Enhancement in Predictive Model for Insurance Underwriting

Akshay Bhalla

(akshay1312@gmail.com)

Application Developer, Computer Sciences Corporation India Ltd, Noida, UP

Abstract – **Underwriting is the most important process of a business where a slight miscue can lead to blunders. An insurance organization's success depends upon the correct assessment of the possible risks associated with each application. Hence, the role of an underwriter becomes crucial. Predictive Analytics takes into account the statistical data and past records of the proposed insured to analyze the risk involved. A score is given to all the applications after analyzing the initial information provided. The applications which score higher than a certain threshold (defined by insurer) are considered to be low risk applications. The proposed methodology is to incorporate this predictive model in underwriting in order to streamline and optimize the process. This technique will help the underwriters to efficiently underwrite the applications.**

Keywords- Predictive Analytics; underwriting; risk assessment; anti-selection; Predictive Underwriting

I. INTRODUCTION TO PREDICTIVE ANALYTICS

Today many business verticals like travel, healthcare, insurance, retail etc thrive on the analysis of past and present data for the evaluation of future risks. The accuracy of this analysis defines the probability of loss or profit for the organization. Predictive Analytics model is an algorithmic solution which assesses the past and present factors to provide a score which guides to determine the potential risk or opportunities for future. It embraces a wide range of analytical and statistical techniques like data mining, modeling, machine learning etc. [1] Credit scoring, for example, a well known application used in financial services, analyses various factors such as credit history, account information, loan repayment history etc for the customer application and provides a credit score which represents the likelihood of his/her repaying the future debts.

Predictive analytics uses data mining technology which makes the use of intial information provided by the customer to develop a model called the Predictive Model which solely corresponds to the requirements of a business. This model scrutinizes various data available for the customer through the existent logs of customer purchases, behavior and demographics. This information is encoded into a model, which, in consortium with the business rules, calculates the risk factor for the customer. Predictive modeling software has computer science at its core, undertaking a mixture of number crunching, trial and error. [6]

Figure 1 Predictive Model

II. PREDICTIVE ANALYTICS IN INSURANCE

Insurance has always been dependent on the future estimations. In the early stages of development, insurers heavily relied upon their rough estimation of premiums. The only factors that determined the result for them were the age of the applicant and the success of his policy history. [1] With the technological advancements that took place with time, more factors came into light which affected the insurer's decision. These factors include age of the applicant, his medical history, policy history, the type of policy opted for, salary, location of residence etc. The Predictive Analytics model takes all these factors into consideration for the risk assessment. Based on these factors, a score is generated which depicts the level of risk in the application. If the score generated for an

application is lower than a certain score range, then the medical requirements are skipped for the case which in turn speeds up the underwriting process.

III. BASICS OF UNDERWRITING

Every customer intending to take an insurance cover is a unique case to the insurance company. With each proposed insured, comes certain risk. This level of risk is measured by the final solvency of the proposed insured to pay the contractual benefits. Underwriting, also called Risk Selection, is the insurance function that is responsible for assessing and classifying the degree of risk a proposed insured or a group represents and making a decision concerning coverage of that risk. This decision is known as Underwriting Decision. [2] The guidelines governing these decisions are different for different companies. These set of guidelines that imply the insurer's business stratagem like pricing etc is called underwriting philosophy.

The underwriting philosophy is usually different for an individual and a group insurance. The information used to evaluate the risk of an individual applying for life insurance will depend on the type of coverage involved. [5] Various factors are taken into consideration by the underwriters while taking decision. These factors include proposed insured's age, blood pressure, EKG, medical history, motor vehicle report, smoking history etc. These factors help the underwriters to evaluate the mortality risk for the proposed insured. Mortality risk is the likelihood that a person will die sooner than statistically expected.[2] Hence, correct evaluation of the mortality risk for a proposed insured exemplifies the pricing assumptions, the premium amounts, a proposed insured's eligibility for a product applied etc.

