Rectification of Deregulation and Liberalisation in Insurance and Risk Industry by Information Business Optimization Techniques

Prayas Kad[1], Manju Khosla[2], Kamal Kad[3]
[1]Capgemini India Pty Ltd., SEP-2, B3, Godrej Complex, Vikhroli-East, Mumbai, India
[2]Capgemini Australia Ltd, Level 7/77, King Street, Sydney, Australia
[3]Infosys Australia Ltd, Market Place, Sydney, Australia

Abstract
People need security. A sense of security is perhaps the next basic objective after food, clothing, and shelter. An individual with economic security is fairly certain that he can satisfy his needs (food, shelter, medical care, and so on) in the present and in the future. The insurance industry has been particularly interesting because of its information-intensive and information-driven nature. In this paper we will present Impact of various I.T. Techniques which have advanced the affectivity in the Insurance and Risk Industry along with how it helped in Rectification of Deregulation and Liberalisation in Insurance and Risk Industry by I.T. Business Optimization Techniques. Most economic risk derives from variation from the expected outcome. One measure of risk is the standard deviation of the possible outcomes. This paper takes a single industry life insurance and looks at the role tabulating machinery and early computers have played in its business processes as well as the role of the insurance industry in the evolution of tabulating technology.

Keywords
Total quality management, Enterprise resource planning, International Organization for Standardization, Failure Mode and Effect Analysis, Information Tabulation.

I. Fundamentals of Insurance and Risk Products[1,2]

Insurance is an agreement where, for a stipulated payment called the premium, one party (the Insurer) agrees to pay to the other (the policyholder or his designated beneficiary) a defined amount (the claim payment or benefit) upon the occurrence of a specific loss. This defined claim payment amount can be a fixed amount or can reimburse all or a part of the loss that occurred. The insurer considers the losses expected for the insurance pool and the potential for variation in order to charge premiums that, in total, will be sufficient to cover all of the projected claim payments for the insurance pool. The premium charged to each of the pool participants is that participant's share of the total premium for the pool.

Normally, only a small percentage of policyholders suffer losses. Their losses are paid out of the premiums collected from the pool of policyholders. Thus, the entire pool compensates the unfortunate few. Each policyholder exchanges an unknown loss for the payment of a known premium. Under the formal arrangement, the party agreeing to make the claim payments is the insurance company or the insurer. The pool participant is the policyholder. The payments that the policyholder makes to the insurer are premiums. The insurance contract is the policy. The risk of any unanticipated losses is transferred from the policyholder to the insurer who has the right to specify the rules and conditions for participating in the insurance pool. The insurer may restrict the particular kinds of losses covered.

Hazards are conditions that increase the probability or expected magnitude of a loss. Examples include smoking when considering potential healthcare losses, poor wiring in a house when considering losses due to fires, or a California residence when considering earthquake damage. In summary, an insurance contract covers a policyholder for economic loss caused by a peril named in the policy. The policyholder pays a known premium to have the insurer guarantee payment for the unknown loss. In this manner, the policyholder transfers the economic risk to the insurance company. Risk is the variation in potential economic outcomes. It is measured by the variation between possible outcomes and the expected outcome: the greater the standard deviation, the greater the risk.

II. Insurance and Risk Policy Key Components[1,2,3]

A. Limits on policy benefits

In all types of insurance there may be limits on benefits or claim payments. More pacifically, here may be a maximum limit on the total reimbursed; there may be a minimum limit on losses that will be reimbursed; only a certain percentage of each loss may be reimbursed; or there may be different limits applied to particular types of losses. In each of these situations, the insurer does not reimburse the entire loss. Rather, the policyholder must cover part of the loss himself. This is often referred to as coinsurance.

B. Deductibles

A policy may stipulate that losses are to be reimbursed only in excess of a stated threshold amount, called a deductible. For example, consider insurance that covers a loss resulting from an accident but includes a 500 deductible. If the loss is less than 500 the insurer will not pay anything to the policyholder. On the other hand, if the loss is more than 500, the insurer will pay for the loss in excess of the deductible. In other words, if the loss is 2000, the insurer will pay 1500. Reasons for deductibles include the following:

a) Small losses do not create a claim payment, thus saving the expenses of processing the claim.
b) Claim payments are reduced by the amount of the deductible, which is translated into premium savings.
c) The deductible puts the policyholder at risk and, therefore, provides an economic incentive for the policyholder to prevent losses that would lead to claim payments.[3]

