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Lifecycle Architecture Using Cloud Computing For Smart
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Business Intelligence and Geographic Information System Lifecycle Architecture using

Cloud Computing for Smart Community

Rawan Sendi

North Carolina A&T State University

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Department: Computer System Technology

Major: Technology Management

Major Professor: Dr. Ibraheem Kateeb

Greensboro, North Carolina

2015

The Graduate School
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Biographical Sketch

Rawan Sendi was born and raised in a small industrial city in the west region of Kingdom of Saudi Arabia where she spent her childhood. She received the Bachelor of Science degree in Management Information System (MIS) from the Yanbu University College (UCY) in 2012. Since her graduation from the Yanbu University College (UCY) she has held various positions in technology and management related Human Recourse, Material and logistics Management, Medical Record, Information Technology, Patient Affair, Finance and Accounting. She is a candidate for a Masters in Technology Management.

Dedication

When you are surrounded by a family who always bring the best in you, you know that you are blessed. I dedicate my humble effort to my sweet and loving; Mother, Father, Siblings, and Husband, Whose affection, encouragement, endless love and prays of day and night made me able to get such success and honor. Along with hard working and respected Professors.

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Abstract

Business Intelligence (BI) is a technique and IT tool that supports business decision making. BI is considered a unique source of competitive advantage in the market place and it can combine data, multimedia, and transactions all in one application to address people's needs. Using BI applications can increase both operational efficiency and customer satisfaction. In addition, BI improves planning that provides the foundation for top successful performances in the future.

Geographic Information Systems (GIS) deliver productivity tools that are highly beneficial for businesses. These benefits include: visualization, business capacity, analysis, and interpreting data to understand relationships, patterns, and trends. Another benefit is a new feature can report drivers who speed, accelerate hard, and make sudden stops. Nowadays, GIS is responsible for developing standard, strategy, and policy that emphasize coordination and cooperation among organizations and businesses in order to maximize cost effectiveness.

Smart card technology is the name that describes plastic cards with an embedded computer chip. Basically, smart cards are usually the most cost-effective solution because it increases the level of processing power, memory, and flexibility. Therefore, implementing a smart card in a driver's license can help to build control in a community.

However, the general objective of the study is to investigate the feasibility of integrating Cloud Computing, BI, and GIS to build smart community. The research focuses on enhancing GIS tools and build control in community. The proposed system is a new approach in Information Technology that can lower business cost and build policy in organization.

The research is nonexperimental study used qualitative method to answer certain research questions posed for the study. The result obtained from analysis exists GIS showed that enhance

GIS can build control in the community. Furthermore, there is a feasibility integrating BI, Cloud and GIS to build smart community. On the bases of these finding, IT synergy will influence the business workflow process and performance of organization. Organizations can achieve many benefits from the integrating Cloud Computing approach, BI and GIS in decision making.

CHAPTER 1

INTRODUCTION

1.1 Overview of Information System

"The secret is now starting to get out...there are more people working in IS jobs in the US today than ever before... IS has been and still is a great career path! "- *Kevin Horner, CIO, Alcoa Global Business Services* [1]. Nowadays, Information Systems (IS) plays a significant factor in failure or success work. IS is defined as a large building that refers to a system designed to create, store, manipulate, or disseminate information [2]. In other words, it is a set of integrated system working together such as hardware, software, data, people and procedures to collect, retrieve, process, store, and distribute information for the purpose of facilitating planning, control and decision making in organizations [3]. IS facilitates operation management functions and support managers in decision making by providing information that managers can use to plan and control the activities of the firm. In addition, IS help to improve quality of services, product and performance in the short term as well as long term.

Basically, the key role in IS is innovation which is the process to make change in something and create value for the company [4]. Development and improvement technology attracts many people which technology innovation is the boundary of information systems. IS and technology complete each other to fit business innovation. For example, Digital Innovation and Information Systems (DIIS) focuses on bridging the gap between business and technology. In other words, DIIS can define business needs and technology resources that match needs and resources together to achieve organization goals. The strategy of combining IS and technology change is the essential key to sustained growth.

However, technology innovation and IS work together to enhance the work place. For instance, IS develop a police database. IS help to increase efficiency of police work, provide a secure and safe environment and keep control of local security services. According to [5], Information Communication Technology (ICT) is an IS that provide a new version of police database. This database connects all police officers together in all counties and contains all information about the offender. That means all police in the country can access a criminals database at any time, inside or outside the office. For example, the law enforcement officers in North Carolina can now access criminal databases outside their offices from their smart phones and tablet computers to identify offenders immediately [6]. This feature helps police to recognize offenders and review criminal records at the same time. In fact, using IS can reduce crime and increase control over all states because the police will find the offender and recognize them from anywhere. Moreover, they can keep offenders away from the street and avoid the risk of another crime, as a result, crime in cities will be reduced and the police will prevent crime. IS innovation helps to organize police work, avoid error and misinformation. IS innovation is a powerful. It connects the United States in one database and accessing this data as soon as they need it without waiting for others to send it. Criminal Behavior can be tracked using this application. This feature helps increase quality service and control all over states and counties.

The business process is improved after using the IS, it is the key factor in the business process for many reasons. First, IS can increase work efficiency and improve the management functions. According to [7], IS reduce duplication work, increase accuracy and give excellent planning and implementation for the task. IS exist in every layers in the business process and makes a positive change in outcome. IS can organize management and give a high quality of service. In fact, business information systems give control process. For example, Enterprise

System Management (ESM) is a powerful system that integrates all company departments into one database. Enterprise systems implement in businesses to increase employee productivity and extend access to business knowledge. Moreover, it helps to minimize the duplication of company data, run all kind of reports instantly, and increases accuracy of data. ESM manages organization function such as monitoring, planning, leading and controlling resources and capabilities of industry. Maximizing return on IT management investment through the best solutions for intelligent management. ESM provides real time integration of management of each department environment.

IS aid healthcare systems and improve service quality, it develops healthcare systems to become more accurate, available, authentic, and confidential. IS develop medical records to an electronic medical record (EMR) which is a digital version of a paper chart that contains all of a patient's medical history from a practice. According to Thompson, more than 4 of every 10 hospitals in United State now use EMR. The study of using EMR among US hospital shows 42% of hospitals use EMR. 5% of hospitals use EMR for exchanging data with other health providers and allows patients to access their records [8]. The number of hospitals that use EMR in United State increased. EMR helps patients to access their file database from different hospitals in the same region. An example of this is a patient primary medical record in North Carolina hospital can access to their file from South Carolina hospital. Because the EMR use the same database that facilitate to accessing information when patients request, EMR provides accurate and immediate information. As a result, IS improves medical records and changes it to electronic form. This major change is developing health care and provides accurate information. It provides a quick access to patient information without waiting for the file. In addition, it reduces using paper work and increases efficiency of healthcare worker. IS eliminates medical error while

recording data in files and allows patients to observe their medical history via smart card. Moreover, the researcher uses the electronic database in medical research because it contains large amounts of information. This information helps scientists to better understand cause, treatment, and medicines of disease. In fact, the electronic health record is one of the biggest improvements in healthcare. Generally, integration technology innovation and IS into a seamless process that can enhance the work flow process.

1.1.1 Technology Innovation

The success of a particular company or organization is chiefly reliant on three elements: strategy, competitiveness, and technology innovation. The strategic management is one tool of an organizational management activity that is used to analyze strategic goals, internal and external environment of the organization [9]. Organizations frequently do not succeed at strategy implementation. But companies accomplished performance breakthrough scheme as a centerpiece to the introduction of a fresh strategy management. Triumphant companies bring into line their key administration procedure for effective strategy execution. Many successful companies continue on focusing on strategy execution. Not all associations, though, understand the necessity for alignment of presented management procedure to strategy [10].

Competitiveness is determined by explicit quality management method associated factors. At the nationwide level, the extensive acceptance of quality management supplies collective economic-competence gauges, improved modernism and the growth of human resources which are imperative in attaining amplified output and level of competitiveness [11].

However, the organization directors believe that company growth depends on robust and sustained innovation [4]. Innovation is the fundamental and an integral part of success business. Where manage innovation create value for existing product and services that help maintain

market share and competitiveness. For any organization, innovation represents the opportunity to grow, survive, and shape industry direction. In 2001, Apple, Inc. launched iTunes and iPod which was a new technology that surprised the market because these were innovations nobody had ever thought in the PC arena [4]. Apple invented a new strategy that is accompanied by technology change and business model change to create new technology concepts. Another Apple technology invention happened when Youtube launched an application for the iPad and iPod. Innovation is the power to redefine, shape, and draw the direction of company. Where technology innovation were considered as the key source of competitive advantages.

Technology is a critical source of innovation which innovation is all about making change in an organization. Managing innovation requires knowledge management and choosing the right innovation strategy to accomplish organizational goals. Play To Win (PTW) and Play Not To Lose (PNTL) are both innovation strategies. These strategies are the key rules to defining where organizations are going, and when the adapt change happens. The first basic innovation strategy is the Play To Win strategy. The PTW strategy is where the company should produce or create something new that competitors cannot be able to create it easily or quickly imitate it. This strategy has ability to create competitive advantage in market place and sustain innovation. One successful company that uses the PTW strategy is Amazon.com. They redefined purchasing habits of books by adding new business models and new software technology [4]. On the other hand, the PNTL strategy creates a certain and a small amount of change in the industry and normally causes a company in fragmented industry because the change occurs infrequently. This makes the competition an able to break down the company. The aim of using this strategy is to keep the company moving quickly, improving its internal capabilities and can sustain

innovation. For instance, the Johnson & Johnson Corporation uses this strategy to accomplish their goals [4].

Technology innovation creates market leadership among competitors. Smart companies define internal and external capabilities and synthesize what organizations have with market technology. Recently computerized data and managing IS add value to products and services which is an important factor in a growing business today. In fact, data is worth nothing without processing it through technologies; however, data will transform into meaningful information that will support business management decisions. Many organizations are searching for new technology that support managerial functions. The latest innovations that support the business process are Business Intelligence technology (BI), Geographic Information System (GIS) and Cloud Computing technology. BI and GIS are part of an interactive visualization that enhances business work. Smart map organization can discover trends and patterns by visualizing and analyzing key business data. In fact, integrating these technologies allows organizations to focus on what's important, making business decisions and drives performance. The majority of business data contains some sort of location information; thus, the synergies between GIS and BI will facilitate to answer company questions such as, where my suppliers are located and who are my customers? Answering these critical questions helps to analyze and optimize product and service sales across multiple geography regions. Indeed, the purpose of these synergies is to gain a clearer understanding of operational behavior, analysis, reporting, and visualization of business application information.

1.1.2 Geographic Information System (GIS)

GIS or Spatial Information is a part of the IS innovation tools which is used to describe and characterize the Earth and other geographies. Spatial data is collected, processed, organized, and

structured to become a maps. In other words, the GIS is a digitized system that is designed to visualize, analyze, manage, and present all types of spatial data [12]. The nature of GIS is to capture and prepare data. This is the most time consuming processes. Capture data is technology that incorporates data into a system and then decides on how to collect data. For example, a programmer wants to add some basic features about meteorologists and oceanographers in GIS. In this case, the first step is to collect georeferenced data and enter it into a system such as the coordinate system. This information presented in color scheme that shows water temperature and wind speed from many locations. This data will collected, maintained and stored in a database. The database is easy to recall and analyze information when displayed in a maps.

Basically, there are a several functions of GIS that allows users to digitalize data and analyze relationships between various geographic features. GIS is designed to answer basic and complicated user questions. Likewise, the Internet search engine is similar to GIS and both systems have designed query systems. Whenever a user performs a query, they are asking a database to find all of the data that is related to the feature they request. For instance, asking basic location questions such as addresses, cities, and country locations. Where is a specific feature located? And what is located at a given point on the earth? Another GIS characteristic is that is it has the capacity to combine layers of data into a single map. For example, road information such as rivers, mountains, valleys and hills there are multiple individual layers that are there for the propose of performing complex queries. In addition, users can discover, view and share maps and locations on their PC or Mobile devices. These are tools for interacting with maps that are simple and contextual. Users can opens view multiple maps at the same time, search for information about organizational assets, and addresses, easily share and track that

information. For example, Figure 1.1 shows shared location and tracking people in vehicles by using Smartphone applications.

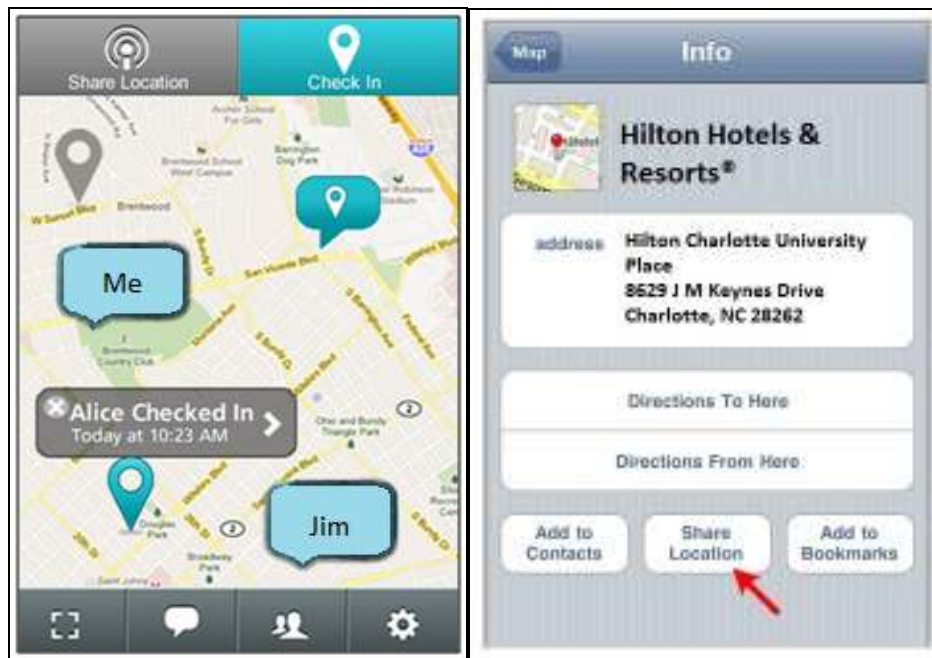


Figure 1.1. GIS Smartphone Function

GIS features that can help organizations and managers to answer complicated and tough questions, analyze and enhance decision making, and the business process. Analyst departments will use location technology to explore, prepare data for analysis, and provide a summary of results that typically include in-depth reporting displayed in an interactive map. Thus, managers get the right information they need to make better business decisions. According to Mennecke, over 85% of business and management functions such as planning, organizing and decision making use GIS as a primary source in problem solving and support decision making [13]. A GIS plays a significant component in routine decision and analysis applications for marketing and demographic analyses.

Another function of GIS can store information about a common location component, business information, and environmental science such as postal zip code, road name, longitude,

population, and demographic information. In fact, Figure 1.2 demonstrates how this information is stored in multiple layers in one database and these layers are linked together to create a common location component and information in maps. In this era, GIS is the fundamental software which is used in civilian planning, education, health care, engineering, business intelligence, emergency services and Web mapping applications. Applications make up the heart of a GIS. Where technology innovation changes society to become more digital and introduces them to a computerized data management system. For example, most of GIS applications are installed in smart phones, tablet PCs, and other Wi-Fi connected devices. These applications are used to analyze geospatial relationships, create queries on data or edit data and display maps. For instance, Google Earth is a web-based application, where we can view, edit and display geospatial information. Another example of GIS application is Historical Material GIS, where Taiwan introduced this application in education to clarify history and to let people easily access the historical the materials of modern history of the Republic of China (ROC)[14].