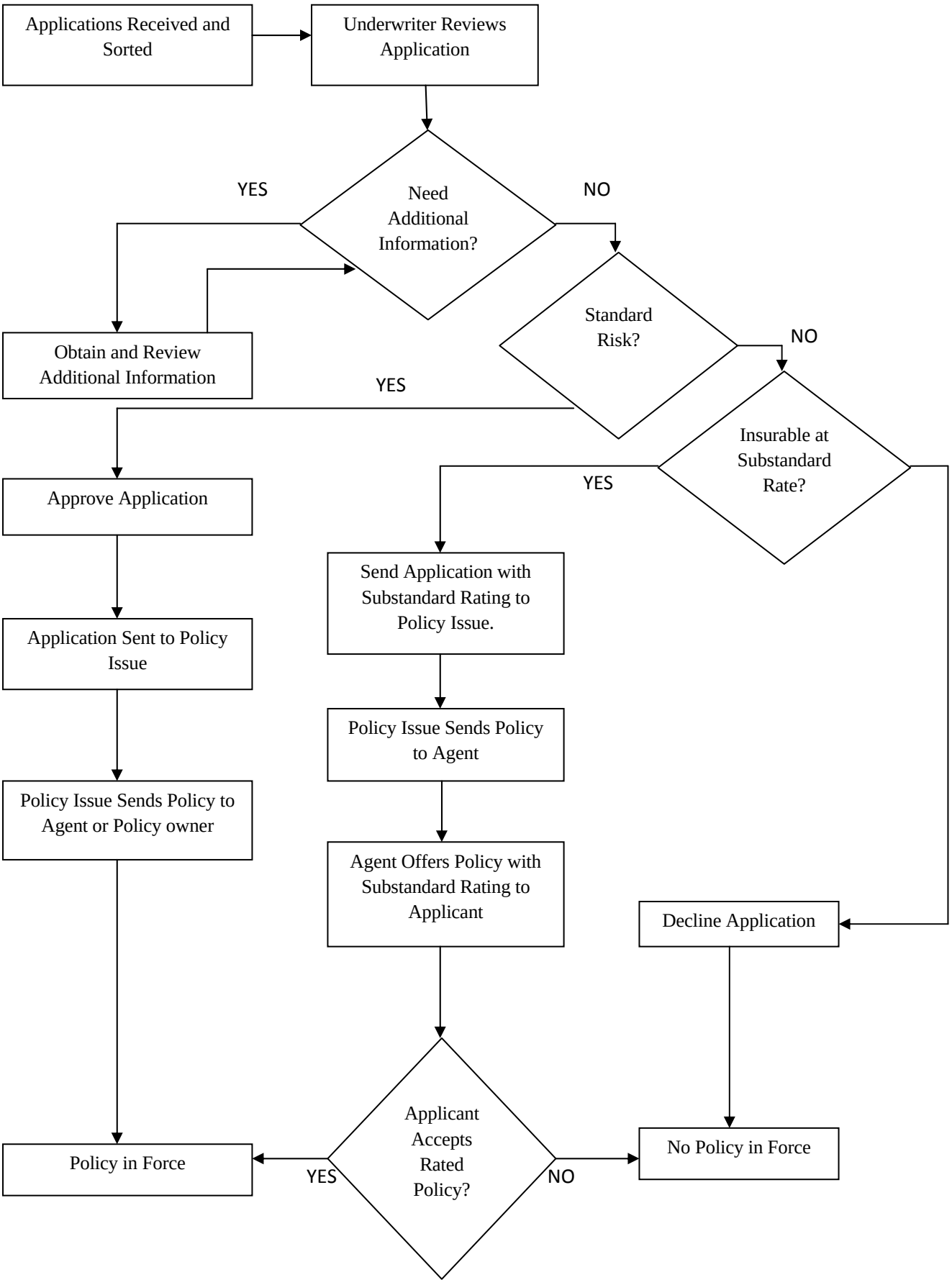
A. Underwriting Workflow

The first step towards underwriting is the field underwriting, where information is gathered about the proposed insured by the agent through which he assesses his suitability for the requested coverage. This survey can be done via Teleunderwriting also. In teleunderwriting, a third party agent gathers this information via telephonic interview. The information obtained is keyed in by the data entry team into the database and sent to the underwriting department for review. An underwriter verifies:

