

New Approach to Insurance Industry Development Based on Virtualization Technology



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ABSTRACT: *Currently speaking, lack of efficient Information Technology infrastructure makes the development of E-Commerce a lot more complicated. This relates to the fact that information required for supervisory-regulatory entities is not being updated. Insurance industry is the most important part of E-Commerce and, hence, shifting all transactions to the electronic environment in order to improve its penetration rate is inevitable. By advent of electronic insurance and its influence in all industrial sectors, rapid development of it can be expected. This paper introduces the life cycle of the insurance industry in which the development process and the role of information technology in each section of this cycle has been studied; In the form of a three-dimensional model, the effect of information technology on the key elements of the industry is analyzed, and in order to reduce costs and increase efficiency in managing large-scale insurance industry, a new approach based on virtualization is proposed in which the new arrangement of information technology infrastructure is described. Finally, by evaluating the effect of virtualization on the development and maintenance of IT infrastructure, efficiency of proposed method is displayed.*

Keywords: Information Technology, Virtualization, Insurance Industry Development, Life Cycle

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1. Introduction

E-Commerce is any form of business or administrative transaction or information technology exchange that is executed using any information and communication technology. The term 'e-commerce' has become widespread. Ecommerce and the IT infrastructure are increasingly becoming one of the most important drivers of strategic change for business and national governments. Yet the insurance industry has been lagging behind other financial services to embrace this new change within its activities. The communication infrastructure has enormous potential, as it is a medium that provides cheaper and more efficient communication links [1].

The domestic insurance market has had little regulatory control, with the emphasis being on freedom and openness. The effect of ecommerce is the subject of intense debate in the insurance industry, although actual translation into solutions is still in its early stages. Moral hazard and adverse selection are typical forms of asymmetric information that lead to risk of insolvency as well as to under-provision of insurance products. They justify the need for government intervention in insurance markets through legal provision, regulation and supervision [2]. IT infrastructure and data center are important component of the

industry management views. Defining and structuring management views is a fundamental task of the specification of data marts and reporting systems. Today such systems are based on data warehouse. A data warehouse stores materialized views on business processes to support the management's information requirements. It is located on a unified data center.

Interestingly enough, one of the key factors of business success is accessibility and analysis of required information which turn out to be a principal parameter in the field of Electronic Insurance. Hence, in addition to the enhancement of supervision command, the analysis of risks history will be far more precise. Increasing awareness of organizational potentials would be another significant factor. Such awareness involves identifying weaknesses, opportunities and threats, which in turn, contributes to more feasible decision making. The last but not the least, Swiss Re's success was owing to its accessibility to financial information, key ratios and the capital market over the last five years [4]. This implies that history analysis of data brings about realistic facts. This kind of history will be available efficiently by IT based solutions.

This paper describes the important elements of insurance industry from information technology aspect and it also proposes new method in order to deployment of IT infrastructure based on virtualization technology. Virtualization is the creation of a virtual (rather than actual) version of something, such as an operating system, a server, a storage device or network resources. In the future, however, virtualization will become an essential part of all computer systems by providing smart interconnection mechanisms for the three major system components - application software, system software, and hardware. Consequently, this is main reason for porting IT based infrastructure to the virtualization technologies [5].

The paper is arranged in such a way that in order to describe its basic idea, first the life cycle of the insurance industry is explained; then, by proposing three-dimensional model of insurance industry management, the role and status of key elements of information technology in the industry are characterized. Subsequently, a new approach based on virtualization is proposed to introduce optimal and efficient method for its infrastructural development. Finally, the results of this research are described.

2. Main Idea

This section describes the main proposed idea of this paper in three different sections.

2.1 Insurance Industry Life Cycle

The first stage regarding effective assessment and improvement of all processes related to the industry is having better understanding of its life cycle. Generally, IT- based architecture plays the main role for an efficient structure of successful insurance industry management. Figure 1 shows the life cycle of insurance industry. Information technology is considered as one of the most important tools for achieving the transcendental goals of insurance industry.

