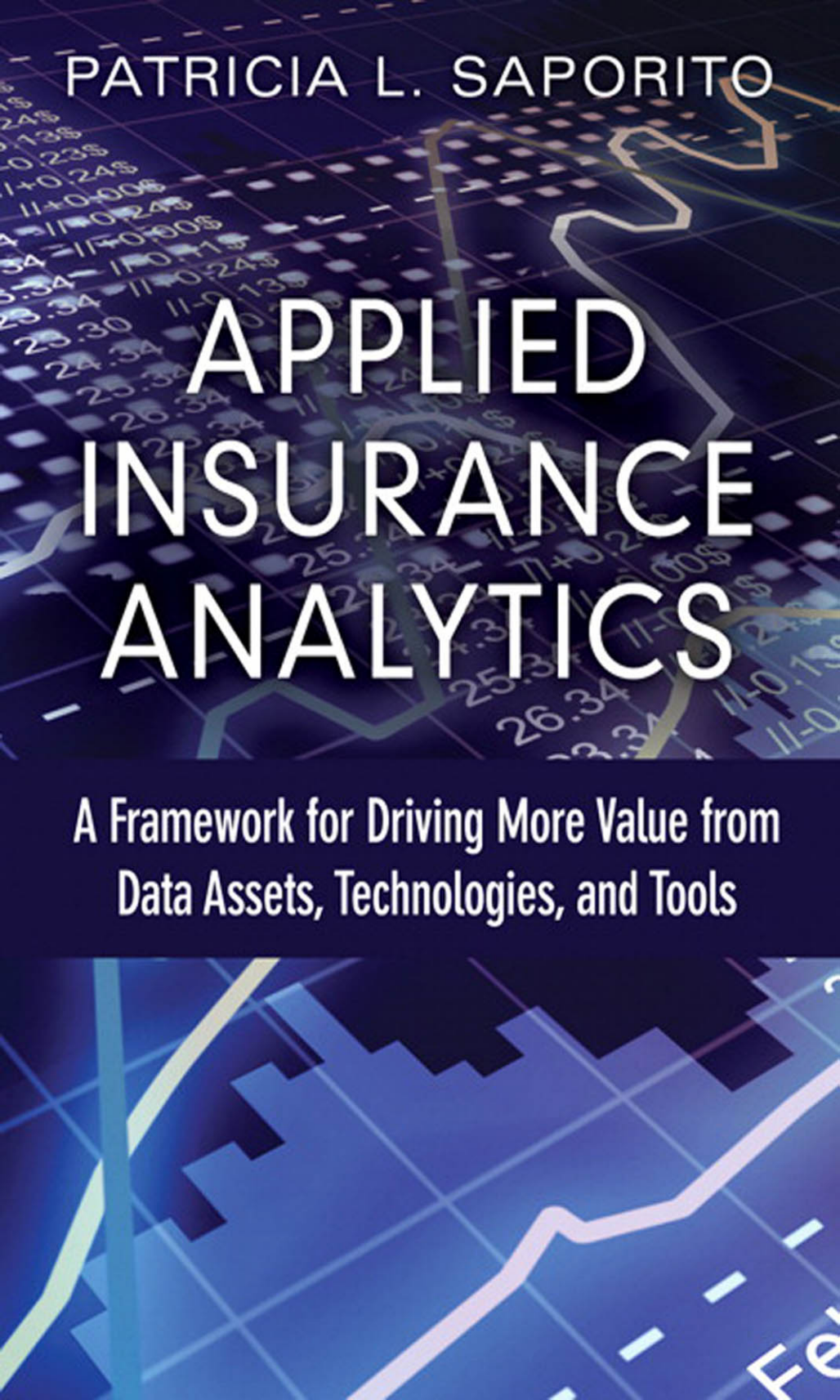
PATRICIA L. SAPORITO
APPLIED INSURANCE ANALYTICS
A Framework for Driving More Value from Data Assets, Technologies, and Tools

Praise for
Applied Insurance Analytics

"Pat Saporito is one of the sharpest minds in the IT business for insurance and financial services. Her deep understanding of the playing field and her devotion to analytics as a key to optimum business processes is unmatched. In particular, Pat really gets it when it comes to the critical importance of the business/IT relationship, and she knows how to apply her wit and wisdom to make all the players around her better."