- The application form filled by the applicant was correct one for the state of his residence.
- Any past policies issued to the proposed insured by the insurance company along with the records for claims taken, premium payment etc. [2]

All this information gathered from the database is then attached to the application and an underwriter is assigned to it. Application of the proposed insured provides the underwriter, details such as Medical Report of the person, Identification details, personal details like hobbies of proposed insured, mode of premium payment selected etc. If the underwriter needs some additional information about the proposed insured to assess the risk, he can request the third party vendors to provide the information. [7] For e.g. he can request the medical history of the proposed insured called MIB Report from Medical Information Bureau. He can also request the proposed insured to go through some medical exams like Urine test etc in order to assess the application. Once all the data has been received and reviewed by the underwriter, only then he takes a decision. An underwriter's decision can be approved or declined. In some cases, an underwriter can rate the application either by increasing the premium amount to cover maximum risk or altering the coverage. This process is described in Figure 2.

Figure 2 Underwriting Workflow



B. Risk Classes

A risk class can be defined as a group which poses similar risk level to the insurance company. A proposed insured can be classified into four risk classes:

- Preferred Class- This class poses the lowest level of risk to the insurer. Hence the premium charged to this class is lower than the average premium.
- Standard Class- Proposed insured who lie in this category are those people whose anticipated mortality is average. [2] Hence they are charged standard premium rates which are higher than the preferred class but lower than the sub-standard class.
- Substandard class- The risk factor posed by this class is higher than the average. This class includes people suffering from an ailment, chain smokers etc. The premium charged to this class is higher than the average premium charged.
- Declined class- This class represents a risk class that falls outside the underwriting standards lay down by the insurer. Hence these applications are rejected. [8]

Table 1- Risk Classes

Likelihood of Loss

Less than average	Average	Greater than average	Too great to be insured
Preferred Class	Standard Class	Substandard Class	Declined Class

C. Anti-Selection

Anti-selection or adverse selection is the adverse impact on insurer when the risks are selected that have a higher chance of loss than the contemplated by the applicable insurance rate. It can be quite debilitating for an insurance company and occurs when a deficit in underwriting information allows a higher risk group to purchase life or health insurance at the same price as a lower –risk group. [3]

The potentially 'adverse' nature of this phenomenon can be illustrated by the link between smoking status and mortality. Non-smokers, on average, are more likely to live longer, while smokers, on average, are more likely to die younger. If insurers do not vary prices for life insurance according to smoking status, life insurance will be a better buy for smokers than for non-smokers. So smokers may be more likely to buy insurance, or may tend to buy larger amounts, than non-smokers. The average mortality of the combined policyholder group will be higher than the average mortality of the general population. From the insurer's viewpoint, the higher mortality of the group which 'selects' to buy insurance is 'adverse'. The insurer raises the price of insurance accordingly. As a consequence, non-smokers may be less likely to buy insurance (or may buy smaller amounts) than if they could buy at a lower price to reflect their lower risk. The reduction in insurance purchase by non-smokers is also 'adverse' from the insurer's viewpoint, and perhaps also from a public policy viewpoint. [4]

D. Technology in Underwriting

Underwriting process has been optimized to a great extent with the use of various algorithmic solutions. These algorithms present the policy to the underwriter for review after initial processing. During this initial processing, a plan type is assigned to the policy which is inferred from the initial information provided to the agent. Before the case is assigned to the underwriter, an Initial Underwriting is done on the case by an automated process which generates the requirements such as medical tests, lab reports etc based on the plan type assigned. Also, the rate class is calculated for the proposed insured which helps the underwriter in reviewing the application. When the application reaches the underwriter for review, he can wave off the requirements generated during Initial Underwriting and can also add requirements for additional information. Underwriter is leveraged to change the suggested rate class if he disagrees with the suggested one.