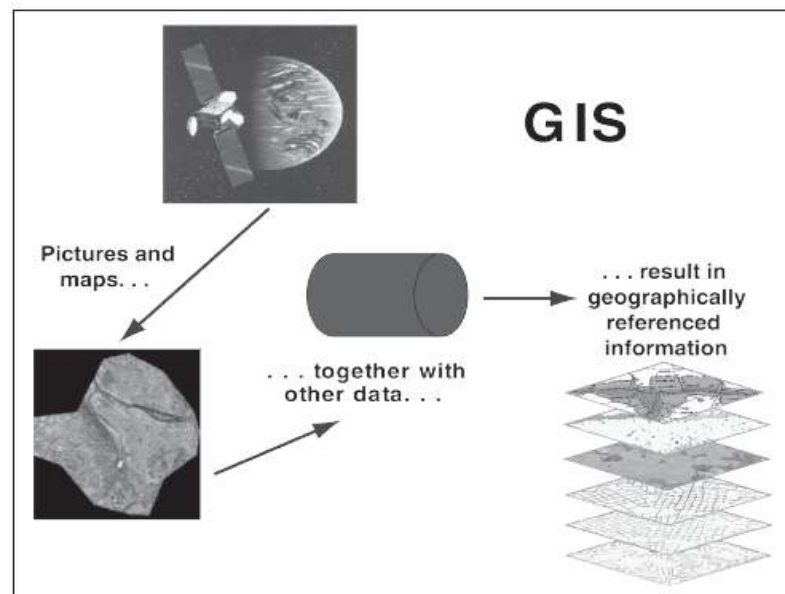


Figure 1.2. Components of Geographical Information Systems [15].

The importance of GIS is overemphasized in the academic and professional arena. In this era, the academic and professionals are using GIS more than ever in solving organizations and business problems, population characteristics, economic activity, and political jurisdictions. In management and business sectors, GIS plays a critical success factor because it has the ability to analyze large quantities of data such as market statistics across a geographic area. In Petra City, Jordan, GIS plays a significant role for tourism in which information technology is the golden key to reduce cost, enhance operational efficiency, and most importantly improve service quality and customer experience [16]. Recently, GIS considered a critical factor for competitive operations of tourism sites as well as hospitality organizations in Jordan. Jordan consider tourism as a way of sustaining economic growth in the country such as tourist facilities and advertisement, this will influence tourism perspective. GIS provides a clear vision about advertisement, market segmentation, and the methods of managing the relationship with tourists. Therefore, marketing through GIS can manage organization functions such as leading, planning, mentoring, contorting and organizing business. One advantages the marking department uses is the tracking system. This feature helps tourist agents and marketing mangers to recognize where tourists are going. In this case, marketing depends on large amounts of geographical database that shows all natural and human components represented in this famous tourist site in Jordan. Generally, this system helps to improve and develop tourism in the country and keep them safe during travel.

Analyzing and understanding information through maps gives business a real-time information, faster service, and a healthier business. GIS facilitates and organizes the business process, workflow and support decision making. Using GIS or Global Positioning System (GPS) vehicle tracking systems on fleet vehicles that can improve the safety record and reduction cost

of business such as vehicle maintenance, asset safety, and driver behavior. According to FleetMatics, the researcher found that improving the safety of drivers and vehicles can reduce cost, accidents, and violations [17]. Most insurance companies have reward systems with companies who follow standard of safety equipment such as a GPS tracking system. Tracking vehicle speed is one solution to changing driver behavior momentarily in which a system has the ability to send immediate notification to drivers to take corrective action. The system will record speed and location data in the database. Another feature that GPS contains are all traffic road information which helps drivers avoid accidents. The tracker can notify the driver immediately when a vehicle has unauthorized hours of operation, or time for maintenance scheduling. In general, this system helps to change driver behaviors, to keep them safe during work hours, and to reduce the cost of business.

1.1.3 Business Intelligence

All organizations are created and maintained to fulfill their intended objectives and goals. Whether the organization is made for financial, psychological or economic reasons, the truth is that all organizations follow a certain criteria. The relationship is important to everything in a business. Surely, any sane individual will believe that the strength of an organization relies on the strength of the relationship between its individual members. Familiarity with each other, the element of trust, and commonalities in the majority of its members often translate to organizational strength. Imagine if we possess the right components to identify, gather, analyze, file, save, and study all of an individual member's sets of wants, and needs, desires and aspirations and even their deepest dark secrets, such wealth of information can be highly valuable for the control and stability of an entire organization. Information is power; information is control [18]. Rogers and Peppers define relationship as a mutual, interactive, and iterative

activity that provides ongoing benefits that changes the behavior toward parties involved thereby becoming uniquely different from other relationships leading to mutual trust and loyalty [18]. Notice that there are three adjectives used to describe the activity. The mutual, interactive, and iterative activity of buying, selling, or using can always be supplied and augmented by Information Systems.

Digital technology allows enterprises to deliver the best service levels for employees and customers. The aim of digital technology is to build strong relationship among suppliers, employees and customers. One of digital technology can supports management functions using BI technology. Managing enterprise through BI tools will provide maximum return on investment and enhance performances. BI helps decision makers make more informs decisions and informed suppliers with accurate information on their customers such as information on seals, complaints, trends and behaviors. BI plays a key role in the strategic planning process of the enterprise. The term BI is defined as tools and system applications that enable access, the analysis of information to improve, and optimize decisions and performance [19]. BI analyzes historical data such as data gathered from transactions or other kinds of business activity. Analyzing past and present data helps business to provide the optimization solutions that match with business situations and support strategic planning.

There are several benefits BI solutions offers to enterprise. First, data and information can efficiently and effectively share with people across departments and companies. BI allows to consolidate data from multiple places in the same data warehouse. This feature keeps business running smoothly and flexible when making decisions. For example, the company may have different branch stores in the different locations and each store has their own data. BI application is responsible in consolidating all of that information into a single set of tables in the data

warehouse. The data warehouse allows manager to create a financial report, statistic sales report, and market segmentation research. This table or report would present all company information from different data system all in one place with easy access. Another benefit that will increase empower strategy among employees, where employee can access analytical data at any time and understand what happen in organization. Then they can work more effectively and support the overall business strategy. This application allows organizations to store, gather, and analyze enterprise data and aid in decision making, market research, market segmentation, and product profitability. BI systems can monitor organization performance and productivity. Through graphs and reports the manager can view current and historical productivity and performance information. Then the manager can analyze and diagnose productivity and performance problems after they set a suitable solution. In general, BI is the key role to illustrate business work, arrange work process, organize planning strategy, and manager keep track with the market.

Three to five years ago, the majority of the companies thought that BI technology is useless and a waste of time. In 2013, Forrester Research, Inc., conducted research in competitive differentiation through innovation in BI that shows "only 17% of organizations regard their BI environment as highly mature, and fewer than one in five think that their BI projects have been mostly highly successful [20]." The results show a small percentage of company trust and regard in BI application, but recently many companies recognize that data is an essential part to keeping the company efficient and effective. Where, IS and self service technology such as BI systems, Business Analytics (BA) and E-business are the way to gain competitive differentiator among competitors. BI tools determines and arranges company capabilities that can aid company to face challenges and organize the priorities. Another characteristic that can combine data, multimedia, and transactions all in one application to address people's needs such as Dashboard. This

application was designed for a particular business function, management responsibility and daily business work. Managers can drill from top to bottom and from specific details in the report to general detail without shifting application. For instance, Dashboard is designed for analysis and display of current information and performance of the enterprise. This page is a data visualization tool that summarizes information such as revenue, sales, and expenses. Within the page, managers can drill down from the summarized information in the seals or revenue data to the general detailers in the report. However, using BI applications can increase operational efficiency, customer satisfaction, and improved planning that provides the foundation for top performing success in the future.

Many companies have invested a considerable amount of assets in the innovation tools to discover new sources for competitive differentiators. Recently, the competitive environment within the context of complex BI and Cloud Computing, these applications have become key strategic tools, which directly impact on the success of business. The synergy between Cloud and BI is expected to be more competitive, accessible, affordable, and flexible in order to share the information and data for decision making and control. BI application is hosted on the Internet which is accessible for multiple devices and users. This feature keeps managers tracking and monitoring business data from their office and outside of work. Cloud computing will increase the capacity of data warehouse, speed of query and the number of users. The application gives organization an opportunity to achieve targets, including reductions in paperwork, improved productivity and more reliable performance. In general, Cloud and BI are techniques and solutions that helps managers to understand business situations.

1.1.4 Cloud Computing

In fact, this era is the era of booming technology in which the innovation technology is market leaders. Leadership technology and competitiveness are the critical success factors to sustaining existing business and continue to grow. Innovation makes a significant changes to key parts of the dominant business which innovation provides the opportunity to redirect the competitive vectors of an entire industry. Examples of innovation leadership can be found in Toyota, Dell, Google and Apple. In 2011, Apple launched its iCloud technology that works fluently with Mac, PC, iPhone and all Apple devices. This automatically and wirelessly stores the content in the iCloud server and push it to all user devices [21]. iCloud stores music, applications, photos, documents, contacts, notes and other data in device keeping them up to data across all user devices. The most important feature is when users make changes on one of their devices and all other devices are updated automatically and wirelessly. However, Cloud uses databases to store data which contains a large amount of information that is stored in digital form. Cloud is the easiest way to manage data, that you can access from anywhere and it's available on time. Nowadays, many enterprises move to Cloud computing where in the past they run applications from software on the physical server within enterprises. On the other hand, Cloud computing allows users access to same application through the internet.

The Internet is designed to be an open system which this feature increases data capacity or capabilities. Cloud computing removes investing in new infrastructure, training new personnel, or licensing new software. Outsourcing data is a practice used to reduce cost, increase revenue and gain the competitive advantage. Outsourcing data will save cost and time where pushing certain work to highly skilled personnel earning a good quality of service, reduction equipment cost and service cost. Cloud computing is a strategy used to improve organization quality by

focusing on core competency and activity. When the organization outsources part of the job it will concentrate on another part. The third party will provide excellent service that can guarantee high quality in production as well as increase profit. The company can focus on things that it does well and leaves outsourcers to complete the weak part of the job. For example, one company that does well in production, but is very weak in IT and digitization service. Thus, this company will depend on a third party to complete a job such as offer Cloud based services to deal with the digitization service and IT resource. Cloud computing has fundamentally changed the way organizations pay for resources. In the past, organizations spend large amount of capital investments to cover their needs such as processing power or space of hardware. Recently, Cloud computing allows organizations to pay for only what they use from hardware and software. They can purchase a scalable space for heavy duty data that fit business demand.

Cloud computing provides flexibility in which the owner can quickly meet business demands. The application has the ability to share, access, store documents and other files over the Internet via web enabled devices such as PC's, Smartphone's and tablets. Most of devices nowadays have good support for diverse networks and protocols that connectivity can be established between mobile participants through 3G, 4G, Wi-Fi, and Bluetooth [22]. A user doesn't need to use offices devise and can track business from their own devises from out their office. For example, police departments can access database from their tablet or Smartphone through specific applications. Another example, GIS needs considerable data warehouse to store real estate data, where users are flexible to access anytime and anywhere from their Smartphone or tablet. Cloud supports GIS function which provides fast access and suitable size to store data. Cloud develops useful applications that assist the manager to managing business and querying business information.

Another characteristic that Cloud computing provides is disaster recovery services. Cloud process data is moved into the cloud data center, run on virtual computing resources in the form of a virtual machine [23]. This application designed to speed up disk-based storage, retrieval of files, avoid missing files and eliminate costs associated with transporting, storing and backup software. Disaster recovery services becomes a cost effective option because backups data in minutes with less resources and equipment. Assuming one company uses the old strategy in recovery data. They would use an expenses including hardware, software, IT experts and an expert team to solve issues that exist. The process of recovery systems takes a long time to retrieve data and secure the system again. This is influences the business process and effects business revenue. For instance, the mid-size company who uses Cloud computing will take an average of 2.1 hours to complete. Instead of another company relying on software or applications other than Cloud, it will take an average of 8 hours to complete [24]. In the same studies the large companies need double time to recover, while mid-size companies need half the time of any large company to recover.

One of the key benefits of using cloud computing is increased collaboration. Collaboration is a technique that integrates people, processes, and technology to support businesses and achieve goals. The collaborative lead to innovation and creativity in the work place leads to gaining a competitive advantage and creativity in problem solving. The successful company depends on building a good internal and external network because it provides superior collaboration among employees and customers. They believes collaboration and group work can achieve extraordinary things. All employees in businesses, organizations and global businesses can sync and work on documents and shared applications simultaneously. Cloud is a real time system where employees can follow other colleagues, record and receive updates immediately. Cloud

develops services and access to increase collaboration. For instance, the process to add or search for data is required by clicking on the web page. As long as employees have internet access, they can work from anywhere and access work. According to Adobe Acrobat "73% of knowledge workers collaborate with people in different time zones and regions [25]." Suppose one company works basic software to store data and depends on email to exchange files, where employees have to send files and arrange it. The process of sending, receiving and analyzing data takes a long time, while using Cloud computing keeps all files in one central location. The manager and employees from everywhere can access and view the same copy of data. For example, market researcher in Tokyo can view the seals of the United States branch. The manager can view, analyze data, update and make decisions immediately depending on voluminous data. This process of exchange and import makes collaboration stronger which increases efficiency and improves a company's bottom line.

In general, BI and GIS are techniques and tools that are used in identifying, extracting, and analyzing business data. These techniques keep organizations comfortable, confident about their decisions, and create a competitive advantage. Through Cloud computing, BI and GIS can delivered the right information to the right people at the right time. Cloud is considered main component for the integration of BI and GIS together. This feature makes the organization structure stronger. Another benefit is that Cloud computing provides opportunities for organizations to become more flexible, cost-effective and productive. As a result, organizations can deliver new capabilities and increase the business value though BI, Cloud, and GIS.

1.2 Statement of Problems

Managing IT can add value to products and services. It is an important factor in innovation technology today. Many companies develop and use digitization technology such as GPS with

vehicles to secure their drivers. The aim of use digitization technology is to maximize business profit and set organization policy. Manage policy in organizations can help to meet their objectives and goals. Many organizations seek for developing and improving their policy for purpose making a difference in the community or developing new products [71]. Recently, invent new IT policy to organize, monitor and control organization is costly and take long time in publishing. IT applications are limited to combine building control in organizations and maximize revenue. In addition, there is a limited research work has been targeted to investigate the factors of change drivers behaviors through IT tools, especially, the feasibility of integrating BI, Cloud and GIS in business growth.

1.3 Objectives and Significance of the Study

The general objective of the study was to investigate the feasibility of integrating Cloud Computing, BI, and GIS to build smart community. The aim of this research was to enhance GIS tools and build control in community. However, the scope of this study was limited to the drivers who use GIS and GPS features.

The significance:

1. To examine the effect of integrating BI, Cloud, and GIS on organization growth.
2. To maximize business profit through new IT approach.
3. To understand driver's behaviors and the level of service they like.
4. To examine the effect of develop GPS on drivers and organization growth.
5. To determine the factors that can change driver's behaviors and increases organization growth.
6. To examine the relationship between BI, GIS, drivers behavior and organization growth.

Research questions:

1. How does IT part of GPS affect driving habits?
2. How does GIS influence business?
3. What are the feasibility of adding smart card to driver license for IT purposes?
4. Does integrating Cloud, Business Intelligence and GIS build smart and safe community?

CHAPTER 2

REVIEW OF LITERATURE

2.1 Business Intelligence and Cloud Computing

BI is a computing technology that uses combined tools together and supports decision making. It is the essential key factor while the application can support the decision making process. The most important features of BI provide current, historical, and predictive views of internally structured data for products and departments. Nowadays, BI, Cloud and GIS are part of IT where it is the leader in business technology. IT has the ability to lead, organize, control and plan business, and achieve organizational goals. According to Gartner, basically, 75% of information technology is allocated to integrate and analyze data [26]. In other words, IT use tools to identify, discover and analyze business data such as sales revenue, products, costs, and income to meet organization goals.

BI, Cloud and GIS plays a significant factor in failure, or success work. BI is defined in as "an umbrella term that includes the applications, infrastructure and tools, and use the best practices that enable access to analysis of information to improve and optimize decisions and performance [27]."

Basically, the innovation of BI began in mainframe era. The idea of the automate decision making process design in the early 1950s and 1960s. Automate decision making uses computers to support complex decision making that has become increasingly sophisticated.