—Ara Trembly, Founder, The Tech Consultant

"Pat's vast experience, knowledge and insights come to life in this book, a must read for all insurers."

—Deb Smallwood, Founder, Strategy Meets Action

"Finally, Pat has provided a data analytics roadmap for insurance industry decision makers—not just research, but applied research to our industry."

—John A. Cherba, Past President, Society of Insurance Research

"Pat Saporito is that rare individual who understands the business end of insurance and can then match business needs with the supporting technology. She cuts right through the jargon with specific insights about insurance business needs, the data at the heart of our business, and applying analytics for optimal outcomes. Essential reading for anyone who needs to leverage data to drive business results.

"Pat worked closely with me as an advisor to the Institutes' Associate in Information Technology (AIT) program and also with the Insurance Data Management Association (IDMA). Anyone studying analytics or insurance data (such as the AIDM or CIDM from IDMA) will find this to be valuable supplemental reading and a treasured reference."

—Martin J. Frappolli, CPCU, FIDM, Senior Director of Knowledge Resources, The Institutes (Institute for Chartered Property Casualty Underwriters and Insurance Institute of America)

"Pat's experience, knowledge, and know-how make her one of the few insurance data professionals who can provide practical and reasonable advice and insight on data uses and needs to carriers and insurance organizations."

—Bill Jenkins, Managing Partner, Agile Insurance Analytics and former CIO, Penn National Insurance

"As we move into a time with big data and cognitive computing, we are very fortunate as an industry to have thought leadership that brings front and center—as Pat has discussed in her book—topics that we must incorporate and look to as points of reference and most importantly, lessons learned. Great reference materials and perspectives!"

—Cindy Maike, Associate Partner, Insurance, Global Business Services, IBM

"Pat Saporito is acknowledged by all who know her as the consummate industry thought leader. Given her range of experience from the business to IT and analytics, she is a tireless evangelist for communication among all the parties that make our industry tick. I am excited about her using her passion for analytics to empower the business users and their technology partners."

—Beth Grossman, Chief Learning Officer, ACORD

"Pat Saporito is both an insurance industry analytics thought leader and a pragmatist. She uses her extensive industry experience to help insurers understand key use cases and then makes them come to life using actual industry case studies."

—Dennis A. Steckler, Partner, Global Insurance Solutions,
Return on Intelligence, Inc.

"I have had the pleasure to work with Pat on a number of occasions to talk with clients about the business value of analytics. Pat knows this better than anyone I know. In her book, she connects the dots between business challenges and analytics capabilities in the insurance industry and provides a roadmap on how to optimize analytics in practice."

—Dwight McNeill, Professor and Author of
A Framework for Applying Analytics in Healthcare:
What Can Be Learned from the Best Practices in
Retail, Banking, Politics, and Sports.

"Pat provides an in-depth analysis and guideline to the competitive advantage weapon for the Insurance industry winners of the future. The difference between winners and losers will be analytics—Pat provides an in-depth guide for successful adoption."

—Piyush Singh, CPCU, SVP and CIO, Great American Insurance Co.

Applied Insurance Analytics

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Applied Insurance Analytics

A FRAMEWORK FOR DRIVING MORE VALUE FROM DATA ASSETS, TECHNOLOGIES, AND TOOLS

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Contents

About the Author

Pat Saporito is a senior director for SAP's Global Center of Excellence for BI and Analytics. She is SAP's thought leader for analytics in the insurance industry. In her role she provides thought leadership and guidance to help customers leverage their data and technology investments. In addition to insurance she has worked with many other industries including airlines, banking, consumer products, healthcare, manufacturing, mining, oil and gas, and utilities.

Pat is a faculty member of the International Institute for Analytics (IIA), co-founded by Tom Davenport, and is a frequent speaker at industry and analytics events on the topics of data warehousing, analytics, and BI Strategy. Pat authored the chapter on business value in the recently published IIA book, *Analytics in Healthcare and the Life Sciences.*

Pat has been a columnist for *Best's Review* magazine's Technology Insights column for the past 10 years. She has blogged in various social media outlets. Pat has served in numerous industry roles. She is past president of the Society of Insurance Research, past chair of the Society of Chartered Property and Casualty Underwriters (CPCU) Information Technology Section, has been a director of Insurance Data Management Association, and has been an education committee member of Insurance Accounting & Systems Association (IASA). She is also past president of APIW, an organization of executive insurance women.

