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*Transforming Underwriting:  
From Risk Selection to Portfolio  
Management*

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**CELENT**

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## ABOUT CELENT AND THIS WHITE PAPER

### ABOUT CELENT

Celent ([www.celent.com](http://www.celent.com)) is an independent, privately owned research and consulting firm that provides technology and business strategy advice to the financial services industry. Celent provides unbiased insight into industry trends, competitors in the market, and market sizes. Celent's research reports are written by in-house analysts with extensive experience at a variety of top global financial services firms, technology vendors, and consultancies.

Celent's research clients include financial institutions, vendors, and consulting firms. Occasionally, our reports evaluate clients who are solution vendors, along with vendors with whom Celent does not have a relationship. Celent evaluates all vendors using the same criteria.

### ABOUT THIS WHITE PAPER

The white paper was commissioned by Fair Isaac to evaluate the potential operational and financial impact of currently available technologies on the property/casualty underwriting process. In preparing it, Celent relied on the following:

- Independent, proprietary analysis of how insurers currently and potentially may deploy various technologies in their underwriting process.
- Material from previously published Celent reports, including *The Evolution of Rule-Based Life Underwriting Systems* (November 2002), *Insurance Data Mastery Strategies* (July 2003), *Insurance Business Value from Business Process Management and Business Rules Engines* (December 2003), and *Business Rules Engines Vendor Profiles* (forthcoming).

**Donald Light**, Senior Analyst in Celent's Insurance group, is the author of this white paper.

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## EXECUTIVE SUMMARY

Nothing in insurance is more important than risk selection and risk pricing. The convergence of four technologies—business rules engines, predictive scores/analytics, data management, and optimization—now provides insurers with a significant opportunity to improve how they do underwriting. These technologies create a superior way to evaluate risks and to determine a strategically competitive rate. They also have the potential to transform the underwriting function from selection and pricing of individual risks to managing risk portfolios. They give insurers tools to manage the relationships among risks and premiums, growth and underwriting profitability. They have immediate applicability to property/casualty personal lines business, and potential applicability to other property/casualty and life/health lines.

Each of the four technologies provides its own benefits:

- A business rules engine is a type of enterprise software which creates and executes rules to automate decisions. Using a business rules engine in underwriting means more decisions are made quickly and consistently.
- Predictive scores give an insurer a more transparent and predictable way to assign applicants to tiers, make underwriting decisions, and determine rates. Insurers develop predictive scores through the use of analytics.
- Good data management gets the data required for underwriting and rating to the right place at the right time.
- Optimization allows insurers to identify and choose among trade-offs in growth, underwriting profitability, and/or other outcome measures.

Working together these technologies can lower underwriting expenses, reduce losses, increase premiums, and improve the premium/risk relationship. Celent estimates that taken together these changes could reduce the average personal lines insurer's "Underwriting Expense Only" ratio by about 30% (0.6 combined ratio points); and reduce the loss ratio by 2% to 4% (1.5 to 3.0 combined ratio points).

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## INTRODUCTION

Nothing in insurance is more important than risk selection and risk pricing. Accepting risks indiscriminately, or for inadequate premiums, is a ticket for a fast ride into insolvency. Alternatively, being too selective or charging the highest quoted premium will lead to stagnation and decline. There is an old saying among actuaries and underwriters, “any risk is a good risk, **if** it is priced properly.” Today, in the current environment of “going bare” and alternative risk mechanisms, one should amend it to, “any risk is a good risk, **if** it is priced properly **and** you can get the policyholder to pay the quoted rate.”

Beyond the truth and humor of both sayings, there are some critical questions. What data and information are necessary in order to really understand the nature of a given risk? What is the proper price? How much will an applicant or policyholder actually pay? And in operational terms, how does an insurer obtain and analyze the necessary information, set prices, make underwriting decisions, and determine rates with superior levels of speed and accuracy?

Celent believes that four technologies, integrated and working together, provide answers to these questions for personal lines property/casualty insurers (and possibly in other lines as well). These four technologies are: business rules engines, predictive scores/analytics, data management, and optimization.