C. Benefit limits

A benefit limit sets an upper bound on how much the insurer will pay for any loss. Reasons for placing a limit on the benefits include the following:

a) The limit prevents total claim payments from exceeding the insurer's financial capacity.
b) In the context of risk, an upper bound to the benefit lessens the risk assumed by the insurer.

c) Having different benefit limits allows the policyholder to choose appropriate coverage at an appropriate price, since the premium will be lower for lower benefit limits.[4,5]

Fig. 1: Worldwide losses to Insurance & Risk Industry (IAG Report, Australia) [5]

III. Life Insurance and Its Information Processing Needs [6,7]

Managers have been relying on the investment in the information technology (IT) for the purpose of enabling business to fulfil its day to day need along with providing business a vision and direction for its future needs. Life insurance, being a very sensitive discipline has significant value for the correct and complete information not only to deal with its functional operations but also to earmark its future potential projections and taking competitive edge in the industry. Insurance companies have been losing heavily due to Climate changes and natural disasters as shown in Fig. 1.

Managers in the Insurance and Risk industry badly rely upon deploying effective I.T. in order to prepare the insurance and Risk plans to be offered to their customers comprising of precise information enabling customers to understand their insurance and risk coverage needs and accordingly choose a suitable plan for their families. I.T. has tremendous capability to prepare such plans based upon the statistical calculations, implementing complex Algorithms, utilising matrix managements and algebra, deploying its optimisation theory and practices along with abstracting the best practices from TQM (Total quality management), Six-sigma and ERP (Enterprise resource planning).

A. Tabulating Technology in the Insurance Industry

The insurance industry was one of the very first private industries to Show interest in Hollerith's system, seeing it as a way to speed up its card based manual sorting and counting systems. Insurance and risk industry has adopted extreme benefits from the technologies developed and utilised in the US for their census needs.

1. Advancements due to U.S. Census

By 1870, the census had become so extensive, and the population of the United States so large, that Census Office clerks could no longer effectively tabulate results by expensive and inaccurate hand counting. In 1872 Charles W. Seaton developed a machine that enabled several tally sheets to be brought close together, making them easier and faster to count. Seaton's device was first used in 1872, for the 1870 census, and then again in 1880. Seaton also invented a matrix printing apparatus for census work. While the Seaton machine was an improvement, the device was not advanced enough to keep up with the flood of data received for the 1880 census;

2. Inventions by Herman Hollerith

a former Census Office employee himself invented a much more effective counting machine. His machine used specially encoded punch cards, each representing an individual's census data. The cards were fed into the counting machine, where the punched holes allowed metal pins to complete an electric circuit. When a circuit was completed, the dial for the corresponding trait would go up. Hollerith's device revolutionized census tabulation. In 1896, Hollerith founded the Tabulating Machine Company. Almost twenty years later, after several mergers and management changes, this company became the International Business Machines (IBM) Corporation. After Hollerith raised the rental prices for his machines to an intolerably high level for the 1900 census, the newly formed Census Bureau decided to create replacements in-house.

3. Streamlining Data Processing

During the 1950s, the Census Bureau and the National Bureau of Standards developed a system called Film Optical Sensing Device for Input to Computers (FOSDIC), which took census and survey questionnaires that had been photographed onto microfilm, "read" blackened dots opposite the appropriate answers and transferred that data to magnetic tape. These tapes constituted the input for the Census Bureau's computers. One important result of this process was the elimination of most discrepancies in data records sent for processing. First used to process 1960 census results, FOSDIC played an integral part in the Census Bureau's data processing system into the mid-1990s. Optical character scanners were used to process returned questionnaires for the 2000 census.

B. Incremental Improvements in Technology and Use

1. Subsequent developments in tabulating technology

This opened the way for new uses in the insurance industry. The technical developments, spurred by the competition between Hollerith and his Tabulating Machine Company (subsequently acquired by the Computing-Tabulating-Recording Corporation which then changed its name to International Business Machines, Inc.), on the one hand, and James Powers and his Powers Accounting Machine Company (later acquired by Remington Rand), on the other, have Been well documented by others.

