

SHARING OPEN SOURCE SOFTWARE APPLICATION SERVICES,  
CHALLENGES AND OPPORTUNITIES FOR THE NAMIBIAN SME  
SECTOR

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF  
MASTER OF SCIENCE INFORMATION TECHNOLOGY

UNIVERSITY OF NAMIBIA

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Dec 2007

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## **Abstract**

Information and Communications Technology is improving at a very high pace. Software applications can be delivered in various forms, the internet growth has made it possible to have software delivered over the internet. One of the most interesting models created by the web is called Application Service Provider (ASP) model. ASP model offers completely a new way of selling and distributing software and software services. ASP services are expected to become an important alternative for smaller companies with low budgets for information technology. The study looked at a possibility of sharing software applications by SMEs in Namibia, it also entailed the work of analyzing whether sharing of applications is a prudent way of lowering software acquisition and maintenance costs.

The study also consisted of two questionnaires to a randomly selected group of SMEs and ICT companies. The questionnaires looked at the ICT usage and outsourcing patterns among SMEs. The data results were used in analysis.

A prototype web based application system was developed and implemented this allowed the researcher to gain an experience in the utilization of the ASP technology. The prototype application was implemented in Oracle 10g express edition for the database and oracle application express for the web based user interface. The Specific case was for accommodation management in hotels; however the general concept can be applied to any other line of business.

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## **Acknowledgements**

The outcome of this work was as a result of support received from many people that I cannot mention all their names individually.

First I would like to thank all the lecturers who helped me extend my knowledge during the course work stage of my study,( Prof. G. E. Kiangi, Prof. P. G. Reddy, Mr. W. Torbitt, Dr. Gasela, Mr. E. Mkusa, Mr. G. Maina, Mr. A. Mwanza ) without you I would not have been able to commence this work.

I would also like to thank my classmates Katongo Lukwesa and Gardner Mwansa for their friendship; invaluable comments, advice and sharing of ideas that made this work a success.

I am extremely fortunate to have such a special family. I would like to thank my family, who continue to support every aspiration I have had. In particular I would like to thank my parents Ambrose and Norah Lumbasi, siblings Ruth and Chris, my sincere gratitude to my aunt Betty Wafula for her constant encouragement during my period of study.

To every individual who gave me the support and made a positive difference during the period of my study, A BIG THANK YOU TO ALL OF YOU AND MAY GOD BLESS YOU ALL.



## **Dedication**

I dedicate this work to all members of my family for their understanding, great support and love.

## **Declarations**

I Jeremiah. N. Lumbasi, declare hereby that this study is a true reflection of my own research, and that this work, or part thereof has not been submitted for a degree in any other institution.

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# **CHAPTER 1**

## **1.0 General Introduction**

The Internet began to receive significant general exposure from the early 1990s. The attention it has received has led to the growth of new business models. One of the most interesting models created by the web is called Application Service Provider (ASP) model. ASP model offers completely a new way of selling and distributing software and software services. Typically, Application service providers (ASPs) deploy, host, support and rent finished applications from a centrally managed datacenter or network of datacenters. Instead of an organization maintaining an IT department, it relies on an ASP as a third party to provide the necessary applications over the Internet or Intranet and accessible via standard browsers. In this context, an ASP can thus be defined as a company that offers individuals or enterprises access over the Internet to applications and related services that would otherwise have to be located in their own personal or enterprise computers. An ASP business model is based on the one-to-many principle. One application is designed for many users in several large, medium or small enterprises.

Application Service Providing (ASP) is gaining momentum as a method by which applications are distributed to end-users. Previously, software was delivered as a product requiring licensing agreements from vendors and annual upgrades to allow access to the latest features and functionalities. These methods can be inefficient and costly for non-frequent users of the application. The introduction of ASP has changed the method of

software distribution into a subscription model, delivering software as a service where users requiring access subscribe to the vendor [19].

ASP services are expected to become an important alternative, not only for smaller companies with low budgets for information technology, but also for larger companies as a form of outsourcing. From this point of view, we can argue that ASP services are a form of information technology outsourcing. According to S. Hanlon and L. Sun [10] “Increasingly, companies are using ASP’s to provide a generation of operational solutions for the effective and efficient distribution of information and to provide a rapid response to IT opportunities”.

Information And Communication Technology (ICT) is important to SME’s, but documented evidence point to a very low usage of ICT in most SME’s in Namibia.

The question is why? Possible reasons include:

- Lack of funds to implement ICT
- Lack of technical skills
- Lack of awareness

The ASP model can drastically lower the cost of software and software services, especially to small and medium sized businesses with limited IT budgets. Despite these benefits, the ASP model is not very widely adopted in Namibia, and Africa in general.

Small and Medium scale enterprises play a major role in Namibia's economic growth and in this information technology age, the use of application service providers should contribute immensely towards the growth of these enterprises.

It is possible to leverage ASP model to minimize a company's information technology burden and maximize its efficiency. The ASP model is based on worldwide standards for Internetworking and security. The applications are made available safely through any device at any time in any place.

When using the ASP model, companies like individuals would access software applications and services on a pay per use or monthly or yearly basis. The ASP model however, has to overcome technical and legal challenges before it can be effectively employed. Larger corporations are essentially providing their own ASP service in-house, moving applications off personal computers and putting them on a special kind of application server.

## **1.1 Web Services**

The Internet as a global system of interconnected computer networks has immensely contributed and revolutionized the way business is conducted all over the world. The World Wide Web (WWW) provides a multimedia interface to resources available on the internet.

### **1.1.1 What are Web Services?**

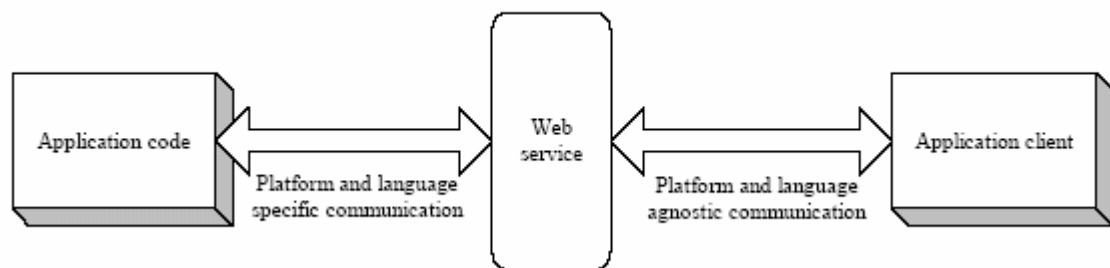
Web services (sometimes called application services) are services (usually including some combination of programming and data, but possibly including human resources as

well) that are made available from a business' Web server for Web users or other Web-connected programs. Providers of Web services are generally known as Application Service Providers. Web services range from such major services as storage management and customer relationship management (CRM) down to much more limited services such as the furnishing of a stock quote and the checking of bids for an auction item. Accelerating creation and availability of these services is a major Web trend [16].

Users can access some web services by going through a central server. As web services proliferate, concerns include the overall demands on network bandwidth, and for any particular services, the effect on performance as demands for that service rise [17].

As Figure 1-1 illustrates, a web service is an interface positioned between the application code and the user of that code. It acts as an abstraction layer, separating the platform and programming-language-specific details of how the application code is actually invoked.

This standardized layer means that any language that supports the web service can access the application's functionality [16].



**Figure 1.1 Web services**

Web services provide an abstraction layer between the application client and the application code.

The web services deployed on the Internet today are HTML web sites. In these, the application services-the mechanisms for publishing, managing, searching, and retrieving content-are accessed through the use of standard protocols and data formats: HTTP and HTML. Client applications (web browsers) that understand these standards can interact with the application services to perform tasks like ordering books, accessing a company database etc. Because of the abstraction provided by the standards-based interfaces it does not matter whether the application services are written in Java and the browser is written in C++, or the application services are deployed on a Unix box while the browser is deployed on Windows. Web services allow for cross-platform interoperability in a way that makes the platform irrelevant. Interoperability is one of the key benefits gained from implementing web services [18].

### **1.1.2 Implications**

The implication of the availability of web services can be fully utilized by SMEs in Namibia that have limited access to application software programs needed in the running of their day-to-day business. Hence there is a need to find ways on how this emerging technology of ASP can be adopted so that SMEs in Namibia can benefit. If the use of application service providers is implemented then SMEs will not be required to deploy, host and maintain expensive applications. The benefits of this will be discussed in detail



in the next chapter. The Application Service Provider operates and maintains the servers that run the applications eliminating the cost burden of having to set-up a specialized IT infrastructure and employ expensive IT resources.

## 1.2 Small and Medium Scale Enterprises in Namibia

This research will target SMEs in Namibia, with the overall aim of investigating the general aspects required to adopt ASP. There is no universally accepted definition of SMEs. The definition from country to country indicates lack of uniformity and reflects relative development of the respective economies. For instance in the USA, the small business administration defines the ‘small business’ as any business with less than 500 employees.

For the purposes of this research project, the definition for small business used is one adopted by Ministry of Trade and Industry in Namibia which defines small business as shown in table 1.1 H. Ashekele and M. Nesongano [pp10, 12].

| Sector             | Criteria             |                      |                              |
|--------------------|----------------------|----------------------|------------------------------|
|                    | Employment           | Turnover<br>N\$ 000s | Capital Employed<br>N\$ 000s |
| Manufacturing      | Less than 10 persons | 1000                 | 500                          |
| All other business | Less than 5 persons  | 250                  | 100                          |

**Table 1.1 Definition of SMEs in Namibia**

According to USAID/NAMIBIA [13], “outside of Namibia’s larger firms, use of information technologies and e-commerce is in its infancy. Providing expanded access to and training about these tools is a promising approach to help SMEs operate more efficiently, effectively and creatively”. Worldwide, the development of SME sector of the economy is recognized as vital for achievement of broader development objectives. One of the key approaches in ensuring the development of the SME sector is the access to technology. J. Chidzomba [14] points out, small enterprise managers operate with inadequate or at best with minimum quantitative data. To save costs they are likely to dispense with information systems. Availability of good infrastructure provides a conducive environment for productive activities to take place in any enterprise and one of this infrastructure is the access to use of Information technology. A. Beyene [15] mentions that SMEs in Africa are not principal users of IT infrastructure and it is recognized international competitiveness crucially depends on successful adoption and diffusion of IT. IT is a tool for achieving quick response, just-in-time management and other modern practices.

### **1.3 Statement of the research problem**

This research will aim at surveying the relevant ASP supporting technologies applicable to SMEs, highlight technological challenges and study the impact of the ASP model on SME’s in Namibia.

ASP is still a new concept that has not gone beyond the proof stages. There are several challenges to be addressed especially regarding computing technologies: Scalability of ASP servers, internet infrastructure, security, ASP service integration. Although these challenges will not be the major objectives of this research as each warrants a research topic of its own, but they are very much worth mentioning.

Some questions which this research hopes to answer include:

- Is hosting of an application program for an SME feasible in the Namibian context?
- What sorts of restrictions are required to ensure the implementation is suitable with the available IT resources?
- How well will the system perform?

#### **1.4 Rationale and Research Objectives**

Application service provision is an emerging business model that may be used by more business enterprises in future. As a form of IT outsourcing the researcher foresees it having an impact on how SMEs manage and use the current IT services and resources.

This research will look at the general use of Information and Communication Technology (ICT) in small and medium scale enterprises in Namibia. The pattern of outsourcing this ICT resources and services will also be observed.

Overall objective:

1. The overall objective of this research is to determine how SMEs can adopt the deployment of Application Service Provision, in order for them to embrace technology with the goal of reducing their information technology costs.

Specific objectives:

1. To identify factors that determines the adoption of Application Service Provision among SMEs in Namibia. Some factors that will be observed are cost-effectiveness, self sufficiency etc.
2. To obtain a more detailed view of potential benefits of ASP as a form of commercial service based computing with the aim of mitigating costs of software acquisition and reduction of software piracy.
3. To survey the main supporting technologies for ASP, and in the process identify major challenges to the development of ASP applications and propose solution approaches.
4. To observe the information technology outsourcing patterns among small scale and medium scale enterprises in Namibia and characterize the overall IT and application service climate for SMEs.

### **1.5 Utilization of ICT in SMEs**

The motivation to have updated IT is high, both because of increased dependence on IT across a broad array of critical activities and because of attendant gains in efficiency. Despite this, most SME's are locked out of ICT, mainly because of three reasons.

Firstly, traditional models of software ownership are prohibitively expensive, and faced with limited IT budgets; most SME's simply resign to not using ICT. Secondly, most SME's lack qualified staff and skills to manage and maintain ICT resources. Thirdly, some SME's, especially in Africa, still lack the awareness on the benefits of adopting ICT as a tool to streamline operations and expand market reach. According to Hellen Beckett it is said "Application service provision would be the answer to skills shortages and enable companies to respond fast to the fluctuations of an e-economy, according to its proponents" [8].

"The factors that affect the degree of adoption are still not well understood. Because of its newness, not much research has been conducted", A. Gherman and F. Wahid [9]. This clearly indicates there is a need to study the parameters that determine and affect the use of application service provision. J. F. Schultz [11] believes that since the ASP model has the ability to use web-enabled technology to provide commonly used software throughout a large organization quickly and efficiently, this business model is largely attractive because of the reduced need for a technical staff and related computer expertise. J. F. Schultz further states that "the ASP model is being rapidly adopted by small to medium-sized organizations as well as large enterprises".

Due to high rate of change and improvement of Information and Communications Technology, modern businesses have become highly dynamic. Small and Medium scale enterprises have to react to changing environment: more sophisticated consumer

demands, strong competition, need to outsource some services, new supplies technologies etc. Desire to survive in the changing market will need to be accompanied by appropriate information technology. In order to compete in global markets the private sectors/SMEs of developing countries have to address and overcome several sincere handicaps, such as lack of awareness about possible impacts of the ongoing rapid technological changes that are taking place. The limited marketing capabilities will be broadened by employing advanced information technology and other tools for global network such as the internet, communications, networking, information storage, support systems and software [35].

According to J. Chisenga “The internet has provided an infrastructure through which resource sharing is being implemented in businesses regardless of the status or type of business, for as long it has access to computers and the internet, it can access information available on the internet ...the internet in Namibia is developing at a steady pace although its use ... is rather very low”.

## **1.6 Thesis Outline**

This thesis focuses on sharing open source application services by SMEs in Namibia as a low cost and technology efficient mode of software acquisition. The thesis will be presented in five chapters as outlined below.

Chapter1 was an introduction to ASP and gives background information about the problem and also presents the list of objectives.

Chapter 2 surveys the literature review of ASP services as a form of IT outsourcing. The chapter explains and describes the ASP concept; the chapter will document various definitions of ASP and characteristics of ASPs. The chapter will also describe the benefits, limitations and challenges of the ASP model to the provider and user.

Chapter 3 describes the research methods used in this study including data collection and analysis. The chapter also presents and discusses the results of the study. Finally the chapter answers the hypotheses in the study.

Chapter 4 contains issues related on development of the prototype, it covers in detail the analysis, design and implementation of the Hotel Accommodation System (HAS). The chapter comes up with the entity relationship model and also lists the reports that will be generated from the system. It also explains in more details the tools and system architecture of the prototype.

Chapter 5 is the final chapter of the thesis work. The chapter presents conclusions and contributions of the study. The chapter looks at how the objectives in chapter 1 were fulfilled, it summarizes results and discussions of the thesis work, problems encountered and finally it concludes by offering further research suggestions.



## **CHAPTER 2**

### **2.0 Application Service Providers**

#### **2.0.1 What is an Application Service Provider?**

Various definitions of an Application service Provider (ASP) have been documented.

This chapter will begin with looking at several definitions of an ASP:

1. John Morency defines an ASP as a service provider whose specialization is the implementation and ongoing operations management of one or more networked applications on behalf of its customer [20].
2. An ASP delivers application functionality and associated services across a network to multiple customers using “pay as you go” payment model [21].
3. Centre for Strategic Information Systems (CSIS)’s definition - ASPs are companies that manage and deliver application capabilities to multiple organizations via data centers operating across a wide area network [22].
4. Application Service Provision (ASP) is a business model, originally derived from the idea to use the Internet or other wide area networks to provide online application services on a rental basis—commercially delivering computing as a service. The ASP model takes advantage of several technological breakthroughs that have made it feasible to sell computing as a service rather than a product [23].
5. An Application Service Provider (ASP) is an entity that provides and manages software solutions as services to customers across the Internet or other types of wide area networks. The ASP not only offers the software solutions but also the

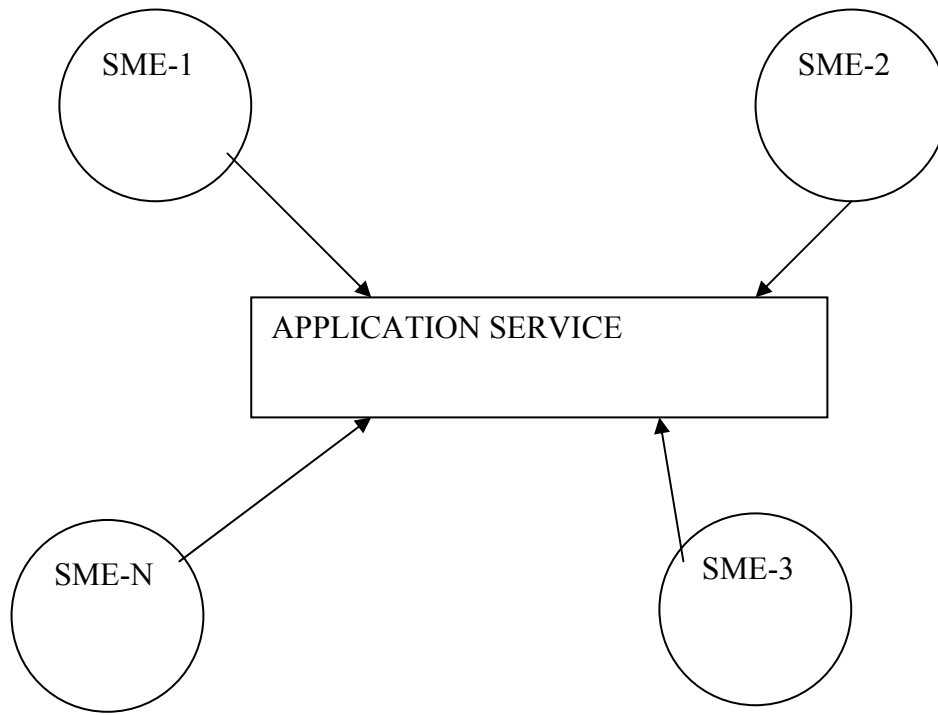
computational resources and software environment to execute them, adopting a thin client model for the user interface [24].