Giving insurers usable answers to these perennial questions would be a major accomplishment. But Celent also believes that the same technologies have the potential to transform the underwriting function:

- **From** selection and pricing of individual risks,
- **To** managing risk portfolios containing sets of territories, producers and/or applicants and policyholders,
- And **even to managing portfolios** of risks and premiums, growth and underwriting profits, market perceptions and channel positioning.

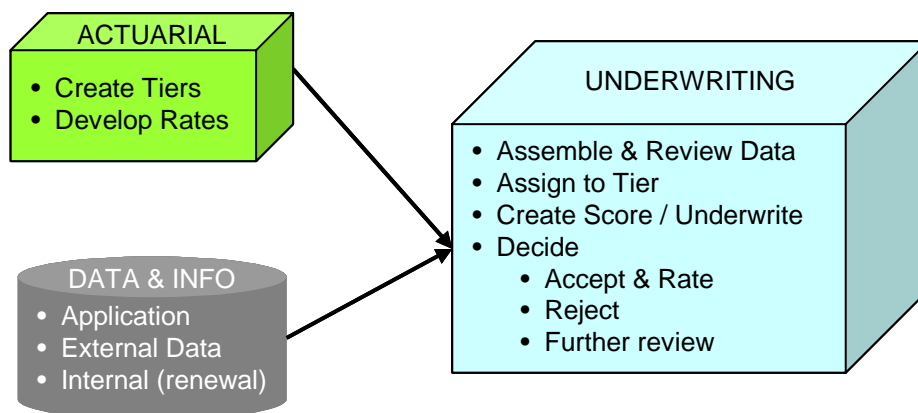
## A PROCESS LOOK AT UNDERWRITING TODAY

Private passenger automobile and homeowners are big, important lines that account for 37% and 11% respectively of the U.S. P/C industry's total 2002 premium of US\$377 billion.

Figure 1 provides a general view of how the industry underwrites these products today.

- Before underwriting begins, actuaries create tiers and develop rates. Tiers are a way to group risks and policies by expected level of average losses paid. Insurers have used tiers for auto for several decades. An insurer may offer two, three or more tiers (standard, preferred, non-standard). Use of tiers for homeowners is more recent, but is becoming more common.
- Actuaries also develop rates—namely, the premium for providing coverage to an applicant. The level of the premium is keyed to the likelihood a specific applicant will have a loss, given the facts and circumstances known to the insurer. Rates are good only if two things are true. First, there must be a reliable relationship between the risk's facts and circumstances on the one hand, and the likelihood of loss on the other hand. Second, the facts and circumstances must be correct (e.g., a car really is only driven on Sunday, 1.5 miles to church).

**Figure 1: The Underwriting Process Today**



Source: Celent Analysis

- Underwriting uses data and information from three sources: the application, external data, and internal data. Agents and customers complete the application. External data typically include driving records (MVR); claims records (CLUE); credit ratings/scores, property inspections, etc. For renewals, insurers can look at their own internal records for payment and claim history, and other information.
- In the actual underwriting process, underwriters and/or systems assemble and review the information. They then place an application into a tier. Often an underwriting score is calculated, although varying levels of review by human underwriters also occur. The score and/or human review determine whether the application is accepted (followed by determination of the rate), rejected, or in need of further review.

While all personal lines P/C companies follow this general process, there is significant variation in how individual insurers execute. In many companies, actuaries create tiers and develop rates using pooled industry data, which may be analyzed only to the point of meeting regulatory scrutiny. Original data entry may still be on paper, with re-entry one or more times not uncommon. Some insurers or agents make case-by-case decisions to order external data; and access to internal data may be limited by siloed IT environments. Assembly of data can be a manual and iterative process, with limited quality control. Even when scores are available, half or more of the underwriting decisions may be ultimately made, or ratified, by human underwriters.

## A FINANCIAL LOOK AT UNDERWRITING TODAY

The combined ratio is the single best measure of underwriting performance by property/casualty insurers. As Figure 2 shows, it is a combination of two ratios: expenses to premiums and losses to premiums. (Various refinements, such as written vs.earned premiums, are not addressed in this discussion.) “Losses” are the cost of adjusting claims and the actual payments to claimants. “Expenses” are basically everything else on which an insurer spends money. They include the cost of underwriting (underwriters, their equipment, systems, office space, and so on). They also include all other expenses incurred by an insurance company, from HR and accounting to general management, etc.