2.2 The Timeline of Technology Revolution of Business Intelligence

In the 1960's, and throughout the mid-80's BI began shaping the market place and Decision Support Systems (DSS) grew. BI and decision support system concepts are focused on helping to

make these decisions in a better way, Below Figure 2.1 shows that. The other important similarity is that both application involve decision making based on data. However, DSS is defined as "a specific class of computerized information systems that support business and organizational decision-making activities [28]." There are two types of decision support systems. The first type is Management Information Systems (MIS) which provides [4]:

- The ability to query a particular data from database,
- Scheduled reports for well-defined information needs, and
- The ability to request a specific report.

The second type of application is operations research/management science (RO/MS), which uses algorithms, mathematical models, and statistics to analyze and understand specific problems [29]. This method uses and finds near-optimal or optimal solutions, rational and meaningful solutions to solve complex problems and decision making.

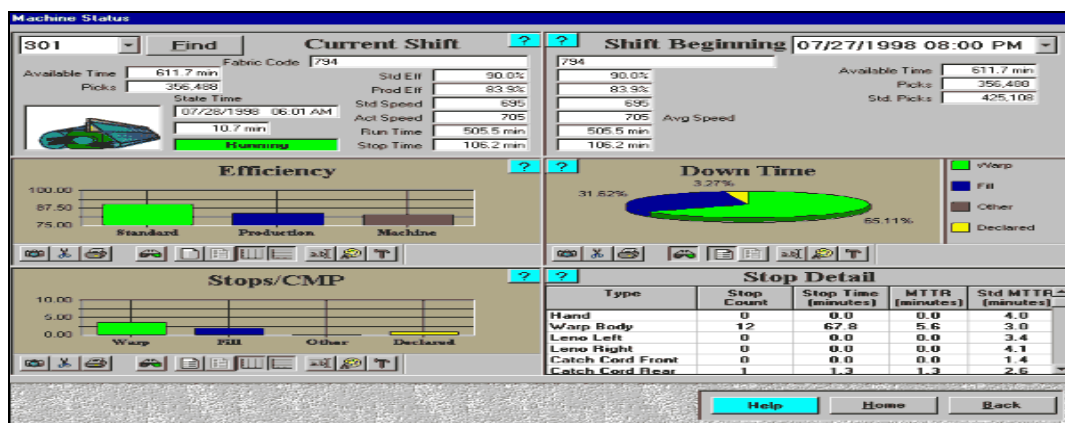


Figure 2.1. DSS Interface Analyze [30]

In the 80's, the task for BI was to print green bar reports from dot matrix printers. Users had huge stacks of papers on their desks. Management could look through 30 to 100 page inventories, production, sales, and payroll reports. One advantage of green bar reports that information is accurate and manager can read information quickly. Figure 2.2 demonstrates the

input and output of green bar reports. The data is well organized on the screen in columns and rows and is printed on paper with green and white stripes.

	A	B	C	D	E	F	G	H
1	Region	Product	Date	Customer	Quantity	Revenue	COGS	Profit
2	Central	ABC	10/16/04	FGH LTD.	700	11858	5929	5929
3	West	ABC	4/20/05	OPQ, INC.	800	13552	6776	6776
4	East	XYZ	6/14/05	DEF, LLC	700	11858	5929	5929
5	East	ABC	11/3/05	LMN PTY LTD	800	13552	6776	6776
6	West	XYZ	2/11/05	DEF, LLC	200	3390	1694	1696
7	East	XYZ	3/16/05	OPQ, INC.	200	3390	1694	1696
8	Central	ABC	6/7/05	TUV GMBH	900	15255	7623	7632
9	West	ABC	10/3/05	FGH LTD.	900	15255	7623	7632

Figure 2.2. Printed Green Bar Report [31]

In the early 1990's, BI transitioned to Online Analysis Processing (OLAP) and Relational Online Analytical Processing (ROLAP). Users had the ability to manage department data in separate cubes and ran queries directly to relational databases. In addition, BI developed the Enterprise Resource Planning (ERP) application that managed the business process system and combined Manufacturing Resource Planning (MRP), accounting, planning, budgeting and a data warehouse. ERP ensures stable and company-wide data that forms the basis of company-wide reporting. Figure 2.3 illustrates ERP application [32]. The primary ERP benefits companies that need one standardized application to run an entire business and give clear solutions to the point. Furthermore, ERP increases work efficiencies, decreases total cost of overall business, reduces operational costs, and improves business profitability.

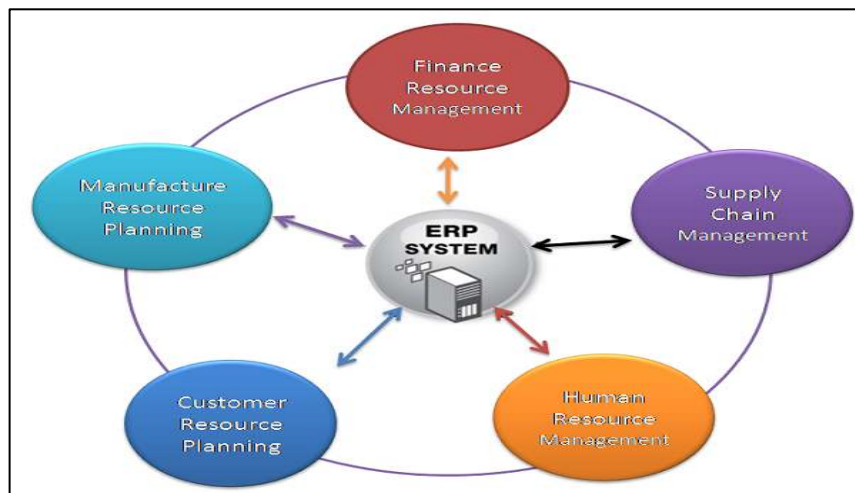


Figure 2.3. Enterprise Resource Planning (ERP)

By the early 2000's, there is a new challenge triggering further evolution of BI solution. Figure 2.4 in page 27 introduced the web based BI in 2000. This application had several functions, first it was user friendly because users could access the real time consumption of information. Second, BI runs reports through web based applications and make charts and graphs to give a graphical look to reports. Finally, users were able to aggregate data to summarize complex reports in a few pages. In general, web application is data analysis software that users have the ability to predict the market and businesses.

The Dashboard application was built in the late 2000's. This innovation helped to reduce the number of page reports and immediate data analysis to make stronger business decisions. On the other hand, Mobile BI was developed by the new trend in Portable and Swift BI in 2010. Portable and Swift BI basically it takes all the BI that has been created in past and integrates into the mobile devices for consumption and also enables visual data discovery for casual business users. This is shown in Figure 2.5.

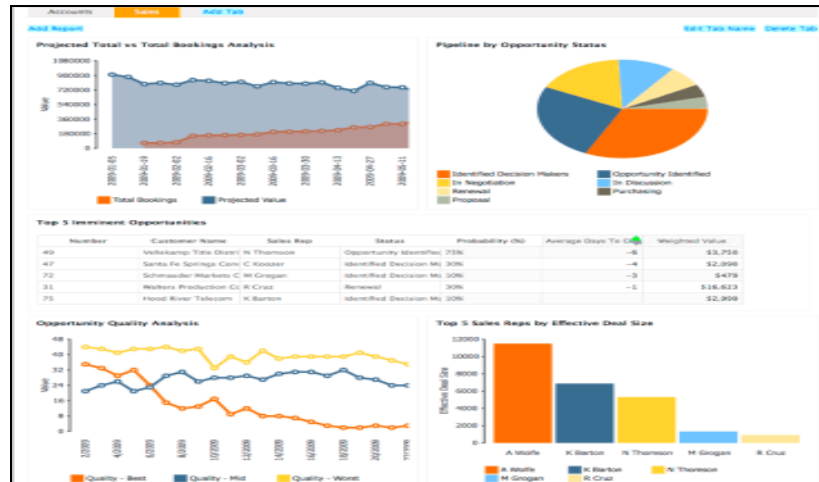


Figure 2.4. The Web Based Business Intelligence [33]



Figure 2.5. Mobile Business Intelligence [34]

2.3 The Current Business Intelligence Applications

BI applications had their own databases that supported organization functions. In fact, 75% of organizations are focused only on structured data to make business decisions [26]. Currently, BI applications are considered as a critical success factor of organization. Organizations and businesses have need the ability to quickly analyze their data to identify issues, causes, and opportunities for improvement. There has always been a need for a tool that allows users to monitor automated reporting, distribute result, and make strategic decisions based on short-term

and long-term data, and trend analysis. The current BI can link spatial data (GIS) with other data sources to aid in report interpretations. Once these analyses are identified, the business now looks for intelligent answers to the following questions through business graphics information [35]:

- How to get fast access to financial data?
- How do we make the product in the consumer reach?
- How to get the right information to the right people at the right time?
- How hurriedly can a business take correct action?
- How should a marketing team act when a new product is launched or an old product is updated?

Companies who use BI and geographic information successfully can achieve a competitive edge through intelligent decision making. Collecting, managing, and delivering the right information to the right people at the right time is a critical success factor to becoming a leading company in the market place.

However, there are several reasons for why organizations cannot achieve organizational goals through BI and GIS to compete in the market [36]:

- Failure to extend the business.
- Determine goals not achieved frequently.
- Contradictory client treatment.
- Reacting to actions not in an exceedingly timely manner.
- Frequent modification in business objectives.
- Failure of opportunities as a result of unpreparedness.
- Repeating process, likewise re-keying data manually.

These factors are related to each other and can be solved at the organizational level. As a result, implemented BI in an organization is important for comparative advantage. In other words, companies use BI to reveal significant events and identify business aspects to adjust quickly to their changing environment [29].

2.4 Need for Business Intelligence and Integrating Information System

How to grasp the latest technology to process this information is the challenge for organizations and is the question that most companies need to answer. An evolutionary business approach shows sound planning to deliver solutions that meet the long-term goals of the organization. This doesn't mean that enterprise will have all the latest and greatest technology, but it does mean that an evolutionary business approach delivers information to begin and sustain enterprise strategic vision and goals. It achieves tactical and strategic goals through information used to create a sustainable competitive advantage. This can be done through simple or complex solutions [36]. Table 2.1 shows data requirement and the solution [72].

Table 2.1. Organization Technology Solutions and Data Requirements [36].

Data Requirement	Solution
Data Integration	Data Transformation, Query, and Information Integration Services
Data Mean	Data Mapping According Schema and User Requirement
Data Mart, Data Warehousing	Aggregation of Queries, Consolidation
Business Rules	Rules Attachment to Measure Data
Track Records, General Ledger, Entity Data	Metadata Storage
Information Management	Discovery Service and Information Management, Analysis Repository

By and large, enhancing BI applications in organizations can provide a competitive advantage in market place. The concept of competitive advantage began with technology innovations and the types of innovations.

2.5 The Various IT Trends Shape Business Intelligence

Big BI trends develops and explores new techniques that can improve performance management. BI can influence decision making that made throughout organizations that improve individual performance and overall performance. Today, BI concedes are a unique source of competitive advantage in the market place. According to Gartner the innovation in the BI industry significantly changes the behaviors of how people access BI applications [37]. According to Columbus the study shows how different users in different organizations started to involve themselves in BI applications and tools [38]. Below Figure 2.6 demonstrates and predicts BI applications growth in the global market from 2013 to 2018. In 2013, BI market launched and earn \$2.2 billion; however, the predictor expected BI market growth and reached to \$3.14 billion in 2018 [39]. Over the decade, Cloud BI developed and was introduced in the market. In 2013, Cloud Business Intelligence officially a lunched and earned \$0.75 billion, where the analyses forecast grew to \$2.94 billion in 2018 [40]. In brief, the chart shows how economic and market growth of BI and Cloud Business Intelligence is increased each year and creates values for business.

The methodology used to tell where you are in the life cycle of the maturity of a product is shown in Gartner Hype Cycle Figure 2.7. As shown in the figure below, any technology that starts with the Technology Trigger phase has great expectations around it. There is a trough because it is harder than people thought it would be and slowly technology moves that into the productivity area which is called Plateau of Productivity. Nowadays, BI located in the

productivity area pass through peak of inflation than descends through the troughs of disappointment, but that does not must that there are not trends and influences which are true inflection points in the BI industry [41].

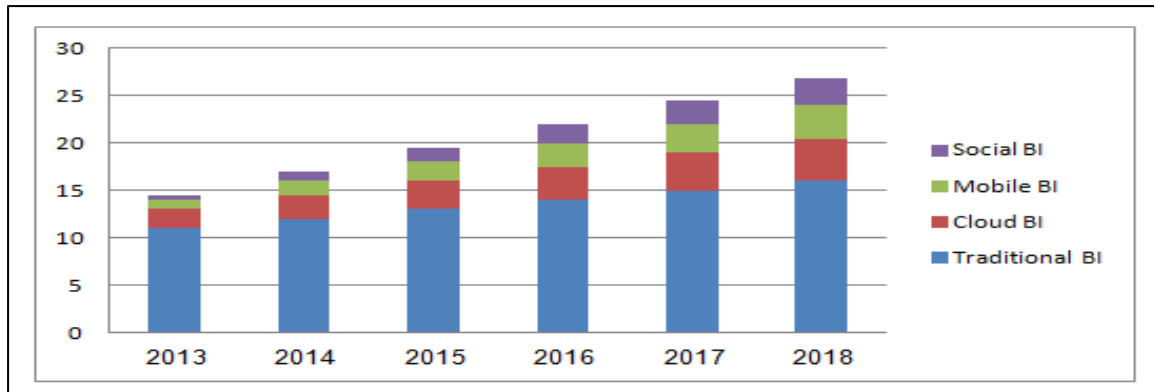


Figure 2.6. The Global Business Intelligence Growth from 2013 to 2018 [39].

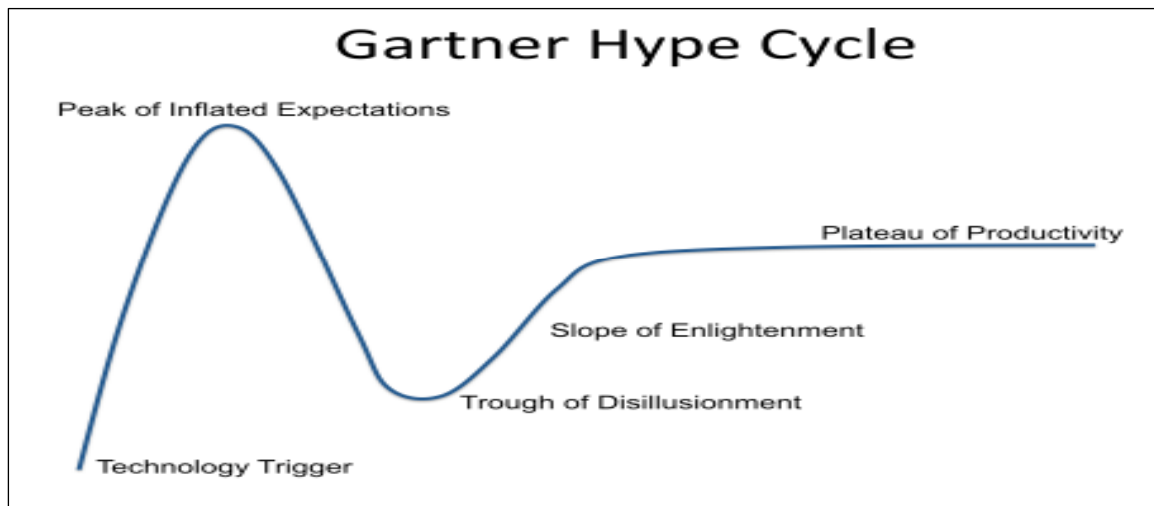


Figure 2.7. Gartner Chart [42].

However, the following are several trends that tell how organizations will consume BI applications in 2014 and the near future.

1. 40% of BI functionality will be consumed via market demographics by 2020 [43].

2. 30% of analytic application will use In- Memory functions to add scale computational speed by 2014 [37].
3. 75% of spending on business analytics will go to system integrators, not software vendors, by 2020 [44].
4. 55% of organizations using BI either have or plan to deploy Mobile BI by 2014 [43].
5. More than 50% of analytics implementations will make use of event data streams generated from instrumented machines, applications, and/or individuals [45].
6. 85 % of Fortune 500 companies will be unable to exploit Cloud and big data for competitive advantage through 2015 [45].
7. The market of GIS will reach 35% compound annual growth rate between 2010 and 2020 [67].