6. Application Service Providers (ASPs) provide network and server infrastructures to support application hosting. An ASP offers individual and enterprises access to software applications (which are referred to by the generic term “services”) over the internet or other network technologies [25].
7. Wikipedia encyclopedia’ definition, an Application Service Provider (ASP) is business that provides computer-based services to customers over a network. The most limited sense of this business is that of providing access to a particular application program (such as medical billing) using a standard protocol such as HTTP [27].
8. An ASP is a company that provides application hosting for customers in the same way that ISPs (Internet service providers) will host a company's Web site. The basic model is that mobile users or office users connect to the ASP to run their applications [28].
9. Broadly defined, an Application Service Provider (ASP) is any organization or third-party that provisions software applications over the Internet, typically for a fee. ASPs host and manage the applications from their facilities or from co-location center(s), and coordinate the ongoing support, maintenance and upgrades of the applications. By combining software, hardware, networking technologies and technical expertise, ASPs provide superior performance and increased security, reliability and scalability over traditional corporate-owned,

in-house corporate-run applications — without a significant up-front financial commitment.

10. IBM's working definition: Application Service Providers (ASP) deliver and manage applications and computer services from remote data centers to multiple users via the internet or a private network [30].

From the definitions above, it can be noted that there is a wide variety of definitions amongst IT researchers, however there is a common thread emphasis in all definitions: ASPs provide the rental delivery of commercially available application services (hence it is a form of IT outsourcing), from shared facilities over a network (typically the internet), to multiple customers (employing a one-to many concept as illustrated in Figure 2.1). All these definitions suggest that an ASP delivers and centrally manages applications to clients via a network.



**Figure 2.1 SMEs using one application**

## **2.0.2 Categorization of ASP services**

There are basically four forms of ASP service provision. These are:

- A **specialist** or **functional** ASP delivers a single application for a specific need, such as credit card payment processing, Web site services, human resources ;
- A **vertical market** ASP delivers a solution package and support for a specific customer type or industry, such as a dental practice; the market is a limited service product.

- An **enterprise** ASP delivers a broad spectrum of solutions (deliver high-end business applications); Enterprise ASPs have large companies as their main target.
- A **local** ASP delivers a wide variety of application services to small businesses within a limited (local) area;
- **Volume Business** ASPs supply general small/medium-sized businesses with prepackaged application services in volume.

Another categorization is from services offered .Some ASPs provide specialized services to select groups. For example, an ASP might specialize in providing various accounting and specialty services for small contractors. Other ASPs may specialize in managing applications such as Oracle Business products. ASPs can also be broken down according to the following categories shown in Table 2.1:

|                        |  |
|------------------------|--|
| Human Resources        | E-Commerce                             |
| Sales Force Automation | E-mail and Calendars                   |
| Remote Access          | Customer Relationship Management (CRM) |
| Operations Management  | Databases                              |
| Finance                | Document Management                    |
| Project Management     | Engineering/Scientific                 |
| Help Desk              | Enterprise Resource Planning           |
| Office Productivity    | Marketing                              |

**Table 2.1 Categories of ASPs**

### **2.0.3 Characteristics of ASPs**

- *Supply over a network:* The ASP offers access to the application over a network (e.g. the Internet, virtual private network or leased lines). Packaged enterprise software is adapted for internet delivery.
  
- *Externally and centrally managed:* Provision of complete application management and support. The application service is externally managed by the service provider from a central location rather than at each customer's site. ASPs reduce the cost of deploying and managing complex enterprise solutions
  
- *One-to-many service:* The ASP model is designed to be a one-to-many service. The ASP offers standardized or customized applications to a large number of

users, providing cost advantages from economies of scale. Thousands of customers can be supported with a single code base.

- *Service-fee-based pricing:* ASPs rent access to finished applications and charge end users a fixed price subscription fee or a variable use fee based on time, number of transaction and number of users.
  
- *Contract realization:* An ASP takes responsibility for delivering application access including the underlying delivery mechanisms and related services as agreed in the contract. The contract is usually referred to as Service level Agreement (SLA). The SLA may be contractual with penalties for non-conformance. The provider should strive meet all the requirements of SLA.
  
- *Ownership:* The ASP owns and operates a software application.

## **2.1 Traditional product model versus ASP model**

Typically software applications are hosted by a data centre or server as opposed to being installed on independent client machines as in the traditional model. The application service provider delivers and manages software applications and computer services [19].

The ASP model has evolved because it offers some significant advantages over traditional approaches. The ASP model offers several benefits to providers themselves and customers (SMEs) ([1], [9], [19], [27], and [31]).

## **2.2 Provider benefits**

- Reduction of application distribution and deployment costs since there is no need to distribute CDs, package applications and print manuals.
- Allows extra protection from software piracy as software applications are hosted in servers, thereby disallowing users to create multiple copies
- Upgrade of new features are installed directly on the server, thus removing the need of providing software patches to clients which usually requires considerations of different computer platforms and operating system in use by clients
- Enables software vendors to target a range of computing platforms, without requiring multiple applications to be developed specifically to cater for the different platforms
- Generates a continuous revenue stream because application usage is based on subscriptions by customers as opposed to requiring annual releases of software products to gain revenue
- Allows providers to monitor usage of the system, enabling them to recognize frequently used features, usefulness and efficiency of the product, and charges subscribers according to their system usage

## **2.3 User (SMEs) benefits include**

- Lower Cost - When compared to buying and implementing a system the ASP alternative provides overall lower cost. Using Application Service Providers



(ASPs) can save companies money, expedite the deployment of new enterprise applications, and enable the re-allocation of scarce resources to strategic business opportunities. Software costs for the application are spread over a number of clients. Enables businesses to utilize expensive software products without the needs of obtaining product licensing and support costs of applications, this lowers total cost of IT ownership. Instead, businesses subscribe to the package they require, which also allows them further access to upgrades as they become available, in short SMEs experience painless frequent upgrades.

- Eliminating the need to acquire and maintain hardware to satisfy software requirements, thereby preventing compatibility issues
- Avoid the trouble of software installation since applications are hosted and installed on the server
- Reduce application downtime as hosts are most likely to be reliable in providing continuous availability
- Decrease recruitment costs as there is no need to hire administration staff for support issues. The ASP model, as with any outsourcing arrangement, eliminates head count. IT headcount tends to be very expensive and very specialized
- Remote site Internet access - The Internet connection provides the convenience to users in the office, plant, warehouse or working remotely, to access their applications. In addition to easy access, software integration issues are eliminated from the client site.

- Cash flow predictability - Instead of investing a large sum of money on an infrequent basis to keep systems working and current, the ASP model will enable companies to spread costs creating cash flow predictability.
- Easy upgrades and fixes - Upgrades and fixes can be performed without disrupting business access, through coordinating a convenient time such as 2:00 am on a Sunday.
- Improved ability to focus resources on core business issues.
- Faster implementation of new applications and technologies, easy application scalability.
- Access to comprehensive security, back-up, disaster recovery and support services.
- Vendors can build more application experience than the in-house staff.
- Focus on business, not technology - Since the ASP will also be providing application management services, the customer gains access to trained personnel right away. This enables the customer to use the in-house IT personnel to solve core IT issues and focus on the strategy of the enterprise.
- Keep current on the latest technology - Customers can automatically leverage the latest technology in their system without incremental upgrade expense or the hassles of upgrading the system themselves.

## **2.4 Limitations and Challenges**

In spite of potential benefits that ASP customers can get, there are some inherent disadvantages of the ASP model, which are:

- The client must generally accept the application as provided since ASPs can only afford a customized solution for the largest clients.
- Continuing consolidation of ASP providers may cause changes in the type or level of service available.
- Security – companies are not comfortable in handing over confidential data to another firm. There must also be a major concern about availability of data. Customers take the possible loss of control and the fact that they are bound by a contract into consideration.
- when evaluating the ASP model as an alternative to an in-house operation
- Affordable internet access – an ASP may assume that businesses have reliable, high speed internet access. This is where the importance of digital subscriber line (DSL) comes in.

## **CHAPTER 3**

### **3.0 Research Methods and Results**

This chapter will focus on the research methods used in this research and analysis of results obtained.

#### **3.1 Hypotheses in the research**

According to M. S. Olivier [31], “Descriptive statistics are more than adequate if you can collect data from the entire population you are interested in, or if you are just interested in the statistic of group you observed or experimented with. If you have observed or experimented with a representative group and want to generalize your observations to the larger population, however, you will have to formulate a hypothesis about the population parameter and use the sample data to test the hypothesis.”

1. Hypothesis 1 (H1) stated that: SMEs can be made aware of the use of ASP services in Namibia.
2. Hypothesis 2 (H2) stated that: Adoption of Application Service Provision is feasible in Namibia.
3. Hypothesis 3 (H3) stated that: Adoption of the Application Service Provision model can reduce software costs for Small and Medium Scale enterprises (SMEs)

### **3.1.1 Hypothesis testing**

The purpose of a hypothesis is to predict a relationship between variables that can be tested. Hypotheses direct one's research by indicating what procedures should be followed [32]. For statistical purposes, a statistical null hypothesis ( $H_0$ ) is formulated to express equality between the parameters of interest. Any different alternative hypothesis ( $H_1$ ) is then formulated [31].

Hypothesis 1

$H_{10}$  : There exists at least limited (15% or more) use of Application Service Provision services by Small and Medium Scale enterprises (SMEs) in Namibia.

$H_{11}$ : There exists little (less than 15%) or no use of Application Service Provision services by Small and Medium Scale enterprises (SMEs) in Namibia.

The first questionnaire meant for SMEs was meant to gather data for this hypothesis. Companies were asked whether they are aware of the Application Service Provision concept and whether they use ASP services. If the proportion of companies using ASP is less than 15% was used to test the null hypothesis. If the proportion is large at 5% level of significance then the null hypothesis ( $H_{10}$ ) is to be rejected and the alternative hypothesis ( $H_{11}$ ) is to be adopted.

## Hypothesis 2

Review of findings of research by Gherman and Wahid [9] was the basis of the formulation of this hypothesis. Their main focus was on adoption of ASP.

H<sub>20</sub> : Adoption of Application Service Provision is feasible in Namibia.

H<sub>21</sub> : Adoption of Application Service Provision is not feasible in Namibia.

A number of variables were identified and used in testing this hypothesis. The variables considered were: cost, level of awareness, in house IT staff and the use of Internet. All these variables each were given a score on a scale. High costs, high level of awareness, low in-house IT staff and high level of internet usage were given high scores favoring the feasibility of ASP adoption.

### **3.2 The Prototype model**

To assess the above hypothesis a prototype model was developed. M.S Olivier[31] says the following about models “ A model captures the essential aspects of a system or process, while it ignores the non-essential aspects. It can serve as a blue print for new systems or processes, or may be used to evaluate existing systems or processes.” Olivier [31] further asserts the following about prototypes, “In Information Technology the term *prototype* refers to a simplified program or system that serves as a guide or example for the complete program or system. Prototypes are constructed because they have some of the characteristic of the complete system, but are much simpler to develop. In fact when constructing a prototype you specifically concentrate on those aspects that need to be

studied and neglect the other aspects. Since the aspects of concern are implemented, a prototype provides more solid basis for decisions than an abstract description or design of the system.

The following aspects of the of the project life cycle of the prototype were covered:

- Analysis
- Data modeling
- Database design
- Construction of the database
- Loading data
- Developing the application system
- Configuring the environment
- Deploying the finished system on the network

Hypothesis 3

H3<sub>0</sub>: Adoption of the Application Service Provision model *can* reduce software costs for Small and Medium Scale enterprises (SMEs)

H3<sub>1</sub>: Adoption of the Application Service Provision model *can not* reduce software costs for Small and Medium Scale enterprises (SMEs)

The fourth section of the questionnaire meant for SMEs sought to examine issues by companies already using ASP. One of the factors that will be considered is whether the external provision of IT services has contributed towards lowering costs for IT services.

Cost-related factors often appeared in surveys on ASP adoption. Low total cost of ownership and lower cost over time are some reasons considered in using IT services from ASPs [9].

### **3.3 Sample and Sampling Procedure**

The method of simple random sampling was used to select a sample of Small and Medium Scale Enterprises (SMEs) to be visited around Windhoek city. Of the 77 business entities that were handed questionnaires 53 responded. Also companies offering Information and Communications Technology (ICT) services were visited. These companies included Internet Service Providers, information technology consultants and retailers.

### **3.4 The Questionnaires**

A Survey conducted using questionnaires was distributed to the sample population. The main reason for using the questionnaire was as follows:

“Worthwhile surveys do not merely count the number of times some phenomenon occurs in some population; they also test theories that put forward the surveyed population” M. S. Olivier [31].

#### **3.4.1 The First Questionnaire**

The main sample population target was SMEs. The design of the first questionnaire sought to assess the level of usage of computers in an organization. Questions on reasons for using and not using computers were clearly formulated. From the random sample the



questionnaire was able to give a general picture on the attitude of SMEs using ICT in their businesses.

The third section of the first questionnaire particularly focused on SMEs using computers. The questionnaire sought to determine the kind of software and how this software is acquired. Software acquisition is important for any organization as the researcher believed problems encountered by any business entity during acquisition of software also determines level of usage ICT. The percentage of employees who use computers and the percentage of the overall budget allocated to Information Technology are very vital. It was necessary to determine these ratios in order for the researcher to find out the level of willingness by SMEs to embrace the use of Information Technology. This section also tried to find out the level of awareness about Application Service Provision concept. The fourth section of the questionnaire targeted companies using ASPs. The questions asked covered the following issues: problems encountered in use of ASP services, security, and the level of satisfaction in using ASP services.

The complete questionnaire is presented in Appendix 1-A.

### **3.4.2 The second questionnaire**

The second questionnaire was designed mainly to support the first one. This questionnaire was short and it was targeted towards ICT companies. It aimed at finding out the main customers of these companies and from this fact the researcher was able to

know where SMEs stand when it comes to seeking and acquiring of ICT services. The kind of software applications supplied and licensing modes were also determined. The researcher also sought to know the kind of services the ICT companies provided. No direct question on Application Service Provision was asked.

### **3.4.3 Distribution of the questionnaire**

As mentioned before, 53 SMEs and 17 ICT companies participated in the research. The researcher handed out the questionnaires personally and where necessary clarifications by the companies participating in the survey were made. This was done in a few cases where some participants needed further technical information or clarification of a question.

The sample population was randomly selected from Windhoek. There are two reasons why Windhoek was chosen as an area of geographical survey. First, it is the capital city and hence the major business hub of the country and therefore was a suitable location as most businesses are based in Windhoek. Secondly, the cost of traveling outside the city was prohibitive for the researcher.

Because of its newness, not much research has been conducted to outline the importance of Application Service Provision, especially to the Namibian SME sector. This thesis is the researcher's attempt to address this void and contribute to research on gaining a better understanding of ASP concept and its contribution to the business community in

Namibia. Thus, an understanding of how companies acquire software, IT budget, kind of IT outsourcing, and how they use the internet was instrumental in forming the basis of this research.

Main questions that the researcher asked himself during analysis of data collected were:

1. What proportion of Small and Medium scale enterprises were using computers as a means of managing information in their businesses?
2. What methods of software acquisition were being used and problems encountered during software delivery?
3. What kind of ICT outsourcing were SMEs using?
4. What percentage level of SMEs is familiar with the ASP concept?
5. What is the general attitude of SMEs towards use of IT outsourcing and ASP services?
6. What kind of problems are being experienced by companies using Application Service provider's services

## **3.5 Research Results**

### **3.5.1 Introduction**

The researcher did not find any documented research results about Application Service Providers in Namibia. This basically reflects that it is a very new concept in this country.

### **3.5.2 Analysis**

The processing of data was relatively straightforward, a sample of data was collected and the researcher was simply interested in totals. Basic statistical analysis was carried out. Description of the usage of Application Service Provider's services is based to a considerable extent on the researcher's retrospective reflection of the project. Additionally data collected during the project is also used.

#### **3.5.2.1 IT Utilization**

The data analysis showed that most companies use computers in their organizations (75.47%) for a variety of purposes including the internet (54.72%), office suite applications (75.47%), finance/ accounting (37.74%), data management (37.74%) etc. Most companies (75.47%) also agree that companies in Namibia that implement and use various existing information technologies have a higher profile than companies that do not, 9.43% disagreed with this statement while 15.1% had no comment. This indicates how SMEs have attached the importance of Information and Communications Technology in conducting and managing their business activities. Regardless of the fact that a substantial proportion of SMEs were using computers, 69% of companies that do not do so indicated that they intend to acquire computers in the near future (in a years time). Figure 3.1 shows how SMEs use the IT infrastructure in their day to day business.