**Figure 2: A Combination of Two Ratios**

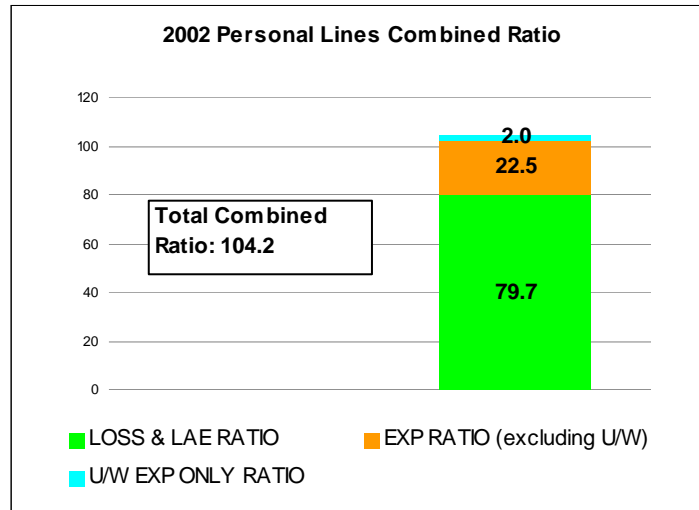
$$\begin{array}{ccc}
 \boxed{\text{EXPENSE RATIO}} & & \boxed{\text{LOSS RATIO}} \\
 \\ 
 \frac{\text{Expenses}}{\text{Premiums}} & + & \frac{\text{Losses}}{\text{Premiums}}
 \end{array}$$

Source: Celent

As Figure 3 shows, in 2002 the combined ratio for U.S. personal lines was 104.2. That is, for every dollar of premium insurers took in, they paid out just over \$1.04: an estimated 2 cents for underwriting expenses, 22.5 cents for all other expenses; and 80 cents for losses. P/C insurers can no longer count on investment income overcoming underwriting losses. Betting

on perpetual appreciation in either equity or bonds has fallen into disfavor.

**Figure 3: 2002 Personal Lines Combined Ratio**



Source: Best's Aggregates & Averages 2003 and Celent estimates

Improvement in underwriting profitability can result from improvement in any, or all, of the parts of the combined ratio:

- Lowering expenses—for underwriting only, or for all expenses
- Reducing losses—choose risks with lower probability of incurring losses
- Increasing premiums—through raising rates and/or selling more policies
- Improving the premium/risk relationship—e.g., reducing premium per policy a bit, and reducing loss per policy even more

Subsequent sections in this white paper will describe how the four underwriting technologies make a positive impact on each of the combined ratio elements.

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## TECHNOLOGY ENABLERS OF CHANGE

There are four technology enablers of change in personal lines underwriting: business rules engines, predictive scores/analytics, data management, and optimization tools. Each makes a distinct contribution to improvements in underwriting performance. Working together, they have an even greater impact.

### BUSINESS RULES ENGINES

A business rules engine (BRE) is a type of enterprise software which creates and executes rules to automate decisions within processes. Without a BRE, human underwriters make decisions by applying their judgement to available facts. With a BRE, specified decisions are made automatically and with complete consistency—given the same data, the BRE will always make the same decision.

Two of the key benefits of a business rules engine are greater ease of use and faster speed to market in comparison with embedding decisions in process-oriented computer programs. Business rules engines provide graphically oriented, easy to use development environments in which trained business users and analysts can make changes without waiting in line at the IT department.

The underwriting process is essentially a set of rules-based decisions. For example, if all necessary information is available, then the application can be assigned to a tier. A business rules engine, working with a data management system as described below, can recognize missing required information, and execute a request to people, systems or databases to obtain that information. Rules can be expressed in several other ways. For example, a business rules engine can execute a rule, in the form of an algorithm, which calculates a predictive underwriting score.

### PREDICTIVE SCORES/ANALYTICS

The insurance industry and insurance companies have a wealth of data on the people and objects they insure, and on subsequent losses. Actuaries use this information to establish tiers and rates (i.e., premiums/prices). A correct price is one that embeds the true expected value of losses on the particular coverage. An insurer's ability to set its prices correctly is extremely important to its long term success.