Pat holds the Society of CPCU professional designation and has been awarded a Fellow of Insurance Data Management by the Insurance Data Management Association (IDMA) in recognition of her advocacy of and contributions to the field of data management and analytics.

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Preface

I have spent more than 20 years working with business users and IT staff using information and technology and have seen both raving successes and raging failures. I have been involved in building both transactional systems as well as analytic applications. Analytics is a field that I am passionate about because I have seen first-hand the impacts that effective analytics can have on the insurance industry and more importantly on our customers. I wrote this book to share my experiences and provide an understanding of analytic capabilities and key considerations in using analytics and building analytic applications for the insurance industry.

I have been a business analyst, a systems owner, a technology consultant, and a management consultant. Failures nearly always result from a lack of communication between business and IT due to differences in expectations and experience. I have seen brilliantly designed data warehouses that were never used by the business. In other words, if you build it they will not come unless it actually meets their needs.

The primary audience for this book is business users; I have kept technical jargon to a minimum and have used common terms that business people will most likely encounter in working with their IT partners. I have purposely omitted references to many important technological functions performed in administration, operations, and architecture, which fall under the chief information officer (CIO) or chief technology officer (CTO). If you are a technical person, I recommend that you read this book from the perspective of the business user; this view can help you improve your alignment and better understand the business needs, especially in the use cases and case studies in Chapter 10, "Use Cases and Case Studies." You should also find the section on business discovery useful in Chapter 11, "Future of Insurance Analytics," because it is critical to extracting these needs.

I began my insurance career as a claims adjuster where I developed interviewing skills that have served me well as both a business analyst and management consultant, and more relevantly in analytics for business discovery and value analysis. As I advanced in my claims career,

I assumed responsibility for field operations and also became the owner of record for the claims administration systems. I moved into IT where I became a business analyst and then a business systems architect and later into a research and development role evaluating technologies for business innovation and new product development. I had my own market research and information management consulting business for 6 years. I have been a technology analyst; I led an insurance industry research service. I then joined the vendor community where I ran a team of industry consultants for the insurance, healthcare, and pharmaceutical industries for a data warehousing vendor and conducted many data warehousing and analytic business discoveries. At my current employer, I have held multiple roles, including analytic insurance solutions management and management consulting. I have worked not only with insurance and healthcare, but also with many other industries including airlines, banking, consumer products, manufacturing, and utilities. In my role in an Analytics Center of Excellence I meet with customers to help them evaluate and advance their analytics maturity using leading practices. I have tried to incorporate experiences and lessons that I have learned along the way into this book.

I have benefited from being mentored and befriended during my career by too many people to name, but I would like to recognize the following and offer apologies to any I have mindlessly omitted: Jim Anastasio, Sandra Ballew, Michael Bernaski, Russ Bingham, Peter Bogdon, Steve Boley, Lamont Boyd, Bill Burns, Art Cadorine, Fran Chemaly, Jack Cherba, Steve Collesano, Chris Christy, Reilly Cobb, Judy DeMouth, Sue Koral, Diana Lee, Ken Levey, Lee McDonald, Cindy Maike, David Moorhead, Anthony O'Donnell, Joe Peloso, Roland Perkins, Peri Pieroni, Shannon Platz, Rick Porter, Barry Rabkin, Bill Raichle, Imran Siddiqi, Piyush Singh, Deb Smallwood, Pat Speer, Jay Spence, Maureen Strazdon, Dale Strobel, Ara Tremblay, David Van den Eynde, and Ray Zolonowski. Thank you all for your knowledge, support, and friendship.

I'd also like to thank numerous people who reviewed and provided input for this book including Christian Blumhoff, Louis Bode, Ken Demma, Bill Jenkins, Shane McCullough, Jeri Ostling, Greta Roberts, Dennis Steckler, Nate Root, and Tracy Spadola.

I'd like to extend a special thanks to Dwight McNeill for encouraging me to write this book and introducing me to my editor, Jeanne Levine, at Pearson.