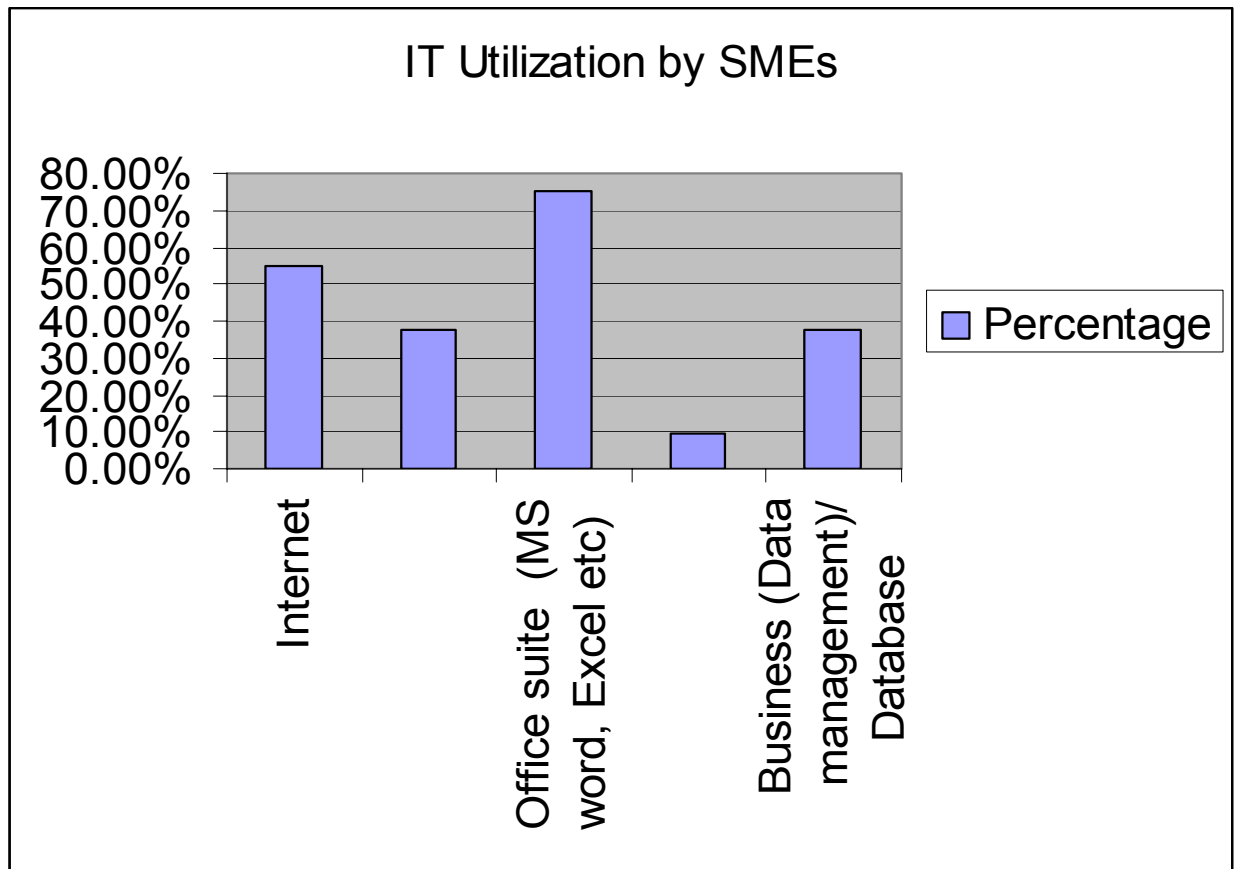


Figure 3.1 IT utilization by SMEs

### 3.5.2.2 Methods of software acquisition

Figure 3.2 summarizes software acquisition methods by SMEs. Out of the 40 SMEs that use computers, only 12.5% indicated that they use application programs customized by programmers and found it to be effective, equally 12.5% indicated that it wasn't effective. 15 out of 40 uses off the shelf applications and the other 15 use software supplied by the hardware supplier. Over 70 % cited that delays, cost and little or no after sales service are the major problems they encounter with IT software retailers/developers and these are problems that need to be addressed. When it came to

methods of payment 5% subscribed to licenses, 82.5% got it for free and 10% did pay for it once and the rest didn't know. The researcher had suspicion that the high percentage of respondents who claimed to have received software for free had it probably installed by the hardware supplier, or it was open source or pirated software.

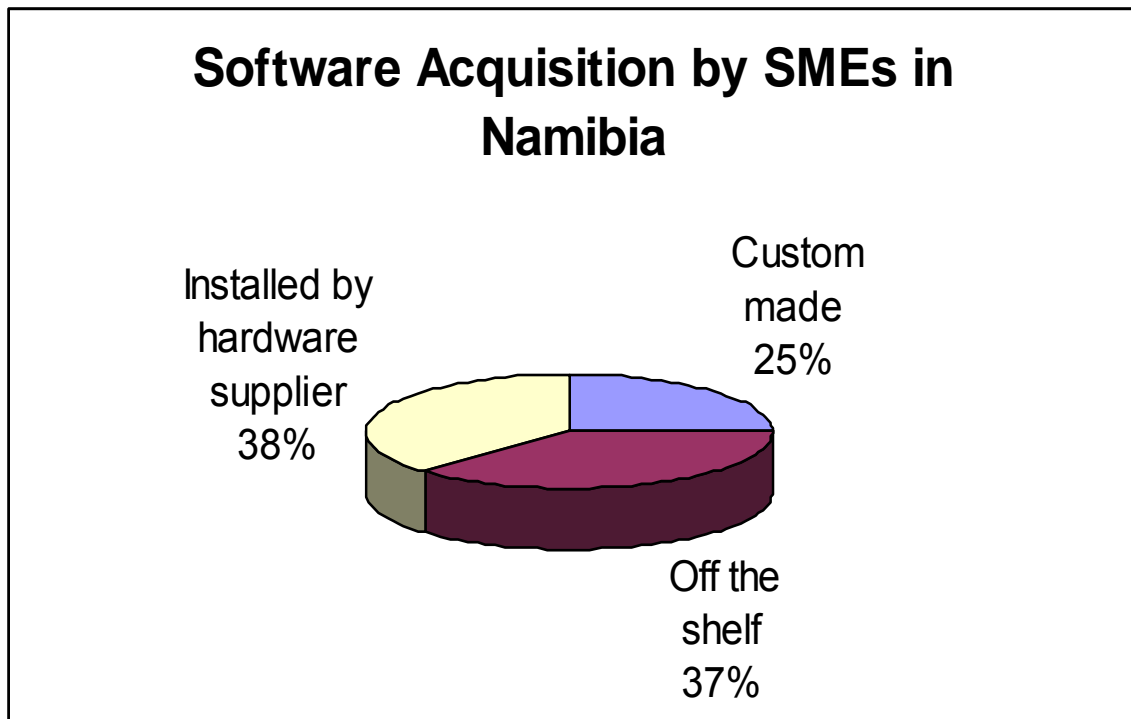


Figure 3.2 Software Acquisition

### 3.5.2.3 Attitudes towards outsourcing

From Table 3.1 it can be seen that, in the sample of companies, 22.5% indicated that their attitude towards use of software provided and hosted by another IT company is below average, the vast majority didn't see any problem with that, this led the researcher to believe that companies are willing to try out outsourcing of software. Outsourcing generally was not a new phenomenon as depicted in Table 3.2, 90% had rented services

such as networking, web hosting etc. The researcher felt that outsourcing could be a solution as 38 out of 40 companies did not have a single in house employee working on IT related issues such as development, maintenance, support or administration and he also believed that cost could be the main cause. 27 out of 40 (67.5%) of SMEs surveyed spent less than 5% of their total budget on IT.

|               |               |
|---------------|---------------|
| Good          | 7/40 = 17.55% |
| Very Good     | 11/40 = 27.5% |
| Average       | 20/40 = 50%   |
| Below Average | 9/40 = 22.5%  |

**Table 3. 1 SMEs attitude towards outsourcing**

|                                       |               |
|---------------------------------------|---------------|
| Internet access                       | 21/40 = 52.5% |
| Web hosting                           | 15/40 = 37.5  |
| Software installation and maintenance | 36/40 = 90%   |
| E-mail                                | 21/40 = 52.5% |
| Hardware installation and maintenance | 36/40 = 90%   |
| Network installation and maintenance  | 5/40 = 12.5%  |
| Other(s)                              | 0%            |

**Table 3. 2 ICT rented services by SMEs**

#### **3.5.2.4 Issues concerning use of ASP services**

Opinions pertaining to issues concerning the use of ASP services were sought, however the researcher didn't find any as no companies were found to be using these services. Issues such as cost, security, level of satisfaction are some of the things that needed to be analyzed.

### **3.5.3 Solutions to Hypotheses**

#### **3.5.3.1 Solution to Hypothesis 1:**

Hypothesis 1 (H1) stated that “There exists at least limited (15% or more) use of Application Service Provision services by Small and Medium Scale enterprises (SMEs) in Namibia” Out of 53 businesses surveyed for using ASP, Use of Application Service Providers services by SMEs in Namibia is non-existent. None of the companies surveyed filled in section D questionnaire 1. This section was meant for companies using ASP services.

#### **3.5.3.1.2 Solution to Hypothesis 2:**

Adoption of Application Service Provision is feasible in Namibia. This is clearly indicated by the existence of the internet and willingness of SMEs to find more about Application Service Provision. 80% of the companies that were using computers were willing to find out more about ASP. The level of computer usage is relatively above average (75.5%), and of this 72.5% were using the internet for one reason or the other. SMEs are also involved in ICT outsourcing services such as web hosting, software, hardware and network installation and maintenance etc were commonly being outsourced. ICT companies were also having SMEs as their major clients (76.47% of ICT companies provided services to SMEs and out of these 41.18% cited SMEs as being their main customers). A prototype model was successfully developed to support this hypothesis (further discussion of the model can be found in chapter 4).



### **3.5.3.3 Solution to Hypothesis 3:**

Hypothesis 3 (H3) stated that “Adoption of the Application Service Provision model *can* reduce software costs for Small and Medium Scale enterprises (SMEs)”. The researcher found it difficult to come to credible conclusion as no companies were found to be using ASP services and hence their opinions about efficiency in utilization of these services was non-existent. The opinions sought included cost of services, quality of services and willingness to continue using ASP services in the near future.

## **CHAPTER 4**

### **4.0 The prototype: Hotel Accommodation System**

#### **4.1 Introduction**

Tourism is one of the major foreign exchange earners in Namibia, therefore hotel reservation and accommodation for tourists plays an important role in supporting this economic activity. The researcher felt developing a vertical ASP model for hotel accommodation could act as a prototype to support small and medium scale establishments that offer services to international as well as domestic tourists. With adoption of internet standards such an application can be shared by several SMEs.

This database system will support in administration and running of day-to-day operations of hotel outlets. The prototype is based on generic data recorded, maintained and accessed by the hotel staff.

#### **4.2 The Hotel Accommodation Systems (HAS) Development**

As mentioned before the following stages to place in the analysis and design of the prototype:

- Analysis
- Data modeling
- Database design
- Construction of the database

- Loading data
- Developing the application system
- Configuring the environment
- Deploying the finished system on the network

### **4.2.1 Analysis**

Before performing the analysis, the objectives or goals of the project were clearly defined. The main goal was to develop a software application system that can be used by an application service provider to offer services to hotel establishments in managing and administering accommodation needs. The application will be shared by these establishments through use of existing internet technology.

#### **4.2.1.1 Data requirements**

Data requirements describe the characteristics of the data to be stored in the proposed system.

##### Guests

When a customer visits a hotel he/she is first allocated a unique customer ID.

The following information is stored about customers:

- Guest ID
- First name
- Surname
- Passport/ ID number
- Nationality

- Address
- phone
- city
- Next of kin
- Comments
- Hotel ID

### Staff

All hotels have a general manager with several managers and supervisors working under the general manager. The duties of the manager are to ensure smooth management. The other managers and supervisors are to help the general manager in day to day administration. Under the supervisors we have the subordinate staff e.g. cleaners, clerks etc.

The following is the information stored about each staff:

- Staff number
- First name
- Surname
- Position
- Gender
- Date of birth
- Immediate manager or supervisor above
- Hotel ID

### Hotel rooms

Each hotel also maintains information about every room for accommodation in its establishment.

Details about rooms include;

- Room number
- Supervisor/manager in charge
- Category of the room
- Daily rate
- Room description
- Status of occupation(Yes or No)
- Hotel ID

### Leases

A customer may use a room for any given amount of time; which may be several day/nights or weeks or months. The management of each hotel decides the terms and conditions for the lease.

The following is the data stored about each lease:

- Unique lease number
- Customer ID
- Room number
- Date from

- Date to
- Deposit
- Hotel ID

### Invoices

Each customer may be given an invoice before or after using accommodation services of a hotel. Each invoice has a unique number.

The data stored on each invoice includes:

- Invoice number
- Lease number
- Customer ID
- Room number
- Date of invoice
- Date from
- Date to
- Method of payment
- Amount
- Hotel ID

### Hotels

Information about each hotel must be stored. Each hotel is uniquely identified by a hotel number.

The following details are stored about the hotel:

- Hotel ID
- Hotel name
- Hotel address
- Manager
- City
- Phone

### Users

Information about every user is stored in the database. This is important for creating views. Email addresses are also stored here to facilitate communication with the database administrators.

Details stored about users are:

- User ID
- Email address
- Phone
- Hotel ID

### Categories

Each hotel has got categories of rooms. A room under each category has got a different price. For example a room may be a single room or a double room.

Information stored about each category includes:

- Category code

- Category name
- Daily rate
- Category description
- Hotel ID

### Bookings

The guest can book or reserve a room in advance

Details include:

- Booking ID
- Date from
- Date to
- Guest ID
- Room ID
- Booking status code (confirmed or provisional)
- Description
- Hotel ID

### Room facilities

A room in a hotel has basic facilities and special facilities for the guest; the type of facilities in a room determines the rate of pay, examples of mini bar, television, internet etc.



Description of data about facilities includes:

- Facility code
- Facility description
- Hotel ID

#### **4.2.1.2 Transaction and Functional requirements**

A transaction requirement describes an action or series of actions carried out by a single user or application program, which reads or updates the contents of the database.

Transaction requirements form the basis for functional requirements.

Transaction requirements entail the following:

- Data Entry
- Data update/deletion
- Data queries

Functional requirements describe the characteristics the processes of the proposed system and the overall system should have. Each function is identified and described. Some functions are dependent on other functions. Proper organization of these functions aids in creating a menu to navigate the entire application developed [33]. Processes include adding, deleting and updating data and producing reports.

At the root the application will have forms, reports and procedures as high level functions. Forms will be used for data entry and updating, the report function will be

used for creating reports and procedures will be used for creating SQL or PL/SQL objects.

Forms will be used in maintaining guests, hotels, rooms, staff, invoices and leases.

### **Reports generated**

Reports that will present the following details of information will be generated:

- i. List names, address, phone, passport/id number and nationality of a guest.
- ii. List room number and comments made by a guest.
- iii. List details of staff.
- iv. List details of room facilities.
- v. Present a report on rooms that are unsatisfactory.
- vi. List rooms that are occupied and names of guests in them.
- vii. Display details of total fee paid by given guest.
- viii. Present a report listing a guest's names, address and phone for each guest with outstanding balance.
- ix. Display details of rooms in a given category.

### **User interface**

The user interface should be easy to use for entering, changing, deleting and querying the data. The users should be able to navigate through the necessary forms and reports through use of links. The user should also be able to view or print reports that they have access to.

#### **4.2.2. Data model and Database design**

A data model is a descriptive representation of a data structure and it makes it easier to understand the meaning of data. Data models are sometimes classified according to purpose. They are sometimes classified according to modeling style. A complete classification requires a specification of purpose and style. Building a data model requires answering questions about entities, relationships and attributes [36]. Database and computer system design involves identifying and defining individual data elements and devising logical groupings for storing and processing them.

Figures 4.1 and 4.2 represent the model used in this paper. Figure 4.1 shows a simple entity relationship diagram which is a high level view of data and includes major entities and their relations, while Figure 4.2 shows the low level ER diagram which can also be called the physical ER diagram as it shows the actual tables used in the implementation of the database.