Setting prices too high is bad because it will drive business away. Setting them too low is even worse. Assume that a set of applicants each has a true expected loss value of US\$300. Carrier A quotes a rate which assumes an expected loss of US\$200; Carrier B quotes a rate based on

an expected loss of US\$300. Carrier A is going to be insuring most of those applicants. This phenomenon, attracting many underpriced risks, is called adverse selection. Carrier A is incurring adverse selection. By pricing correctly, Carrier B has a distinct competitive advantage.

In recent years, some insurers have begun to use a simple but powerful tool for developing rates and making underwriting decisions: predictive scores. Predictive scores give an insurer a more transparent and predictable way to assign applicants to tiers, make underwriting decisions; and determine rates.

A predictive score is usually calculated from 8 to 20 variables. These variables could be such things as a house's size in square feet and its year of construction, or the make and models of insured automobiles and traffic violations by drivers. Each variable must have either a distinct value (less than 1,500 square feet, 1,500 to 2,500 square feet, etc.) or a condition (there has, or has not, been a moving violation in the past three years). Weights are assigned to the variables, e.g., the most desirable square footage has twice the weight as the most desirable age of construction. The total of weighted values and conditions produces a predictive score, which is expressed on a maximum/minimum scale, for example, 200 to 800.

Insurers use analytics to select the variables; to assign points to values and conditions; and to determine weights. Analytics uses sophisticated methods of statistical analysis to discover relationships and predict outcomes. Analytics requires the use of various forms of software, such as data warehouses and business intelligence applications.

After analytics determines the method for creating predictive scores, the speed and flexibility of business rules engines make them the preferred way to implement and modify those predictive scores.

Business rules engines are also well suited for using predictive scores in the underwriting process. For example, an insurer can calculate a predictive score, then use other rules to place an application in a tier (e.g., does the applicant have other policies with us?) or to "knock out" an otherwise good application (e.g., is there a drunk driving conviction?).

Predictive scores are double-edged swords. If they accurately predict losses, they will mow down the competition. If not, they will cause self-inflicted wounds.

## **D A T A   M A N A G E M E N T**

Predictive scores, and business rules-driven underwriting and rating decisions all require data. This data can originate externally from third parties (driving records, claims history with other insurers, credit scores, property inspections, etc.). For renewals, it can originate internally within the insurer (claims and payment history, etc.).

Insurers need good data management capabilities in order to access and utilize these various kinds of data in an efficient and timely manner. Each data source or repository has its own access requirements; and the data itself will be in a variety of formats. An insurer's systems must have the right connectors and protocols, and the IT group must continuously monitor the data management processes of access, validation, classification, storage, error resolution, and so on.

Here again, business rules can play an important role in managing the priorities and sequencing of data acquisition. For example, a predictive score for homeowners insurance may require external data from a mortgage company and the public registrar of deeds. The BRE can confirm the availability of that data, or request it from the appropriate sources. If a calculated predictive score does not give a clear accept or reject signal, a BRE can then trigger a request for a property inspection at an additional cost.

Good data management capabilities will enable an insurer to reach an underwriting decision more quickly and accurately.

## **OPTIMIZATION TOOLS**

Optimization means organizing activities to achieve stated goals, subject to constraints. Typically, in personal lines insurance, the goals will be some combination of growth and underwriting profitability. Insurers often follow a zigzag course while trying to find the appropriate combination of those two numbers. For example, in recent years, a well-known insurance company strongly emphasized growth through pricing and underwriting actions, only to find that its underwriting results were quite poor. It then reversed course by raising prices and significantly restricting sales to new policyholders in certain territories. Optimization tools can clarify such trade-offs among growth, underwriting profitability, product line mix, distribution channels, home office and field staff, etc.

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## TRANSFORMATION OF THE UNDERWRITING PROCESS

An insurer can combine a business rules engine (BRE), predictive scores and data management to transform the underwriting process.