I hope in some small way this book provides payback and inspiration to others.

1

Analytics in Insurance Overview

Insurance is an industry that runs on data. Regardless of the industry segment—Property and Casualty, Life, or Health—insurers provide a service or financial product versus a physical product to policyholders, and most often a promise to pay to or to indemnify on behalf of a policyholder or to invest on behalf of. From the initial marketing and customer insurance shopping and buying experience, through to a claim payment or investment payout, the entire ***insurance value chain,*** the end-to-end link business processes, are data driven. Data is literally the life blood of the insurance industry and analytics drive overall industry business performance through increased revenue or decreased expenses. It relies on data and analysis to improve financial performance and services to shareholders and policyholders.

Analytics is the discovery and communication of meaningful patterns in data. ***Business intelligence (BI)*** strictly speaking is a subset of analytics. BI is generally understood to be more narrowly focused on reporting and data visualization technologies such as dashboards. Another area of analytics is ***predictive analytics***, which includes data mining, text mining, and predictive modeling. ***Advanced visualization*** is yet another area of analytics which includes maps, three-dimensional graphics and more sophisticated visual representations beyond tables and simple graphics such as those found in Microsoft Excel. BI and analytics are used interchangeably through this book from a practical perspective.

Analytics improve business processes, decision making, and overall business performance and profitability through insights gleaned and actions taken based on these insights. Analytics rely on the simultaneous application of statistics, computer programming, and operations

research to quantify performance. Analytics often use data visualization to communicate insights.

The overall analytics process takes raw data from multiple operational systems, transforms that data so that it is "normalized," (or in the same format regardless of its source), often augments it with external or third-party data, and turns it into information. It then enables analysis and produces insights or observations from the information and, lastly, guides decisions or actions based on the insights made.

Operational Versus Traditional Analytics

Analytics take two major forms: operational analysis and traditional analysis. ***Operational analytics***, often referred to as ***embedded analytics***, are embedded or built right into the business processes or application systems such as marketing, underwriting, claims adjusting, and so on. Operational analytics are more real time because immediate access to the data brings higher value for certain functions before an action is taken, for example, claim fraud detected during a first notice of loss reporting. It is more effective to identify and prevent paying a fraudulent claim than to pursue the payment recovery.

Traditional analytics such as loss development trend analysis or emerging loss exposure analysis occur after the processing transactions take place and are based on more aggregated analysis. Analytics in both these areas are increasingly using ***predictive analytics*** to go beyond understanding historical trends about what happened and why, by using leading indicators and correlation metrics to forecast what will happen and even to optimize future business performance

External Data

It's hard to imagine the industry running without analytics as analytics have been so hard-coded into the industry DNA in marketing, underwriting, pricing, and claims with a wealth of data available at the micro or tactical operational level. Yet at the macro or strategic level, when deciding on new products to offer or markets to enter, insurers have limited and sometimes not any internal data. In these cases, insurers can turn to ***external data*** from third parties such as state insurance

department filings, industry composite databases from rating agencies, or public records for information needed to develop new market offerings. Insurers can also use ***psychographic data*** (psychological or behavioral data plus demographic) as proxies for target marketing and even underwriting characteristics, for example, income, occupation, and so on. Even when insurers have data, they often use external data to augment and enrich their internal data.

Table 1-1 shows common business functions where third-party data is used, how it is used (use case), and the type of data used.

Table 1-1 External Data Sources

Function	Use Case	Third-Party Data Type/Source
Marketing	Marketing Campaigns	Psychographic
Product Management	New Product Development, Pricing	State Insurance Rate Filings
Claims	Subrogation Recoveries	Warranty Data, Product Recalls
Underwriting	Risk Profile Enhancement, UW Risk Assessment	Motor Vehicle Records (MVRs) Credit Reports
Sales	Lead Generation	College Alumni Records
Medical Management	Health and Wellness Management	Prescription

The following descriptions provide more detail on the above Use Cases:

- Marketing has used psychographic data to augment existing customer data or as proxies for customer data in target marketing. Profiling characteristics of existing customers, it looks for similar traits in prospects.
- Product managers often review competitor rate filings to compare products and product pricing, as well as target markets.
- Claims recovery analysts have used warranty data and product recall data to augment claims and underwriting data for claims involving defective products. Two examples are sport utility vehicle rollovers involving faulty tires and kitchen fires that originated in dishwashers or stoves.