Exclusive infrastructure is one of the most important components involved in the life cycle of the insurance industry. This platform is the communication backbone for insurance industry through which all insurance companies with their agents and branches, as well as other relevant organizations are connected.

Security and availability of services in such a network is really significant. Via this communication structure, all generated data and information of the industry will be accessible. Refinement and classification of this pure data makes it more useful information. As shown in figure 1, in the life cycle, all gathered data is stored in the data center. All related data of insurance industry is kept separately for each company. The nature of data is different (Insurance data, financial data, statistical data, etc.). Therefore, analyzing and refining mechanisms for any given set of data requires certain skills and knowledge. Thus, it is apparent that best decisions would be made according to this type of information. Utilizing appropriate computer-based mechanisms, will improved this process in the best way possible. Patterns are obtained through data correlations, and behavioral analysis of each pattern is used to make knowledge. Decision making is strategic determiner for the life of the industry. Decisions are generally made by top managers of the industry as its custodians and supervision is one of their important aims. A number of decisions, however, can be made based on methods of artificial intelligence and expert systems. Considering the data refinements, the output data is of great financial value that can be used for developing business in insurance industry. Based on achieved required, senior managers propose strategic plans. They can make decisions by selecting best plans. Implementation of plans and also monitoring their execution leads to the problem solving of the insurance industry.

Strategic plans are used to function as an input for planning the information system. Information system planning is conducted according to industrial macro strategies. Based on data analysis and attained information, the aims of information systems are