Pricing becomes more fine grained as predictive scores enable the creation of more tiers. An insurer with a predictive score range from 200 to 800 could produce ten, twenty or even sixty tiers, based on segments within the overall range. In practice, an insurer would probably go from three tiers to six or twelve. This in turn broadens its market appetite, as it is able to provide attractive prices to applicants at the higher and lower ends of the risk spectrum. An insurer with only three tiers is not likely to have an appropriate rate for an inexperienced driver with two citations, or for a person driving for thirty years with a totally clean record and low annual mileage. However, an insurer with twelve tiers can have predictive score-driven tiers for both drivers.

Even more importantly, an insurer can offer accurate prices to applicants everywhere on the risk spectrum. Predictive scores developed through sound analytics result in prices neither too high nor too low. By having more accurately priced tiers, the insurer is reducing the amount of adverse selection in its own book, and increasing the adverse selection in its competitors' books.

The insurer also becomes a more attractive business partner to independent agents in several ways. Producers will prefer doing business with a company that accepts 95% of the people who walk in the door, rather than a company that accepts only 60%. As the business rules engine increases speed, accuracy, consistency and auditability, producers know they will get a correct answer quickly. And as the insurer's internal efficiency increases, producers will have more access to human underwriters for their difficult cases.

Data management technology also plays a key role as it assembles internal and external information and reviews it for completeness and consistency. Staff spends time on exceptions, not on routine applications. As described above, the BRE can order supplemental information only when doing so is economically justified. The BRE calculates a predictive score, assigns it to a tier, and decides whether to accept, reject or submit an application for further review. The BRE can also calculate the rate, although that task is more typically done by a rating engine (which is itself a kind of specialized BRE).

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## TRANSFORMATION OF UNDERWRITING FINANCIALS

The same three technologies, business rules engines (BRE), predictive scores and data management, can also transform an insurer's underwriting profitability.

As each step in the underwriting process becomes automated, the percentage of applications which reach an "accept and rate" or "reject" decision with little or no human involvement can increase, for example from under 50% to 80% or higher. The number of underwriter and support staff needed to process a given number of incoming applications could drop from 20% to 40%. That will reduce the "underwriting expense only" ratio (as the numerator decreases). Alternatively, an insurer could maintain the level of underwriting staff to handle an increased premium volume—which will have the same effect.

Several factors will also drive down the numerator of the loss ratio (losses and loss adjustment expenses). Accurate predictive scores will produce accurate rates—an applicant with an expected loss of US\$300 will not be charged a premium as if the expected loss were US\$200. Correct rates will drive away previously subsidized poor risks. The consistency of rules-driven scores and pricing decisions has another subtle but important advantage. Any mis-pricing of a given group will appear more clearly, thus enabling earlier corrective action.

Premium (the denominator of the expense and loss ratios) will increase for reasons described above: the insurer's market reach and appetite has increased, and it is a more attractive business partner for its agents. Retention of improving risks will also increase, as many policyholders become better risks over time. A rule for renewing policies can call for new data which generate a better predictive score, yielding a lower rate and higher retention.

Lastly, more fine-grained rates will allow an insurer to improve its premium/risk profile. For example, an insurer begins selling to a new market segment which it formally would have rated based on an expected loss of US\$300. Now with better predictive scores, it knows that group's true expected loss is US\$250. The insurer can begin selling to the group, charging a premium based on an expected loss of US\$275 -- lowering premium some, but losses even more.

Celent estimates that, taken together, these changes could reduce the average personal lines insurer's "underwriting expense only" ratio by about 30% (0.6 combined ratio points) and reduce the loss ratio by 2% to 4% (1.5 to 3.0 combined ratio points).

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## TRANSFORMATION OF THE UNDERWRITING FUNCTION

An insurer that has implemented these technologies and finds itself with a reduced need for underwriting resources could reflexively reduce underwriting staff. However, doing so foregoes a potentially powerful benefit: an opportunity to transform the mission and function of the underwriting group from selecting individual risks to managing risk portfolios.