2. Printing Tabulator

This was first commercially introduced by the Powers Accounting Machine Company around 1914, by which year Peirce had also contracted with at least two life insurance companies to custom build printing tabulators. The Tabulating Machine Company followed with its own improved version an automatic printing tabulator, in 1920. Initially, printing tabulators printed out the totals previously simply displayed on a register to be copied down. Soon they could list data on a whole set of cards and print subtotals as well as totals. The interest of the insurance companies in the printing tabulator was based on the new possibilities it opened up for consolidating steps as well as Speeding up previous processes. In a paper presented at the Life Office Management Association around 1926, the author noted the impact of this innovation on life insurance practices:

3. Initial Adoption for Faster Sorting, Counting, and Adding

Modern society provides many examples of risk. A homeowner faces a large potential for variation associated with the possibility of economic loss caused by a house fire. A driver faces a potential economic loss if his car is damaged. A larger possible economic risk exists with respect to potential damages a driver might have to pay if he injures a third party in a car accident for which he is responsible. Historically, economic risk was managed through informal agreements within a defined community. If someone's barn burned down and a herd of milking cows was destroyed, the community would pitch in to rebuild the barn and to provide the farmer with enough cows to replenish the milking stock. This cooperative (pooling) concept became formalized in the insurance industry. Under a formal insurance arrangement, each insurance policy purchaser (policyholder) still implicitly pools his risk with all other policyholders. However, it is no longer necessary for any individual policyholder to know or have any direct connection with any other policyholder.

As an example, consider the cost of a car accident for two different cars, a Porsche and a Toyota. In the event of an accident the expected value of repairs for both cars is 2500. However, the standard deviation for the Porsche is 1000 and the standard deviation for the Toyota is 400. If the cost of repairs is normally distributed, then the probability that the repairs will cost more than 3000 is 31% for the Porsche but only 11% for the Toyota.

4. Mathematical Support and Illustration

Losses depend on two random variables. The first is the number of losses that will occur in a specified period. For example, a healthy policyholder with hospital insurance will have no losses in most years, but in some years he could have one or more accidents or illnesses requiring hospitalization. This random variable for the number of losses is commonly referred to as the frequency of loss and its probability distribution is called the frequency distribution. The second random variable is the amount of the loss, given that a loss has occurred. For example, the hospital charges for an overnight hospital stay would be much lower than the charges for an extended hospitalization. The amount of loss is often referred to as the severity and the probability distribution for the amount of loss is called the severity distribution. By combining the frequency distribution with the severity distribution we can determine the overall loss distribution.

Example: Consider a car owner who has an 80% chance of no accidents in a year, a 20% Chance of being in a single accident in a year, and no chance of being in more than one accident 4 in a year. For simplicity, assume that there is a 50% probability that after the accident the car will need repairs costing 500, a 40% probability that the repairs will cost 5000, and a 10% probability that the car will need to be replaced, which will cost 15,000. Combining the frequency and severity distributions forms the following distribution of the random variable X, loss due to accident:

$$f(x) = \begin{cases} 0.80 & x = 0 \\ 0.10 & x = 500 \\ 0.08 & x = 5000 \\ 0.02 & x = 15{,}000 \end{cases}$$

The car owner's expected loss is the mean of this distribution, E[X] :

$$E[X] = \sum x \cdot f(x) = 0.80 \cdot 0 + 0.10 \cdot 500 + 0.08 \cdot 5000 + 0.02 \cdot 15{,}000 = 750$$

On average, the car owner spends 750 on repairs due to car accidents. A 750 loss may not seem like much to the car owner, but the possibility of 5000 or 15,000 losses could create real concern. To measure the potential variability of the car owner's loss, consider the standard deviation of the loss distribution:

$$\begin{aligned} \sigma_X^2 &= \sum (x - E[X])^2 f(x) \\ &= 0.80 \cdot (-750)^2 + 0.10 \cdot (-250)^2 + 0.08 \cdot (4250)^2 + 0.02 \cdot (14{,}250)^2 = 5{,}962{,}500 \\ \sigma_X &= \sqrt{5{,}962{,}500} = 2442 \end{aligned}$$

If we look at a particular individual, we see that there can be an extremely large variation in possible outcomes, each with a specific economic consequence. By purchasing an insurance policy, the individual transfers this risk to an insurance company in exchange for a fixed premium. We might conclude, therefore, that if an insurer sells n policies to n individuals, it assumes the total risk of the n individuals. In reality, the risk assumed by the insurer is smaller in total than the sum of the risks associated with each individual policyholder. These results are shown in the following theorem.

IV. Information Technology: Stimulating the Insurance Business Process [1,5]

These days Insurance and risks products comes as integrated product bundle offering diversified classes of benefits to the insured, in order to provide user complete solution to what all needs to be encapsulated i.e. Superannuation, Managed Investments, Wealth Protection and distribution, Special Risks coverage etc. Because of the exhaustive advancements in I.T. to provide cutting edge support to such requirements various tools and I.T. business optimization techniques have been already formulated and tested functionally fully working in the applied circumstances. Many companies strive daily to use technology to enhance and improve their business operations. Companies using information technology in the insurance streamlining process are rapidly making progress as thorough and efficient as possible resulting in to expedite their financial recovery and final settlement.