2.6 Current Business Intelligence Applications

Today, business decisions are based on complete data in which BI offers tools and techniques to take correct decision, keep organization feel comfortable and believe in their decisions. BI is unique because it can combine data, multimedia, transactions all in one application to address people's needs and wants. Below Figure 2.8 illustrates one BI applications as Dashboard or Web Dashboard that is produced by the BI and GIS team today consists of graphs, some charts and several lists of drill down capabilities [46]. Integrate BI and GIS application can help company to maximize their existing assets and extract business value. The synergy between BI and GIS allows organizations to focus on what's important and make business decisions to drive performance.

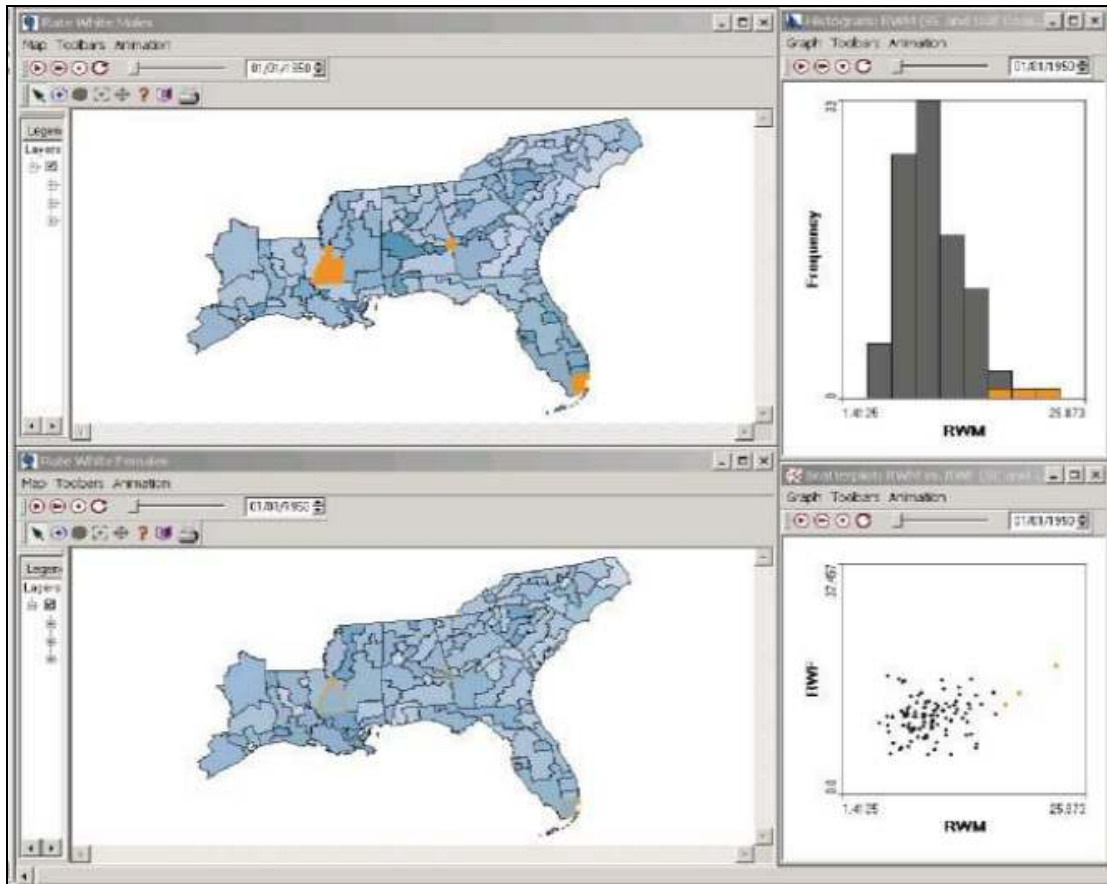


Figure 2.8. Integrate BI and GIS Application [66].

2.6.1 Dashboard 1.0

In general, many users are experiencing applications over the web and mobile devices. They are really not aware if it is an analytics or a transactional application. For example, a Redfin Real Estate App for a iPhone & iPod touch uses GIS to track properties, property values, and tax information, where multiple sources of data are displayed on one page Dashboard. However, there is huge difference as a user perspective. We are wonder in the industry why the user adoption rate is higher. This is because there is a huge difference between classes of applications that users are enjoying on their mobile device and on the Web and the class of application that organizations are pushing out to the users in terms of analytics [47].

Dashboard 1.0 in the 1990's and 2000's was just simply a data consolidation. Instead of having 20 different reports in the folder, users took those reports and put them in a single dashboard or grid and graphs.

Dashboard 1.0 was very useful at that time because users did not have to run several different reports to get the information on one page, but fundamentally those reports worked independently because there was no connection between them and their work flow and guided navigation. Below Figure 2.9 illustrate this.

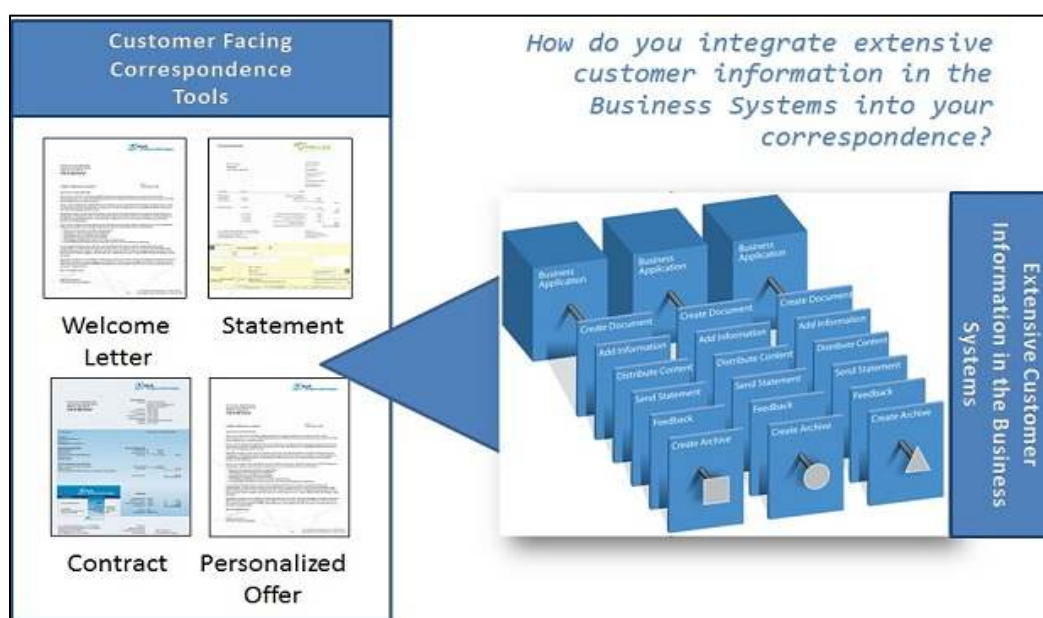


Figure 2.9. Dashboard 1.0 [46].

2.6.2 Dashboards 2.0

To understand how Dashboards 2.0 is different to the Dashboards 1.0, the following characteristics are to recognize the development of Dashboards [73].

1. *Business Process Workflow*: Dashboard 2.0 does not only display operational information on screen; it seeks to tie the operational data to the strategic goals of the company and eliminates useless reports. Based on the previous example of GPS and Dashboard, a GPS

unit does not ignore the cars current speed, but it is used to calculate approximate time to destination. In general, Dashboards 2.0 seeks to close the loop between business strategy and business operations. This facilitates the workflow of business process and builds bridges between their operational performance and their strategic goals.

2. *Mass Personalized Distribution:* These applications can be distributed to many users in organizations with auto role-driven customization which users only see the data they are entitled to see, and can only access what they are authorized to use. These applications have the ability to push high volumes of data with Web and mobile-enabled applications.
3. *Multimedia and Other Content:* Dashboards have become the front-end and first line of access to BI. In many cases, businesses will require both analytical and operational dashboards in different parts of the company for the sake of long term performance insights and day-to-day business decisions respectively. In other words, technology is smart enough to handle all the structured data from the databases and places it into purposed Dashboards. However, unstructured data and semi-structured data, such as social media, audio-video, and log files. Are still out there and need to be integrated into dashboards. This is the idea of structured and unstructured data.
4. *Concept of Application:* A Dashboard is real-time data that is used to monitor business operations. The application is a self-contained application that contains information from multiple sources in one page. The application features are easy to use, it engages user experience, it is convenient the fast access to relevant and timely business information. One example of this application is a GPS Navigation Unit that allows you to define your target destination, tells you where you are currently, continuously tells you which way to turn, and monitors the progress of your trip.

Combining the above characteristics into one application helps us to take the full benefits of all the attributes and improve the application into one easy-to-use application. On the other hand, there are more new technologies that have improved due to BI. One important systems is In-Memory Technology.

2.7 In-Memory Technology

Technology is rapidly changed to meet users demand for higher BI performance. In-Memory technology is a new concept of expansion of both data volumes and number of users that use BI in organizations and across industries. In-Memory acceleration is significantly improving BI performance. The real-time query performance will improve through increasing capacity speed and size of memory. For example, GPS application, Mobile and Dashboard applications are needed for rapid response times. In- Memory technology can serve and connect a large number of clients up to 30,000 clients and up per hour.

In general, focusing on the performance of the Random-Access Memory (RAM) is the magic bullet of increasing BI systems performance. Increasing the capacity of the RAM platform significantly enhances the system and will replace the traditional disk-based systems. However, the speed difference between In-Memory RAM systems versus traditional disk-based systems is 1000x times faster than traditional disk-based system [48]. That means RAM can process 1000x times per second. When In-Memory combines with multiple parallels the result is In-Memory performance. This will improve BI system in seconds to run a Dashboard application.

There are five main reasons why In-Memory BI is becomes more and more critical for GIS:

1. Dashboard concepts.
2. Big Data expectations.
3. User expectations.

4. Mobile expectations tied to user expectations.
5. Cloud in BI.

The combination of these five reasons and requirements of speed have driven every BI system to In-Memory performance. While an In-Memory application is among one of the important systems in BI, there is also something very important in BI: Cloud in BI and commercial grade.

2.8 Cloud Business Intelligence

BI is about delivering the right information to the right people at the right time, and cloud computing provides a lightweight, agile way to access BI applications. Cloud BI applications are “hosted on a virtual network, such as the internet [49].” This application has the authority to access multiple devices and web browsers. Integration of BI system and data warehouse on the web has led to a new BI capability. Figure 2.10 illustrate this.

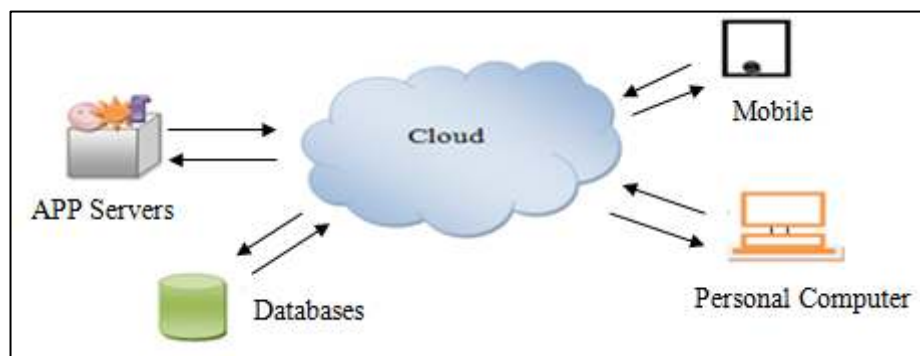


Figure 2.10. Cloud Computing

BI on the cloud has several functions that make application more critical [69] [70]:

1. *Accuracy, Speed of Implementation and Deployment*: Cloud on BI delivers more accurate and immediate information without any dependency on the long periods to operate the system. All operations would be done correctly and immediately, which ensures that any information coming from the center is accurate. This system will provide more accurate

information such as social, marketing, sales, and billing statements that will reduce mistakes. The Cloud BI will save effort of analyzing data and reduces the BI implementation time window. On the other hand, applying the Cloud approach could be difficult for some organizations because they may lose data during an upgrade. Furthermore, Cloud computing could limit the size and performance of data warehouses that cause system latency. The latency occur when BI applications exist in the Cloud, but the data exists at a user's site. This happens when are large amounts of data processed and returning.

2. *No Redundancy*: BI on Cloud avoids any redundant data because data will be stored in the data warehouse on the Cloud. It is impossible to have same data saved; the Cloud system will automatically replace one of them and keep the other. This feature keeps data updated, records immediately, and removes mistakes. Another benefit is that it keeps business with proper planning and forecasting.
3. *Flexible System*: BI on the Cloud can deliver a vast range of analytic functionality for large amounts of their clients because it is available on the web. BI, database technologies and Cloud infrastructure is a computing power because it opens up new streams that makes the process more elastic. In addition, Cloud application has the ability to automate the process of uploading data into the center of the Cloud.
4. *User-Friendly*: Cloud on BI is user friendly because it is easy to merge, easy workflows, and web-based interfaces for analyzing and managing Big Data. Software as a Service (SaaS) the category of Cloud computing services that provide a friendly and intuitive user interface for the provisioning of these features for business customers, administration, and end-users as well as Web Services for integration in existing environments.

5. *Lower Cost and Focus on Core Strength:* Cloud BI is the fastest and most cost effective way for organizations to make their strategies highly competitive. Cloud BI is cost effective through reduced resources, lower hardware, lower upgrade costs, and rapid deployments. This feature keeps organizations focused on their core capabilities.
6. *Availability:* Cloud BI application is immediately available on any device without any extra work. Users can literally run the entire business from a Smartphone in the Cloud. The application support mobile device is easy to use. Where the users can access everything from the Cloud platform to manage data and the data warehouse layer to the analytics platform.

2.9 Issues to Consider When Contemplating Cloud Computing

There are many broad issues to be considered when embarking upon BI on the Cloud.

Although, there are few recommendations on addressing the concerns, these include, but are not limited to [69] [70]:

1. *Lack of Security:* Security and privacy are still concerns of many organizations, they believe adopting Cloud services have a negative impact on security and workflow in organizations. Confidentiality, availability and integrity of the data play a significant factor for utilizing the Cloud. Thus, companies should trust famous Cloud vendors that provide a more secure environment than what exists at customer sites such as SAP and Oracle.
2. *Loss of Control:* IT professionals are still concerned about the risk of Cloud computing with loss of control over data. Data control, data ownership and reliability of service are the challenges that clients face. Thus, organizations should design control standards,

models and the accreditations they want to hold to ensure their business critical data are in safe hands.

3. *On premise Integration*: The Cloud moves large amounts of data that going fast. Data residing outside the enterprise firewall needs to be controlled and managed. However, when users demand access to data within the firewall from anywhere using any device it becomes an overarching integration challenge. As a result, the IT need for hybrid integration bridges between databases, warehouses, Cloud applications, clients, systems, and Big Data.
4. *Cloud Pricing Standards*: Lack of standardized pricing models make it difficult for customers to select the right one.

Cloud BI solution has several features that help to develop company strategy such as flexibility of implementation, cost benefits, availability and speed of implementation. The amount of data used by BI from internal systems and the Web, will grow and become Big Data.

2.10 Business Intelligence and Commercial Grade

BI is a method to enhance business decision making by using support systems and technology [50]. One of these technologies is commercial grade BI which brings the class of technology that an organization needs to distribute information widely throughout enterprise users. In fact, the THz commercial grade BI concept was around for almost ten years with different names such as enterprise scale and industrial strength. In 2016, Gartner predicts 30% of businesses will be monetizing data, meaning they will be selling their data to end users [51]. Here are the aspects of technologies for monetizing data assets[73]:

1. Easier to install or run
2. Cloud and virtualization ready

3. Easier to assemble and build
4. Easiest to keep or maintain

Technology innovation has many different aspects and tools that make work easier. It is important to use these aspects when considered as an easier tool for monetizing.