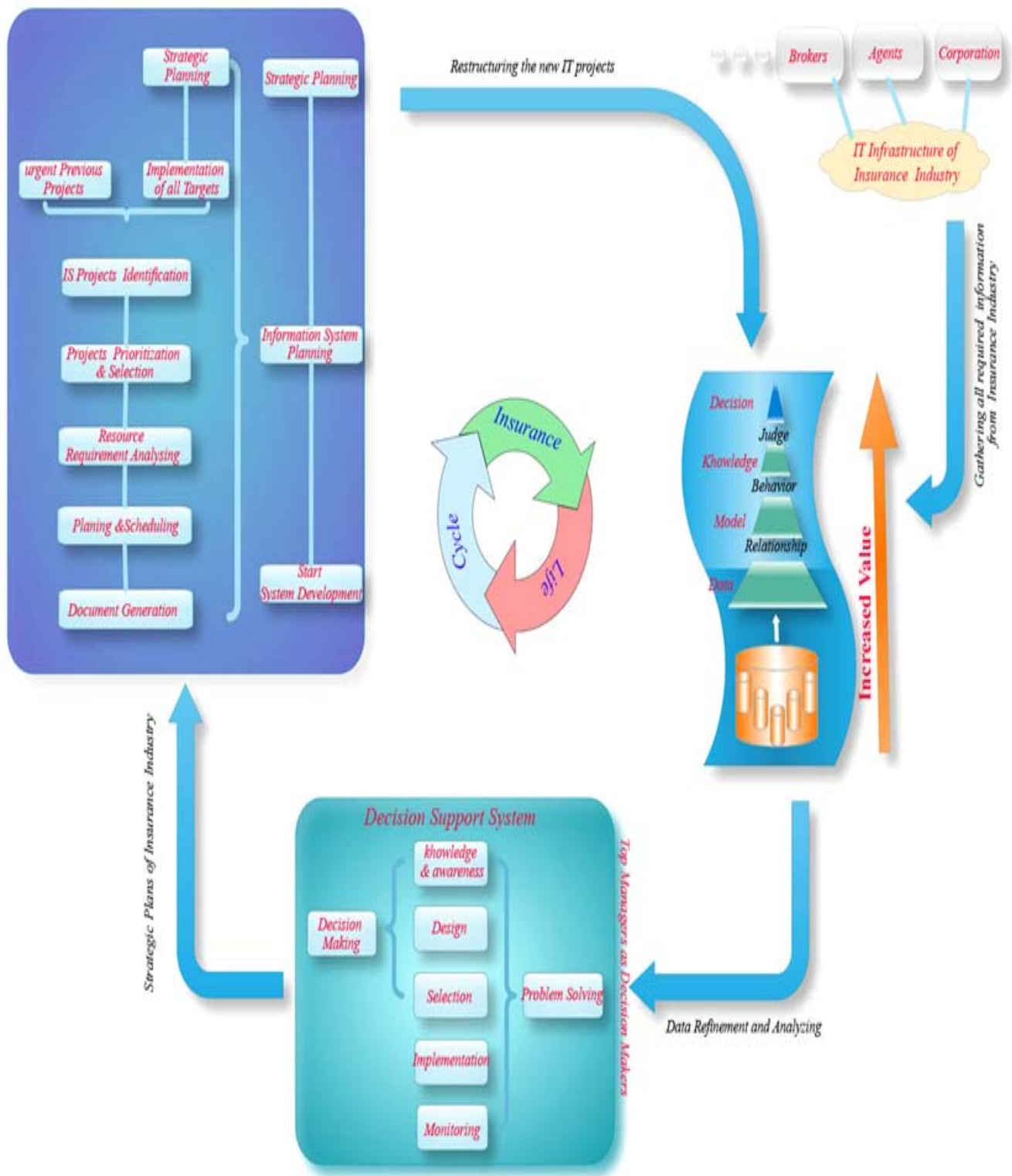


Figure 1. Insurance Industry Life Cycle

identified and implemented. In the first step, the projects pertinent to information system have been identified and prioritized for implementation. Likewise, project requirements must be identified for implementing it, followed by appropriate planning and time scheduling. The final stage involves submitting documentations of information system plans.

Repetition of the life cycle processes and new technology resources, managed in efficient manner, speeds up the industry development. In such circumstances, new technologies of IT management turn it into a successful industry. So far, the role of information technology in the industry life cycle is described.

Advantages of this system are evidently plentiful. Accurate data analysis of the industry contributes to a well-defined system of all projects pertinent to information system since planning and prioritization of projects are more realistic. More importantly, updated information from various industry-related resources and centers plays vital role in accelerating the process of industrial development. In addition, calculation and refinement of information, along with enhanced services, all add to the financial value, not only for customers but also for companies and organizations.



Figure 2. 3D model of insurance industry management development

2.2 3D Model of Insurance Industry Management

As shown in figure 2, a three-dimensional model is presented. Effective parameters of insurance industry is analyzed from the perspective of insurance industry management which is used for policy making and management of insurance industry based on information system facilities. For insurance industry management, three aspects must be taken into consideration; information system management, risk management, and supervision management. Each of these aspects will be described in details. Next, every dimension will be described in details.

2.2.1 Information System Management Dimensions

This dimension is related to the information technology infrastructure and all generated data of insurance industry. By applying the security services to all data and existing communications of the industry, favorable condition is provided for information technology in order to play its roles efficiently. By using the insurance industry infrastructure, that referred in the study of life cycle, all updated information are collected, and after applying any needed processes, refined information is extracted. Hence, in order to review and devise a successful insurance program, the study of financial information and risks history seem to be effective.

Protecting information about the data of insured, insurers, and etc. is of great concern. Thus, different mechanisms and security services are required. Brief definitions of such services are as follows:

- **Confidentiality:** This service prevents anonymous individuals' access to data.
- **Integrity:** This service guarantees that data manipulation has not occurred during the course.
- **Non-repudiation:** This service blocks the process of denial regarding sending or receiving information between sender and recipient.
- **Authentication:** It is used to ensure accessibility of authorized individuals to the systems and prevention of anonymous access to this service.
- **Authorization:** This service allows licensed individuals' access to the required sections using availability control mechanism.
- **Availability:** Using the network by authorized individuals without any interference.