A. Claims Handling/Management process and I.T.

One of the first steps in the claims process is to capture the financial impact of the event to the organization. Setting up specific accounts in the existing accounting system to capture loss-related costs is one way to use information technology. However, not all costs are captured that easily (e.g., incremental logistics costs), and custom accounting reports may be needed to better capture the financial impact to the organization. Working with the information technology department to prepare these reports on the front end of the claim process will make it much easier to obtain the necessary data throughout the process.

B. Functional Transactions and I.T.

In addition to financial reports, the purchase orders, contractor invoices and other vendor invoices supporting loss-related costs should be presented to insurers in an electronic format that expedites the sharing and reviewing of information. Scanning invoice information versus providing hard copies, then sharing the electronic data via compact disc or by using web-based e-rooms are good techniques to efficiently update claim data and share with insurance company representatives. Companies should also keep a cumulative electronic index of supporting data provided (uniform file naming for quick organized searches) that also includes any insurer questions and follow-up information provided in response to those questions. Complete tracking of information provided to insurers and the resolution to any follow-up questions and requests greatly assists with keeping the claim process on track.

C. Huge Data Volumes handling and I.T.

In conjunction with providing the information supporting an insurance loss, companies should use spreadsheet tools to assimilate the often large quantity of supporting data into a comprehensive set of claim schedules that build up, almost pyramid-like, into summary schedules by primary claim categories that are easily reviewed by the insurers and their representatives. To further expedite the review of the claim by insurance company representatives, supporting information can be linked to these schedules using hyperlinks.

Technology provides innovative tools for process improvement, and the Insurance business process is no exception. By employing some of the I.T. techniques outlined above, companies can better streamline the documentation process for their claim, minimize the disruption to personnel in the organization, and hopefully more quickly reach a successful settlement.

V. Survival of Insurance and Risk

I.T. & Global Climate Change: Referring to study performed by team of IAG Insurance Australia, on the changing climate worldwide and its impact on the Insurance and Risk, the use of information technology has proved versatile helping them to consolidate the previous history of data and with the help of various I.T. tools and techniques helped them to forecast further change in climate and protecting the future of Insurance and Risk Industry. Fig. 1 refers to the main worldwide losses which have incurred heavy losses to the Insurance and Risk Industry and that triggers the optimum utilization of the I.T. Resources available worldwide to achieve maximum benefits and protect the future of Insurance and Risk.

VI. Impact of I.T. and Six Sigma Techniques on Insurance & Risk Industry

Risk Management Standard is the result of work by a team drawn from the major risk management organizations worldwide like - The Institute of Risk Management (IRM), the association of Insurance and Risk Managers (AIRMIC) and ALARM The National Forum for Risk Management in the Public Sector. In addition, the team sought the views and opinions of a wide range of other professional bodies with interests in risk management, during an extensive period of consultation. Risk management is a rapidly developing discipline and there are many and varied views and descriptions of what risk management involves, how it should be conducted and what it is for. Some form of standard is needed to ensure that there is an agreed:

Quality management practices such as Total Quality Management (TQM) whose effectiveness is difficult to measure; Six Sigma based improvement programs make use of statistical tools, which can measure the effect of changes being made in a very short time. Six Sigma focuses on process orientation, enabling organizations to identify key business processes that are necessary for improving customer satisfaction. This helps managers in understanding the exact requirements of their customers and in altering business processes to suit customer needs and expectation and utilize the best practices from information technology as shown in Fig. 2. Six-Sigma has helped insurance companies in improving quality as well as reducing costs of services offered. It has enabled insurance companies to follow a disciplined approach, which has helped in preventing errors, minimizing hand-offs, and eliminating rework and workarounds. It has also helped in increasing the speed of business processes used in the insurance industry.

Fig. 2 : Insurance and Risk Analysis Methods & Techniques

Importantly, the standard recognises that risk has both an upside and a downside. Risk management is not just something for corporations or public organisations, but for any activity whether short or long term and it becomes absolute responsibility of Managers to apply suitable risk identification technique as mentioned in Fig. 3. The benefits and opportunities should be viewed not just in the context of the activity itself but in relation to the many and varied stakeholders who can be affected. There are many ways of achieving the objectives of risk management and it would be impossible to try to set them all out in a single document. Therefore it was never intended to produce a prescriptive standard which would have led to a box ticking approach or to establish a certifiable process. By meeting the various component parts of this standard, albeit in different ways, organisations will be in a position to report that they are in compliance. The standard represents best practice against which organisations can measure themselves. The standard has wherever possible used the terminology for risk set out by the International Organization for Standardization (ISO) in its recent document ISO/IEC Guide 73 Risk Management - Vocabulary - Guidelines for use in standards.