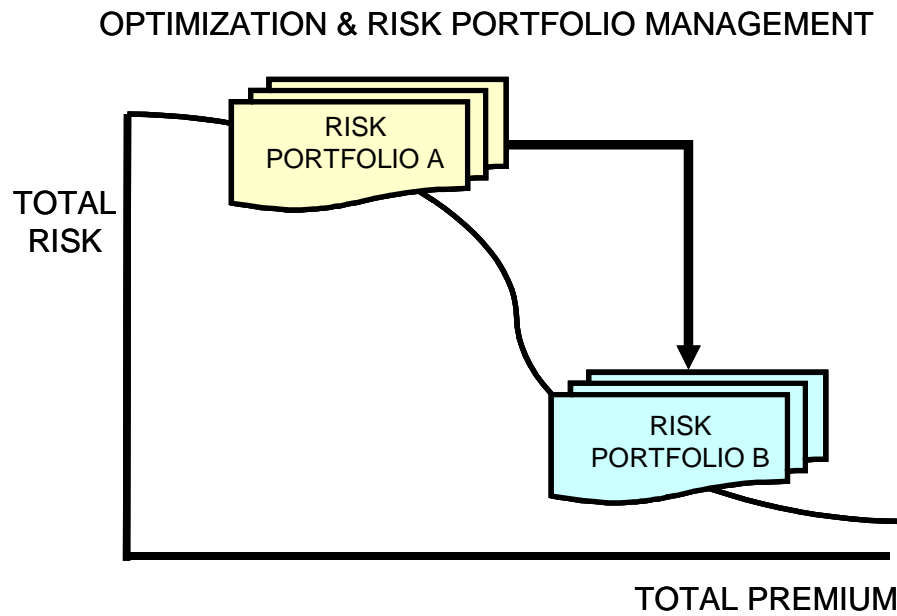
Historically, the job of a personal lines underwriter is to review individual auto or homeowners applications submitted by a group of agents located in a specific geographic territory. Working with field-based staff, an underwriter has only a limited ability to influence the kinds of risks that those agents submit.

Using the technologies described in this paper, an underwriter can shift focus from individual risks to a portfolio view of all submitted, accepted and rejected risks. With predictive scores and analytics, an underwriter can ask questions such as:

- How does the actual distribution of applications among tiers compare to a target distribution?
- If the actual distribution is far from the target, is the tier mis-priced or are agents misunderstanding the insurer's relative appetites?
- Do applications or policies tend to have or to lack certain predictive score variables. (Are there a lot, or very few, three-car policies? Do many, or few, homes have fire/burglar alarms?)
- Which agents are submitting a desirable mix of business and which agents see the company as the only place to send applications with two at-fault accidents?

As answers to these questions become clear, an underwriter and field staff can begin to communicate with agents and influence the agent/company relationship in new ways. The underwriting department can work with actuaries to shape tiers and rating structures in order to manage the company's aggregate risk/premium relationship actively. As shown in Figure 4, over time the aggregate portfolio of risks and premiums which the insurer has accepted will shift to a more favorable relationship.

**Figure 4: Optimization & Risk Portfolio Management**



Source: Celent

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## POSSIBLE USE BEYOND PERSONAL LINES

### REQUIREMENTS FOR OTHER INSURANCE LINES

The benefits these technologies provide to personal lines underwriting will apply to certain other lines of insurance as well. The major prerequisite is the availability of sufficient underwriting and loss data so that analytics can produce valid predictive scores. In addition, data definitions and collection methods must be reasonably uniform and objective. Some kinds of insurance are poor candidates because they are written on small pools of risk and/or using significant amounts of qualitative information. (Examples include Directors & Officers and Kidnap & Ransom lines.)

A secondary requirement is the ability to retrieve external data in digital form. Some lines have traditionally depended on manually collected information, such as, workplace safety inspections and product safety evaluations. Digitizing these kinds of information requires resources and time.

### COMMERCIAL LINES

Certain mass-market oriented commercial lines are good candidates. These lines include Business Owner Policies (BOP) and workers compensation for small and mid-size employers, and Commercial Auto. These lines have large pools of risks, with significant amounts of information available digitally.

### LIFE HEALTH

There are several promising products in the life/health sector as well. Non-medically underwritten term is an outstanding candidate, with significant data for creating predictive scores and BRE-driven underwriting. Good data management techniques can be especially helpful for some forms of medically underwritten term and whole life, both of which are dependent on Attending Physician Statements and medical laboratory results. Individual health is another good candidate. Individual disability might be, but would require a sophisticated combination of rules and predictive scores, due to the large amounts financially at risk among the predominantly professional group of insureds.