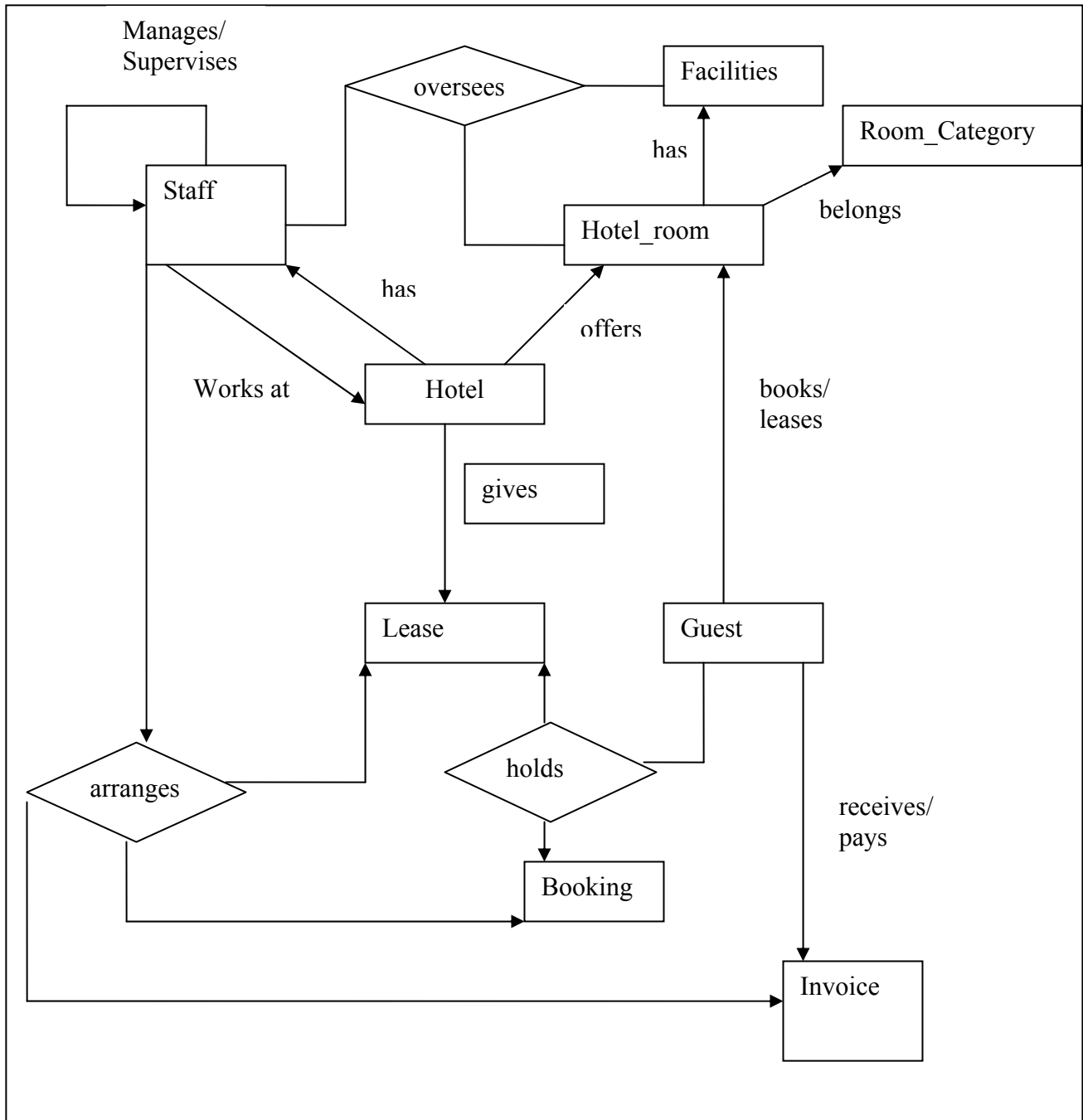


Figure 4.1 Simple entity relationship diagram

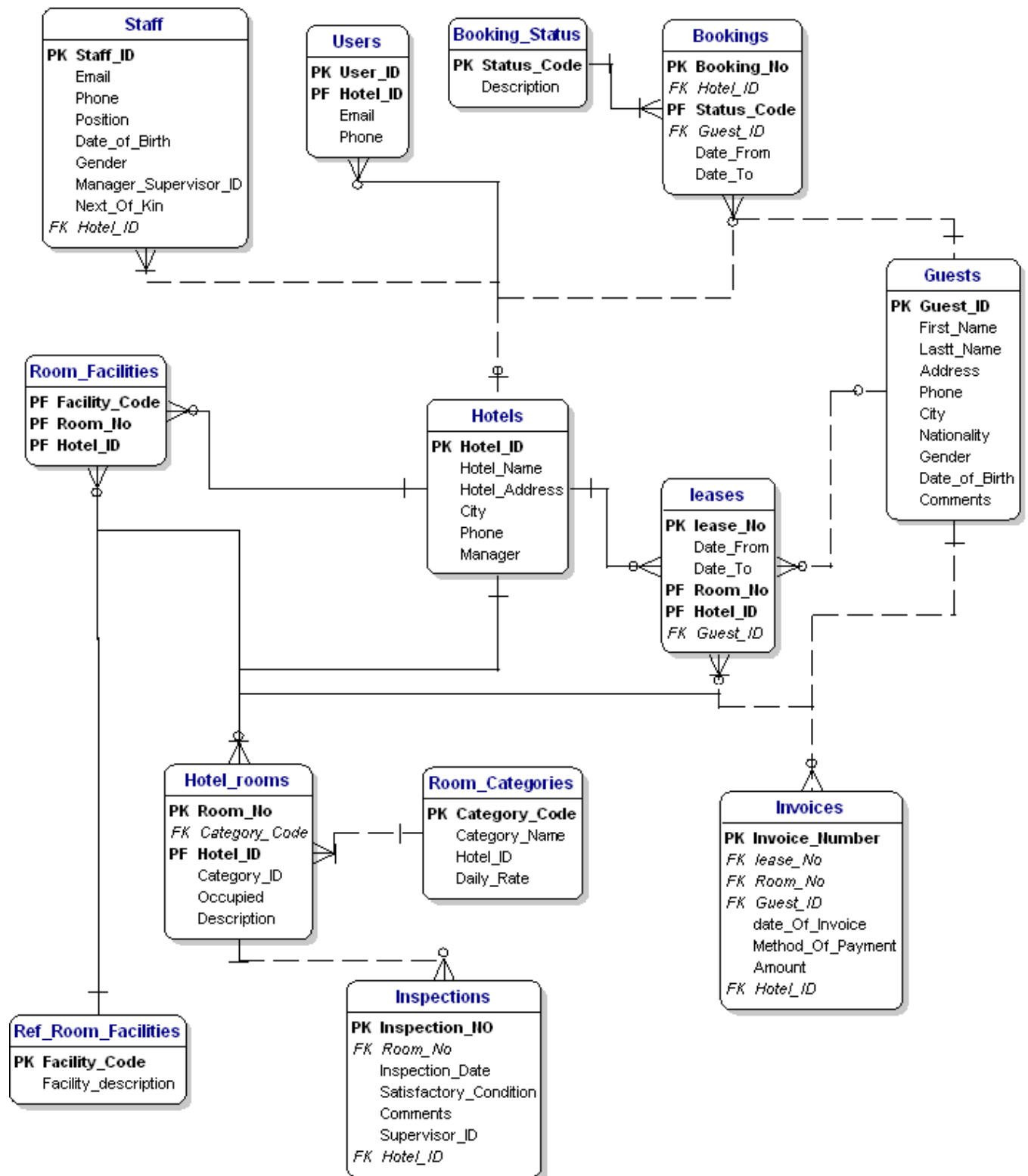


Figure 4.2 Physical ER model

### 4.3 The Tools and System Architecture of HAS

Users of HAS will access it through the web. The concept of the Web is being continuously pushed to new heights. The concept of enabling clients to access and run applications through Web interfaces is one of the latest developments of the Web.

The Web infrastructure illustrated in Figure 4.3 of the present day consists of, but is not limited to, Web servers, application servers, backend database server, cache servers, proxy servers, and edge servers in various shapes, sizes and configurations depending on the operational requirement of the business providing the service.

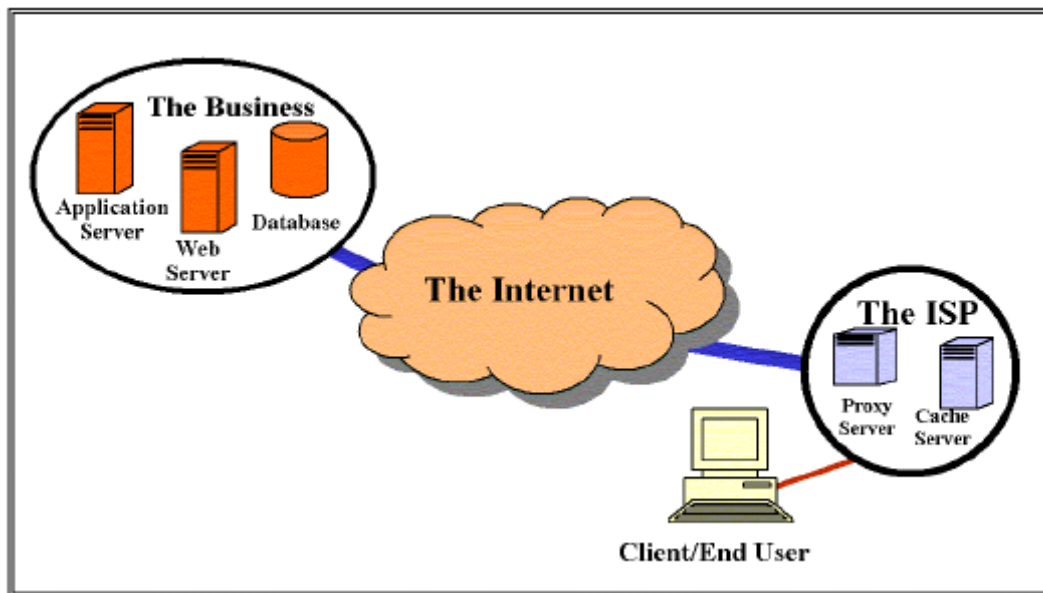


Figure 4.3 Simple Web Infrastructure

The prototype application was implemented in Oracle database 10g express edition for the database and oracle application express for the web based user interface.

Oracle database 10g express edition (Oracle Database XE) is an entry-level, small-footprint database based on the Oracle Database 10g Release 2 code base that's **free** to develop, deploy, and distribute; Oracle Database XE is a great starter database for:

- Developers working on PHP, Java, .NET, XML, and **Open Source applications**
- DBAs who need a free, starter database for training and deployment
- Independent Software Vendors (ISVs) and hardware vendors who want a starter database to distribute free of charge
- Educational institutions and students who need a free database for their curriculum

Oracle Database XE includes Oracle Application Express (Oracle APEX), a declarative, graphical development environment for creating database-centric Web applications. Oracle APEX is installed in Oracle Database XE as the primary tool for managing the database and building Web-based applications. Oracle HTTP Server (Apache) with mod\_plsql can be used in three tier architecture as illustrated in Figure 4.4.

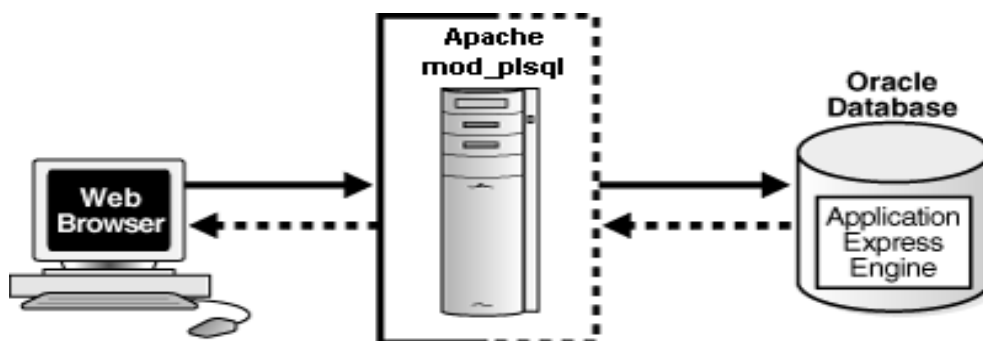
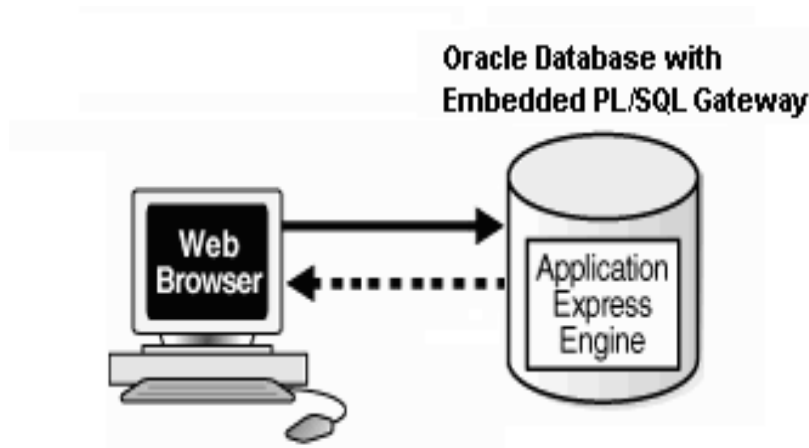


Figure 4.4 Oracle HTTP server with mod\_plsql

With Oracle Database 10g Express Edition, one can use the embedded PL/SQL gateway instead of the Oracle HTTP Server and mod\_plsql. Figure 4.5 illustrates the architecture using the embedded PL/SQL gateway.



**Figure 4.5 Oracle database with embedded PL/sql gateway**

The embedded PL/SQL gateway provides the Oracle database with a Web server and also the necessary infrastructure to create dynamic applications. The embedded PL/SQL gateway runs in the XML DB HTTP server in the Oracle database and includes the core features of mod\_plsql, but does not require the Oracle HTTP Server powered by Apache. Inclusion of the embedded PL/SQL gateway simplifies the architecture and eliminates the middle tier entirely

To view Oracle Application Express applications, the Web browser must support Java Script and the HTML 4.0 and CSS 1.0 standards. Ensure also that cookies are enabled.

The following browsers meet this requirement:



- Microsoft Internet Explorer 6.0 or higher
- Mozilla Firefox 1.0 or higher

## **4.4 Testing and Evaluation**

### **4.4 .1 Testing**

The finished system was tested using realistic data to determine whether the system performed according to the specification and requirements as set out in the requirements phase. Testing covered usability of the system. The web based user interface is easy to learn and use. However the acceptance test to be performed by randomly selected SMEs running hotels was not carried out due to time constraint. A large number of transactions were performed to assess the accuracy, safety and privacy of the system.

### **4.4 .2 Evaluation**

The evaluation process aimed at to assessing all the results of conducting the tests to determine whether the system succeeded or failed in meeting its stated objectives.

The main objective was to demonstrate the sharing of the application by SMEs. HAS was able to restrict users to view data that belongs to their hotel, hence the systems privacy and safety objectives were achieved. The system also allows multiple users to use the system simultaneously. One main failure during the testing and evaluation process was in involving the actual SMEs in testing the system; this would have given a clearer picture about the shortfalls of the system.

## **CHAPTER 5**

### **5.0 Conclusions and Further Research**

This research focused on outsourcing, specifically Application Service Provision as a way of software acquisition and sharing by SMEs in Namibia. The chapter discusses answers to thesis questions, conclusions drawn from the research, limitations and constraints and finally gives suggestions for further research.

Evolution of technology is taking place at a high pace. This evolution definitely impacts the way business is conducted all over the world. The internet has created many opportunities for all kinds of businesses (from small to large enterprises). However SMEs in Namibia seem to be lagging behind in keeping up with the technology trend.

### **5.1 Objectives and Research Questions**

#### **5.1.1 Overall objective:**

The overall objective of this research is to determine how SMEs can adopt the deployment of Application Service Provision, in order for them to embrace technology with the goal of reducing their information technology costs.

### **5.1.2 Specific objectives:**

1. To identify factors that determines the adoption of Application Service Provision among SMEs in Namibia. Some factors that will be observed are cost-effectiveness, self sufficiency etc.
2. To obtain a more detailed view of potential benefits of ASP as a form of commercial service based computing with the aim of mitigating costs of software acquisition and reduction of software piracy.
3. To survey the main supporting technologies for ASP, and in the process identify major challenges to the development of ASP applications and propose solution approaches.
4. To observe the information technology outsourcing patterns among small scale and medium scale enterprises in Namibia and characterize the overall IT and application service climate for SMEs.

### **5.1.3 Research questions**

Main questions that the researcher asked himself during analysis of data collected were:

1. What proportion of Small and Medium scale enterprises were using computers as a means of managing information in their businesses?
2. What methods of software acquisition were being used and problems encountered during software delivery?
3. What kind of ICT outsourcing were SMEs using?
4. What percentage level of SMEs is familiar with the ASP concept?

5. What is the general attitude of SMEs towards use of IT outsourcing and ASP services?
6. What kind of problems are being experienced by companies using Application Service provider's services

## **5.2 Results and Discussions**

### **5.2.1 Adoption and current status of ASP services by SMEs in Namibia**

The first hypothesis H1 was to test whether there exists at least 15% of usage of ASP services by SMEs in Namibia. Based on findings of data gathered, it was found that no SME utilized ASP services and hence the null hypothesis  $H_{10}$  was rejected. The alternative hypothesis  $H_{11}$  stated that “there exists little (less than 15%) or no use of Application Service Provision services by Small and Medium Scale enterprises (SMEs) in Namibia” and since results findings indicated that 0% of SMEs use software from ASP the alternative hypothesis was adopted. It also appeared that no ICT services company offered this form of outsourcing. The reasons for not offering ASP services were not investigated.

### 5.2.2 Feasibility of adoption of ASP concept

The main reason the researcher came up with hypothesis H2 was just in case he found out that there exists little or no use of ASP services in Namibia (from hypothesis H1)

Hypothesis H2 was formulated as follows:

Null hypothesis H2<sub>0</sub> : Adoption of Application Service Provision is feasible in Namibia.