CHAPTER 3

BUILD SMART COMMUNITY

Building smart communities reflects organization and business environment. The term smart organization has been gaining quite a bit of attention lately. Many organizations are seeking for technology innovation for one objective, is to build organization that is more productive, transparent, responsive, efficient and more engaging on its customers. IT is the key to making organization growth sustainable. Recently, there are lots of smart approaches that can meet the needs of building a smart community. This approach will support organizations to improve the quality of service and production. There are several methods in creating a successful strategy to supporting smart communities.

3.1 Business Intelligence Cloud

Develops and explores new techniques of BI that can improve performance management. BI can influence decision making that is made throughout organizations and can improve performance at the level of the individual. Currently, Cloud computing is new tool that supports BI application. Cloud is computing as a service on the Internet, which is a significant trend with the potential to increase agility and lower costs. Cloud computing provides a simple way to access servers, storage, databases and a broad set of application services on the Internet. However, there are certain categories of Cloud Computing services [52], and here is a rough breakdown of what Cloud computing is all about:

1. *Software as a Service (SaaS)*: SaaS is defined as Software deployed as a hosted service and accessed over the Internet. This type of Cloud Computing service delivers a single application through the browser to thousands of users using a multitenant architecture.

Figure 3.1 shows, SaaS application is designed for end-users that are delivered over the web [53]. SaaS has the ability to extend stack and incorporate the application layer in the Cloud. In addition, users can access data from any connected computer.

2. *Platform as a Service (PaaS)*: Platforms that can be used to deploy applications provided by customers or partners of the PaaS provider. Figure 3.1 explains, how this category can deploy a new web application to the Cloud in minutes and reduce complexity with middleware as a service [53]. However, PaaS is another type of Cloud Computing service that provides a computing platform and a solution stack as a service.
3. *Infrastructure as a service (IaaS)*: Computing infrastructure, such as servers, storage, and network, delivered as a Cloud service, typically through virtualization. Figure 3.1 shows, how IaaS has an ability to managing networking, the operating system environment, stores, servers and platform virtualization without investment in hardware [53].

3.2 Cloud Business Intelligence Solutions

In the diagram below, Figure 3.2 illustrates the category of a Cloud Computing services stack [54]. First, PaaS which builds on IaaS to further include managed middleware. It is the set of tools and services designed to make coding and deploys those applications quickly and efficiently. Second, IaaS is the hardware and software which provides operation system environments and managed networking. The third category is SaaS which has an ability to extend this stack to and incorporate application layer [70].

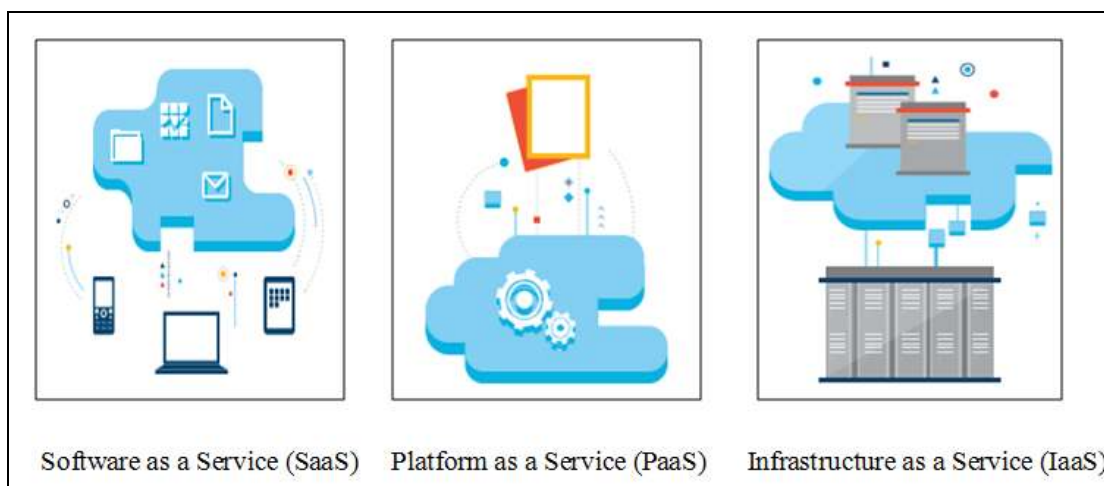


Figure 3.1. Categories of a Cloud Computing Services [53].

The market research and development found that SaaS represents the largest segment in the market which is the total spending of \$109 billion worldwide. Moreover, they found 77 % of the total market uses IaaS, the fastest growing area of Cloud Computing [55]. By 2016, they expect companies to spend around \$207 billion on Cloud Computing [56].

Cloud based BI is a tool to enhance BI for small to large enterprises. Cloud BI delivers productivity tools and applications that are highly beneficial to businesses. For example, small and medium business uses BI tools to make their marketing strategies highly competitive. On the other hand, large enterprises are using BI tools to expand their market and make it more productive.

Basically, BI has become an essential key for managing businesses. Organizations know the importance of data warehouse to BI, and Cloud computing to integrate and incorporate with an organization's BI application. Thus, integration Cloud computing with BI can enable business intelligence systems and analytical tools to communicate freely among themselves and with data warehouses.

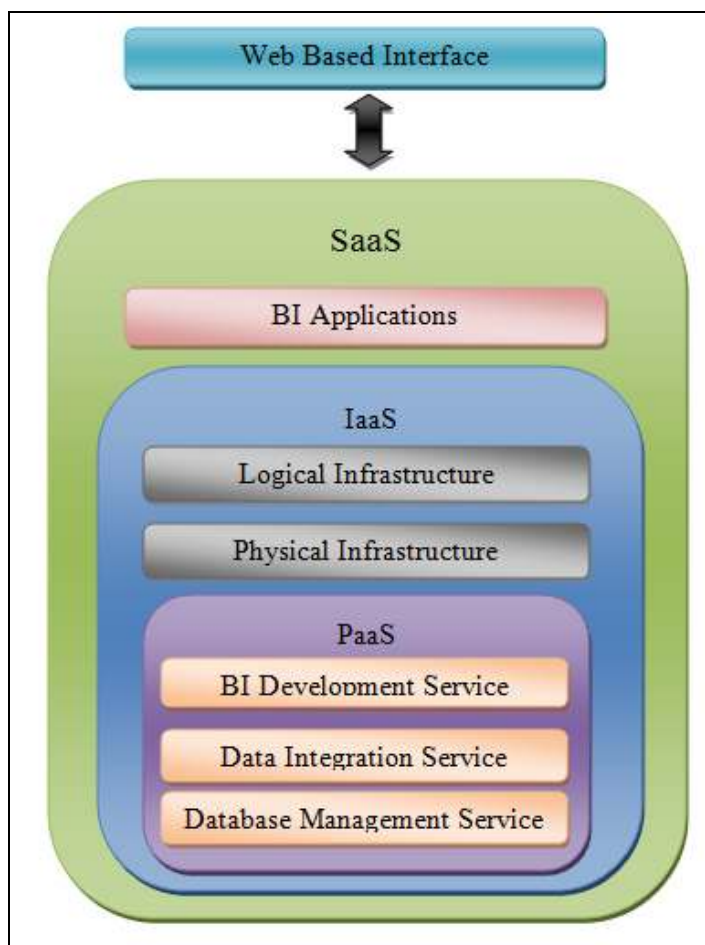


Figure 3.2. Cloud Computing Services

3.3 GIS and GPS Cloud

GIS and GPS are a part of IS innovation tools. These are used to describe and characterize the Earth and other geographies. GPS is a technology used to track the movement and could not possibly be used to its full potential without GIS. It stores and manipulates information about common location components such as postal zip codes, road names and longitudes that GPS accumulates. The information is stored in multiple layers in one database and these layers are linked together to create common location components in maps. Recently, GIS and BI has been considered as powerful tool when it integrated together to become one application. The application has the ability to analyze aerial photographs and satellite images then create statistical

models, or draft maps. Integration information are essential features of GIS that helps in decisions making, data analysis, and introduces new capabilities for business models and technology innovation.

Most of organization uses GIS and GPS in advertising, marketing, sales, and logistics to locate businesses. This approach deals with large amounts of data and real-time data. In addition, it is applicable with Smartphone and PC's. For example, the managers who need to access business information out of their offices, they can use their Smartphone to access vehicle, trailer, equipment, and asset tracking histories by using a Smartphone application.

However, GIS Cloud has several values in the integration that make application more critical such as:

1. *Increase Capability:* One of the GIS features is compiling, storing, using, and distributing data to the end users. Using Cloud on GIS can increase the operation process and represent data effectively. In addition, Cloud is flexible enough to handle large traffic fluctuations. For instance, Cloud service can take around 30 seconds or less to present high quality GPS locations such as Google Earth.
2. *Increase Reliability:* When GIS adopted on Cloud providers, it became easier for applications to interact and deliver accurate information. Mobile application, Social application and Data Warehouse are applications that deliver information. In this case, these applications will share common technology foundations that reduce time consumption and represent accurate information. Case in point GIS, shares different locations via Mobile Application and Social Application.
3. *Analyzed and Digitized Data:* Data is stored in multiple layers and these layers are linked together to create a common location component in maps. Digitizing data is the method

of creating and editing data. Users can display aerial photographs and satellite images on screen. The components that display on screen are roads, buildings, vehicles, containers and people are the outcome of analyzing digitized data. This type of analysis helps in critical decision making. For instance, global companies depend on several criteria to decide a new branch location. GIS analysis facilitates decision making via geographical analysis (climate, density, and market size) and demographic analysis (income, ethnic background, and family) that displays on the map.

4. *Resilience:* GIS tools for enhancing communication, collaboration and analysis of business workflow that matches user needs. GIS assists businesses to answer basic business questions and explores opinions that make better decisions. For example, sales departments want to know which location receives the highest sales this month. The information that enters in the system will immediately process and integrate with GIS, then display the results. Therefore, the manager gets timely answers that meet organizational goals.
5. *Big Picture:* GIS is a concept of visualization, analysis, and interprets data to understand relationships, patterns, and trends. GIS plays a significant key in small and large businesses because it draws all areas of the business and market. In addition, GIS defines company capacity, risk level, financial resources and competitive advantages which are considered successful element factors of business. Case in point, marketing departments want to introduce new products in the market. Based on GIS they will establish distribution locations, and predict sales and productions. This information delivers full market images to start out the business.

6. *Building Policy*: Managing, planning, mapping tools and monitoring business are the key factors for successful work. GIS provides characteristics for designing, implementing, growing and managing the business process in organizations. For example, GIS serves to businesses that create connections, and answer fundamental questions such as, what do you need to do? Where should we begin? Another example of how GIS works, happens when marketing departments depend on GIS information such as geographic and demographic information to distribute products, create a competitive advantages and track customers. GIS shapes businesses through marking and paints the full picture of the next steps in the business model. As a result, GIS promotes policy and plans effective business strategies.

In order to maximize cost effectiveness, GIS is responsible for developing standards, strategies, and policies that emphasizes coordination and cooperation among organizations and businesses. In fact, building policies can protect businesses as well as employees. For example, a tracking system is an automated system that monitors and manages fleets of vehicles, containers and people. Vehicles tracking can draw business policy and help to reduce costs in several ways such as, cost of vehicle speed, routing and dispatching, decrease idle time, maintaining vehicles, control, and managing fuel costs. Moreover, there is a new feature where an application can report drivers for traffic violations such as speeding, accelerate hard, and sudden stops. GIS and GPS rely upon real-time data, communicate with satellites and database network via Cloud. Figure 3.3 and 3.4 show the communication process of application [57]. Most of GPS and GIS vehicle tracking provides accurate speed information about each vehicle tracked. The drivers who speed, run red lights or stop signs, accelerate hard, or make sudden stops will record and

notify immediately when a vehicle exceeds a set speed threshold, or accelerate hard. Figure 3.5 through 3.10 shows the GIS and GPS workflow process.

GIS and GPS use real-time data and Cloud computing to support this feature. Cloud computing has the authority to access multiple devices and web browsers. Thus, GIS and Cloud are considered as opportunities for organizations to become more cost-effective, productive, and flexible in order to rapidly deliver new capabilities, sustain competitive advantages, and sustain technology innovation. In Figure 3.3, GIS and GPS communicates with databases first then the database communicates with Cloud to create a series of integrated images. The data will be transferred in secure way from the GIS, and Smartphone devices to the application running on the PC and Smartphone. Automatically all new applications that related to GIS will store on the GIS database via cloud. The Cloud is responsible to retrieve, update, and store data.

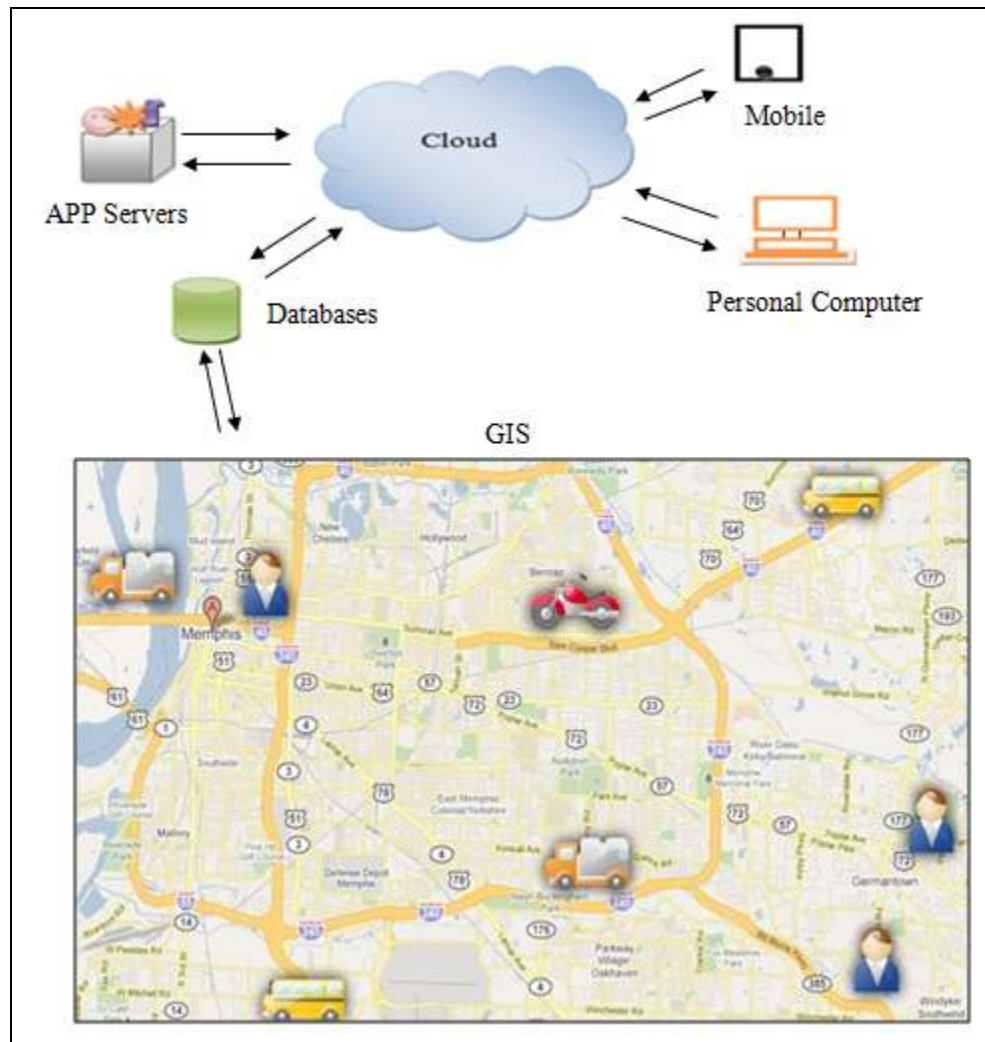


Figure 3.3. GIS and GPS Connected With Cloud.