- Underwriting has used credit scores as part of its underwriting risk models, where allowable.
- Sales management and producers have used various sources such as college alumni records for lead generation.
- Medical managers are using prescription data and even retail data from drug stores to profile members as part of their wellness and disease management programs.

Insurance Industry Data Flow

To understand and apply analytics effectively, it is essential to understand how data is created and processed, and how it flows throughout the organization. Figure 1-1 traces data from data originators on the left, across the business processes with key metrics by process, how it flows to the accounting systems and general ledger, and ultimately to statistical reporting. Although the example is for Property and Casualty, the flows are similar for Life and Health industry segments.

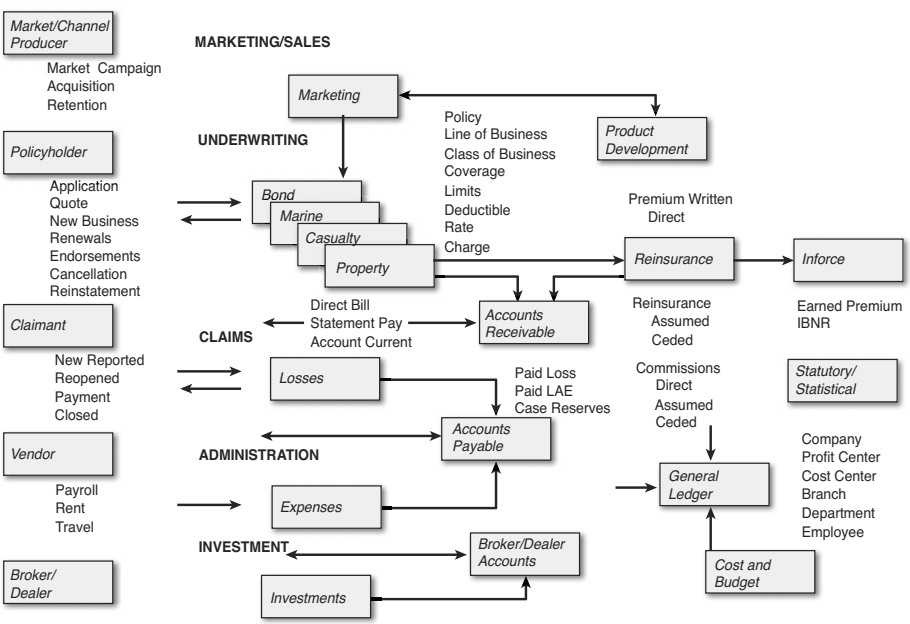

Figure 1-1 Property and Casualty Industry Data Flow

Analytic Maturity

Analytic maturity, or the increasing sophistication in the use of analytics, is based on a number of factors. Following are the four key factors:

- **People:** How analytically sophisticated the employee area is (and how data driven the organizational culture is)
- **Process:** How mature the analytic processes within an organization are
- **Technology:** What tools have been selected, deployed, and made available to employees
- **Data:** How well data is managed, governed, and made available within the organization

Figure 1-2 shows different analytic maturity levels.

Reactive → Proactive

	Analytics Laggards	Analytics Aspirers	Analytics Novices	Analytic Practitioners	Analytic Savants
People	• Gut Based Decisioning	• Analytic Awareness • Use Analytics to validate Gut	• Tactical Decisioning	• Support Strategic Decisions	• Drive Strategy • Embedded in DNA • Chief Analytics Officer
Process	• None	• Ask others for analytic reports	• Create own reports • Analysis vs. Reporting	• BICC • Business participates as Business Analyst, Data Steward	• Analytic Mentors • Mature BICC • Analytic Communities of Practice
Technology	• Excel	• Standard Rtpg • Limited Ad Hoc Rptg	• Ad Hoc Rptg • Dashboards	• Visualization • Data Exploration	• Predictive • Text Mining • Sentiment Analysis
Data	• Data Silos • Poor Data Quality	• Spreadmarts • Data Quality Awareness	• Data Marts • Data Dictionary	• Integrated Data Views • Data Governance	• Embedded Analytics • Data as strategic corporate asset