Alternative hypothesis H2<sub>1</sub> : Adoption of Application Service Provision is not feasible in Namibia

As it appears from the results of sample data, Table 5.1 gives us a summary of data related to the above hypothesis

|  |       |
|--|-------|
| Companies that were using computers were willing to find out more about ASP  | 80%   |
| Level of computer usage by SMEs  | 75.5% |
| Proportion of SMEs that were using the internet for one reason or the other out of companies that were using computers       | 72.5% |
| In house IT staff  | 3.77% |
| Companies that experienced no problems(delays, cost, little) or no after sales service when it comes to software acquisition | 5%    |

**Table 5. 1 Summary of computer usage**

Findings do indicate that with that level of computer usage, existing infrastructure (the internet), and significant amount of problems experienced when acquiring software and low proportion of in house does point to the fact adoption of ASP is feasible and SMEs

may be willing to adopt it if they are enlightened about the concept and it proves to be a worthwhile investment. 67.9% of SMEs that use computers shows that they already outsource one form of service or another (networking, web hosting, hardware maintenance etc) from an ICT company; however no ICT service provider indicated offering of ASP services. The researcher was unable to come up with concrete reason as to why no ICT company in the sample did not offer application service provision as it could be lack of awareness or business viability and so on.

Any conclusions drawn from this investigation must be qualified by an acknowledgement of the limitations inherent in the design of the study. The limitations include use of a separate questionnaire or section of a questionnaire to determine technology adoption process by SMEs. This questionnaire together with the other questionnaires used would have given the author a clear graphical picture about the process and problems encountered during adoption of a new Information and Communication Technology concept.

### **5.2.3 The cost factor and ASP**

Another purpose of this investigation was to discover whether acquisition of software through an Application Service Provider reduced costs for SMEs in Namibia. The results of this study did not provide any answer, as no SME was found to be using this service. This being the first research on ASP the researcher believes it has provided a platform for further work in the area of outsourcing and application service provision in Namibia.

### **5.3 HAS Prototype**

A web based application system was developed. The aim of developing the HAS system was to demonstrate that it can be used as an example of ASP software and enterprises in the same line of business can use this shared application via the internet. The system can be used to assist the management of hotels with administration of rooms for accommodation. The application software developed can be shared across several hotel establishments with each hotel being able to view only its data; hence security was one factor that was given priority in design of this system.

The prototype also played a role in guiding the research process by helping the researcher on focusing his mind on issues concerning application service provision. The author believes studying various business processes in a particular line of business is important in coming up with a shared application. The objective of designing the system was fulfilled.

### **5.4 Problems faced**

The following are some of the problems faced during the development of this thesis

- Data could not be gathered outside the Windhoek city as traveling costs proved to be prohibitive.
- Some respondents to the questionnaire did not fill in the required data and some questionnaires were returned incomplete, in some instances the researcher had to follow up in order to obtain data. This proved to be time consuming.

- One supervisor went on a transfer to a different university outside the country.

The author therefore did not have the convenience of face to face supervision.

### **5.5 Suggestions and Recommendations for Further Work**

- The government, through a relevant ministry like the Ministry of Trade and Industry, could consider establishing and funding ASP providers who can host ASPs servers in order to provide services to SMEs. This will go a long well in boosting SMEs in their endeavor to grow.
- Distributed rather than centralized processing can be used to improve efficiency and reliability of ASPs servers.
- Since it was discovered that none of SMEs were using an Application Service Provider services, the researcher suggests that a randomly selected group of companies can be provided with ASP services for case study purposes. This will provide a better understanding of the ASP concept in Namibia.
- Institutions like universities should encourage research on outsourcing patterns for SMEs especially in the area of Information and Communications Technology



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## APPENDIX 1-A

### Questionnaire for SMEs

#### Questionnaire

*Thank you, for participating in this questionnaire. The researcher is very pleased to be able to offer you this survey to assure your input into important business and information technology issues.*

#### Section A

1. Company name  
(optional) \_\_\_\_\_
2. Which of the following categories best describes your organization?  
 service organization  manufacturing
3. Does your business have branches within Namibia?  Yes  No
4. Do you use computers in your organization?  Yes  No

If yes for what purposes please select from below

|   |                          |
|---|--------------------------|
| <input type="checkbox"/> Internet                             | <input type="checkbox"/> |
| <input type="checkbox"/> Finance/Accounting                   | <input type="checkbox"/> |
| <input type="checkbox"/> Office suite (MS word, Excel etc)    | <input type="checkbox"/> |
| <input type="checkbox"/> E-commerce                           | <input type="checkbox"/> |
| <input type="checkbox"/> Business (Data management)/ Database | <input type="checkbox"/> |

Other please  
specify \_\_\_\_\_

5. Do you agree/ disagree with the following statement.  
Companies in Namibia that implement and use various existing information technologies have a higher profile than companies that do not.  
 Agree  Disagree  I don't know

#### Section B

*(If you do not have computers please answer the following questions)*

6. What is the main reason for not using computers?  
 Cost                       My business doesn't need computers                       I don't know

7. Do you intend to acquire computers for your organization soon (in a year's time?)  
 Yes                       No                       I am not sure

If yes what will you mainly use it for

|   |                          |
|---|--------------------------|
| <input type="checkbox"/> Internet                             | <input type="checkbox"/> |
| <input type="checkbox"/> Office suite (MS word, Excel etc)    | <input type="checkbox"/> |
| <input type="checkbox"/> E-commerce                           | <input type="checkbox"/> |
| <input type="checkbox"/> Finance/Accounting                   | <input type="checkbox"/> |
| <input type="checkbox"/> Business (Data management)/ Database | <input type="checkbox"/> |

### **Section C**

*(If you do use computers in your organization please answer the questions in this section)*

8. How do you acquire your software (computer programs) that you mainly use for managing records in your business, indicate whether they are effective or not by ticking ✓)

|   | Effective | Not Effective |
|---|-----------|---------------|
| <input type="checkbox"/> Customized by programmers      |           |               |
| <input type="checkbox"/> Off the shelf (ready made)     |           |               |
| <input type="checkbox"/> Installed by hardware supplier |           |               |

9. What problems do you experience between your company and IT software retailers/developers in terms of delivery?

Delays                       Little or no after sales service  
 No problem                       Cost (expensive)  
 other (please specify below)

10. Method of payment for the software

Software subscription (Annual Licenses)                       one off costs (pay once)  
 Free                       I don't know

11. How many computers does your organization have?

1-5                       5-10                       more than 10

12. What operating system do you mainly use?

Windows (98, 2000, XP)                       Linux/Unix

I don't know  Other (please specify)\_\_\_\_\_

13. If you are using a database in capturing, storing and managing your data, please specify which database management software you are using

Microsoft Access  Oracle  MySQL  Microsoft Sql Server

Other (Please Specify )\_\_\_\_\_

14. Do you have internet Access in your organization  Yes  No

If yes what is it used for

Browsing the internet  E-mail  E-commerce

Other (Please Specify )\_\_\_\_\_

15. What is the general company attitude towards use of software provided and hosted by another company?

Good  Very Good  Average  Below Average

16. What percentage of employees uses computers in their daily work?

0-5%  6-10%  11-20%  21-30%  31-40%  over 40%

17. Do you rent any Information and Communication Technology (ICT) services, like (Networking, Web hosting (etc)

Yes  No

If yes please specify the services that you rent

Internet access  E-mail  Web hosting  
 Hardware installation and maintenance  Network installation and maintenance  
 Software installation and maintenance

Other(s) (please specify)\_\_\_\_\_

---

18. Which of the following categories of employees use rented Information Technology (IT) services?

Top management (managers, supervisors etc)  
 Operational staff (e.g. clerks, cashiers etc)

Technical staff (technicians, network administrators, Database administrators etc)

19. Are there any employees in your organization that work with it related issues such as, for instance development, maintenance, support, or administration?

Yes                       No

If yes please specify what they work with \_\_\_\_\_

—

20. What software applications do you rent, you do not rent, you do not use?

|   | We do rent | We do not rent | Do not use |
|---|------------|----------------|------------|
| Office suite (eg Microsoft Word, Excel)       |            |                |            |
| E-mail systems                                |            |                |            |
| Enterprise & Resource Planning (ERP) systems  |            |                |            |
| E-Commerce                                    |            |                |            |
| Website                                       |            |                |            |
| Payroll system                                |            |                |            |
| Accounting/finance system                     |            |                |            |
| Customer Relationship Management (CRM) System |            |                |            |

Do you rent any other software application? Please specify below

21. Do you agree with the following statements about internal IT development?  
(Please tick the appropriate cell)

|   | Strongly Agree | Agree | Disagree | Strongly Disagree | No Comment |
|---|----------------|-------|----------|-------------------|------------|
| Internal IT development offers a better way to get needed IT functionality          |                |       |          |                   |            |
| Internal IT development is a better way to avoid being dependent on network failure |                |       |          |                   |            |
| Internal IT development offers less threat of IT becoming obsolete (old)            |                |       |          |                   |            |

22. What is your IT budget as percentage (%) of total company budget?

Less than 5 %       6-10 %       11- 15 %       more than 15%



23. Of all IT budget in your company, what percent (%) is allocated for IT outsourcing (Hiring IT Services) to external party?

- 0%       Less than half       More than half

24. What type of IT outsourcing does your company do? (check all that apply)

- None                                       Data Entry  
 Application development/ customized software programs  
 Application /Software maintenance  
 Data storage  
 Network management  
 IT consulting  
 Disaster recovery  
 IT services from application service provider  
 Other(s) (please specify)
- 
- 

25. Are you familiar with the ASP (*Application Service Provider*) Concept?

- Yes                                       No

Definition of *Application Service Provision*

26. Does your company use ASP services?

- Yes                                       No

27. If your company does NOT use ASP services please select the statement that mostly suits you

1.  We don't intend to use services of ASPs
2.  We Still need to find out more about ASPs
3.  We intend to use services of ASPs in the near future

In case of option 1 above for what reason has your company considered not to use IT services from ASP in the near future

## Section D

*(This section is for companies that are using ASP services)*

1. How does the outcome of using ASP concept agree with your expectations?

- Long implementation period
- The application follows ICT development
- Problems with network connections
- Security in external IT operation
- Control of data and Security

2. Do you agree that the following statements are important for the decision to choose a specific provider?

|   | YES | NO | NOT SURE |
|---|-----|----|----------|
| A. The provider should have systems of tracking ensuring that the promised functionality is ensured           |     |    |          |
| B. the provider should have service level agreements that regulate reliability and security in the networking |     |    |          |
| C. The provider should have service level agreements that stipulate the response time for the applications    |     |    |          |

3. Do you agree that the following criteria have been fulfilled with the external provision of IT services

|   | AGREE | DISAGREE | NOT SURE |
|---|-------|----------|----------|
| A. lower costs for implementations                          |       |          |          |
| B. lower costs for IT                                       |       |          |          |
| C. lower costs for services                                 |       |          |          |
| D. Better accessibility to the best IT personnel & services |       |          |          |
| E. Better support for users                                 |       |          |          |
| F. increased opportunities to implement IT faster           |       |          |          |

4. Do you agree with the following statements about renting software hosting services?

*(A- Agree, SA-Strongly Agree, D-Disagree, SD- Strongly Disagree, NS- Not Sure).*

*Please tick an appropriate cell*

| Statements   | SA | A | D | SD | NS |
|--|----|---|---|----|----|
| Our organization is satisfied with the security offered by the ASP |    |   |   |    |    |
| Our organization is satisfied with how software piracy is handled  |    |   |   |    |    |

|   |  |  |  |  |  |
|---|--|--|--|--|--|
| by the ASP  |  |  |  |  |  |
| Our organization is satisfied with how ASP informs us         |  |  |  |  |  |
| Our organization is satisfied with how ASP handles IT hosting |  |  |  |  |  |

5. What kind of applications/software programs from the ASP are you using? Check all that apply.

- Accounting/Finance                       Database                       E-mail  
 E-commerce                                       Enterprise Resource planning (ERP)  
 Human Resources                               Customer Relationship Manager (CRM)  
 Data Warehousing                               Supply Chain Management

6. How long has your company been using ASP services?

- Less than 1 month       1-6 months       7-12 months       1-2 years  
 more than 2 years

7. Give your opinions on the following reasons

(A-Agree, D- Disagree, NS-Not Sure)

|      |  | A | D | NS |
|------|--|---|---|----|
| i    | Using services of ASP does will enable my company to accomplish tasks more quickly |   |   |    |
| ii   | Using services of ASP will enhance/enhances on the job effectiveness of my company |   |   |    |
| iii  | Using services of ASP makes it easier for my company to do business                |   |   |    |
| iv   | Using ASP services will improve the quality of my work                             |   |   |    |
| v    | Using ASP services gives my company greater control over my company work           |   |   |    |
| vi   | Using services of ASP is clearer and understandable for my company                 |   |   |    |
| vii  | Using services of ASP is compatible with all aspects of my company's work          |   |   |    |
| viii | The impact of using ASP services is apparent to my company                         |   |   |    |
| ix   | Using services of ASP reduces IT infrastructure investment in the company          |   |   |    |
| x    | My company finds there are no investment problems in using services of ASP         |   |   |    |
| xi   | My company finds that there are risks in using ASP services in future              |   |   |    |

8. After using services of ASP so far, which of the following reflects your future intentions?

- i. We will stop using services of ASP

- ii. We will continue to use services of ASP
- iii. We will use services of ASP almost totally for our IT services

9. Does your company have other specific reasons in deciding to use services from AS?  
If YES, please write them here

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## APPENDIX 1-B Questionnaire for ICT companies

### Questionnaire

*Thank you, for participating in this questionnaire. The researcher is very pleased to be able to offer you this survey to assure your input into important business and information technology issues.*

1. Company name (optional)

---

2. Which of the following categories best describes the customers you do offer services to (choose all that apply)

- Private persons  large enterprises
- Small and medium scale enterprises
- Non Governmental Organizations and Government institutions

Of the above which are your main customers?

---

—

3. What services do you offer to your clients? Choose all that apply

- Data Entry
  - Web hosting
  - computer hardware retail
  - Software retail (off the shelf applications)
  - Application development/ customized software programs
  - Application /Software maintenance
  - Data storage
  - Network (management & operation)
  - Computer hardware installation, maintenance, & repair
  - IT consulting
  - Disaster recovery
  - Other(s) (please specify)
- 
- 

—

---

–

4. If you do supply software to your clients, what is the **main** method of payment (licensing)

- software subscription (annual licenses)
- one off costs (pay once)
- free (use of open source)

5. What software applications do you supply?

|                          |  |
|--------------------------|--|
| <input type="checkbox"/> | Office suites                                  |
| <input type="checkbox"/> | E-mail systems                                 |
| <input type="checkbox"/> | Enterprise & Resource Planning (ERP) systems   |
| <input type="checkbox"/> | E-Commerce                                     |
| <input type="checkbox"/> | Website  |
| <input type="checkbox"/> | Payroll system                                 |
| <input type="checkbox"/> | Accounting/finance systems                     |
| <input type="checkbox"/> | Database applications                          |
| <input type="checkbox"/> | Customer Relationship Management (CRM) Systems |

Others please specify

---

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6. Does your company have a Research and Development department?

- Yes
- No

If yes what are the main areas

- networking services
- software development/ acquisition for customers
- web services and maintenance

Others please specify

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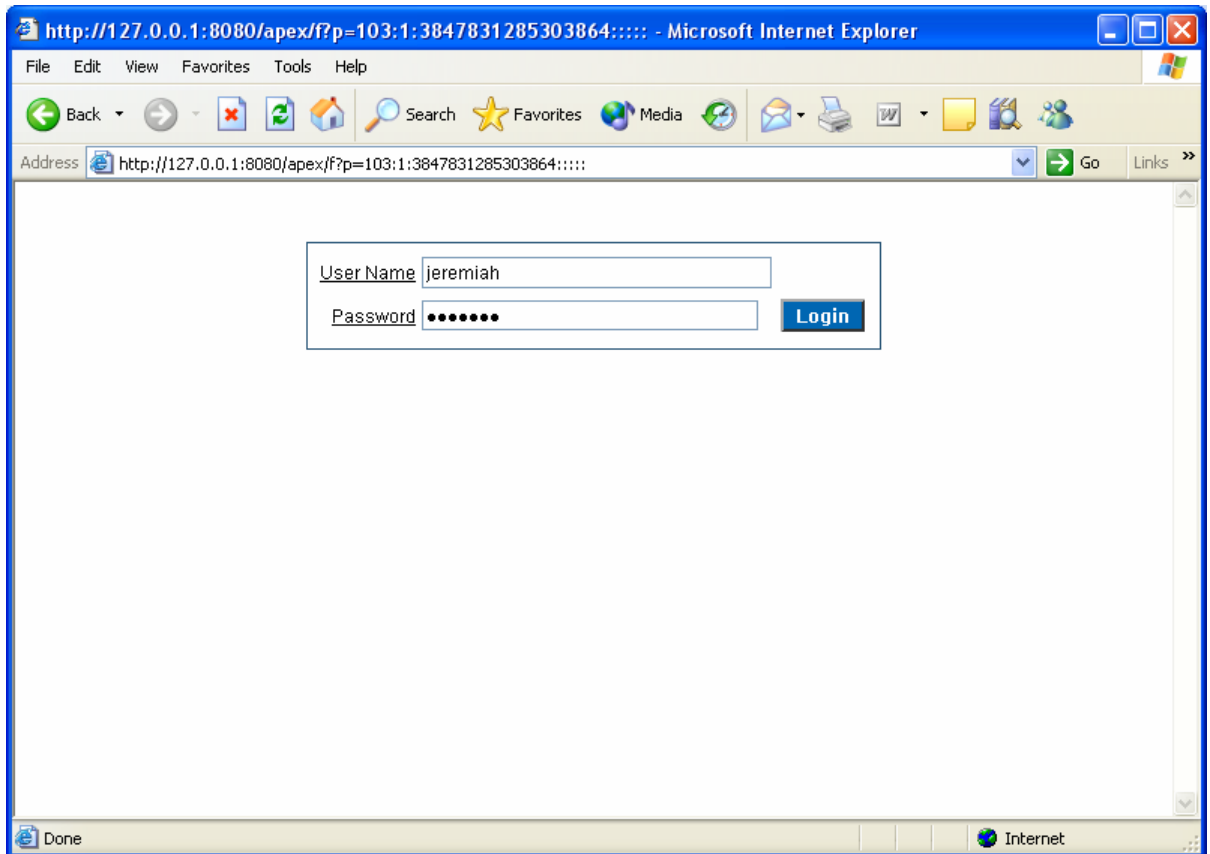
## **APPENDIX 2 – A walk through the HAS Application**

Hotel Accommodation System (HAS) application consists of two major components, a web based interface designed using Oracle Application Express and a database using Oracle 10g express edition. HAS being a web based browser application is launched through a uniform resource locator (URL) address. Once the correct URL has been entered the first screen is a login in screen that authenticates the user.