Using GIS or Global Positioning System (GPS) vehicle tracking systems on fleet vehicles that can improve the safety record and reduction cost of business such as vehicle maintenance, asset safety, and driver behavior. The GIS tracking system process is shown in Figure 3.4 in page 52. This system uses real-time data that enables a car to communicate with satellites and mobile data networks via Cloud computing. Users can use a Mobile Application or Personal Computer (PC) where it communicates with Cloud, database networks, and satellites to retrieve GIS information. Each mile and activity during the driver's journey will be recorded and saved in

database, then displayed on the GPS, PC, and Mobile Application in a report via Cloud. In fact, all information on how the drivers are driving during their trip help managers and authorized companies keep track of the behavior of the drivers. The tracker can notify the driver and manager immediately when a vehicle has unauthorized hours of operation, or time for maintenance scheduling. This will make it easy to publish a policy for the company. For example, insurance companies can use this information to monitor a vehicle's speed and activities to get the right rate for them based on the report they receive from GPS and GIS. Tracking vehicle speed is one solution to changing driver behavior in which a system has the ability to send immediate notification to drivers to take corrective action. The system will record speed and location data in the database. In general, this system helps to change driver behaviors, to keep them safe during work hours, and to reduce the cost of business.

As shown in Figure 3.5, there are specific types of traffic violation icon in GPS and GIS which violations speed limit, running a red light or stop sign, leaving the scene of an accident, accelerating hard, and stopping suddenly. Each icon has different colors that distinguish the type of traffic violation. These icons will appear and will display on the GIS and GPS screen while drivers receive one traffic violation.

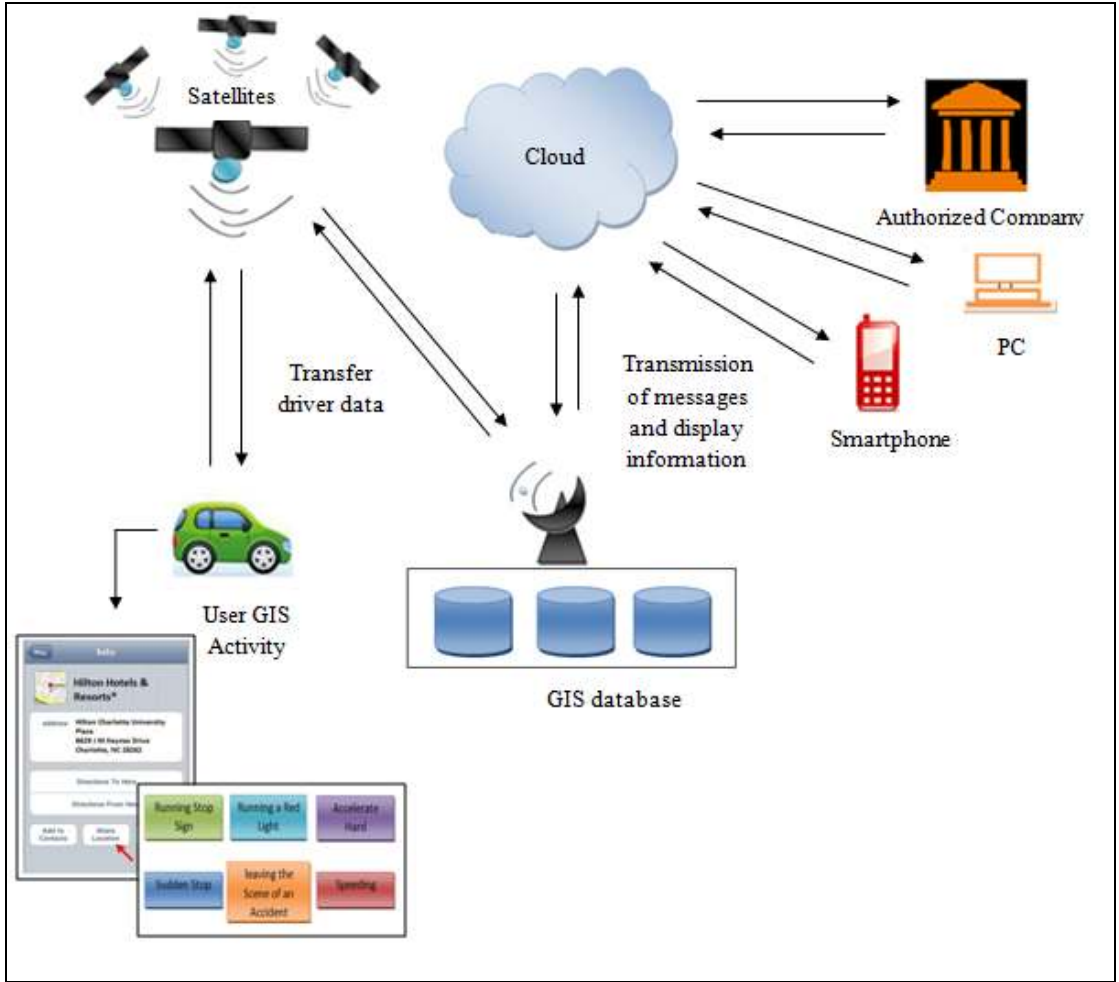


Figure 3.4. GIS and GPS Communication Process.

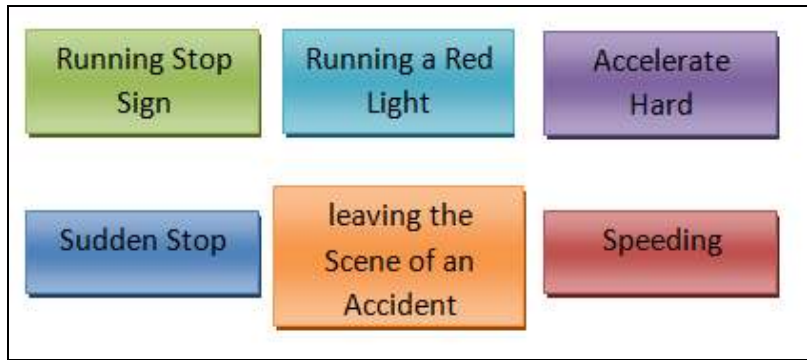


Figure 3.5. Traffic Violations

As shown in Figure 3.6 and 3.7. This illustrate GPS and GIS new feature, that alerts drivers for traffic violations such as violation speed, running a red light or stop sign, leaving the scene of an accident, accelerating hard, and stopping suddenly while they are driving.



Figure 3.6. GPS Speed Alerting Features.



Figure 3.7. GPS Sudden Stop Alerting Features.



Figure 3.8. Driver Report

As shown in the Figures 3.8 above, the GIS and GPS has another function where all traffic violations immediately record in a database and are saved via Cloud. The GPS will alert driver when they receives any type of traffic violation. The driver can see a report by clicking the Violation Icon. Then the whole report will display details (date, action and time). This feature directs the drivers to take correct action and control the driver's behaviors.

Basically, managers and authorization companies can track, monitor, and manage fleets of vehicles, containers and people via the GIS system. The tracking system requires mutual authentication and a successful PIN entry. Using GIS and GPS vehicle tracking systems on fleet vehicles that can improve the safety record and reduction cost of business such as vehicle maintenance, asset safety, and driver behavior. Tracking vehicle speed is one solution to changing driver behavior in which a system has the ability to send immediate notification to drivers to take corrective action. The system will record speed and location data in the database. In fact, the tracker can notify the manager or driver immediately when a vehicle has unauthorized hours of operation, or time for maintenance scheduling.

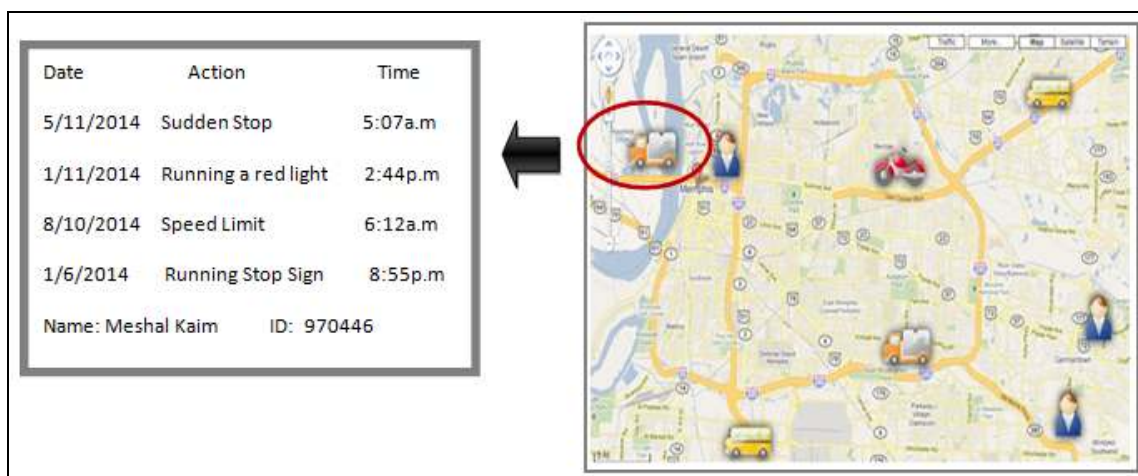
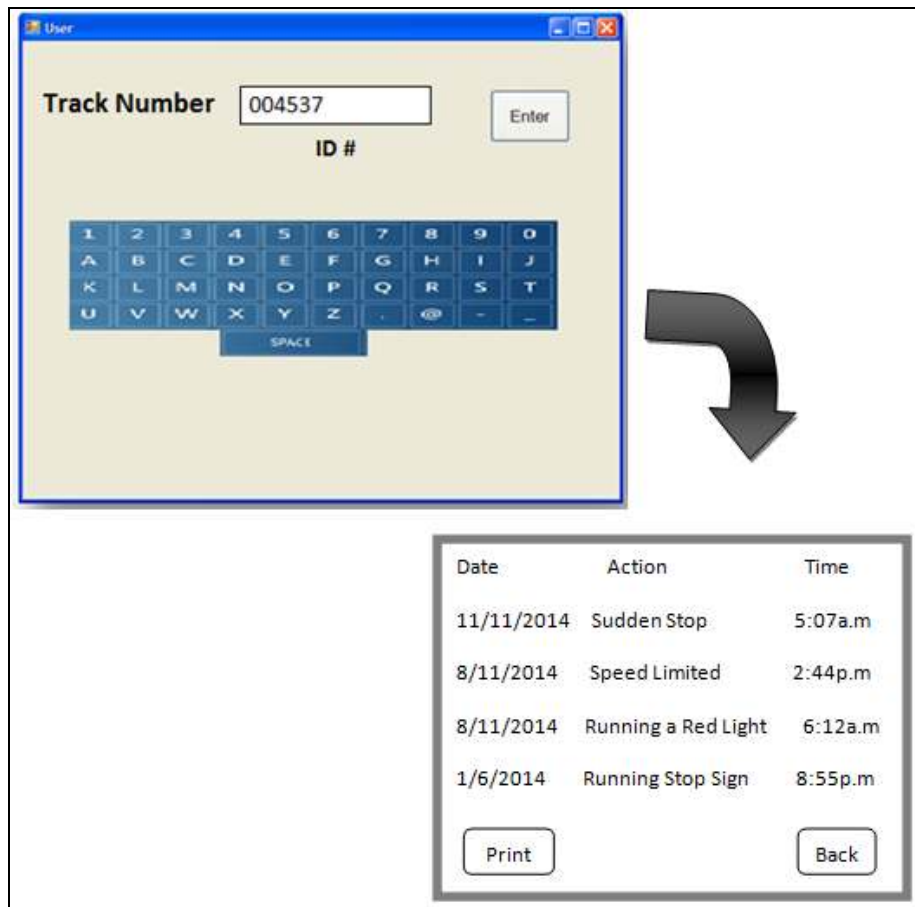


Figure 3.9. Manager Tracking System

Manager can clicking on the Vehicles Icon or any other Icon, the report will display specific details such as data, action, time, driver's name and ID number. This information helps the manager to recognize the driver and apply organization policy, Figure 3.9 shows.

The authorization companies such as insurance company can track vehicles via specific system by entering the vehicle number, ID number or insert driver license smart card into Cared Acceptance Device (CAD), Figure 3.10 demonstrate that. The data will be transferred in secure way from the database or smart card to the application running on the PC. This step requires mutual authentication and a successful PIN entry. Then the report automatically is displayed on the screen. Typically, GIS and GPS new feature maintains control and policy within the organization and community. An application helps to improving the safety of drivers and vehicles where it can reduce cost, accidents, and violations.

Most insurance companies have reward systems with companies who follow standard of safety equipment such as a GPS tracking system. GIS system helps to change driver behaviors, to keep them safe during work hours, and to reduce the cost of business.



Date	Action	Time
11/11/2014	Sudden Stop	5:07a.m
8/11/2014	Speed Limited	2:44p.m
8/11/2014	Running a Red Light	6:12a.m
1/6/2014	Running Stop Sign	8:55p.m

Figure 3.10. Authorization Company's Tracking System

CHAPTER 4

BUILD CONTROLS IN COMMUNITY

4.1 Smart Card Driver Licenses

The concept of a smart card is not particularly new. A smart card is a mini computer without monitor screen and keyboard, and is one of the greatest achievements in the world of electronics and information technology. This device includes a microchip with Integrated Circuit Chip (ICC). A smart card consists of operation system, Central Processing Unit (CPU) and different kinds of memory on a microchip. The architecture of a microchip consists of an interrupt controller, cryptographic co-processor, control logic, Read-Only Memory (ROM), microprocessor, Random-Access Memory (RAM), Electrically Erasable Programmable Read-Only Memory (EEPROM) [58]. This attribute provides a large capacity to process and store information via a computer chip such as driver's identification. For example, the EEPROM can holds from 256 bytes to 64K bytes [59]. However, the following are the main functional elements of the microchip just to mention [60]:

- *Central Processing Unit (CPU)*: this unit is responsible for interpreting and executing instructions delivered to it by the operating system.
- *Read-Only Memory (ROM)*: this unit is responsible for storing data that once written cannot be changed or removed. ROM's proceeds without power.
- *Random-Access Memory (RAM)*: it acts like the CPU, where it can store and modify written data. Most devices use RAM to store executing programs and data temporarily. RAM proceed when receiving power, if disconnected it contents are permanently lost.

- *Electrically Erasable Programmable Read-Only Memory (EEPROM)*: this category's use for data needs to be modified or erased, such as application data. EEPROM is comparable to a hard disk, or flash drive. The data that is stored and modified can remain in the (CPU) memory in the absence of power.

Since 1980, the concept of memory cards were developed until it became the smart card [61]. Recently, smart cards are widely used in telecommunication, building entry, computer logon, banking, health care, personal identification, and travel. The following are some smart card usages [61]:

- 1- *Electronic Cash*: this type of smart card is used in purchasing card such as a Visa card.
- 2- *Personal Identification*: this type of smart card is used to store private information such as passwords, account numbers, fingerprints, and photos.
- 3- *Personal Data*: this type of smart card is contains a general information such as purchase history, driver violations, and medical treatment history.

As shown in Figure 4.1, a smart card hardware components include: servers, mainframe host computers, cards, and terminals with or without workstations. The connectivity could be direct or indirect via a public or private network. For instance, some Card Acceptance Devices (CAD) such as copy machines and vending machines could work offline, or without online connectivity [62].

4.2 Smart Card Operation System

The core of a smart card is its operating system. The smart card operating system is comparable to the operating system of PC's, where the difference is in the memory capacity. The operation system is the software that handles file management, secures access to on card storage, input and output (I/O), and encryption. The smart card does not contain a battery where power is provided from outside by the reader. Most of smart cards are built from layers of differing materials that brought together to become a simple device. The total components of the card equal twelve separate items. However, the most common type of smart card are the following [62]:

- *Contact card*: is a small electronic gold plate on the card contact. This piece on the card when inserted in a smart card reader makes contact and passes data.
- *Contactless (Proximity) card*: this smart card works with an embedded antenna. This type of smart card passes data and applications through radio frequency and without contact with a smart card reader.