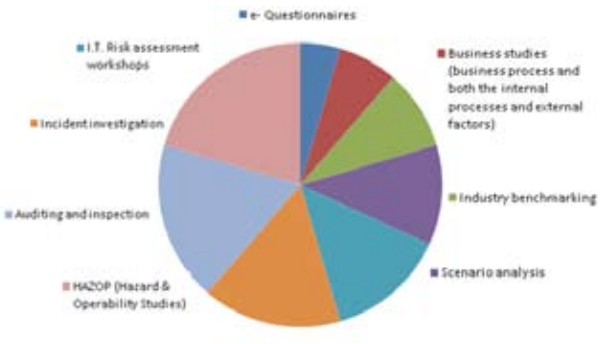

Fig. 3: Risk Identification Techniques

VII. Concluding Remarks

This paper advances reader's understanding on the Insurance and Risk Industry and the deployment of Information Technology on effective and efficient management performance by developing a set of information processing design choices, demonstrating the relationship between these information processing design choices and insurance companies' risk management performance, and indicating that the relationship between these design choices and risk management performance is moderated by the organization's strategy. This paper demonstrates utilization of information technology and six-sigma for various analysis activities and forecasting, which is the survival key for Insurance and Risk industry along with taking into consideration the effect of climate hazards and protection of business using information management. We hope this study encourages further research that will help to unravel the nature of the complex relationship between IT and insurance organizational performance.

Addition, future studies should incorporate a longitudinal standpoint to scrutinize how well the I.T. performance relationship shifts as insurance and risk industry grows. Such studies might enable researchers to investigate causality and establish which variables are truly driving both the industry and the performance of individual companies and suggests that all life/health insurance organizations should be using I.T. to increase cost-effectiveness. However, other uses of I.T. should be more closely aligned with organization's strategic posture.

References

[1] Harris, S.E., Katz, J.L., "Organizational performance and information technology investment intensity in the insurance industry". Organization Science, 2, 3 (1991), 263-295.

[2] Hitt, L.M., "The impact of information technology management practices on the performance of life insurance companies". In J.D. Cummins and A.M. Santomero (eds.). Changes in the Life Insurance Industry: Efficiency, Technology and Risk Management. Boston: Kluwer, 1999, pp. 211-243.

[3] Kumar, R.L., "A framework for assessing the business value of information technology infrastructures". Journal of Management Information Systems, 21, 2 (Fall 2004), 11-32.

[4] Keen, P.G.W., "Shaping the Future: Business Design Through Information Technology". Boston: Harvard Business School Press, 1991.

[5] Zhu, K., "The complementarily of information technology infrastructure and e-commerce capability: A resource-based assessment of their business value". Journal of Management Information Systems, 21, 1 (Summer 2004), 167-202.

[6] Study by Anna Gero Climate Research Analyst, Natural Hazards Research Insurance Australia Group

[7] Geoffrey D. Austrian, Herman Hollerith (New York, 1982).

Having over 13 years of extensive IT Experience with MNC's like Quark, Ness Technologies, Amdocs and Capgemini, Prayas Kad is currently working as a Manager – Technology Services division of Capgemini India Private Limited. His areas of interests are software verification and validation, QMS, Sourcing Practices on IT, optimization techniques using ITIL and Six-sigma management tools and Software defect management. He also has been working in the Leadership team for ISO 20000 Certification for Capgemini India along with publishing software engineering Newsletters during the course of ISO 20000 accreditation. He enjoyed working with Blue chip IT Clients across different domains located worldwide as USA, UK, Israel, Greece and Australia.

Having 9 years of extensive IT Experience with MNC's like Sungard Financial Services, Amdocs and Capgemini, Manju Khosla is currently working as Senior Consultant – Technology Services division of Capgemini Consulting Private Limited. Her areas of interests are software quality assurance, Web architecture , micro-processors design and Database management systems.
She has got diverse experience of working across various countries like UK and Australia during her IT Career.

A Senior Manager from Infosys Technologies, Kamal Kad has been enjoying a tremendous and very high profile roles and responsibilities while working with Global clients worldwide. Having over 18 Years of IT Experience he has been serving RCC, Quark Media House, Fidelity, HCL Technologies and Infosys Technologies. His areas of interest are Software Quality and Testing practices, project and program management, pre-sales and proposals designs.