### FRAUD DETECTION IN CLAIMS

In detecting claims fraud, there are real optimization trade-offs between fast-track processing of a claim on the one hand, and referral to a special investigation unit on the other.

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## CONCLUSIONS

For a long time, it has been difficult to make much money writing personal lines insurance. The convergence and mutually reinforcing interaction of four technologies—business rules engines, predictive scores/analytics, data management, and optimization—now provide insurers with a significant opportunity to improve and transform their underwriting function.

Insurers using these technologies will gain a number of benefits, including:

- A broader market reach made possible by a wider range of tiers
- Being a better business partner for agents
- More accurate pricing within tiers through the use of predictive scores developed through analytics
- Lower loss ratios resulting from more accurate pricing and less adverse selection
- More rapid, consistent, and accurate underwriting decisions driven by business rules engines
- A reduced requirement for underwriting resources to make routine accept/reject decisions, with a lower “underwriting-only” expense ratio
- Improved speed to market and agility as business users depend less on IT groups for changes
- An ability to transform the underwriting function from selection of individual risks to managing portfolios of risk—with the potential to improve the aggregate risk/premium relationship

The technologies offer win-win-win potential: for the customer, the agent, and the insurance company. Insurers who do not underwrite with these or similar tools will be at a long-term disadvantage.

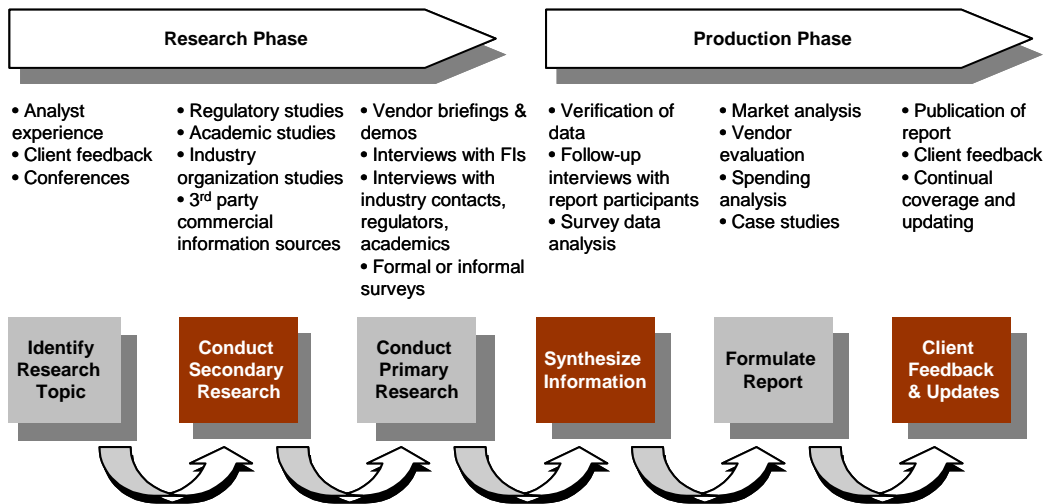
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Celent’s research clients include financial institutions, vendors, and consulting firms. Occasionally, our reports evaluate clients who are solution providers, along with providers with whom Celent does not have a relationship. Celent evaluates all vendors using the same criteria, whether or not they use our research and advisory services.

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When citing third-party data or opinions, Celent provides source information. When citing formal survey results, Celent provides as much information as possible about survey methodology and participants, within the limits of confidentiality. All other material appearing in Celent’s reports is created by the analysts and is derived from the sources listed above and from Celent’s experience. Figures and charts based on this analysis are labeled “Celent analysis.”

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Celent Communications is a research and advisory firm dedicated to helping financial institutions formulate comprehensive business and technology strategies. Celent publishes reports identifying trends and best practices in financial services technology, and conducts consulting engagements for financial institutions looking to use technology to enhance existing business processes or launch new business strategies. With a team of internationally experienced analysts, Celent is uniquely positioned to offer strategic advice and market insights on a global basis.

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