### A2.1 The login screen

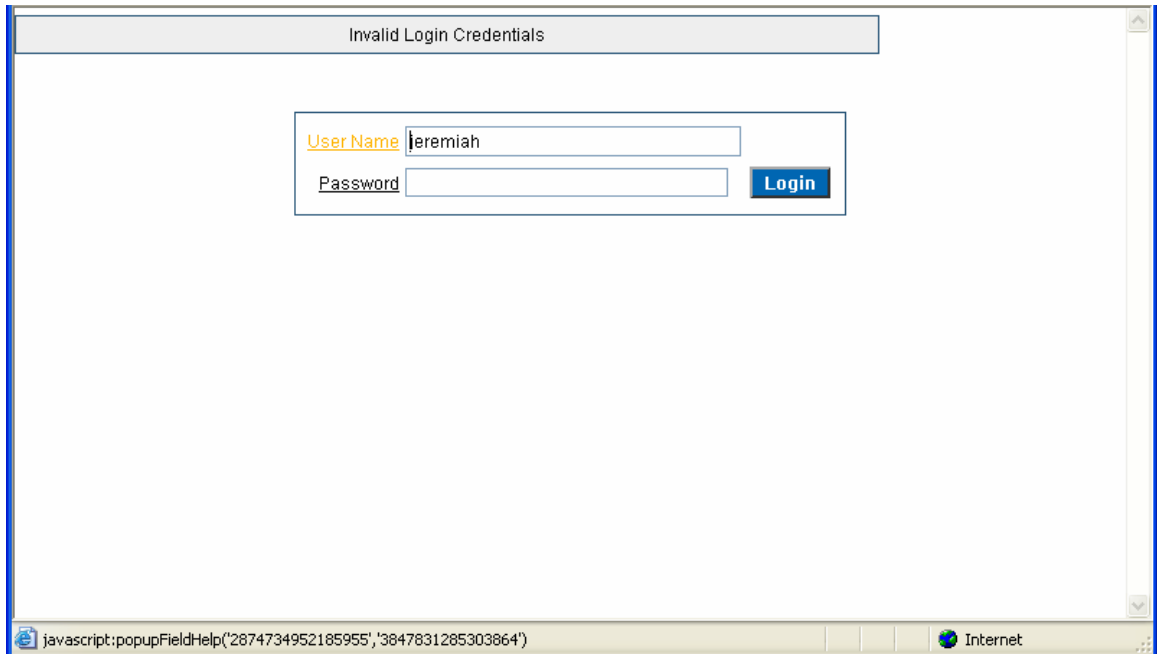
Access to the database is password controlled. User accounts are managed by the administrator, a user can only be able to login if his/her username and password exist in the database. The login in screen appears as shown in Figure A2.1.





**Figure A2.1 login in screen 1**

If the user enters the wrong user name or password the following screen in Figure A2.1 appears.



**Figure A2.2 Unsuccessful logon screen**

After successful login the user is taken to the home page Figure A2.3

## A2.2 The Home page

With the home page of the application one can go to any desired direction within the application, this navigation is made possible by inclusion of links which simplifies the experience of using the application.

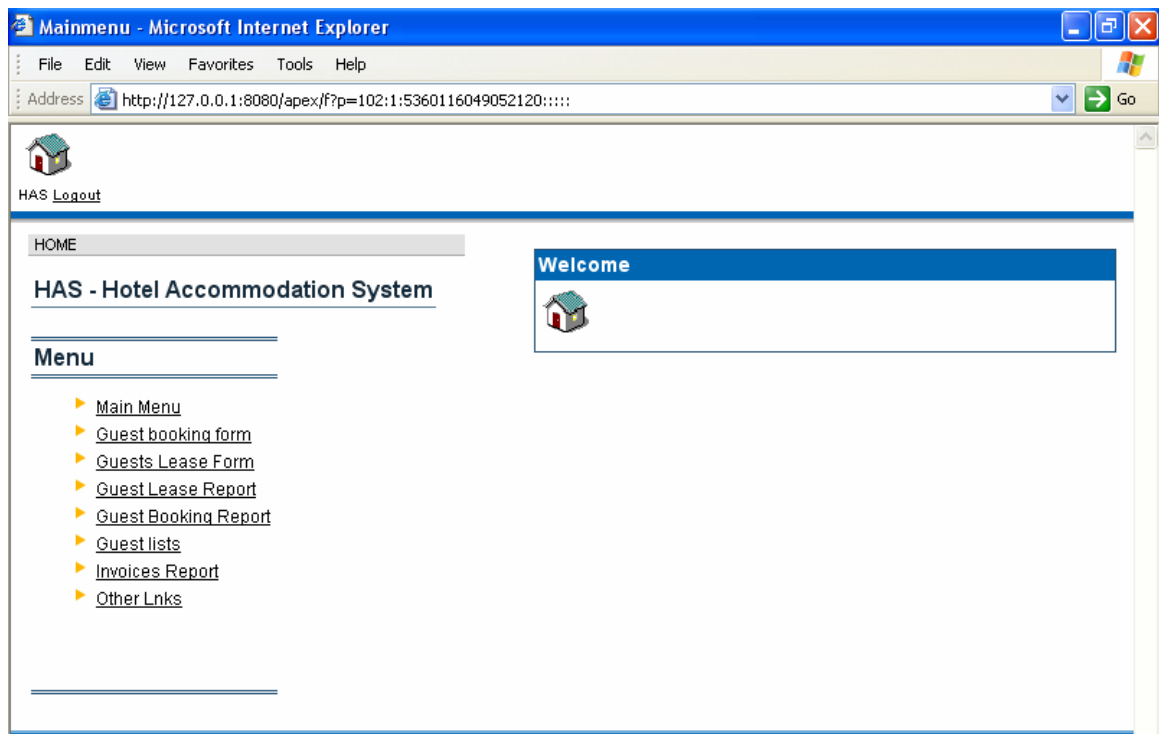


Figure A2.3 Home Page

## A2.3 Guest Booking

When a visitor clicks on the *Guests Booking form* link, this page with text boxes to capture guest and booking details is displayed. The user can also click on the hotel rooms button to view available rooms and navigate back to enter details.

**Form on GUEST BOOKINGS**

\* First Name

\* Last Name


\* Address

Phone

City

Nationality

Gender


Date Of Birth  


Comments

\* Status Code(1-confirmed or 2-provisional)

\* Hotel Id

\* Room No

Date From  

Date To  

**Figure A2.4 Guest Booking form**

#### A2.4 Guest Lease Form

The *Guest Lease form* link allows the user to enter guest and lease details into the system at same time. After entering all the details the user clicks on create to store the information

**Guest Lease Details**

Cancel
Create

\* First Name

\* Last Name

\* Address

Phone

City

Nationality

Gender

Date Of Birth

Comments

\* Hotel Id

\* Room No

Date From

Date To

**Figure A2. 5 Guest Lease Form**

### A2.5 Guest Lease Report

A click on this link takes one to a report with guest and lease details of all guests using or who have used accommodation facilities of the hotel. Clicking on create takes the user to an entry form discussed above for entering new information and clicking on edit button on the row allows the user to delete or alter information

Lease Report

## GUESTS LEASES REPORT

Create

| Edit | First Name | Lastt Name | Address | Phone    | City     | Nationality | Gender | Date Of Birth | Comments    | Lease No | Hotel Id | Room N |
|------|------------|------------|---------|----------|----------|-------------|--------|---------------|-------------|----------|----------|--------|
| Edit | Anthony    | George     | 7837    | 541814   | windhoek | Naminian    | M      | 28-FEB-75     |             | 12       | 300      | 303    |
| Edit | Tina       | James      | 305     | 159634   | Windhoek | Namibian    | F      | 15-MAY-76     |             | 13       | 300      | 301    |
| Edit | Jeremiah   | Lumbasi    | 1000    | 081-1000 | Windhoek | Kenyan      | M      | 30-AUG-07     |             | 15       | 300      | 301    |
| Edit | Sarah      | Njuguna    | 8937    | 181117   | Windhoek | Namibian    | F      | 01-JUL-74     |             | 5        | 300      | 302    |
| Edit | John       | Michael    | 34293   | 162158   | Windhoek | Namibian    |        | 14-JAN-68     |             | 4        | 300      | 304    |
| Edit | Nelly      | Kasyoka    | 587     | 411610   | Windhoek | Namibian    |        | 04-MAR-66     |             | 2        | 300      | 203    |
| Edit | Karen      | Otieno     | 2196    | 421016   | Windhoek | Namibian    |        | 03-APR-66     |             | 3        | 300      | 101    |
| Edit | Janet      | Mburu      | 33889   | 159613   | Windhoek | Namibian    |        | 13-JAN-34     | No comments | 1        | 300      | 104    |
| Edit | Bruce      | Nyaga      | 44984   | 119114   | Windhoek | Namibian    | M      | 07-MAY-46     |             | 6        | 300      | 102    |

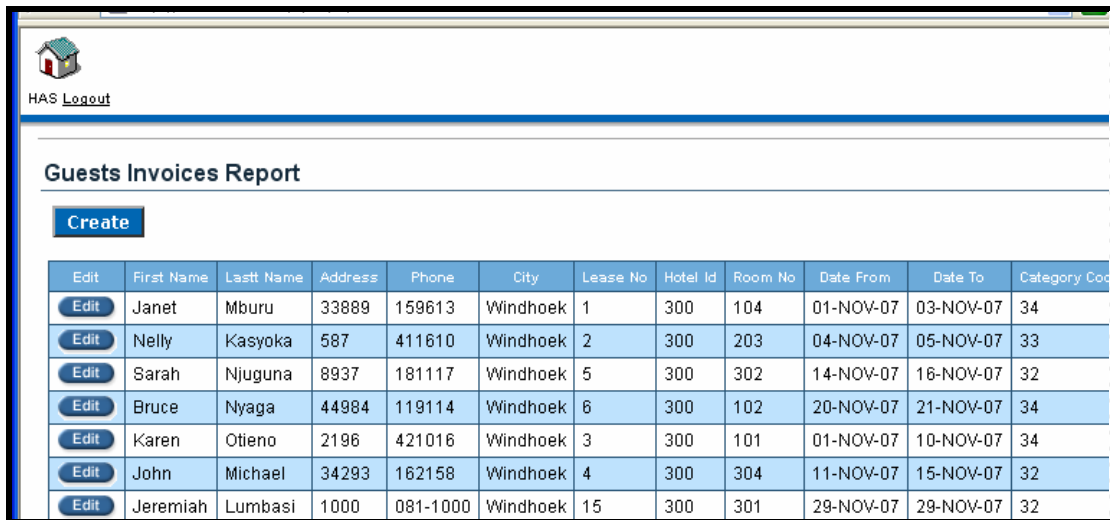
**Figure A2. 6 Guest Leases Report**

### A2.6 Guest Booking Report

Similar to the above report but it shows booking details instead of lease details of guests.

## A2.7 Invoices Report

This report shows the invoice details of a guest including the amount payable and the amount paid. Clicking on the edit button will take one to an invoice form of a particular customer where the amount paid can be entered.



The screenshot shows a web application interface. At the top left, there is a house icon and the text 'HAS Logout'. Below this is a blue header bar with the title 'Guests Invoices Report'. Under the header is a blue button labeled 'Create'. The main content is a table with 12 columns: Edit, First Name, Last Name, Address, Phone, City, Lease No, Hotel Id, Room No, Date From, Date To, and Category Code. The table contains 8 rows of data, each with an 'Edit' button in the first column.

| Edit                 | First Name | Last Name | Address | Phone    | City     | Lease No | Hotel Id | Room No | Date From | Date To   | Category Code |
|----------------------|------------|-----------|---------|----------|----------|----------|----------|---------|-----------|-----------|---------------|
| <a href="#">Edit</a> | Janet      | Mburu     | 33889   | 159613   | Windhoek | 1        | 300      | 104     | 01-NOV-07 | 03-NOV-07 | 34            |
| <a href="#">Edit</a> | Nelly      | Kasyoka   | 587     | 411610   | Windhoek | 2        | 300      | 203     | 04-NOV-07 | 05-NOV-07 | 33            |
| <a href="#">Edit</a> | Sarah      | Njuguna   | 8937    | 181117   | Windhoek | 5        | 300      | 302     | 14-NOV-07 | 16-NOV-07 | 32            |
| <a href="#">Edit</a> | Bruce      | Nyaga     | 44984   | 119114   | Windhoek | 6        | 300      | 102     | 20-NOV-07 | 21-NOV-07 | 34            |
| <a href="#">Edit</a> | Karen      | Otieno    | 2196    | 421016   | Windhoek | 3        | 300      | 101     | 01-NOV-07 | 10-NOV-07 | 34            |
| <a href="#">Edit</a> | John       | Michael   | 34293   | 162158   | Windhoek | 4        | 300      | 304     | 11-NOV-07 | 15-NOV-07 | 32            |
| <a href="#">Edit</a> | Jeremiah   | Lumbasi   | 1000    | 081-1000 | Windhoek | 15       | 300      | 301     | 29-NOV-07 | 29-NOV-07 | 32            |

Figure A2.7 Invoices Report

| INVOICE                               |   |  |                                       |
|---------------------------------------|---|--|---------------------------------------|
| <input type="button" value="Cancel"/> |   | <input type="button" value="Apply Changes"/> |                                       |
| * <u>First Name</u>                   | <input type="text" value="Jeremiah"/>   | * <u>Last Name</u>                           | <input type="text" value="Lumbasi"/>  |
| * <u>Address</u>                      | <input type="text" value="1000"/>       | <u>Phone</u>                                 | <input type="text" value="081-1000"/> |
| * <u>Lease No</u>                     | <input type="text" value="15"/>         | <u>City</u>                                  | <input type="text" value="Windhoek"/> |
| <u>Date From</u>                      | <input type="text" value="11/29/2007"/> | * <u>Hotel Id</u>                            | <input type="text" value="300"/>      |
| <u>Date To</u>                        | <input type="text" value="11/30/2007"/> | * <u>Room No</u>                             | <input type="text" value="301"/>      |
| * <u>Category Code</u>                | <input type="text" value="32"/>         |  |                                       |
| * <u>Daily Rate</u>                   | <input type="text" value="430.95"/>     |  |                                       |
| <u>Amount Payable</u>                 | <input type="text" value="430.95"/>     |  |                                       |
| <u>Amount Paid</u>                    | <input type="text"/>                    |  |                                       |
| <u>Method Of Payment</u>              | <input type="text" value="cash"/>       |  |                                       |
| * <u>Date Of Invoice</u>              | <input type="text" value="12/01/2007"/> |  |                                       |

**Figure A2.8 invoice form**

### A2.8 Other links

This link leads the user to a page with other links information on hotel rooms, staff, room facilities, and room Inspections, separate forms for entering guest details, leases and booking can be accessed via this link. Other reports can also be accessed form this link.