The role of information technology in this area is so remarkable that affects all other aspects which facilitate the process of risk management and monitoring.

In section 1-1, a new method is proposed for implementing information system, in which the cost of deployment is very low and its flexibility and capability is much higher than conventional method. However, despite adequate infrastructure for information system, its role in key elements of the industry can be analyzed. For this purpose, the following sections revolve on how to use information technology facilities in risk management and supervision.

2.2.2 Risk Management

Risk management in the insurance industry plays a vital role since high capability in this area can be a key to success in this industry. Overall, risks can be divided into two categories: insurance risk of low-grade and high-grade insurance risks.

The first type of risks in this industry which is of more concern relates to all acceptable hazards and risks of accidents and natural disasters. In order to control acceptable risks, care must be taken at time of making policy accepting risks. Hence, risk analysis on a term basis as well as loss records, in addition to periodic analysis of risk expansion would all contribute to more accurate risk acceptance policy. To control risks related to accidents and natural disasters, it is advisable to adopt a method based on periodic analysis of number and types of disasters, and its impact on liquidity.

The second type is high grade insurance risk. This is made possible only with updated information which is why without proper infrastructure of information system, right analysis and evaluation cannot be done. In many cases, especially in under developed countries, the center of attention is on the first type of risks, while there are other kinds of risks that their importance is high grade.

Considering such risks definitely leads to success for highly developed insurance companies. Various types of hazards and approaches to controlling them are introduced and described as follows;

Insurance Program Risk: This one is related to the development, review and understanding of the insurance program. To control its activities few steps must be taken; the first step involves insurance need analysis. Then, revision of procedures and guidelines is crucial in identifying the best program for insurance which is practicable. The analysis of risk damage history is undoubtedly needed not only for devising such a program, but also for establishing criteria for further achievement and voluntary acceptance. Lastly, appropriate amendment related to terms and conditions of insurance contracts seems to make it possible to control insurance risks.

Insurers' Risks: Such risks pertain to the market development. In order to control these risks, it is advisable to adopt an accurate approach and technique to evaluate reinsurers and brokers. Another step in controlling reinsurers' risks would be the study of policy regarding insurance allotment and organizing meetings with reinsurers and brokers. Determining requirements and information about the rating agencies could be useful in this regard.

Human Resources Management Risks; risks such as lack of sufficient resources or appropriate technical knowledge, competition,

and experience of staff in the field of insurance are classified in this group. Accessibility of insurance capacity in management, training facilities for new employees, and also availability of specifications, manuals and provisions related to work, are important in controlling the risk of human resource management.

Operational Organization & Information Risks: risks related to the operational organization, which influence its precision, integrity and validity. Limitations and priorities of policymaking and management of risks must be identified to formulate warning policy for optional risks and losses.

Operational Data Risk; risks related to operational data that are independent from management requirements. Monitoring the results of insurance contracts, making general reports, and summarizing correspondence all facilitate the trend of controlling risks efficiently.

It can be summarized that the theory of risk control entails designing appropriate insurance strategies, access to the history of insurance risk, insurance risk control, supervisory attention on risk control efficiency, and imposing changes in insurance operational programs.

The Information Technology infrastructure best caters for availability of risk information, maintenance of its history, along with the transaction of updated data pertinent to operational and executive information in this industry.

2.2.3 Supervision Management

Supervision is one of the main tasks of authorities in the insurance industry. In order to develop an appropriate supervisory model, a number of issues will be discussed in this section. Insurance experts must devise an approach for the purpose of evaluating the insurance program. By the use of information technology, it seems possible to devise a smart and automatic system for evaluating the program.

Data collection and storage of such issues as insurance strategies and programs plus financial statements are also of paramount importance in the realm of supervision. On the other hand, quality verification and precision of the recorded data are considerable confrontations which all together mean an appropriate method is required to ensure the precision of such data. Therefore, it is prudent to make use of the information on all risks and the history of insurance risks. Also, appropriate mechanisms must be adopted to control risks properly, and the impact of such control must be investigated and evaluated, accordingly.