Figure 1-2 Analytics Continuum Matrix

Key Insurance Analytics

Key analytic application areas within insurance are

- Marketing analytics used for customer segmentation, cross-sell and upsell, marketing campaign management;
- Product management analytics used for product management and product profitability;
- Underwriting analytics used for risk assessment and pricing;
- Claims analytics used for claim valuation, reserving, settlement and recoveries, and fraud detection;
- Enterprise risk analytics for solvency and capital allocation;
- Sales analytics for channel and producer management, and incentive compensation management;
- Finance management for planning, budgeting and forecasting, and profitability analysis.

These areas will be explored in depth with use cases and example case studies in Chapter 10, "Use Cases and Case Studies." Figure 1-3 shows an overview of commonly used analytics by business process.

Figure 1-3 Key Insurance Processes and Analytics

Analytics Users and Usability

Literally every function in the industry uses analytics: actuaries, underwriters, claims professionals, loss control specialists, marketing professionals, finance analysts, customer service representatives, agents and brokers, and regulators. Everyone in the insurance value chain needs and uses some form of analytics.

However, within these functional areas, different roles have different analytic needs. Executive management, such as CEOs, and board and senior management want key metrics in an easily consumable and highly visual format: dashboards or score cards, and increasingly on mobile devices such as tablets or mobile phones. Middle management wants key operational dashboards with more navigation including drill to detail and often standard or ad hoc reports and desktop, as well as mobile access. Analysts want yet even more detail plus the ability to manipulate data, create additional metrics, and even create their own reports/analytic views. Tools are reviewed further in Chapter 7, "Analytics Tools."

Challenges

Yet as much as analytics are needed, analytic adoption often falls short because insurance stakeholders face a myriad of challenges using analytics.

First and foremost, insurance stakeholders often lack ***data access*** to complete, trusted, and understandable data. Insurers should strive not just for quality, but for trusted data that is well documented, that can be used for its intended purpose, and where any "nuances" in the data are understood. Data can also be augmented; for example, structured data can be augmented with unstructured data such as text data from customer surveys or customer sentiment data from social media. A solid ***data governance*** process can ensure the documentation of existing data and define new data needed. Often the best "home" for data governance in an insurance company is in actuarial or finance departments because

both are responsible for internal and external reporting and have a high interest in data quality and integrity. Further, these areas often use data from across multiple business domains and are familiar with the challenges in integrating data.

A second hurdle is a lack of or limitation in ***analytic skills***, which inhibits its effective use of analytics. One cause is cultural, often due to a lack of awareness or perhaps lethargy. All too often we rely on gut instinct for decisions. We mistake reporting for analysis. Data exploration and data visualization, enabled by user-friendly tools, are helping enterprise employees improve their analysis and their analytic insights. In addition, organizations are hiring new employees with analytic skills and developing the skills of existing employees. Those organizations who invest in ongoing analytic skill development will see higher analytic adoption and increased employee satisfaction and retention.

Yet a third barrier is the ***analytic tools*** themselves. It's important to select and use the right tool for the right analysis and the right user. At one extreme, executives want to use highly visual, summarized analytics through dashboards and mobile devices. At the other end, analysts are looking for robust tools that allow them to manipulate and merge or augment data, create new calculations, and perform complex analysis. "Data scientists," who include marketing analysts, finance analysts, and actuarial analysts, want even more robust predictive and statistical capabilities. Many companies have formed ***BI Competency Centers or Centers of Excellence*** to provide training, encourage end user analytic tool adoption, and engage business users in the evaluation and selection of new tools as well as to define and execute an overall BI strategy and to provide overall governance.

Technologies continue to evolve. Enterprise information management tools allow companies to better access and integrate data; to scrub it, to understand its source, and to understand the impact on existing analytics if it is added to or changed. In memory, databases provide increased performance and speed for cranking through ever more granular data for actuarial pricing and reserving analysis. Geographic Positioning

Systems (GPS) and geomapping technologies enable organizations to augment risk and loss data to better understand underwriting risk and loss patterns. Visualization tools enable users to make more sense of market and customer data. Organizations have access to machine-generated data through devices in automobile insurance; similarly, they can integrate data from medical devices providing biofeedback for health insurance and wellness monitoring and intervention. User interfaces go beyond the desktop or laptop, to mobile not just for field employees like agents, loss inspection, and claims professionals but for all employees—data anywhere, anytime, on any device making data security critical as data and analytics access become ubiquitous.