IV. PREDICTIVE UNDERWRITING: PREDICTIVE ANALYTICS IN UNDERWRITING

In the old conventional underwriting model, the underwriter had to wait for the medical data of client to be received to get to the final decision even for the cases where level of risk was much lower. [1] Received data was then assessed and reviewed, after which the underwriter took the decision. With the introduction of predictive

model, the initial data available is assessed by a scoring engine and a score is provided to all the applications. This score is used to screen the applications with low risk. Applications getting a score below certain defined threshold are declared as high risk applications and go through the traditional underwriting technique, whereas the applications above the threshold are low risk applications and go through predictive underwriting. Predictive Analytics when applied to underwriting process is called Predictive Underwriting.

V. PROBLEM DEFINITION

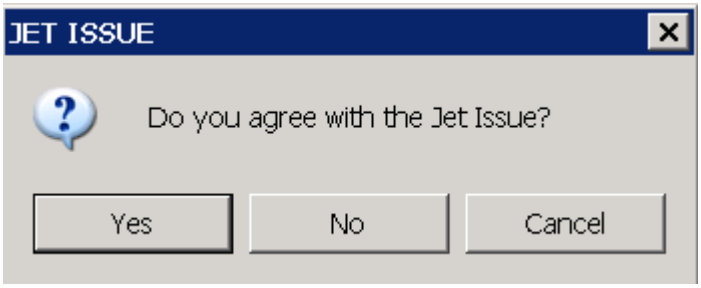
Predictive model provides a score to all applications based on the initial information provided by the applicant. It also classifies the application into a risk class category. But, how is this information provided to the underwriter? The underwriting applications used by the insurance companies need to be optimized in order to incorporate the predictive model efficiently. If the information like score, risk class etc generated by the predictive model can be presented to the underwriter, it can augment the speed of underwriting for low risk applications. Also, by providing an indicator for the low risk cases, the medical requirements generated during the initial underwriting of an application can be skipped. The final decision remains in the hands of the underwriter.

VI. ENHANCEMENT METHODOLOGY

This methodology incorporates the predictive model in insurance underwriting and leverages the underwriter to underwrite more number of policies in lesser time.

In this approach, a predictive requirement called a JET ISSUE requirement was added and attached to the application at the scoring stage before forwarding the application for underwriter review: SCORE=XXX LOW RISK=YES/NO RISK CLASS=XXXXX. The initial underwriting algorithm was altered and a check was introduced to verify whether the Jet Issue requirement contained LOW RISK= YES or NO. If the string found was YES, then all the medical requirements were skipped and none were added during initial underwriting. If NO, then the case went through the traditional underwriting. The case was then assigned to an underwriter for review. As the final decision remains in the hands of the underwriter, he can choose to disagree with the with risk class suggested. To optimize this, a new functionality was provided which was active only in the case of LOW RISK=YES.

Figure 3 JET ISSUE Decision



A button, JET ISSUE, was provided to the underwriter on the underwriting screen which on the click gave the pop up in the Figure 3. If the underwriter agreed with the JET ISSUE requirement, the risk class in the jet issue requirement was assigned to the case. If the underwriter disagreed, he could alter the rate class as per his analysis and also order medical requirements if needed.

VII. CONCLUSION

Enhancing the underwriting algorithms to incorporate the predictive model helps the underwriters to avoid spending time on the low risk applications and concentrate more on the ones which involve higher degree of risk. This enhancement increases the number of policies issued per day for an insurance company and hence the profit.

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