Last but not least, by making lists of the property resulted from changes in insurance strategies and investigating the impact of risk control, supervision management can be best realized in the insurance industry. More interestingly, data access and management will be carried out through the establishment of a suitable and efficient information system. The infrastructure development and techniques that are based on the Information Technology make it possible to achieve the above-mentioned targets.

2.3 New Approach for Structure of Information Technology Industry

It is time to introduce a new approach that paves the way for progress and further development of Information technology Industry more effectively and economically. Due to the fact that the mission of any organization is to accomplish more with less resources (financial, technological, or human), organizations inevitably need virtual servers in such a setting that necessitates less real space, energy, network, and media. This will reduce maintenance costs and, particularly, expenses for purchasing hardware.

Virtualization is not a new approach, and many top organizations and companies benefit from it, these days. This method can be adopted for all organizations, regardless of their size. Today, more than 30 percent of the world servers have been virtualized and it is expected in the near future to increase by 50 percent.

In the world today, similar primary infrastructure and virtual servers exist for virtualizing desktop computers; yet, distribution of servers still exist in many cases ; even with the virtual servers, the development of storage media causes stress in getting support from the information retrieval subsystem and the error rate at time of supporting is ever-increasing. In many structures, such as data centers, resource consumption for providing energy for servers and establishing server cooling system is growing. Disaster recovery seems to be one of the greatest dreams that many organizations aspire to realize, yet they are still unwilling to

try. Regarding the development of technology, the only organizations that can survive in the market are those qualified for the sense of competitiveness.

By and large, many resources (energy, finance and technology) are wasted in traditional methods. Targets concerning cut in expenses can only be obtained via the improvement in IT structure, which is why there is a high demand in changing managers' view points.

Virtualization is a technique for concealing physical features Hide of computational resources to facilitate the way in which other systems, applications or end users are able to transact with system resources [].

In this part of the paper, advantages and disadvantages of virtualization, and the usage of this technology in the development of Information Technology will be explained. Based on the usage and level of correlation with the actual machine, the virtual machine is of two types; a virtual system machine that provides comprehensive system and an operating system that can be entirely implemented. The software level that provides virtualization is called Virtual Monitor Machine or 'Hypervisor'.

On the other hand, there is a virtual machine known as Process Machine designed in such a way that can operate one application only. This machine is launched at the beginning of the process and halts when the process is terminated. Virtual machines contain virtual disks that can be of fixed or dynamic type. In dynamic mode, the disk size automatically changes according to the requirements of the virtual machine. In other words, this procedure resembles file copying. Hence, momentary imaging would be unsophisticated and restoring the latest changes while comparing different disks will also be possible. Such command is especially helpful for supporting server data, and the cost of hardware is rather low. As for networking, there are differences in the virtual world. Virtual machines are designed in such a way that can form an internal network without hardware redundancy, or through the bridging mechanisms to link with the outside world [6].

2.3.1 Application of Virtualization

The scope of virtual technology is literally vast. It is not hyperbole if one admits the fact that virtualization can sense anything. As an illustration, virtual servers can be established. That way, the assembly of corresponding servers for the purpose of mass production would be far too effortless. It is also feasible to configure servers in such a way that in case of failure of one, its substitute automatically resume providing services. In large data centers, many computer systems are used leading to a rise in cost of equipment and energy consumption as well. Multiple servers are placed in one physical machine that contributes to the optimal consumption of resources. A number of points regarding its application are described in details to shed light on the way it functions.

a. Disaster Recovery

By using virtual technology, the time required for uploading a server is reduced from days to only a few minutes or hours, utmost. Moreover, once an error occurs, servers automatically activate the alternate servers to resume and provide services within a few minutes.