## APPENDIX 3 – DDL script of HAS

This appendix contains DDLs (data definition language) script that was used in creating the application.

```
CREATE TABLE "BOOKING_STATUS"

( "STATUS_CODE" NUMBER(*,0) CONSTRAINT "NN_STATUS_CODE" NOT
NULL ENABLE,

"DESCRIPTION" VARCHAR2(200) CONSTRAINT "NN_DESCRIPTION" NOT NULL
ENABLE,

CONSTRAINT "PK_BOOKING_STATUS" PRIMARY KEY ("STATUS_CODE")
ENABLE
)

/

CREATE TABLE "HOTELS"
( "HOTEL_ID" NUMBER(*,0) CONSTRAINT "NN_HOTEL_ID" NOT NULL
ENABLE,

"HOTEL_NAME" VARCHAR2(20) CONSTRAINT "NN_HOTEL_NAME" NOT NULL
ENABLE,

"HOTEL_ADDRESS" VARCHAR2(40) CONSTRAINT "NN_HOTEL_ADDRESS" NOT
NULL ENABLE,

"CITY" VARCHAR2(40) CONSTRAINT "NN_CITY" NOT NULL ENABLE,

"PHONE" VARCHAR2(20) CONSTRAINT "NN_PHONE" NOT NULL ENABLE,

"MANAGER" VARCHAR2(40) CONSTRAINT "NN_MANAGER" NOT NULL ENABLE,
CONSTRAINT "HOTELS_ID" PRIMARY KEY ("HOTEL_ID") ENABLE
)

/

CREATE TABLE "GUESTS"

( "GUEST_ID" NUMBER(*,0) CONSTRAINT "NN_GUEST_ID" NOT NULL
ENABLE,
"FIRST_NAME" VARCHAR2(20) CONSTRAINT "NN_FIRST_NAME" NOT
NULL ENABLE,
```

```

        "LASTT_NAME" VARCHAR2(20) CONSTRAINT "NN_LASTT_NAME" NOT
NULL ENABLE,
        "ADDRESS" VARCHAR2(40) CONSTRAINT "NN_ADDRESS" NOT NULL
ENABLE,
        "PHONE" VARCHAR2(20),
        "CITY" VARCHAR2(40),
        "NATIONALITY" VARCHAR2(40),
        "GENDER" CHAR(1),
        "DATE_OF_BIRTH" DATE,
        "COMMENTS" VARCHAR2(250),
        "HOTEL_ID" NUMBER,
        CONSTRAINT "PK_GUESTS" PRIMARY KEY ("GUEST_ID") ENABLE,
        CONSTRAINT "HOTELS_GUESTS" FOREIGN KEY ("HOTEL_ID")
        REFERENCES "HOTELS" ("HOTEL_ID") ENABLE
    )
/
CREATE TABLE "ROOM_CATEGORIES"
( "CATEGORY_CODE" NUMBER(*,0) CONSTRAINT "NN1_CATEGORY_CODE"
NOT NULL ENABLE,
  "CATEGORY_NAME" VARCHAR2(40) CONSTRAINT "NN_CATEGORY_NAME"
NOT NULL ENABLE,
  "HOTEL_ID" NUMBER(*,0) NOT NULL ENABLE,
  "DAILY_RATE" NUMBER(10,2) CONSTRAINT "NN_DAILY_RATE" NOT
NULL ENABLE,
  CONSTRAINT "PK_ROOM_CATEGORIES" PRIMARY KEY
("CATEGORY_CODE") ENABLE
)
/
CREATE TABLE "HOTEL_ROOMS"
( "ROOM_NO" NUMBER(*,0) NOT NULL ENABLE,
  "CATEGORY_CODE" NUMBER(*,0) CONSTRAINT "NN_CATEGORY_CODE"
NOT NULL ENABLE,
  "HOTEL_ID" NUMBER(*,0) NOT NULL ENABLE,
  "OCCUPIED" CHAR(1),
  "DESCRIPTION" VARCHAR2(200),
  CONSTRAINT "PK_HOTEL_ROOMS" PRIMARY KEY ("ROOM_NO",
"HOTEL_ID") ENABLE,
  CONSTRAINT "ROOM_CATEGORIES_HOTEL_ROOMS" FOREIGN KEY
("CATEGORY_CODE")
  REFERENCES "ROOM_CATEGORIES" ("CATEGORY_CODE") ENABLE,
  CONSTRAINT "HOTELS_HOTEL_ROOMS" FOREIGN KEY ("HOTEL_ID")

REFERENCES "HOTELS" ("HOTEL_ID") ENABLE
)
/
CREATE TABLE "BOOKINGS"
( "BOOKING_NO" NUMBER(*,0) CONSTRAINT "NN_BOOKING_NO" NOT
NULL ENABLE,

```

```

"HOTEL_ID" NUMBER(*,0) NOT NULL ENABLE,
"STATUS_CODE" NUMBER(*,0) NOT NULL ENABLE,
"GUEST_ID" NUMBER(*,0) NOT NULL ENABLE,
"DATE_FROM" DATE,
"DATE_TO" DATE,
"ROOM_NO" NUMBER NOT NULL ENABLE,
CONSTRAINT "BOOKINGS_CON" CHECK ( "BOOKING_NO" >0) ENABLE,

CONSTRAINT "PK_BOOKINGS" PRIMARY KEY ("BOOKING_NO",
"STATUS_CODE") ENABLE,
CONSTRAINT "GUESTS_BOOKINGS" FOREIGN KEY ("GUEST_ID")
REFERENCES "GUESTS" ("GUEST_ID") ENABLE,
CONSTRAINT "BOOKING_STATUS_BOOKINGS" FOREIGN KEY
("STATUS_CODE")
REFERENCES "BOOKING_STATUS" ("STATUS_CODE") ENABLE,
CONSTRAINT "HOTEL_ROMS_BOOKINGS" FOREIGN KEY ("ROOM_NO",
"HOTEL_ID")
REFERENCES "HOTEL_ROOMS" ("ROOM_NO", "HOTEL_ID") ENABLE
)
/
CREATE TABLE "HTMLDB_PLAN_TABLE"
( "STATEMENT_ID" VARCHAR2(30),
"PLAN_ID" NUMBER,
"TIMESTAMP" DATE,
"REMARKS" VARCHAR2(4000),
"OPERATION" VARCHAR2(30),
"OPTIONS" VARCHAR2(255),
"OBJECT_NODE" VARCHAR2(128),

"OBJECT_OWNER" VARCHAR2(30),
"OBJECT_NAME" VARCHAR2(30),
"OBJECT_ALIAS" VARCHAR2(65),
"OBJECT_INSTANCE" NUMBER(*,0),
"OBJECT_TYPE" VARCHAR2(30),
"OPTIMIZER" VARCHAR2(255),
"SEARCH_COLUMNS" NUMBER,
"ID" NUMBER(*,0),
"PARENT_ID" NUMBER(*,0),
"DEPTH" NUMBER(*,0),
"POSITION" NUMBER(*,0),
"COST" NUMBER(*,0),
"CARDINALITY" NUMBER(*,0),
"BYTES" NUMBER(*,0),
"OTHER_TAG" VARCHAR2(255),
"PARTITION_START" VARCHAR2(255),
"PARTITION_STOP" VARCHAR2(255),
"PARTITION_ID" NUMBER(*,0),
"OTHER" LONG,

```

```

        "DISTRIBUTION" VARCHAR2(30),
        "CPU_COST" NUMBER(*,0),
        "IO_COST" NUMBER(*,0),
        "TEMP_SPACE" NUMBER(*,0),
        "ACCESS_PREDICATES" VARCHAR2(4000),
        "FILTER_PREDICATES" VARCHAR2(4000),
        "PROJECTION" VARCHAR2(4000),
        "TIME" NUMBER(*,0),
        "QBLOCK_NAME" VARCHAR2(30)
    )
/
CREATE TABLE "INSPECTIONS"
    ( "INSPECTION_NO" NUMBER(*,0) CONSTRAINT "NN_INSPECTION_NO"
NOT NULL ENABLE,
        "ROOM_NO" NUMBER(*,0) NOT NULL ENABLE,
        "INSPECTION_DATE" DATE,
        "SATISFACTORY_CONDITION" CHAR(1),

"COMMENTS" VARCHAR2(200),
        "SUPERVISOR_ID" NUMBER(*,0),
        "HOTEL_ID" NUMBER(*,0) NOT NULL ENABLE,
        CONSTRAINT "PK_INSPECTIONS" PRIMARY KEY ("INSPECTION_NO")
ENABLE,
        CONSTRAINT "HOTEL_ROOMS_INSPECTIONS" FOREIGN KEY
("ROOM_NO", "HOTEL_ID")
        REFERENCES "HOTEL_ROOMS" ("ROOM_NO", "HOTEL_ID") ENABLE
    )
/
CREATE TABLE "LEASES"
    ( "LEASE_NO" NUMBER(*,0) CONSTRAINT "NN_LEASE_NO" NOT NULL
ENABLE,
        "DATE_FROM" DATE,
        "DATE_TO" DATE,
        "ROOM_NO" NUMBER(*,0) CONSTRAINT "NN_ROOM_NO" NOT NULL
ENABLE,
        "HOTEL_ID" NUMBER(*,0) NOT NULL ENABLE,
        "GUEST_ID" NUMBER(*,0),
        CONSTRAINT "PK_LEASES" PRIMARY KEY ("LEASE_NO", "ROOM_NO",
"HOTEL_ID") ENABLE,
        CONSTRAINT "HOTEL_ROOMS_LEASES" FOREIGN KEY ("ROOM_NO",
"HOTEL_ID")
        REFERENCES "HOTEL_ROOMS" ("ROOM_NO", "HOTEL_ID") ENABLE,
        CONSTRAINT "HOTELS_LEASES" FOREIGN KEY ("HOTEL_ID")
        REFERENCES "HOTELS" ("HOTEL_ID") ENABLE,
        CONSTRAINT "GUESTS_LEASES" FOREIGN KEY ("GUEST_ID")
        REFERENCES "GUESTS" ("GUEST_ID") ENABLE
    )
/

```

```

CREATE TABLE "INVOICES"
( "INVOICE_NUMBER" NUMBER,
  "LEASE_NO" NUMBER(*,0) NOT NULL ENABLE,
  "ROOM_NO" NUMBER(*,0) NOT NULL ENABLE,
  "GUEST_ID" NUMBER(*,0) NOT NULL ENABLE,
  "DATE_OF_INVOICE" DATE CONSTRAINT "NN_DATE_OF_INVOICE" NOT
NULL ENABLE,
  "METHOD_OF_PAYMENT" VARCHAR2(40),
  "AMOUNT" NUMBER(10,2),
  "HOTEL_ID" NUMBER(*,0) NOT NULL ENABLE,
  CONSTRAINT "PK_INVOICES" PRIMARY KEY ("INVOICE_NUMBER")
ENABLE,
  CONSTRAINT "LEASES_INVOICES" FOREIGN KEY ("LEASE_NO",
"ROOM_NO", "HOTEL_ID")
REFERENCES "LEASES" ("LEASE_NO", "ROOM_NO", "HOTEL_ID")
ENABLE,
  CONSTRAINT "GUESTS_INVOICES" FOREIGN KEY ("GUEST_ID")
REFERENCES "GUESTS" ("GUEST_ID") ENABLE
)
/
CREATE TABLE "REF_ROOM_FACILITIES"
( "FACILITY_CODE" NUMBER(*,0) CONSTRAINT "NN_FACILITY_CODE"
NOT NULL ENABLE,
  "FACILITY_DESCRIPTION" VARCHAR2(200),
  CONSTRAINT "PK_REF_ROOM_FACILITIES" PRIMARY KEY
("FACILITY_CODE") ENABLE
)
/
CREATE TABLE "ROOM_FACILITIES"
( "FACILITY_CODE" NUMBER(*,0) NOT NULL ENABLE,
  "ROOM_NO" NUMBER(*,0) NOT NULL ENABLE,
  "HOTEL_ID" NUMBER(*,0) NOT NULL ENABLE,
  CONSTRAINT "PK_ROOM_FACILITIES" PRIMARY KEY
("FACILITY_CODE", "ROOM_NO", "HOTEL_ID") ENABLE,
  CONSTRAINT "REF_FACILITIES_ROOM_FACILITIES" FOREIGN KEY
("FACILITY_CODE")
REFERENCES "REF_ROOM_FACILITIES" ("FACILITY_CODE")
ENABLE,
  CONSTRAINT "HOTEL_ROOMS_ROOM_FACILITIES" FOREIGN KEY
("ROOM_NO", "HOTEL_ID")
REFERENCES "HOTEL_ROOMS" ("ROOM_NO", "HOTEL_ID") ENABLE,
  CONSTRAINT "HOTELS_ROOM_FACILITIES" FOREIGN KEY
("HOTEL_ID")
REFERENCES "HOTELS" ("HOTEL_ID") ENABLE
)
/
CREATE TABLE "STAFF"

```

```

        ( "STAFF_ID" NUMBER(*,0) CONSTRAINT "NN_STAFF_ID" NOT NULL
ENABLE,
        "EMAIL" VARCHAR2(100),
        "PHONE" VARCHAR2(20),
        "POSITION" VARCHAR2(40),
        "DATE_OF_BIRTH" DATE,
        "GENDER" CHAR(1),
        "MANAGER_SUPERVISOR_ID" VARCHAR2(40),
        "NEXT_OF_KIN" VARCHAR2(40),
        "HOTEL_ID" NUMBER NOT NULL ENABLE,
        "FIRSTNAME" VARCHAR2(40),
        "LASTNAME" VARCHAR2(40),
        CONSTRAINT "PK_STAFF" PRIMARY KEY ("STAFF_ID") ENABLE,
        CONSTRAINT "HOTELS_STAFF" FOREIGN KEY ("HOTEL_ID")
        REFERENCES "HOTELS" ("HOTEL_ID") ENABLE
    )
/

CREATE TABLE "USERS"

(
    "USER_ID" VARCHAR2(40) CONSTRAINT "NN_USER_ID" NOT NULL
ENABLE,
    "HOTEL_ID" NUMBER(*,0) NOT NULL ENABLE,
    "EMAIL" VARCHAR2(50),
    "PHONE" VARCHAR2(20),
    CONSTRAINT "PK_USERS" PRIMARY KEY ("USER_ID", "HOTEL_ID")
ENABLE,
    CONSTRAINT "HOTELS_USERS" FOREIGN KEY ("HOTEL_ID")
    REFERENCES "HOTELS" ("HOTEL_ID") ENABLE
)
/

CREATE UNIQUE INDEX "HOTELS_ID" ON "HOTELS" ("HOTEL_ID")
/

CREATE UNIQUE INDEX "PK_BOOKINGS" ON "BOOKINGS" ("BOOKING_NO",
"STATUS_CODE")
/

CREATE UNIQUE INDEX "PK_BOOKING_STATUS" ON "BOOKING_STATUS"
("STATUS_CODE")
/

CREATE UNIQUE INDEX "PK_GUESTS" ON "GUESTS" ("GUEST_ID")
/

CREATE UNIQUE INDEX "PK_HOTEL_ROOMS" ON "HOTEL_ROOMS"
("ROOM_NO", "HOTEL_ID")
/

CREATE UNIQUE INDEX "PK_INSPECTIONS" ON "INSPECTIONS"
("INSPECTION_NO")
/

```

```

CREATE UNIQUE INDEX "PK_INVOICES" ON "INVOICES"
("INVOICE_NUMBER")
/
CREATE UNIQUE INDEX "PK_LEASES" ON "LEASES" ("LEASE_NO",
"ROOM_NO", "HOTEL_ID")
/
CREATE UNIQUE INDEX "PK_REF_ROOM_FACILITIES" ON
"REF_ROOM_FACILITIES" ("FACILITY_CODE")
/

CREATE UNIQUE INDEX "PK_ROOM_CATEGORIES" ON "ROOM_CATEGORIES"
("CATEGORY_CODE")

/

CREATE UNIQUE INDEX "PK_ROOM_FACILITIES" ON "ROOM_FACILITIES"
("FACILITY_CODE", "ROOM_NO", "HOTEL_ID")
/
CREATE UNIQUE INDEX "PK_STAFF" ON "STAFF" ("STAFF_ID")
/
CREATE UNIQUE INDEX "PK_USERS" ON "USERS" ("USER_ID",
"HOTEL_ID")
/
CREATE SEQUENCE "BOOKING_NO_SEQ" MINVALUE 1 MAXVALUE
999999999 INCREMENT BY 1 START WITH 2 NOCACHE NOORDER NOCYCLE
/
CREATE SEQUENCE "GUEST_ID_SEQ" MINVALUE 1 MAXVALUE
999999999 INCREMENT BY 1 START WITH 13 NOCACHE NOORDER
NOCYCLE
/
CREATE SEQUENCE "INSPECTION_NO_SEQ" MINVALUE 1 MAXVALUE
999999999 INCREMENT BY 1 START WITH 1 NOCACHE NOORDER NOCYCLE
/
CREATE SEQUENCE "INVOICE_NUMBER_SEQ" MINVALUE 1 MAXVALUE
999999999 INCREMENT BY 1 START WITH 9 NOCACHE NOORDER NOCYCLE
/
CREATE SEQUENCE "LEASE_NO_SEQ" MINVALUE 1 MAXVALUE
999999999 INCREMENT BY 1 START WITH 16 NOCACHE NOORDER
NOCYCLE
/
CREATE OR REPLACE TRIGGER "BI_BOOKINGS"
BEFORE INSERT ON Bookings
FOR EACH ROW
BEGIN
IF :new.Booking_No is null
THEN SELECT Booking_No_seq.nextval
INTO :new.Booking_No

```

```

FROM DUAL;
END IF;
END;
/
ALTER TRIGGER "BI_BOOKINGS" ENABLE
/
CREATE OR REPLACE TRIGGER "BI_GUESTS"
BEFORE INSERT ON Guests
FOR EACH ROW
BEGIN
IF :new.Guest_ID is null
THEN SELECT Guest_ID_seq.nextval
INTO :new.Guest_ID
FROM DUAL;
END IF;
END;
/
ALTER TRIGGER "BI_GUESTS" ENABLE
/
CREATE OR REPLACE TRIGGER "BI_INSPECTIONS"
BEFORE INSERT ON Inspections
FOR EACH ROW
BEGIN
IF :new.Inspection_NO is null
THEN SELECT Inspection_NO_seq.nextval
INTO :new.Inspection_NO
FROM DUAL;
END IF;
END;
/
ALTER TRIGGER "BI_INSPECTIONS" ENABLE
/
CREATE OR REPLACE TRIGGER "BI_INVOICES"
BEFORE INSERT ON Invoices
FOR EACH ROW
BEGIN
IF :new.Invoice_Number is null
THEN SELECT Invoice_Number_seq.nextval
INTO :new.Invoice_Number
FROM DUAL;
END IF;
END;
/
ALTER TRIGGER "BI_INVOICES" ENABLE
/
CREATE OR REPLACE TRIGGER "BI_LEASES"
BEFORE INSERT ON leases
FOR EACH ROW

