made insurance products and solutions, and fraud detection
3. Manage customized marketing, orchestrate proactive customer service, collect data from sensor devices to track probable claims
4. Develop a data-centric business culture that adheres to data standards and seamlessly stores and retrieves data, which is what will render business sustainability in the long run

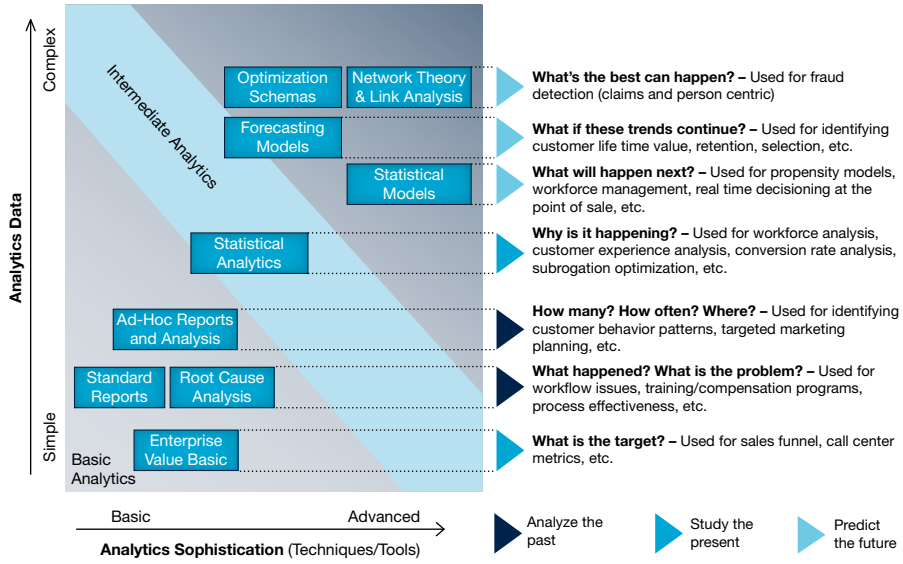
Life insurance firms can leverage various basic and advanced analytical tools to monetize all data types—simple to complex. Insurers can decide which analytics tools they require based on the type of insights they want to generate from their data. Often big data analysis is used to generate at least one of three types of information: identify a trend (from past data); apply (or test) that trend, based on a hypothesis to the present data; and develop future offerings.

Analytics studies vary in terms of the simple or complex data and sophistication of the tools utilized, which can be basic or advanced. Complex data would require advanced tools for analysis, such as statistical models that might be used for propensity models, workforce management, real-time decision making at point of sale, etc.; or network theory and analysis, which would be used for fraud detection claims, and person centric.

Advanced analytics methods require deep analytical skills. However, resources with these skills to translate big data to big analytics continue to pose a challenge for insurers.

Exhibit 8 provides a snapshot of analytic tools and techniques insurers can use to analyze basic and complex data types.

Exhibit 8. **Analytical Tools Utilization**



Source: Capgemini Financial Services Analysis 2014; State Farm, 2014

Using big data analytical tools can greatly enhance an insurer's:

- Sales, marketing, and underwriting
- Operational activities that reduce costs
- Strategies to better understand and reduce risk

By investing in analytical tools now, insurers could ultimately be assured of increased market penetration, deeper customer relationships, streamlined business processes—all of which add up to enhanced revenues and profits.

5 Success Stories

1 A global insurance firm collaborated with a **telecom partner** to launch digital services for **retail and corporate customers**

About the offering

- A global insurance firm offers a comprehensive range of insurance and asset management products and services
- The insurance and telecom firms integrated services to include advice, insurance coverage, and damage repair, to produce a digital service offering for retail and corporate customers:
  - For retail customers, the agents combine information, communications, and sensor technology with insurance and service offerings
  - For corporate customers, they will offer a combination of holistic cyber security solutions alongside insurance coverage

Potential benefits to life insurance firm

This life insurance firm can support monitoring and assisting claimants with specific medical conditions. For example, they offer mobile heart rate monitors for those with underwriting criteria in this area. The new service has the potential to boost brand image, increase brand awareness, and attract new customers through innovative use of connected technology.

Benefits to customer

- Allows customers to monitor their own homes using sensor technology and their smartphones
- Sensors will automatically inform the firm's emergency hotline of any potential issues or problems
- Corporate customers benefit from integrated solutions for damage prevention, network, security, and risk management

② A global life insurance firm has launched an application that provides a better customer view by bringing **together data** into a **single record**

About the offering

- This life insurance firm is among the largest providers of insurance, annuities, and employee benefits programs in the US
- The company introduced an application which provides a timeline of customer transactions—claims, records, status, etc.—making it possible to easily access information and cross-sell products
- This application files all related and linked customer information into a single record, providing the relevant information needed in one screen, which helps to quickly and more easily serve customers
- It shows every interaction each customer has had with the company across all touch points, such as call center, in-person interactions with agents, as well as claims and policy updates
- The application was created and launched after only three months of development

Potential benefits to life insurance firm

- Provides a quick 360-degree (although not 100%) view of a customer's policy and their interactions with the insurer
- Enhanced view of customer data allows the back office to better serve customer needs
- Call center agents work with customers more effectively
- Customer service experience is more accessible and digestible

Benefits to customer

- Quick resolution to queries
- No need to explain the case in detail to the service agent
- Better and more meaningful interaction with service agents

6 Conclusion

Adopting big data analytics offers life insurers numerous benefits as they seek ways to improve business results and remain competitive.

Insurers would be prudent to adopt a strategy that follows the analytics framework described within this paper and utilize opportunities offered by new big data technology. Starting internally to begin a data management-oriented business culture will eventually lead to a business model transformation that is big data friendly. In this era of limited and shrinking budgets, it is important to strategically examine use cases where big data can provide targeted benefits, such as the following.

Market Identification and Product Targeting

Analytics can help identify existing gaps in a customer base caused by changing demographics and cultural shifts. Analytics can, for example, help understand the needs of the homemaker segment (which can be a potentially rewarding area for new business) and help design appealing products and features targeted to this group.

Better Market Assessment for Effective Segmentation

This is closely related to the identification of under-penetrated markets, as micro-segmentation uses insights from preferences and behaviors of clearly defined market segments (small business owners, for example) to develop appropriate products and distribution strategies.

Identifying Retention Risks and Cross-Selling Opportunities

Big data analytics can help life insurers identify customer behavior patterns that could potentially lead them to switch providers.

Similarly, analytics can help identify opportunities to preserve and expand relationships—by highlighting customers nearing retirement age who might benefit from private pension or annuity products, for example.

Creating a Customer Relationship-Focused Business Model

Analytics can generate life-long customers and provide a high level of customer satisfaction. Companies can combine all their direct customer connections, such as e-mails, call center, adjustor reports, etc., with indirect sources, such as social media, blog comments, website, and click stream data. This offers a 360-degree profile of each individual which provides the means to refine the insurer's approach to sales, marketing, and customer service.

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The authors would like to thank **Chirag Thakral, David Wilson,** and **William Sullivan** for their contributions to this publication.

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