b. Software Testing & Configuration

As far as virtualization is concerned, launching laboratory setting is truly swift and can be utilized for training users, updating test process, configuration or training, without any disruption in the operating system.

c. Penetration Test

Penetration test, system audit, and recovery from attacks at the time of using this technology can be easily done. Provided that a virtual machine is used to upload security tools, redundant applications will not be included in the system and conditions for security assessment will be at its best. Care must be taken for using hacking tools as they may penetrate the system and damage it. Browsing security and hacking websites undoubtedly cause damage to the computer networks. Thus, auditing all systems and eradicating the mentioned threats can be both carried out by using virtual performing machine server in the background.

2.3.2 Advantages of Virtualization

Virtual machines have many advantages that are as follows:

- **Rapid Deployment & Support:** Considering momentary imaging from the whole system, creating a backup file by file copying from the image would be swift and easy.



Figure 3. Application of virtualization

- **Faster Recovery following Updating Failure:** Most servers need upgrading after a while. It is possible to test the process prior to updating operating systems in the virtual machine.
- **Faster Recovery against Attacks:** If an attack endangers the security of a server in an organization, the server can be retrieved to the situation before the attack. It is also possible to extract the system attack scenarios from the virtual data machine, and make necessary arrangements for server restoration.
- **Optimal Use of Hardware Resources:** Virtual technology literally realizes “Minimum Resources Consumption to do the Utmost”.
- **Cut in Maintenance Expenses:** No need to purchase expensive maintenance equipment when it comes to virtual technology to perform a set of operations, in no time, including support system status information and the operation.
- **Less Energy Consumption:** Reducing the number of physical servers will dramatically decrease energy consumption.
- **Configuration Test of Backup Server in Advance:** Any configuration change in operation server may cause interference in its function. By means of this technology, all relevant configuration tests can be done in virtual machines.
- Virtual machines are **suitable laboratory environment** for promotion tests, new modifications, and new configuration modifications, without any interference in the operational server.
- **Rapid Deployment:** Swift set up for services in order to provide virtualized services is made possible.
- Virtual machines **cater for auditing security and penetration test.**

2.3.3 Disadvantages of Virtualization

Virtual machines have limitations as far as their architecture and new structures are concerned; such drawbacks are explained

below:

- The performance of a virtual machine is less than a real one, due to indirect access to hardware.
- Despite plenty means of management, the capability of virtual machines has not yet fully understand.
- Virtual Disk delay is of great concern
- Managing and updating, plus security systems are significant challenges in many systems.
- Dealing with virtual machine support and its collected data is also highly complicated.
- Monitoring security specifically for virtual machine is considered a big challenge.

3. Conclusions

The insurance industry must begin to aggressively embrace e-commerce. Indeed banks, securities brokers and investment companies all have a strong head start on the insurance industry in implementing practical and effective ecommerce solutions in their day-to-day activities. Therefore, in this paper, all aspects of Insurance Industry have been analyzed from IT view. Also, after describing the insurance industry, proposed 3D model shows the different elements of this industry with its correlation by IT based solutions. Application of virtualization technology is not in early stage, but there are many open problems for doing more research. Therefore, Security and high availability of virtualization based architecture are new topics for our future researches.

References

- [1] Faure, Michael (2003). Policy Issues in Insurance: Insurance and Expanding Systemic Risks, Vol. 5. Paris.
- [2] Creadon, S. (2000). e-insurance problem or opportunity for brokers?, *The Actuary*, June, 24-25.
- [3] Davidan, G. (2003). The E-commerce Directive and Regulations. *The Actuary*, April, 22-23.
- [4] Raj Singh (2010). Integrative Risk Management: Advanced Disaster Recovery, Swiss Reinsurance Company Ltd.
- [5] Smith, James E (2005). A Unified View of Virtualization, VEE'05, June 11–12, Chicago, Illinois, USA.
- [6] Black, Keith, (2007). Datacenter Reference Guide, Sun white paper, July.