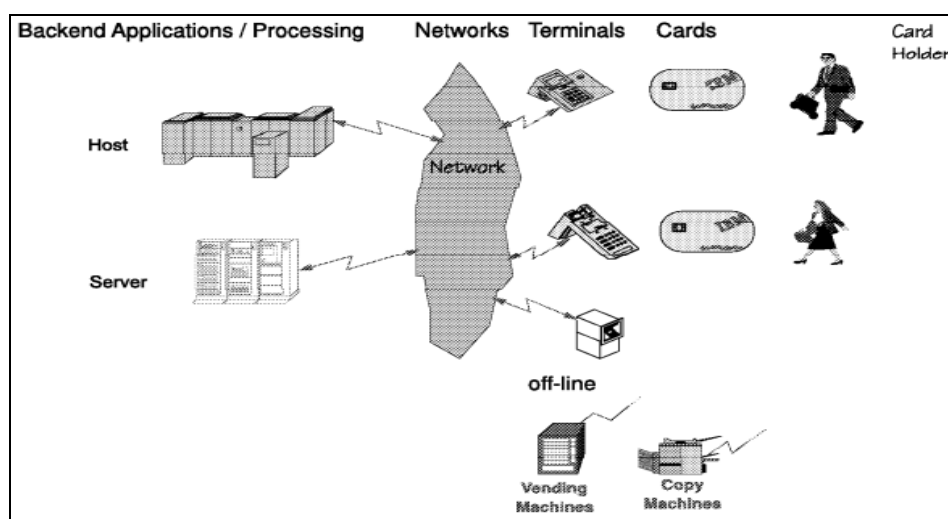


Figure 4.1. The Smart Card Components [62].

Lately, the Contact Card is the most commonly seen card in the market. Figure 4.2 illustrates the smart card and contains a simple integrated circuit chip (ICC). The ICC contains six contacts for the following purpose [62]:

- *Vcc*: power supply input where it provides the voltage usually up to three up to five volts.
- *RST*: is a reset signal supplied from the interface device, or it can supply internally from combing with a circuit.
- *I/O*: data Input or Output for integrated circuits inside the card.
- *CLK*: timing signal.
- *GND*: is the reference voltage.
- *RFU*: reserved for future use
- *VPP*: programming voltage.

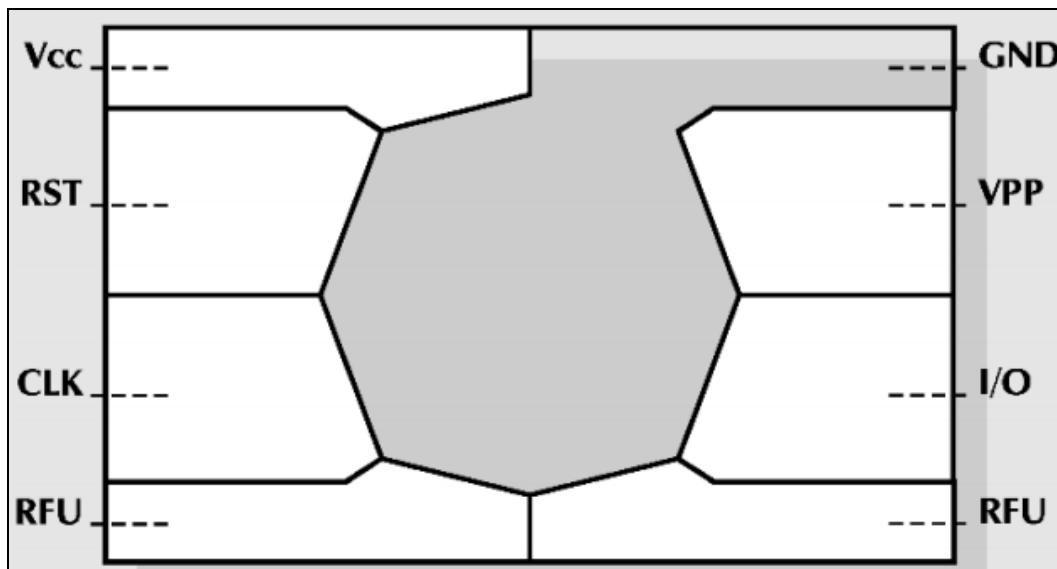


Figure 4.2. Card Contacts [62].

4.3 The Benefit of Using A Smart Card

Smart card technology is the name that describes plastic cards with an embedded computer chip. Currently, the smart card chip is developed to protect, store, provide access to secure data, and manage data. In addition, it delivers the reliability, convenience, and durability that is required to support fast transactions in a secure environment. Smart cards have numerous benefits such as:

- 1- Smart card has the ability to store a large amount of information and easy mobility.
- 2- Access control to information and functions such as writing, updating data, selecting files, and reading.
- 3- The card is secure because it has cryptographic algorithm procedures. This means it is hard to hack into the system.
- 4- Impossible to obtain fake official documents because it hard to penetration this technology.
- 5- It contains a digital record with date, location, and time.
- 6- Any PC or reader device can read and display data if it has cryptographic algorithm.

In general, smart card technology securely stores a variety of collections of data:

- 1- Personal identification information.
- 2- Expiry date, issues date and vehicle record.
- 3- Driver license records.
- 4- Insurance coverage information.
- 5- Medical emergency information.

Basically, smart cards are usually the most cost-effective solution because it increased level of processing power, memory, and flexibility. Determining business requirements and evaluation costs that help to choose the right type of smart card for a business application. Automation systems in organizations provide an efficient working environment for business professionals. Several organizations are finding smart cards to be an efficient way to manage and control businesses.

4.4 Driver's License Smart Card

IT plays an essential role in the smart card, where it used as portable integrated devices with data storage and data processing capabilities. The system uses smart cards for personal identification, a transfer of the driver's data, and provides data communication via a distributed protocol. Access to accurate driver's data quickly is one of the main functions of these systems. Whereas this systems contains an information network that acquires processes and stores driver's information. Speed, security and portability properties make smart cards a potential tool in driver systems. The system developed is called smart card drivers system. The driver, police, and authorization companies can access the system. Police use cards to be authenticated in the system while driver cards can be accessed without any database connection.

The driver license smart card process, is shown in Figure 4.3. The system consists of server, client, and database. The nature of client and server applications is that clients connect directly to the database server and perform queries. When the user inserts a driver license smart card into the Cared Acceptance Device (CAD), the data will be transferred in secure way from the smart card to the application running on the PC. In addition, all new data that is stored on the database will automatically send and store in the driver license smart card. This step requires mutual

authentication and a successful PIN entry. To complete this process the client server (PC) will communicate with GIS databases and Cloud to retrieve, update, and store data.

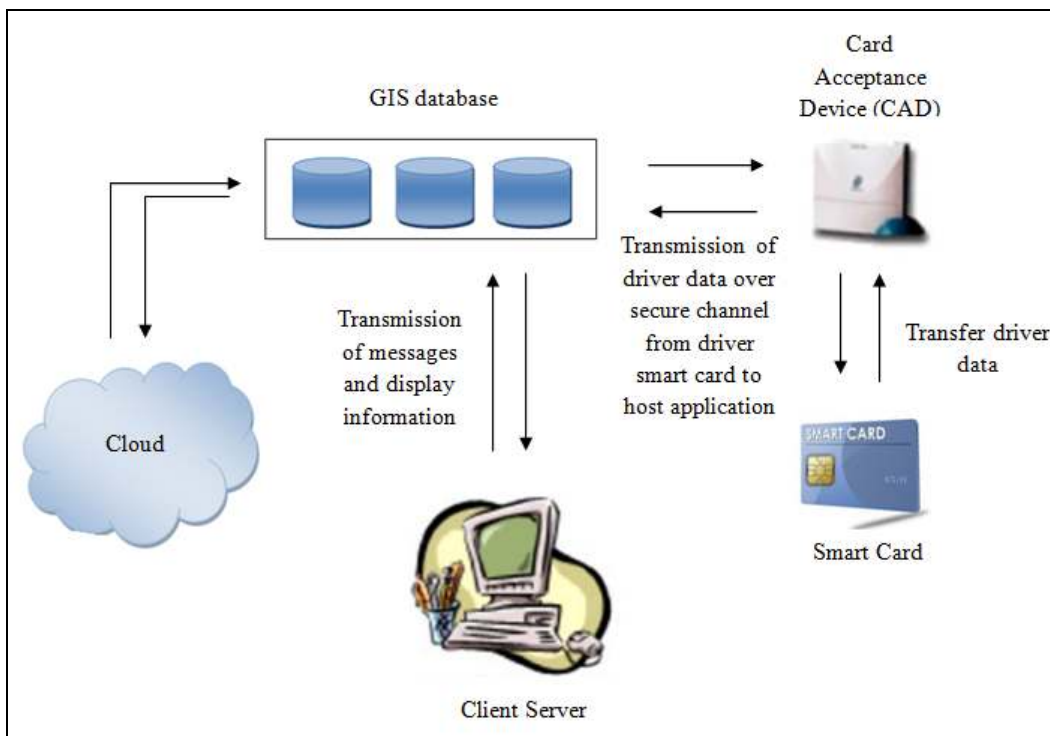


Figure 4.3. Driver License Smart Card Process.

4.5 GIS and Drivers License Smart Card

A Driver's license is probably the most used ID document nowadays. The synergy between a GIS database and driver license smart cards build control in the community and enhance driving behavior. This integration will force drivers to follow driving rules and stay under community policy. As shown in Figure 4.4, this system uses real-time data that enables a car to communicate with satellites and mobile data networks. Users can use a Mobile Application or Personal Computer (PC) where it communicates with Cloud, database networks, and satellites to retrieve GIS information. Each mile and activity during the driver's journey will be recorded and stored in a database. In the case, a driver's license smart card is inserted into the Card Acceptance

Device (CAD), this data is transferred in a secure way from the smart card to the application running on a client's PC or Smartphone. This process happens after the mutual authentication and successful password entry. The PC and Smartphone application communicates with the GIS database and Cloud to retrieve general driver information.

Basically, this system provides accurate and rapid access to driver information. The police and any authorized company such as an insurance company will gain an advantage from using this system and to assist building control in the community. The main purpose of integrating a driver license smart card with a GIS database is to increase the efficiency of police work, and provide a secure and safe environment. Police use this information to issue violations and penalize the offender. Correspondingly, insurance companies use this information to set driver rates where insurance companies can reward safe drivers with cheaper rates and charge drivers who make sudden stop, run red lights, accelerate hard, running stop signs, and speeding. The card is easy to hold. If the authorized company does not have a network to communicate with a GIS database. The smart card stores driver information that is easy to retrieve without Internet connection. This system will help to change driver behavior, manage work, and provide a high quality of service. Today, through this technology, integration the organization can build smart and control community.

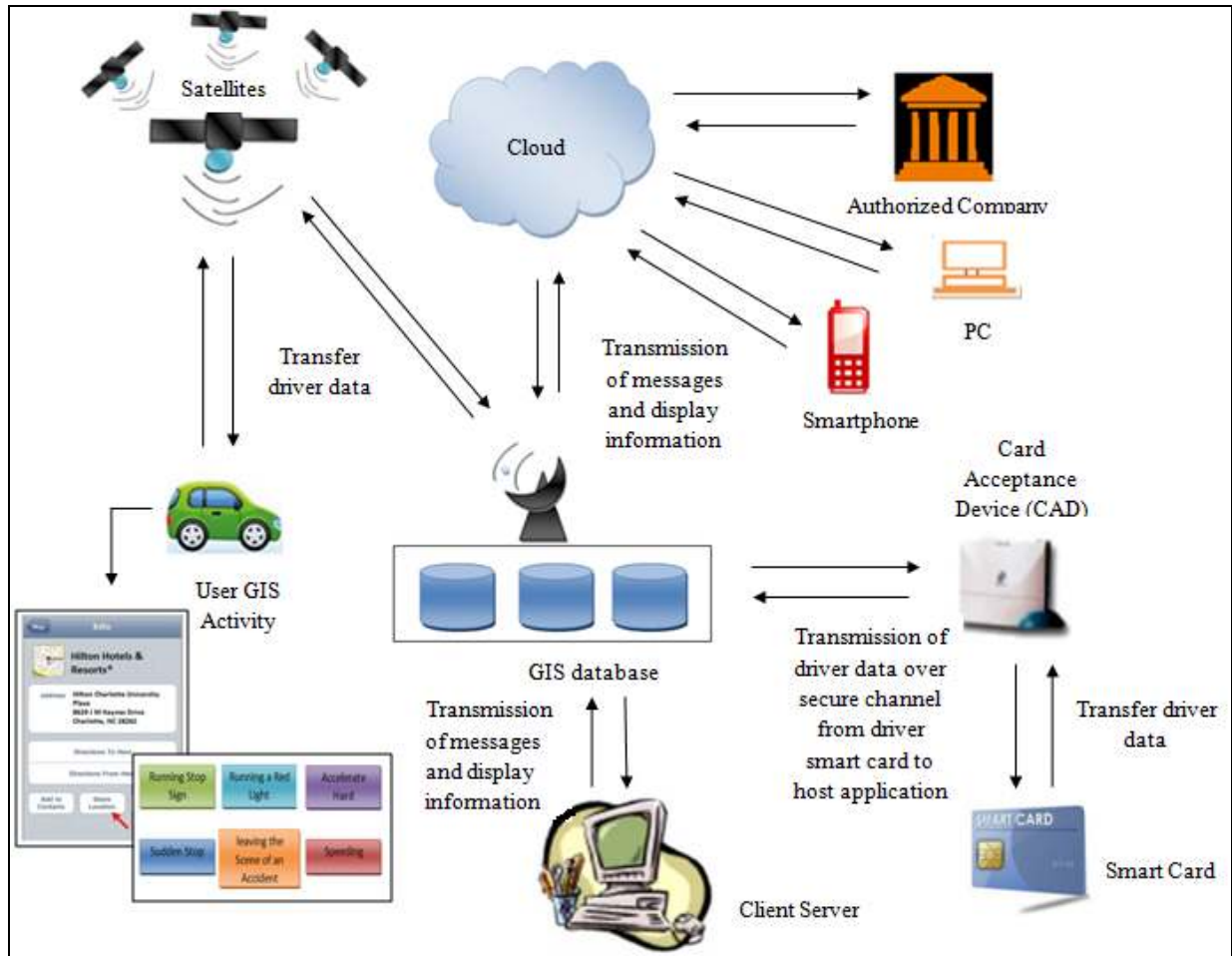


Figure 4.4. Integrating Driver License Smart Card with GIS Database.

4.6 Driver Incentive System

The incentive system is the psychology process that makes people give a positive motivation to do some things without forcing them. One of these motivations is a reward system which plays an essential part to change people behavior. Insurance companies use this strategy to help government build control. Thus, they offer discounts for specific driving behaviors based on driver's information. The smart card on the driver license facilitates work process, where the main objectives are:

- Information stored on the card and easy access.

- All operations would be done correctly in a short period of time.
- Redundant data cannot be accepted because the card automatically remove duplicated data.
- Fast and easy recovery data.
- Increase reliability.
- Less paperwork.
- High quality service.
- More secure.
- Increase data storage capacity.

In general, authorized companies are seeking for accurate and immediate information to deliver work in the right time. This system is a support incentive system strategy where it reward drivers if they change driving behavior. Furthermore, it helps the government to spread control in the community.

4.7 Integrating Business Intelligence, Cloud, and GIS

Typically, BI, Cloud, and GIS synergy can add value to a community, Figure 4.5 . This synergy can contain a boom economy in region where it shapes managerial functions within organizations. For example, the Dashboard application shows sales, the outfitting products, and the wholesaler. The map enhances a Dashboard that provides simply interpreted visualization of the revenue performance and company sales. Furthermore, it displays the historical trends, knowledge workers, and analysts of which locations are performing well. In this situation, Cloud is responsible for moving a large amount of data, data processing, storage, and distribution. Cloud facilitates to increase speed of routing data through enterprises. Where BI and GIS assets

to make better business decisions and uncovering new opportunities. The objective of this synergy is an organization that can enhance analysis in:

- Optimizing revenues, profitability by region and service costs.
- Analyze total insured value and risk management based on region.
- Recruiting and management based on demographic area.
- Analyze financial asset, liquidity and utilities cost.
- Scheduled and analyze worker performance.