```



```

BEGIN
IF :new.lease_No is null
THEN SELECT lease_No_seq.nextval
INTO :new.lease_No
FROM DUAL;
END IF;
END;
/
ALTER TRIGGER "BI_LEASES" ENABLE
/
CREATE OR REPLACE TRIGGER "GUESTS_INVOICES"
INSTEAD OF UPDATE on GUESTS_INVOICES_VIEW
FOR EACH ROW
BEGIN
--allow the following updates to the underlying invoices table
UPDATE INVOICES SET
        AMOUNT = :NEW.AMOUNT,
        DATE_OF_INVOICE = :NEW.DATE_OF_INVOICE,
        METHOD_OF_PAYMENT = :NEW.METHOD_OF_PAYMENT
        WHERE INVOICE_NUMBER = :OLD.INVOICE_NUMBER;
END;
/
ALTER TRIGGER "GUESTS_INVOICES" ENABLE
/
CREATE OR REPLACE TRIGGER "GUEST_BOOKING"
INSTEAD OF INSERT on GUESTS_BOOKINGS_VIEW
FOR EACH ROW
DECLARE
rowcnt number;
SEQNO NUMBER;

BEGIN
SELECT COUNT(*) INTO rowcnt FROM GUESTS WHERE GUEST_ID =
:NEW.GUEST_ID;
IF rowcnt = 0 THEN
INSERT INTO GUESTS(FIRST_NAME, LASTT_NAME, ADDRESS, PHONE, CITY,
NATIONALITY, GENDER, DATE_OF_BIRTH, COMMENTS)
VALUES (:NEW.FIRST_NAME, :NEW.LASTT_NAME, :NEW.ADDRESS,
:NEW.PHONE, :NEW.CITY, :NEW.NATIONALITY,
:NEW.GENDER, :NEW.DATE_OF_BIRTH, :NEW.COMMENTS);
SELECT Guest_ID_seq.CURRval INTO SEQNO FROM DUAL;
END IF;
SELECT COUNT(*) INTO rowcnt FROM BOOKINGS WHERE BOOKING_NO =
:NEW.BOOKING_NO;
IF rowcnt = 0 THEN
INSERT INTO BOOKINGS(STATUS_CODE,HOTEL_ID, ROOM_NO, GUEST_ID,
DATE_FROM, DATE_TO)

```

```

VALUES (:NEW.STATUS_CODE, :NEW.HOTEL_ID, :NEW.ROOM_NO, SEQNO, :NEW.DATE_FROM, :NEW.DATE_TO);
END IF;
END;
/
ALTER TRIGGER "GUEST_BOOKING" ENABLE
/
CREATE OR REPLACE TRIGGER "GUEST_LEASES_INVOICES"
INSTEAD OF INSERT on GUESTS_LEASES_VIEW
FOR EACH ROW
DECLARE
rowcnt number;
SEQNO NUMBER;
SEQNO1 NUMBER;
AMT NUMBER;

BEGIN
SELECT COUNT(*) INTO rowcnt FROM GUESTS WHERE GUEST_ID =
:NEW.GUEST_ID;
IF rowcnt = 0 THEN
INSERT INTO GUESTS(FIRST_NAME, LASTT_NAME, ADDRESS, PHONE, CITY,
NATIONALITY, GENDER, DATE_OF_BIRTH, COMMENTS)
VALUES (:NEW.FIRST_NAME, :NEW.LASTT_NAME, :NEW.ADDRESS,
:NEW.PHONE, :NEW.CITY, :NEW.NATIONALITY, :NEW.GENDER,
:NEW.DATE_OF_BIRTH, :NEW.COMMENTS);
END IF;
SELECT COUNT(*) INTO rowcnt FROM LEASES WHERE LEASE_NO =
:NEW.LEASE_NO;
IF rowcnt = 0 THEN
INSERT INTO LEASES(HOTEL_ID, ROOM_NO, GUEST_ID, DATE_FROM,
DATE_TO)
VALUES (:NEW.HOTEL_ID, :NEW.ROOM_NO, :NEW.GUEST_ID, :NEW.DATE_FROM, :
NEW.DATE_TO);
SELECT lease_No_seq.CURRval INTO SEQNO1 FROM DUAL;
END IF;

INSERT INTO INVOICES (LEASE_NO, HOTEL_ID, ROOM_NO, GUEST_ID )
VALUES (SEQNO1, :NEW.HOTEL_ID, :NEW.ROOM_NO, :NEW.GUEST_ID);

END;
/
ALTER TRIGGER "GUEST_LEASES_INVOICES" ENABLE
/
CREATE OR REPLACE TRIGGER "INSERT_HOTEL_ROOMS_VIEW"
INSTEAD OF INSERT on HOTEL_ROOMS_VIEW

```

```

FOR EACH ROW
DECLARE
rowcnt number;
BEGIN
SELECT COUNT(*) INTO rowcnt FROM HOTEL_ROOMS
WHERE HOTEL_ID = :NEW.HOTEL_ID AND ROOM_NO = :NEW.ROOM_NO;
IF rowcnt = 0 THEN
INSERT INTO HOTEL_ROOMS(HOTEL_ID, ROOM_NO, CATEGORY_CODE,
OCCUPIED, DESCRIPTION)
VALUES (:NEW.HOTEL_ID, :NEW.ROOM_NO, :NEW.CATEGORY_CODE, :NEW.OCCUPI
ED, :NEW.DESCRPTION);
END IF;
END;
/
ALTER TRIGGER "INSERT_HOTEL_ROOMS_VIEW" ENABLE
/
CREATE OR REPLACE TRIGGER "INSERT_INSPECTIONS_VIEW"
INSTEAD OF INSERT on INSPECTIONSVIEW
FOR EACH ROW
DECLARE
rowcnt number;
BEGIN
SELECT COUNT(*) INTO rowcnt FROM INSPECTIONS WHERE INSPECTION_NO
= :NEW.INSPECTION_NO;
IF rowcnt = 0 THEN
INSERT INTO INSPECTIONS(HOTEL_ID, ROOM_NO, INSPECTION_DATE,
SATISFACTORY_CONDITION, COMMENTS, SUPERVISOR_ID)
VALUES (:NEW.HOTEL_ID, :NEW.ROOM_NO, :NEW.INSPECTION_DATE,
:NEW.SATISFACTORY_CONDITION, :NEW.COMMENTS,
:NEW.SUPERVISOR_ID);
END IF;
END;
/
ALTER TRIGGER "INSERT_INSPECTIONS_VIEW" ENABLE
/
CREATE OR REPLACE TRIGGER "INSERT_LEASESVIEW"
INSTEAD OF INSERT on LEASES_VIEW
FOR EACH ROW
DECLARE
rowcnt number;
BEGIN
SELECT COUNT(*) INTO rowcnt FROM LEASES WHERE LEASE_NO =
:NEW.LEASE_NO;
IF rowcnt = 0 THEN
INSERT INTO LEASES(HOTEL_ID, ROOM_NO, GUEST_ID, DATE_FROM,
DATE_TO)
VALUES (:NEW.HOTEL_ID, :NEW.ROOM_NO, :NEW.GUEST_ID, :NEW.DATE_FROM, :
NEW.DATE_TO);

```

```

END IF;
END;
/
ALTER TRIGGER "INSERT_LEASESVIEW" ENABLE
/
CREATE OR REPLACE TRIGGER "UPDATE_LEASESVIEW"
instead of update on LEASES_VIEW
for each row
begin
-- allow the following updates to the underlying leases table
UPDATE LEASES SET
HOTEL_ID = :NEW.HOTEL_ID,
ROOM_NO = :NEW.ROOM_NO,
GUEST_ID = :NEW.GUEST_ID,

DATE_FROM = :NEW.DATE_FROM,
DATE_TO = :NEW.DATE_TO
WHERE LEASE_NO = :OLD.LEASE_NO;
END;

/

ALTER TRIGGER "UPDATE_LEASESVIEW" ENABLE

/

CREATE OR REPLACE FORCE VIEW "BOOKINGS_VIEW" ("BOOKING_NO",
"STATUS_CODE", "HOTEL_ID", "GUEST_ID", "ROOM_NO", "DATE_FROM",
"DATE_TO") AS
select B.BOOKING_NO, B.STATUS_CODE, B.HOTEL_ID, B.GUEST_ID,
B.ROOM_NO, B.DATE_FROM, B.DATE_TO
FROM BOOKINGS B,USERS

WHERE B.HOTEL_ID = USERS.HOTEL_ID AND
USERS.USER_ID = USER

/

CREATE OR REPLACE FORCE VIEW "GUESTSVIEW" ("GUEST_ID",
"FIRST_NAME", "LASTT_NAME", "ADDRESS", "PHONE", "CITY",
"NATIONALITY", "GENDER", "DATE_OF_BIRTH", "COMMENTS") AS
select G.GUEST_ID, G.FIRST_NAME, G.LASTT_NAME, G.ADDRESS,
G.PHONE, G.CITY, G.NATIONALITY, G.GENDER, G.DATE_OF_BIRTH,
G.COMMENTS
FROM GUESTS G,USERS
WHERE G.HOTEL_ID = USERS.HOTEL_ID AND
USERS.USER_ID = USER
Order by GUEST_ID
/

```

```

CREATE OR REPLACE FORCE VIEW "GUESTS_BOOKINGS_VIEW"
("GUEST_ID", "FIRST_NAME", "LASTT_NAME", "ADDRESS", "PHONE",
"CITY", "NATIONALITY", "GENDER", "DATE_OF_BIRTH", "COMMENTS",
"BOOKING_NO", "STATUS_CODE", "HOTEL_ID", "ROOM_NO", "DATE_FROM",
"DATE_TO") AS

```

```

select G.GUEST_ID, G.FIRST_NAME, G.LASTT_NAME, G.ADDRESS,
G.PHONE, G.CITY, G.NATIONALITY, G.GENDER, G.DATE_OF_BIRTH,
G.COMMENTS, B.BOOKING_NO, B.STATUS_CODE, B.HOTEL_ID,
B.ROOM_NO, B.DATE_FROM, B.DATE_TO
FROM GUESTS G, USERS, BOOKINGS B, BOOKING_STATUS BS, HOTEL_ROOMS
HR

```

```

WHERE BS.STATUS_CODE = B.STATUS_CODE AND
HR.ROOM_NO = B.ROOM_NO AND
HR.HOTEL_ID = B.HOTEL_ID AND
G.GUEST_ID = B.GUEST_ID AND
B.HOTEL_ID = USERS.HOTEL_ID AND
USERS.USER_ID = USER
/

```

```

CREATE OR REPLACE FORCE VIEW "GUESTS_INVOICES_VIEW"
("FIRST_NAME", "LASTT_NAME", "ADDRESS", "PHONE", "CITY",
"INVOICE_NUMBER", "LEASE_NO", "HOTEL_ID", "ROOM_NO",
"DATE_FROM", "DATE_TO", "CATEGORY_CODE", "DAILY_RATE",
"AMOUNT_PAYABLE", "AMOUNT", "METHOD_OF_PAYMENT",
"DATE_OF_INVOICE") AS
select G.FIRST_NAME, G.LASTT_NAME, G.ADDRESS, G.PHONE, G.CITY,
I.INVOICE_NUMBER, I.LEASE_NO, I.HOTEL_ID, I.ROOM_NO, L.DATE_FROM,
L.DATE_TO, RC.CATEGORY_CODE, RC.DAILY_RATE, (RC.DAILY_RATE *
(L.DATE_TO - L.DATE_FROM)) "AMOUNT_PAYABLE", I.AMOUNT,
I.METHOD_OF_PAYMENT, I.DATE_OF_INVOICE
FROM GUESTS G, USERS, LEASES L, ROOM_CATEGORIES RC, HOTEL_ROOMS
HR, INVOICES I

```

```

WHERE RC.CATEGORY_CODE = HR.CATEGORY_CODE AND
HR.ROOM_NO = L.ROOM_NO AND
HR.HOTEL_ID = L.HOTEL_ID AND
L.LEASE_NO = I.LEASE_NO AND
I.GUEST_ID = G.GUEST_ID AND
I.HOTEL_ID = USERS.HOTEL_ID AND
USERS.USER_ID = USER
/

```

```

CREATE OR REPLACE FORCE VIEW "GUESTS_LEASES_VIEW" ("GUEST_ID",
"FIRST_NAME", "LASTT_NAME", "ADDRESS", "PHONE", "CITY",
"NATIONALITY", "GENDER", "DATE_OF_BIRTH", "COMMENTS",
"LEASE_NO", "HOTEL_ID", "ROOM_NO", "DATE_FROM", "DATE_TO",
"CATEGORY_CODE", "DAILY_RATE", "AMOUNT") AS

```

```

select G.GUEST_ID, G.FIRST_NAME, G.LASTT_NAME, G.ADDRESS,
G.PHONE, G.CITY, G.NATIONALITY, G.GENDER, G.DATE_OF_BIRTH,
G.COMMENTS,
L.LEASE_NO, L.HOTEL_ID, L.ROOM_NO,L.DATE_FROM, L.DATE_TO,
RC.CATEGORY_CODE, RC.DAILY_RATE, (RC.DAILY_RATE * (L.DATE_TO -
L.DATE_FROM)) "AMOUNT"

```

```

FROM GUESTS G,USERS, LEASES L, ROOM_CATEGORIES RC, HOTEL_ROOMS
HR
WHERE RC.CATEGORY_CODE = HR.CATEGORY_CODE AND
HR.ROOM_NO = L.ROOM_NO AND
HR.HOTEL_ID = L.HOTEL_ID AND

```

```

G.GUEST_ID = L.GUEST_ID AND
L.HOTEL_ID = USERS.HOTEL_ID AND
USERS.USER_ID = USER

```

/

```

CREATE OR REPLACE FORCE VIEW "HOTEL_ROOMS_VIEW" ("HOTEL_ID",
"ROOM_NO", "CATEGORY_CODE", "OCCUPIED", "DESCRIPTION") AS
select HR.HOTEL_ID, HR.ROOM_NO, HR.CATEGORY_CODE,
HR.OCCUPIED, HR.DESCRPTION
FROM HOTEL_ROOMS HR,USERS
WHERE HR.HOTEL_ID = USERS.HOTEL_ID AND
USERS.USER_ID = USER

```

/

```

CREATE OR REPLACE FORCE VIEW "INSPECTIONSVIEW"
("INSPECTION_NO", "HOTEL_ID", "ROOM_NO", "INSPECTION_DATE",
"SATISFACTORY_CONDITION", "COMMENTS", "SUPERVISOR_ID") AS
select "INSPECTIONS"."INSPECTION_NO" as "INSPECTION_NO",
"INSPECTIONS"."HOTEL_ID" as "HOTEL_ID",
"INSPECTIONS"."ROOM_NO" as "ROOM_NO",
"INSPECTIONS"."INSPECTION_DATE" as "INSPECTION_DATE",
"INSPECTIONS"."SATISFACTORY_CONDITION" as
"SATISFACTORY_CONDITION",
"INSPECTIONS"."COMMENTS" as "COMMENTS",
"INSPECTIONS"."SUPERVISOR_ID" as "SUPERVISOR_ID"
from "INSPECTIONS" "INSPECTIONS", "USERS" "USERS"
WHERE INSPECTIONS.HOTEL_ID = USERS.HOTEL_ID AND
USERS.USER_ID = USER

```

/

```

CREATE OR REPLACE FORCE VIEW "LEASES_VIEW" ("LEASE_NO",
"HOTEL_ID", "ROOM_NO", "GUEST_ID", "DATE_FROM", "DATE_TO") AS

select L.LEASE_NO, L.HOTEL_ID, L.ROOM_NO, L.GUEST_ID,
L.DATE_FROM, L.DATE_TO
FROM LEASES L,USERS

```

```

WHERE L.HOTEL_ID = USERS.HOTEL_ID AND
USERS.USER_ID = USER
/
CREATE OR REPLACE FORCE VIEW  "ROOM_FACILITIES_VIEW"
("FACILITY_DESCRIPTION", "FACILITY_CODE", "ROOM_NO", "HOTEL_ID")
AS
  select      "REF_ROOM_FACILITIES"."FACILITY_DESCRIPTION" as
"FACILITY_DESCRIPTION",
      "ROOM_FACILITIES"."FACILITY_CODE" as "FACILITY_CODE",
      "ROOM_FACILITIES"."ROOM_NO" as "ROOM_NO",
      "ROOM_FACILITIES"."HOTEL_ID" as "HOTEL_ID"
  from "ROOM_FACILITIES" "ROOM_FACILITIES",
      "REF_ROOM_FACILITIES" "REF_ROOM_FACILITIES", "USERS"
"USERS"
  where
"ROOM_FACILITIES"."FACILITY_CODE"="REF_ROOM_FACILITIES"."FACILIT
Y_CODE" AND
      "ROOM_FACILITIES"."HOTEL_ID" = "USERS"."HOTEL_ID" AND
      "USERS"."USER_ID" = USER
/
CREATE OR REPLACE FORCE VIEW  "STAFFVIEW" ("STAFF_ID",
"FIRSTNAME", "LASTNAME", "POSITION", "EMAIL", "PHONE",
"DATE_OF_BIRTH", "GENDER", "HOTEL_ID", "MANAGER_SUPERVISOR_ID",
"NEXT_OF_KIN") AS

  select
S.STAFF_ID,S.FIRSTNAME,S.LASTNAME,S.POSITION,S.EMAIL,S.PHONE,
S.DATE_OF_BIRTH,S.GENDER,S.HOTEL_ID,S.MANAGER_SUPERVISOR_ID,
S.NEXT_OF_KIN
FROM STAFF S,USERS
WHERE S.HOTEL_ID = USERS.HOTEL_ID AND
USERS.USER_ID = USER
/

```