Insurance Analytics Evolution

Insurers increase their analytic maturity as they improve their data management and metric sophistication. As they increase data granularity and data quality and integrate it across more than one functional area or business domain, they enable more sophisticated analytics. Similarly, as they measure not only historical key performance indicators but also the leading indicators (or driving analytics), they also enable more predictive analytics within and across functional areas.

Figure 1-4 reviews the maturity evolution for a subset of insurance processes: marketing, product development, pricing, underwriting, and claims. The overall industry analytic maturity is indicated with the dots. A useful exercise is for individual organizations to assess their maturity, compare it to where they aspire to be, and to identity the hurdles that keep them from reaching their desired state. Following this self-assessment, they can define plans to address areas of needed improvement to reach their next level of maturity and use analytics for strategic competitive advantage.

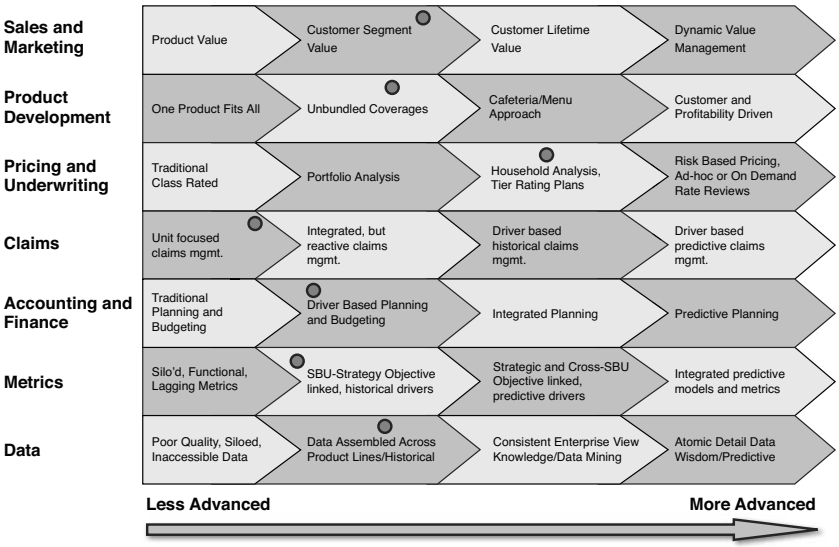

Figure 1-4 Insurance Analytics Evolution

Summary

Learning Objectives

Test your basic knowledge of the main points in this chapter by answering the following questions:

- Name major insurance business processes and key analytics used by these processes.
- Review how data originates and flows across and outside the organization.
- Apply the Insurance Analytics Evolution Framework to measure maturity.

Discussion Questions

Further check your application of key concepts by reviewing the following discussion questions:

- Describe how analytics are used in marketing, sales, underwriting, claims, and finance.
- Identify and explain three external data sources and what analytics areas they can be used in.
- Discuss the three challenges in effectively using analytics and how they can be overcome.

Key Terms

Analytic maturity refers to the increasing sophistication in the use of analytics and involves four key dimensions of analytic users, analytic processes, analytic technologies, and data.

Business Intelligence Competency Center (or Center of Excellence) is a corporate function that defines and executes a strategic business intelligence program through BI Governance committees.

Data governance is a corporate process that ensures data quality and data understandability. It involves a Data Governance council and includes data stewards from various business areas who participate in this process.

Operational analytics are analytics used within a transactional system such as claims management; these would include a list of new claims created, a list of claims open more than 30 days, and so on.

Predictive analytics are analytics that use historical data to forecast future results. These include data mining, text mining, predictive models, and so on.

Additional Resources/Reading

"The Data-Driven Organization." Marcia W. Blenko, Michael C. Mankins, Paul Rogers. *Harvard Business Review*. June 2010.

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Index

A

B

C

D

E

F

G

H

I-J

K

P-Q

R

S

T

U

V

X-Y

Z