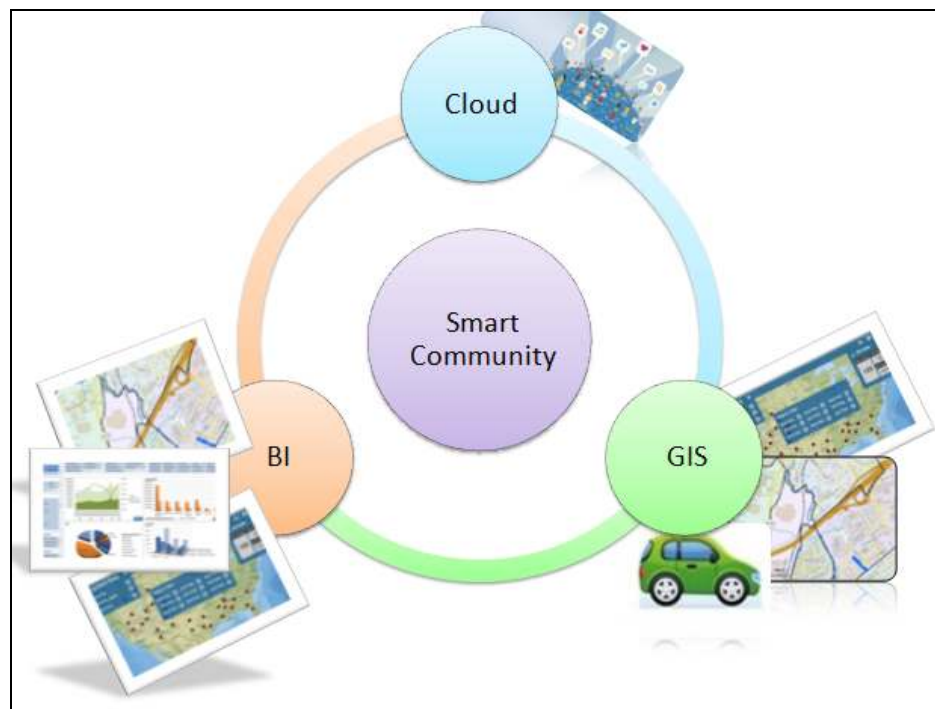


Figure 4.5 Integrating Business Intelligence, Cloud, and GIS

As a result, this integration can assist in understating the complex interrelationships of natural business resources and human need. Innovation in BI, Cloud and GIS are helping enterprises drive business success.

Many companies are focused on improving organization technology rather than improving business solution technique. They believe in concentrating on building a stronger data warehouse that can afford a complete solution to the needs of their business. In fact, adapted integration technology techniques in the company provide a powerful product for building and accessing the data warehouse. The synergy between BI, Cloud, and GIS builds better data warehouse, increases data capacity, and supports business solutions in organizations. Cloud computing servers are a repository for both unstructured and structured data. Cloud servers build a better secure environment and speed up internal and external routing data. In addition, it provides BI application with data gathered from diverse devices at anytime and anywhere. The flexibility and efficiency of Cloud acts as an ideal complement to BI activity. Finally, GIS provides an accurate picture of the business at specific point in time. Where BI provide enterprises with the optimizing solution to design its business strategy based on factual data. Integration systems are the sponsor to building a better data warehouse that influences design business decisions.

The integration and authenticity among these technology techniques provide a quick and efficient means to integrate and analyze vast collections of data. Increased business visibility through this synergy can promote effective data-driven decisions within each level of the enterprises. A successful organization not only collects data, but also turns that data into meaningful information and uses as resource in decision making. BI, Cloud, and GIS allows for increased controlling, monitoring, proper forecasting, risk assessment, and customers engagement. The three applications serve as a full service application that provides a better understating of the internal and external organization opportunities. Those applications can improve the analytical and decision making process that retain on maximizing resources and revenue.

Cloud computing, BI and GIS are the master key for Project Management. Recently, organizations have different complex programs and software that need to be accessible and updatable in real time data. The strong integration applications will provide suitable toolkits for Project and Program Management. Managers need to distinguish location, time, and costs that are associated with project to begin. Thus, Cloud computing, BI and GIS objectives for Project and Program Management include:

- Cloud and BI provide the best methodology to access and project information where it saves time and money.
- The application is Web- based where it is a fast process query.
- Increase scalability and flexibility.
- Share information between team members and departments.
- The ability to update, centralize and manage Project and Program Management outside of office using web based applications.
- The ability to frame quick decisions based on context.

Determine Cloud computing, BI and GIS in organizations aid project managers to set clear plans. The plan of Project Management is to contain, control, coordinate, arrange human resources, estimate time and cost, risk, and production. Therefore, the synergy will support managers to design work around the business scope. Also, it shapes and prints a clear view for a deliverable project, requirement, and objective. This information will be used as a source for future project decisions.

4.8 Benefit of System Implementation

Implement Cloud, BI, and GIS in enterprise helps to meet most IT service needs at a lower Total Cost of Ownership (TCO) and a higher Return On Investment (ROI). Total Cost of

Ownership is "a financial estimate whose purpose is to help consumers and enterprise managers determine direct and indirect costs of a product or system [63]." Examples of TCO are: cost of operation, installation, and maintenance. In addition, Return On Investment is how much profit or cost saving is realized. Developing ROI models show how Cloud, BI and GIS adoption can benefit both business and IT consumers. Figure 4.6 illustrate the ROI in the coming years [64].

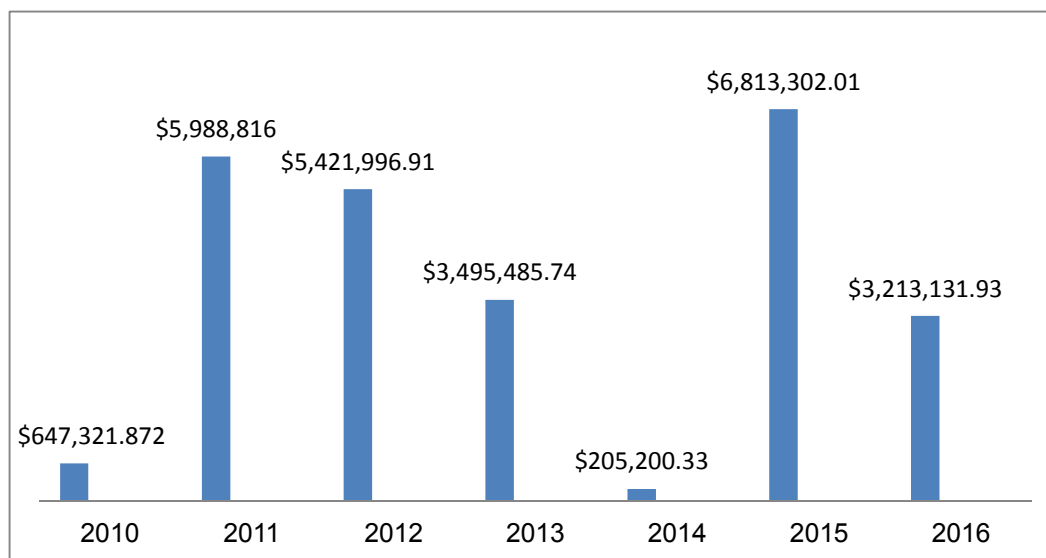


Figure 4.6. Cost Saving Estimating [64].

The benefits of implementing the integrating of BI, Cloud, and GIS in different operational departments lead to reduction costs in IT services and businesses. As shown in Figure 4.29 above, the total cost saving will reach around \$6 billion in 2015. On the other hand, the integration will save around 50% to 80% of organization costs. This integration helps organization to gain the competitive advantage and cut costs. However, BI, Cloud, and GIS applications will exploit in the next few years and the total cost saving will increase.

The integration does not save cost and ROI only. Also, it can maximize the value of an organization all. Organizations need for a shortened implementation timeline, improve operational management, increase productivity, and improve strategic performance for

organizations. Managers should determine business requirements to accomplish goals and create business value. In order to determine business value, the executive managers should measure the critical success, and use strategy and recourse to implement projects. In fact, the synergy smooth working process serves several levels from top management and fits the gap between people who understand company information and technical capabilities with people who need that information to address company goals. Organization involve in organization issues, critical challenges, and strategic opportunities to apply creative problem solving skills. In general, BI and Cloud applications give immediate evaluation of current trends, historical performance, and forecast planning. Whereas, GIS applications determine and evaluate the customer, sales management, and paints the big picture. Highlighted below are some specific examples in which integration applications have been successfully applied to improve organizational performance.

1. *Product Development Management*: research and development products and services significantly influence organization growth. Failure in estimating time of the life cycle product development can influence the assessment process. The inconsistency work often leads to significant overruns and product, or service failure. Typically, Cloud Business Intelligence application is designed to indicate the potential for continuing failure and success and report results. Another function for applications that provide a schedule and budget report for launching a new product. The most important function of Cloud Business Intelligence application is the ability to identify new service and product opportunities, strengthens, threats, and weaknesses.
2. *Conflict of Interest Assessment*: usually law firms have routine checks throughout the company to determine conflict of interest. The working process requires long time and effort with the possibility of errors that can significantly affect operation performance.

The Cloud Business Intelligence application can automatically connect staff and attorneys, check organizational records, improve worker productivity and reduce time operation. The application can reduce operation time to conduct conflict checks approximately 75% [65].

3. *Financial Management*: the majority of organizations have issues with providing a real time update information. Real time data is a critical success factor to sustaining growth in a competitive marketplace today. Most organizations rely on quarterly reports to support the decision making process, where it can cause a poor performance. Cloud Business Intelligence applications provide a real time data of performance that could be directly correlated to the business model. The application shows income statements, competitor's performance, balance sheets, and negative trends that require immediate attention.

GIS and online maps help organizations make smarter and quicker business decisions. The traditional maps are static and do not always show the detail needed to answer questions that come up in meetings. Implementation of a GIS application aid to explore more details about the project immediately and simply by clicking on a web map. The authorized users can access only those maps and data that relate to their projects. In addition, global users can access GIS data and share information within organizations and across countries. For example, project managers, engineers, and executive manages can log on and access relevant data without requesting that data from other departments.

Building control in an organization through the integration has actual positive impact in changing organization behavior. Measuring the desired action and reducing the change in organizations is the best way to change organizational behavior. Managers should measure desired behavior and set expectations for businesses and workers who document through

Business Intelligence and GIS. Finance departments and business analysts are responsible for documenting the cost of doing business and implementation. GIS, Cloud and Business Intelligence solutions aid to the standardization process and documented work that sponsor to reduce the change in work.

4.9 Issues of System Implementation

Managing information systems can add value to products and services where it is a critical success factor for organization growth. Digitized information helps organizations make smarter and quicker decisions. Business Intelligence is a technology achievement that is used to identify, extract, and analyze business data. This idea aims to support business decision making. Many organizations keep pace with the era of the evolution process. The innovation began in the early stages of computers through today's information age. In fact, organizations can increase their business value through the BI application by identifying business capacities, and knowing how to evolve into an intelligent company.

Recently, organizations recognize the economic value of information. Analysis data is an essential factor for any business looking to stay competitive. In business, the volumes of detailed data are extend each business day. Therefore, organizations need to store, process, and manage a large amount of data in an efficient way. Organizations are concerned about using the next generation analytics technologies such as Big Data. The majority of organizations are invested in Business Intelligence and analytical tools, but currently think that Big Data technology will replace BI technology. The new technology will change the market and the competition becomes difficult. In addition, concerns about Big Data challenges other companies and the trends that will shape future business technology.

BI, Cloud, and GIS are techniques and tools that are used in identifying, extracting, and analyzing business data. These techniques keep organizations comfortable and confident about their decisions while creating a competitive advantage. Basically, GIS and online maps are the primary basis for building control in community. Police and authorization companies access driver information to control driver behavior. Upon this basic activity they are concerned, if the GPS and GIS are offline and how can we monitor and track vehicles during the trip? In this case, GIS cannot communicate with satellites and databases to record violations. In addition, the smart card cannot receive updated driver information when the driver update their file at the Division of Motor Vehicles (DMV).

In brief, technology innovation will enhance to build smart and controlling communities. Seeking a new technology could aid to improve business and find specific answers for technology and business.

CHAPTER 5

CONCLUSIONS AND FUTURE WORK

5.1 Conclusion

Nowadays, IT is the leadership in business technology. The innovation of BI began in the mainframe era and plays a significant factor in failure, or success work. BI is defined as a computer-based technique that makes critical decisions based on meaningful information culled from a complicated and huge database system. BI plays a significant factor in business decisions because it provides current, historical and predictive views of internally structured data for products and departments. Using BI applications can increase both operational efficiency and customer satisfaction. In addition, BI applications improve planning that provides the foundation for top successful performance in the future.

In the 1960s and throughout the mid-80s BI began shaping the market place and the Decision Support System (DSS) grew. Next, the Enterprise Resource Planning (ERP) application was developed. After the ERP, BI introduced the first web based Business Intelligent application. Typically, BI is rapidly growing and future trends will shift dramatically from traditional BI solutions of the past. One of these trends is Dashboard, a real-time data that is used to monitor business operations. Currently, Dashboard Business Intelligence, Mobile Business Intelligence and Cloud Business Intelligence develop and contribute as the business leader technology in the market. This innovation helps to reduce the number of report pages and a quicker analysis in making business decisions. Furthermore, In-Memory technology is a new concept of expansion of both data volumes and the number of users who use BI in organizations and across industries. However, In-Memory BI become more critical for several main reasons. One of these

reasons are the Cloud Computing delivers the right information to the right people at the right time.

Integrating a critical component of BI together makes organization structure stronger. Companies are looking for the best data integration system that meets organization goals. There are several characteristics for integrating Cloud and BI. First, organizations can get the right information at the right time and anywhere. Second, Cloud supports BI application through giving multi-users the authority to access multiple devices and web browsers. Cloud Business Intelligence is the fastest and most cost effective way for organizations to make their strategies highly competitive. Cloud Business Intelligence is cost effective through reduced IT resources including: lower hardware, lower upgrade costs, and rapid deployments. This feature keeps organizations focused on their core capabilities.

GIS is a part of information system innovation tools. GPS is a technology used to track the movement and could not possibly be used to its full potential without GIS. It stores and manipulates information about common location components such as postal zip codes, road names and longitudes that a GPS accumulates. Currently, GIS delivers productivity tools that are highly beneficial for businesses. Among these benefits include: visualization, defining business capacity, risk assessment, financial resource, analysis, and interpret data to understand relationships, patterns, and trends. Another benefit, is a new feature that the application can report drivers who speed, accelerate hard and make sudden stops. In order to maximize cost effectiveness, GIS is responsible for developing standards, strategies, and policies that emphasizes coordination and cooperation among organizations and businesses.

A smart card is a mini computer without a monitor screen and keyboard and is one of the greatest achievements in the world of information technology. The microchip in the smart card is

developed to manage data, protect, restore, and access private data. Recently, smart cards are widely used in telecommunication, building entry, banking, health care, personal identification, and travel. Automation systems in organizations provide an efficient working environment for business professionals. Several organizations are finding smart cards to be an efficient way to manage and control business. Smart cards are usually the most cost-effective solution because it increases level of processing power, memory, and flexibility. Therefore, implementing smart cards on a driver's license can help to build control in a community where it provides fast access to accurate driver data. The synergy between driver license smart cards and a GIS database can build control in the community and enhance driving behavior. This integration will force drivers to follow driving rules and stay under community policy.

Business Intelligence, Cloud, and GIS synergy can add value to a community. This synergy can contain a boom economy in a region where it shapes managerial functions within organizations. In fact, Business Intelligence applications organize the business workflow process, information system, and performance of industry. The GIS and online map assist organizations by making smarter and quicker decision. Also, the Cloud computing facilitates increase speed of routing data through enterprises. Generally, Cloud computing, BI, and GIS solutions are the critical success factor for business workflow.

5.2 Future Work

Research, experience and knowledge are required for relevant collection of information needed to develop the system. During analysis GIS system and collected data will shape the future work of IT. The following approaches help to enhance proposed system and building smarter community:

- Implementation of all techniques mentioned as a subsystem and as module.

- Make sure that all links and actions are working properly.
- Write all algorithms and programs.
- Build all subsystems and system for the proposed system.

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